RESPONSE OF CERTAIN SERUM ENZYMES TO EXERCISE IN ENTIRE, CASTRATED AND VASECTOMISED MALE BUFFALOES. V. K. Agarwal, S. P. Agarwal, Narinder Singh and P. K. Dwaraknath. Dept. Physiology and Pharmacology. Haryana Agricultural University. Hissar, Haryana.

Twelve male buffaloes, 4 each in entire, castrated and vasectomised group were exercised by pulling a 100 kg roller on a kaccha ground for three hours. Blood samples were drawn immediately before and after exercise and after 1, 2, 6 and 20 hrs of rest. Serum from these samples were analysed for the enzyme concentration of lactic dehydrogenase (LDH), serum glutamic oxaloacetate transaminase (SGOT), serum glutamic pyruvate transaminase (SGPT) and alkaline phosphatase (ALKP). The level of ALKP was significantly higher in entire as compared to vasectomised and castrated animals. The enzyme level marginally increased after exercise but returned to pre-exercise level after 2 hours of rest. The basal level of LDH was significantly higher in castrated group. Although, the level did not change much immediately after exercise, it continued to increase up to six hours of rest and were maintained up to 20 hours of rest. The SGOT level was lowest in castrated animals, slightly increased after exercise and continued to rise for 1 hour after rest. The high level was maintained up to 20 hours of rest, except in controlled group where it returned to pre-exercise level. The SGPT level was more or less constant between different groups and in relation to exercise. It is concluded that the LDH, SGOT and SLP are more prone to fluctuations as a response to exercise in male buffaloes.

2

SIGNIFICANCE OF ACID PHOSPHATE STUDIES IN MALE INFERTILITY. S. Ajmera, R. C. Gupta, and S. N. Gupta. Dept. Physiology. S. M. S. Medical College. Jaipur, Rajasthan.

A detailed microscopic investigation of semen along with biochemical estimations of two androgen dependent constituents of seminal plasma, fructose and acid phosphatase, was carried out in 50 males of reproductive age seeking advice for an infertile marriage.

In our series, azoospermia, as a group showed a very wide range of fructose as compared to healthy fertile male. Oligozoospermia showed higher levels of fructose than normozoospermics but it was not significant statistically. Again the acid phosphatase levels were higher in oligozoospermics and azoospermics as compared to normozoospermic infertile male and healthy control group. There was definite correlation found between sperm density and motility. Higher counts were associated with higher percent motility. Number of viable cells was not related statistically to sperm count. Fructose and acid phosphatase levels bear no direct correlation with each other, although both are androgen dependent constituents, or when sperm density is taken into consideration. Acid phosphatase levels were inversely related to percent motility, but this correlation is unexplainable because prostatic secretions as such are known to improve the human sperm motility.

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SOME PHYSIOLOGICAL PARAMETERS DURING THE PERFORMANCE OF CERTAIN ASANAS. V. Anantharaman. Dept. Physiology. P.G. Institute of Basic Medical Sciences. Taramani, Madras.

Twenty normal healthy subjects who had practised yoga rigorously for more than two years were asked to perform some basic asanas. (1) Ardha Padmasana, (2) Dharmic Asana, (3) Sarvangasana, (4) Sethubandhasana and (5) Ardha Matsyendrasana. Records of E.C.G., E.E.G., E.M.G., Respiration and Blood flow were done during that particular posture of the asana. Each parameter of each asana was compared with that of ardha padmasana which is taken as a control. The results showed that there was a significant increase in peripheral blood flow. A burst of acitvity whenever the muscles are involved was seen. The E.E.G. showed a change from alpha to beta predominance from the control to that of the asana studied.

4

EFFECT OF ESTRUMATE (ICI 80996) ON PLASMA PROGESTERONE AND OESTRADIOL IN BUFFALO HEIFERS. N. K. Bachlaus, R. C. Arora, A. Prasad and R. S. Pandey. Hormone Research Laboratory. Division of Dairy Chemistry. National Dairy Research Institute. I.C.A.R. Karnal, Haryana.

Estrumate (ICI 80996 Cloprostenol) a synthetic analogue of prostaglandin F₂ alpha is a very potent luteolytic agent effective in cattle at a single intramuscular (im) dose of 0.5 mg. This property of the drug has been successfully harnessed for the control of buffalo oestrous cycle by a single i.m. injection. In the present experiment, a regime of two such injections have been administered in 8 cycling buffalo heifers at an interval of 12 days between them, in order to examine the efficacy of this regime for synchronization of oestrus. Plasma progesterone and oestradiol- 17β were monitored from the day of first injection till 4 days after the second injection of the drug. Following second injection of Estrumate, there was high degree of synchrony in the return of oestrus. Seven (7) of the 8 cycling heifers treated (87.50%) exhibited oestrus within $3.14 \pm$ 0.26 days after the second dose, with ovulation in 6 and conception in 4 heifers. A rapid decline in plasma progesterone within 24 hours showed evidence of Estrumate induced luteolysis. Oestradiol-17ß increased within 48-72 hours post-injection. Hormonal changes around oestrus following induced luteolysis were closely similar to those occuring around a spontaneous oestrus. The technique offers the possibility of controlled breeding in buffaloes.

5

EFFECT OF PIRACETAM ON HALOPERIDOL INDUCED CATALEPSY IN RATS. J. J. Balsara, T. R. Bapat and A. G. Chandorkar. Dept. Pharmacology. Dr. V. M. Medical College. Solapur, Maharashtra.

Piracetam, 2-OXO-1-pyrrolidine-acetamine (Nootropil), is a cyclic GABA analogue. As GABA mimetic compounds have been shown to potentiate haloperidol induced catalepsy it was therefore decided to study the effect of

Piracetam on haloperidol-induced catalepsy in rats. Piracetam, in high doses, was found to induce catalepsy while sub-cataleptic doses of Piracetam were found to potentiate significantly haloperidol-induced catalepsy in rats. Piracetam, however, failed to antagonise apomorphine-induced stereotyped behaviour thereby ruling out the possibility of its possessing dopamine receptor blocking activity.

The possible mechanism involved in the induction of catalepsy by Piracetam and in the potentiation of haloperidol-induced catalepsy by subcataleptic doses of piracetam is discussed on the basis of its structural similarity to GABA.

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THIOCYNATE CONTENT OF VEGETABLES, IN AND AROUND DELHI. S. K. Basu and M. N. Srinivasan. Radiation Pathology Dept. Institute of Nuclear Medicine and Allied Sciences. Delhi.

Thiocynate, an antithyroid agent, is known to interfere in the mechanism of iodine utilisation for the formation of thyroid hormones. Food samples (5gm, fresh weight) were macerated with activated sand (ARE. Merch) and extracted with methanol and filtered. The filtrate was passed through alumina column which elutes thiocyanate quantitatively, retaining all the interfering colouring pigments. The eluate was quantitatively estimated for thiocyanate by comparison with a standard curve prepared under identical condition with known quantities of thiocyanate using a colour reaction with a pyridinebenzidine reagent.

7

SERUM ELECTROLYTES OF RATS UNDER INDUCED DIARRHOEA. S. K. Basu and M. N. Srinivasan. Dept. Radiation Pathology. Institute of Nuclear Medicine & Allied Sciences. Delhi.

Male albino rats of average body weight 210–220gm were used in the experiment. Control group of rats were given water ad. libitum and the experimental groups were subjected to acute dehydration through purging by giving Magsulph (300mg/100gm) through orogastric tube. Na⁺, K⁺ and Cl⁻ concentrations in serum and the packed cell volume (PCV) percentage was determined. An increase in red cell potassium and consequent decrease in cellular sodium was observed. Concentration of serum Na⁺ and Cl⁻ increased markedly but with a marginal increase in serum K⁺. PCV percentage showed marked increase with about 10% loss in body weight in dehydrated cases. Significance of the above findings will be discussed.

EFFECT OF CONTINUOUS MODERATE EXERCISE ON SERUM FATTY ACIDS IN MATURITY ONSET DIABETICS. N. K. Bhardwaj, N. P. Singh Verma and A. S. Chakrabarty. Dept. Medicine and Physiology. Maulana Azad Medical College. New Delhi. 10

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Ten diabetics in the age group between 40-55 years and ten identical controls were selected for this study. All the subjects performed work on a bicycle ergometer. The work consisted of 900 revolutions of the wheel against one kg. resistance over fifteen minutes. Serum free fatty acids were estimated 5 minutes before the start of exercise, then every 5 minutes after the start of exercise till 15 minutes, and then 5, 10, 15 and 60 minutes after the cessation of exercise. In the diabetics the level fell after 5 minutes exercise. It then rose and assumed significantly higher levels at the end of exercise compared with the controls. The level kept on increasing progressively during the subsequent rest period. After one hour of rest, although the level had come down, they were significantly higher than the pre-exercise level. The rise in free fatty acid level was depressed by the presence of insulin. The result indicated that the increased concentration of free fatty acids initiated by exercise in diabetics was due to greater mobilisation of free fatty acids as compared with diabeties at rest.

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EFFECT OF INTERMITTENT MODERATE EXERCISE ON SERUM LIPIDS IN MATURITY ONSET DIABETICS. N. K. Bhardwaj, N. P. Singh Verma and A. S. Chakrabarty. Dept. Medicine & Physiology. Maulana Azad Medical College. New Delhi.

The study was undertaken to find out the effect of intermittent exercise on serum lipids in maturity onset diabetics. Thirty newly diagnosed cases of non obese diabetes without any complications were selected for this study. All the patients were in the 40–55 years of age group. Intermittent exercise was carried out as follows:

The patients ran for ten minutes at about 10 km/hr. and walked briskly for the next five minutes, the sequence being repeated over a distance of three kilometers in the evening. Prior to these studies the patients were trained. Serum cholesterol, triglycerides and free fatty acids were estimated before the start of experiments and after one month with insulin and the results were compared after one month of exercise with insulin. There was no significant change of serum cholesterol and triglycerides in diabetic patients compared with the initial values, after one month of insulin and after one month of insulin and exercise. There was significant reduction of free fatty acid level after one month of insulin where there was no significant difference of free fatty acid level between one month of insulin and one month of insulin and exercise. Thus, one month of intermittent exercise could not modify lipid metabolism in diabetes mallitus.

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STUDY OF CHANGE OF POTENTIALS ACROSS THE LIVING MEMBRANE WITH K⁺ AND Na⁺ IONS. P. Bhargava, K. P. Tewari and N. K. Misra. Dept. Physiology. H. P. Medical College. Simla, H. P. A two compartment model is used to study the potential profiles of the frog skin membrane (abdominal) at different molar conc. of KCl and NaCl solutions, keeping the concentration-ratio of the respective solutions to 1:10. At different mean-concentrations, different value of potential-difference is found. KCI solutions showed normal behavior. The present membrane is found to be electronegative. NaCl showed a peculiar behavior. It has also been found to change the nature of the membrane. In a group of six experiments, potential-difference comes down to~5 mV at 10⁻³M concentration. If one increase the molarity, a further increase in electronegativity is observed which is further reduced till it attains equilibrium. When KCl is added it is found to compete with Na⁺ ions as is observed earlier. In between 10⁻⁴ to 10⁻³M concs. of NaCI, the membrance potential has always been found to decrease considerably showing a sudden change. This sudden change can occur when some structural changes are also associated. These experimental data of Na⁺ and K⁺ ions to the living membrane-interface are discussed in the present work.

11

"DERMATOGLYPHICS"-SOME-OBSERVATIONS. V. S. Bhat, Vidya G. Parulkar and J. V. Bhatt. Dept. Physiology. T. N. Medical College. Bombay.

Finger print patterns of 100 normal males and 70 normal females were studied. Total ridge count was found to be lesser in females as compared to males. The findings will be discussed.

Finger print patterns of normal and mentally retarded due to non-genetic cause and genetic cause were also studied.

Finger print patterns of mentally retarded due to non-genetic cause did not differ from normal.

Finger print patterns of mentally retarded due to genetic cause significantly differed from normal.

Results will be discussed.

12

EFFECT OF ENVIRONMENTAL TEMPERATURE ON TOTAL RED CELL VOUME. Ajit Bhattacharya. Dept. Physiology. Christian Medical College. Ludhiana, Punjab.

Total Red Cell Volume was determined as the difference between plasma volume (determined by dilution of Evan's blue dye 10 minutes after injection in 96 young adults-52 males and 44 females, in early and late summer and winter) and blood volume (determined from plasma volume and packed cell volume) and expressed as ml/kg body weight. Comparison of the mean values of the different groups show that : a) in males it was 12.2% higher, and b) in females it was 20.8% higher in early summer than in early winter, c) in males it was 2.6% higher and d) in females it was 10.4% higher in late summer than in late winter. The changes in groups a), b) and c) were statistically significant.

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The Red Cell Volume is significantly higher in summer as compared to winter. The changes are more marked initially, in the females and become less pronounced after prolonged exposure.

13

RAT LIVER ENZYMES AND LIGHT AS A ZEIT GEBER OF CIRCADIAN RHYTHM. R. D. Bhattacharya. Institute for Anatomy I. Hannover. W. Germany.

It is accepted that natural or artificial light dark cycle of a 24-h period is the most effective synchronizer of zeit geber of animals. From the previous studies, it has been observed that by inverting the light dark cycle by 180°, the rhythmic pattern of body activity and the mitotic index will phase shift within a relatively short span of life, irrespective of the sex and strain of the animals. The present study has been performed in the month of June-July on female Wister rats to investigate the 180° light dark shift on some liver enzymes, along with the phase shift markers : body activity and mitotic index. This study suggests that the synchronizing effect of light-dark cycle atleast for some rhythmic variables of rodents might not give the same response. Some variables can be shifted immediately whereas others might take longer time.

14

CIRCADIAN RHYTHM OF URINARY ZINC IN HEALTHY SUBJECTS AND DIABETES MELLITUS. *Radium Dalwadi Bhattacharya* and *B. N. Mazumdar*. Dept. Physiology. B. J. Medical College. Ahmedabad, Gujarat.

The circadian rhythm of urinary zinc excretion has been studied in twenty five presumably healthy subjects. The peak of the excretion occured at 0900 (1.152 mg/lit) and at 1800 (0.636 mg/lit). When the highest and lowest values were compared, a statistically significant difference has been observed (P=0.01). A reference value has been established for zinc excretion for this particular ethnic group (Gujarati) with vegetarian food habit from 24 hours overall mean. The value observed is 0.9079 mg/lit, which is higher than the referred values in books. The probable reasons for this will be discussed. An independent study has been carried out in diabetic (mellitus) patients in respect to the change in phasing, cycle and amplitude of circadian rhythm of urinary zinc excretion. The 24-4 overall mean "urinary zinc excretion is higher in diabetic patients.

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TEMPERATURE VARIATIONS IN DAILY CURRICULUM OF ADULT MALES—A CRITICAL STUDY. S. Bhushan, S. P. Singh and P. Seth. Dept. Physiology. B. R. D. Medical College. Gorakhpur.

Oral temperature of the patients is routinely recorded in the clinics and hospitals but what is normal range and when it is febrile or subnormal is not clearly understood. In routine practice it is observed that the temperature above the tittle red arrow at 37°C on clinicalthermometers is taken to be febrile and below the arrow as non febrile. Does it apply to Indians or it is just for western countries but accepted blindly for us? Also the diurnal variations, effect of food intake, excercise, anxiety and tensions in Indians needs clear elucidation.

Keeping the above facts in view 124 male medical students (17-19 years) were selected. They were thoroughly examined and only healthy subjects were selected. All the thermometers were tested for the accuracy before providing them to students. The subjects were put under basal conditions and morning oral temperature was recorded for 5 minuts in each case for 3 days and thus a mean value of 30°C was obtained. Mean diurnal variation of 1°C was recorded. The temperature increased by a mean value of 0.3°C after taking food. The students were subjected to a fixed excercise and significant change in the temperature was observed.

The results obtained will be discussed in detail.

16

A HAND GRIP DYNOGRAPH AND WEIGHING MACHINE : TWIN APPLICATION OF A SIMPLE PRINCIPLE. R. L. Bijlani. Dept. Physiology. All India Institute of Medical Sciences. New Delhi.

A hand grip dynograph and weighing machine have been developed by applying the relationship 'force/area=pressure'. Force is applied to a relatively constant area provided by the partially inflated bladder taken from the compression cuff of a sphygmomanometer. Under circumstances, the rise in pressure is proportional to the force applied, and after calibration, the pressure reading can be used to deduce the force. Thus the force, be it in the form of hand grip strength, or in the form of body weight, can be measured. The maximum isometric hand grip tension measured by the reported device and a standard instrument are well correlated (r=0.86). The relative load isometric endurance tests performed on the two instruments do not compare favourably (r=0.23). The estimation of body weight performed on the device described here and a standard machine are very close (r=0.98).

The devices are simple, sturdy and inexpensive. The dynograph may be used for research and teaching. The weighing machine may be found useful in clinical practice where a standard machine is not available, as well as in field work, where a standard machine may be difficult to transport.

NUTRIENT ABSORPTION FROM HIGH FIBRE LACTOVEGETARIAN DIETS. R. L. Bijlani, V. R. Young and N. S. Scrimshaw, Dept. Nutrition and Food Science. Massachusetts Institute of Technology. Cambridge, U.S.A.

Seven human volunteers were fed three diets closely approaching North Indian, South Indian and North American vegetarian diets, respectively, for consecutive periods of 14 days each. All the three diets were high fibre diets, providing 44, 16 and 21 g of plant cell wall components every day. Dietary intake data and fecal excretion during the last nine days of each dietary period were used to assess absorption. Mean fecal excretion of energy on the three diets was 263.0 kcal; 169.6 kcal and 167.6 kcal/day, giving an apparent digestibility of 91.3%, 94.6% and 94.4%, respectively. The mean fecal nitrogen excretion on the three diets was found to be 2.81 g, 2.30 g and 1.88 g/day, giving apparent digestibility of 85.1%, 86.3% and 87.4% respectively. Corresponding figures for fat are 11.2 g (89.7%), 9.2 g (89.8%) and 9.4 g (92.4%), respectively.

The impaired availability of nutrients from high fibre diets has important physiological as well as public health implications. The additional fecal losses deserve to be considered while using dietary intake data to assess the nutritional status of marginally nourished populations, as well as while recommending allowances for them.

18

HOARDING SCORE IN CAUDATE-LESIONED ALBINO RATS. A. S. Borker and M. G. Gogate. Dept. Physiology. Goa Medical College. Bambolim. Panjim, Goa.

The hoarding score was determined in nine adult albine male rats after allowing them to hoard the food pellets for 30 minutes and consume the food for subsequent 90 minutes. The food was withheld for 22 hours and water was allowed ad libitum throughout 24 hours. In 6 subjects bilateral anterior caudatal lesions were carried out with stainless steel unipolar electrode with the tip diameter of 100 microns by passing anodal D.C. current from $1\frac{1}{2}$ volt D.C. source for 30 seconds. During the post-operative period the mean score was observed to be significantly reduced in all. Three remaining subjects were treated as Sham series in which electrodes were passed in the anterior caudate region but no lesion was attempted. In all these Sham series no sigcificant alteration in the hearding score was observed. The results suggest the possible role of anterior caudate in hoarding of food.

19

GASTRIC JUICE ELECTROLYTES. Brahma Dutt. Jhansi Medical College. Jhansi, U.P.

Different rates of secretion along with Pavlov-Hollander dual secretions, or Teorell's back diffusion, or gastric mucosal barrier to Na ions, theories had been used as basis for estimating either gastric juice volumes or concentrations



of H ion or its output to explain the pathophysiology in dyspepsias. In this pilot study the concept of 'active' hydrogen ions was examined by measuring osmolality as evidence of free dissociated ions as different from chemically determined amounts. The main H, Na, K, & Cl ions were estimated from visual indicator titration, flame photometry and isoelectric titrations respectively. The above were measured in stimulated, basal and residual (the pretest aspirates to empty the stomach) samples of gastric juice from 16 randomly selected subjects. Freezing point determinations gave osmolality directly. Calibration readings were taken daily from standards. Pentagastrin was the stimulant in supramaximal dose. Mechanical collection of the 10 min. aliquotes was done from a fluoroscopically sited gastric tube. Data seem to show the differences reflecting the nature of secretions and most probably does reflect the hitherto nonmeasurable yet important components of gastric juice indirectly-chiefly the proteins and mucus. More data would be needed for physiological influence of sex, age and weight for diagnostic use.

20

HUMAN PLACENTAL ACETYL CHOLINE (ACh) IN HEALTH AND DISEASE. P. Brahmayya Sastry, M. Satyanarayana and G. Ramakrishnam Raju. Dept. Physiology and Obstetrics and Gynaecology. Andhra Medical College. Visakhapatnam, A. P.

Placental mince in case of deliveries of 19 healthy and 23 diseased women was incubated, in triplicate, for 2 hrs. at 37° C in 10 ml of phosphate-buffered (pH 7.4), eserinised (5×10^{-5} g/ml) and oxygenated Ringer-Locke's fluid. Fluid incubate, collected every $\frac{1}{2}$ hr for free (F) ACh, and acid-extracted tissue-incubate at 2 hrs for bound (B) ACh were assayed on the recorded arterial blood pressure of chloralosed and eviscerated cat. Incubates cold-stored for 2 hrs served as controls. *The normal ACh* in microgram/g of wet tissue was 7.4 (F), 8.1 (B), 0.85 (F/B) and 11.34 (Synthesis).

In Rh-ve mothers, antepartum haemorrhage and diabetes the placental ACh showed no change; but in concealed accidental haemorrhage, preeclamptic toxaemia, eclampsia, intrauterine foetal death and anencephalic foetus, the F, B and synthesis values for ACh were reduced to 20 to 50% of the normal; while the F/B and the *rate of increase* of ACh release along the 2 hour incubation course remained unchanged. The authors are grateful to Govt. of A.P., and the U.G.C., for their support and the Rockfeller Foundation, New York, for their gift equipment.

21

ACETYLCHOLINE (ACh) TURNOVER FROM CEREBRAL CORTEX DURING EPILEPTIFORM ACTIVITY IN DECEREBRATE CAT. P. Brahmayya Sastry and K. R. Rajeswari. Dept. Physiology. Andhra Medical College. Visakhapatnam, A. P.

Cat's brain was exposed under aether H; and decerebration, and, in some experiments, neurological isolation of one suprasylvian gyrus (SSG) were made. A small perspex cup was placed on either SSG and filled with eserinised

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is, or s had atrations (10^{-4} g/ml) and bicarbonate-buffered (pH 7.4) Ringer-Locke's fluid (ERL). The cups were emptied every 15 minutes and refilled with fresh ERL for $2\frac{1}{2}$ hours. At the end, the cortex, exposed to ERL, was excised and acid-extracted. The free (F) ACh and the bound (B) ACh were determined by bioassay on recorded arterial blood pressure of chloralosed and eviscerated cat.

In 20 unstimulated SSG the ACh turnover was 0.50F (intact) and 0.36F (isolated) in mug/cm²/min; and 3.8B and 3.7B in ug/g respectively. In 13 experiments the SSG was concurrently stimulated (1.0 msec; 10 CPS; for 5 Sec) with suitable voltage that evoked epileptiform after-discharge (EAD). The ACh (F) during EAD was 211% of that during normal activity in the stimulated SSG (57/45 observations); and was 248% on the contralateral, unstimulated SSG showing EAD spread (22/21 observations). An EAD spread to isolated cortex seems to increase ACh only on par with that from the stimulated intact SSG. The ACh kinetics in relation to cortical activity would be discussed. The authors are grateful to Govt. of A. P. and ICMR for their support and to Rockfeller Foundation, New York for their gift equipment.

22

FEEDING BEHAVIOUR IN SOCIALLY ISOLATED RATS. K. Chakrabarty, A. S. Chakrabarty, O. P. Bhatnagar and S. K. Lal. Dept. Physiology. Maulana Azad Medical College. New Delhi.

The aim of the present investigation is to study the effect of social isolation on feeding behaviour in albino rats. Albino rats, weighing between 50-60 gms, were selected for our experiments. They were housed in a group of 4 animals. When they attained weights between 100 to 150 gms, they were trained daily in a skinner's box for 15 minutes after an overnight fast, to press the bar for getting a reward in the form of a small pellet of food. When the rate of bar-pressing reached to about 80/hr., 8 animals were separated and housed in separate cages, while the rest of the 8 animals were kept in two groups of 4 animals. After 3 weeks the rate of bar-pressing was counted for 15 days in both socially isolated and grouped animals. The results showed that the socially isolated, when compared with grouped rats, decreased the rate of bar-pressing. After 5 weeks food consumption was measured for four hours after an overnight fast for five days. Average food consumption was found to be less in isolated animals. As administration of corticosterone increases food intake, the decrease of food intake in socially isolated adult rats cannot be attributed to long-term stress.

23

ELECTROLYTE COMPOSITION IN NORMAL AND CATARACTOUS LENSES. A. G. Chandorkar, P. M. Bulakh and M. V. Albal. Dept. Pharmacology. Dr. V. M. Medical College. Solapur, Maharashtra.

The study of eventual changes of cations and chloride content in lenses undergoing cataractous process could be anticipated to be of some interest as possible evidence of a failure of the mechanisms which regulate lens volume and hydration.

Hence Sodium, Potassium, Magnesium, Calcium and Chloride contents were determined in normal lenses of goats and dogs and in the human cataractous lenses obtained after intracapsular extraction. An attempt was also made to study the effect of inhibition of cation pump by cooling and/or damaging lens menbrane by freezing and thawing in normal animal lenses.

Our results indicate an increase in Sodium, Chloride and Calcium content along with a decrease in potassium contents in later stage in experimental cataracts and in human cataractous lenses. Increase in lens hydration and opacification was also observed after cooling and freezing.

The increase in sodium ion concentration and in calcium ion concentration along with an increase in lens hydration may be responsible for the lens turbidities and for later opacification. The increase in chloride ion concentration may be secondary to increase in the Sodium ions so also the decrease in ionic concentration of potassium.

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A NEW HYPOTHESIS IN THE PATHOPHYSIOLOGY OF R. SCHIZOPHRENIA AND DRUG INDUCED PARKINSONISM. Chandramouli and Sarda Subrahmanyam. Dept. Physiology. P. G. Institute of Basic Medical Sciences. Taramani, Madras.

Extrapyramidal symptoms were induced in chronic ashizophrenics by administering Chloropromazine. They were divided into two groups, Under double blind conditions one group received L.DOPA alone (1g/day) in two divided doses orally for 2 months and the other group received L.DOPA in the same dosage as Group I along with Chlorpromazine (300 mg/day) for the same period. Psychological, clinical and biochemical assessments were done before L.DOPA administration, during therapy and after completion. Homovanillic Acid (HVA), the metabolite of dopamine showed a rise in the C.S.F. and urine, after L.DOPA administration in both the groups. Psychotic symptoms were exacerbated in both the groups after L.DOPA. The group which received L.DOPA alone showed the disappearance of extrapyramidal symptoms during L.DOPA therapy. The other group, where L.DOPA was given along with Chlorpromazine showed no improvement in the extrapyramidal symptoms. Based on Klawn's two receptor theory for dopamine in the striatum, a new hypothesis is put forward to explain the pathophysiology of schizophrenia and the incidence of neuroleptic-induced parkinsonism.

25

DEGREE OF DAMAGE OF LIVER PARENCHYMA BY PROTHROMBIN TIME. Archana Chatterjee and S. B. Chatterjee. Dept. Biochemistry I.P.G.M.E.T.R. Calcutta, W. Bengal.

Prothrombin time has a close relationship with the liver disease because prothrombin itself is synthestised in the liver. There are various means for evaluation of the liver function. Dysfunction is indicated by evidence of Jaundice. If this is due to hepatic parenchyma in its early state, it has been observed alongwith other liver function tests, prothrombin time can also

indicate the degree of damage of the hepatic parenchyma. In this laboratory during the determination of Prothrombin time in case of Jaundice, it has been observed that it is more increased in obstructive cases-than in case of early hepatic damage.

Prothrombin time test is done by modified quick's method(1).

It has been observed that normal Prothrombin time is 18 seconds in average. In case of infective hepatitis (in its early stage) varies from 22–28 secs. whereas serum albumin, globulin ratio is almost normal and alkaline phosphatase is also not high. In the case of obstructive Jaundice, albumin, globulin ratio is altered and alkaline phosphatase is high, while Prothrombin time varies from 30–40 secs.

So, the conclusion is arrived at by the clinical as well as other laboratory observations.

Reference :- Quick, A. J. (1939), Amer, J. digest DIS 6, 716.

26

POSSIBLE IMPACT OF CORTICAL HORMONE ON CERTAIN HYDROLASES IN AMPHIBIA (BUFO MELANOSTICTUS). Ajay K. Chatterjee, Anuj Paul and Pranabes Nath. Dept. Physiology. University College of Sciences. Calcutta, West Bengal.

The role of cortisone acetate on certain hydrolases, such as, ATPase, RNAase and leucine aminopeptidase was studied in toads (*Bufo melanostictus*). Male toads weighing 40-60 g were administered with cortisone acetate (1 mg/100 g body weight for 5 days) to study the effect of cortisone *in vivo*. The effects of contisone *in vitro* were studied by adding cortisone acetate at various concentraions to the incubation systems containing the tissue preparations. Cortisone *in vivo* elevated the ATPase activity of both liver and kidney tissues, but *in vitro* it had a depressing effect. Cortisone *in vivo* as well as *in vitro* depressed the liver RNAase activity. The leucine aminopeptidase activity of liver or kidney tissue was not found to be influenced by the cortisone treatment *in vivo*, but their activities were depressed when cortisone was added *in vitro*. The possible signifiance of these findings will be discussed.

27

STUDY ON THE OESTROUS CYCLE OF RATS UNDER THE DIFFERENT GRADES OF EXERCISE. Pratima Chatterjee, A. M. Chandra, S. Chatterjee and C. Deb. Dept. Physiology. Work Physiology Lab. Calcutta.

The effect of different grades of excercise viz (i) long-term running on treadmill and (ii) short-term running on treadmill have been investigated on the oestrous cycle in the albino rats.

It is an established concept that physical exercise exerts a marked influence on the normal functioning of several endocrine glands. Reports are also available that different intensities of exercise can influence the activities of these glands differently, it becomes highest in case of intense or prolonged type of exercise and there occurs a moderate or no change during a light or moderate execise bout.

It has been observed that long-term exercise produced a disturbance in the oestrous cycle ultimately leading to diestrous in rats but with the application of short-term exercise there was no inhibition of sexual cycles in female rats. The present study indicates the possibility of disturbance in the ovarian functions after long-term exercise but not short-term. Other biochemical and histo-chemical studies are at present being carried out on the matured rats to note the steroidogenic activities of ovaries and adrenals at a particular stage of reproductive cycle in both normal and experimental conditions.

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ROLE OF NOREPINEPHRINE IN STEREOTYPED BEHAVIOUR OF RHESUS MONKEYS.* Mandira Das and S. K. Manchanda. Dept. Physiology. A.I.I.M.S. New Delhi.

Norepinephrine and dopamine are present in high levels both in limbic and neo-striatum. Although it is now well established that dopamine is essential for stereotype behaviour, the role played by norepinephrine remains controversial. In an earlier communication we have described that in the rhesus monkey amphetamine increased vigilance and head movements, decreased blink rate and locomotion, while apomorphine induced continuous bucco-linguomasticatory movements with variable changes in vigilance, increased head movements, increased blink rate and hyperactivity. The usual grooming, eating, drinking and locomotion were absent during these periods of stereotypy. Pretreatment with alpha-methyl-p-tyrosine (20-75 mg/kg, i.p.) which is known to block conversion of tyrosine to DOPA, blocked the amphetamine stereotypy, but not the apomorphine induced stereotyped behaviour. On the other hand, pretreatment with disulfiram (200-400 mg/kg, i.p.) which prevents conversion of dopamine to nor-epinephrine and phenoxybenzamine (1.5-2.5 mg/kg, i.m.), the nor-adrenergic receptor blocking agent, converted the amphetamine induced stereotyped behaviour into the apomorphine type of stereotypy consisting of continuing bucco-linguo-masticatory movements as if performed by an automaton unmindful of the surroundings. It seems that the dopaminergic nerve endings provide the major pathways for the elaboration of repetitive stereotype activities, while the nor-adrenergic pathways exert the environment dependent modulating influences on these activities.

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29

CARDIORESPIRATORY ADAPTATION IN NORMAL PREGNANCY. Tarun Das, R. B. Prajapati, M. Pujara and H. Jana. Dept. Physiology. Smt. N. H. L. Municipal Medical College. Ahmedabad.

Most observations on physiological parameters in pregnancy are done in early, middle or late cases. In this study four ladies have been the subjects from their



early pregnancies. Pulse, blood pressure, oral and surface temperatures, pulmonary ventilation and vital capacity have been recorded during pregnancy and lactation. Postlactation data were taken as their normal nonpregnant data. All the subjects had normal uncomplicated gestation period and they had normal childbirth.

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Increase of body weight was about 10 kg on an average. Pulse, blood pressures, respiration rate and body temperatures were slightly higher than those in their nonpregnant state. Inspiratory capacity was found to rise as the pregnancy advanced, but their vital capacities were at the same level throughout pregnancy. Vital capacities and FEV, determined by Vitalograph (open circuit) were definitely higher than those observed by closed circuit Benedict-Roth apparatus.

30

SKINFOLD MEASUREMENTS AND CORRELATION WITH BODY DENSITY IN YOUNG ADULTS. Suneeta V. Datar, D. C. Salgar, S. N. Shirodkar and V. A. Katti. Dept. Physiology. Govt. Medical College. Miraj.

In the present study the body density was measured in young college students by densitometric method. Skinfold thickness was measured at nine different sites in each student.

Total body fat content is estimated by Behnke's formula. The range of body fat content, the mean body fat and probable upper limit of body fat content is found out in these students.

Coefficient of variation for each skinfold was determined and it was least for subscapular skinfold in males and it was least for the skinfold midway between the umbilicus and anterior superior iliac spine in females.

Graphs of body density against skinfold thickness were plotted and it was observed that subscapular skinfold showed better correlation with body density in our series, in males. In females, skinfold midway between the umbilicus & nipple, showed better correlation with body density.

Cardiac efficiency was estimated and it was observed that there was no correlation between body fat content & cardiac efficiency.

Blood levels of various fat components were studied and there was no significant correlation observed between the blood levels of various fat components & body fat content.

31

SPLANCHNIC NERVE AFFERENTS IN RELATION TO VISCERAL PAIN. Violet Dawka. Dept. Physiology. Gauhati Medical College. Gauhati.

Observations on the pathway of visceral pain made in animals were reviewed. Electrical stimulation of the afferent fibres of splanchnic nerve, visceral afferents in the intestine and mesenteric nerve bundle done on 20 dogs anaesthetized with chloralose showed a rise of blood pressure, changes in respiration, dilatation of the pupil and visceromotor reflexes in all. Vocalisation was heard in four dogs. These reactions were seen to be similar to those produced due to pain positively. Effects on blood pressure showed a decline as the lower parts of the intestine was explored presumably due to descending gradient of afferent activity. After bilateral vagotomy blood pressure rise changed to a more prominent and lasting one probably due to loss in the buffer mechanism. Pupil dilation was a very delicate and constant response and could be relied on as an index of visceral afferent activity. A correlation to fibre type that is small sized fibres histologically seen are most probably responsible for carrying pain.

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EXPERIMENTAL INTESTINAL ISCHEMIA AND THE EFFECT OF INTRALUMINAL OXYGEN. Violet Dawka. Dept. Physiology. Gauhati Medical College. Gauhati.

The small intestine of 20 (twenty) rats were made Ischaemic by occluding the Superior Mesenteric artery for 120 minutes. 10 (ten) of the rats were treated gaseous oxygen introduced intraluminally after 30 minutes of clamping of with S.M.A. The rest 10 (ten) rats were in the control group. Revascularisation was done after 120 minutes in both groups. The mortality rate of the control group was 100% significantly higher then 40% mortality of the oxygen treated rates. Histological changes caused by ischaemia were markedly reduced in the oxygen treated group, suggesting therefore that intraluminal oxygen might be an important additional factor in the therapy of Partially Ischaemic bowel.

33

MECHANISM OF ATROPHY OF DEVELOPING BRAIN IN MALNURITION. K Deo, V. Bijlani and M. G. Deo. Dept. Physiology. A.I.I.M.S. New Delhi.

Protein calorie malnutrition in first three weeks of life retards the growth of cerebellum in rats. Growth is a balance of two processes, i.e. cell division and cell death in the EGL (External granular layer). Our studies on cell generation time showed prolongation of cell cycle time in undernourished rats. Present study is aimed to see whether there is any alteration in the kinetics of neuronal death in developing cerebellum in malnutrition.

Number of dead cells per EGL in control as well as undernourished, rats were counted as different days of age. No differences were observed. No of dead cells will also depend on the rate of disappearance of the dead (Pyknotic) cells, which will be governed by rate of autolysis. The autolytic time was estimated by killing the cells of EGL at known time by 200r whole body irradiation. In both the group t/2 autolytic time was of 8 hours medicating that the process of autolysis is not affected by malnutrition.

A study of the process of cell death vis a vis phases of the cell cycle indicate that in both the groups cell die in the last $\frac{1}{2}$ hour of the S phase. No change in dead cell kinetics of EGL was present in undernourished rats. The reduction in size of the cerebellum is due to decrease in proliferative activity of the EGL.

403

ELECTROPHYSIOLOGY OF ORGANIZATION OF THE PREFRONTAL CEREBRAL CORTEX OF PRIMATE. T. Desiraju. Dept. Neurophysiology. National Institute of Mental Health of Neuro Sciences. Bangalore.

Although the preforntal cerebral cortex is a uniquely magnified endowment of primate evolution subserving both higher nervous and mental functions, little is known about its physiological organization. By laminar recording of field potentials in the cortex of rhesus monkey it was found that the augmenting and recruiting potentials could be generated by electrical stimulations in nucleus medialis dorsalis and rostral border of internal medullary lamina respectively of the thalamus. In contrast to these responses, the ones generated by stimulations of cingulate gyrus were found to be of the primary type. In further experiments in which the responses of the limbic cortex were recorded during stimulations of prefrontal cortex, it was observed that the limbic system cortex and prefrontal cortex have reciprocally influencing mechanisms. These findings suggest clues to the specialization of the prefrontal cortex as a basis for mechanisms of association of the so-called rational with the affect.

35

ZINC, A TRACE ELEMENT ESSENTIAL IN VITAMIN A MOBILIZATION FROM THE LIVER. G. S. Dhekne, S. K. Ganeriwal and D. L. Patil. Dr. V.M.M.C. Solapur, Maharashtra.

Zinc is necessary to maintain normal concentrations of serum vitamin A, but the exact mechanism of its action remains to be explored, an attempt has been made in the present work for the same. Animal experiments have been carried out on albican rats by putting them on double deficient diet (deficient in vit. A and zinc) and then supplimenting the diet with vitamin A and zinc. Estimations of zinc and vitamin A are carried out on serum and liver tissue. The results indicate that zinc has definite role in mobilization of vitamin A from liver.

36

WATER AS ENTRAINER OF CICARDIAN RUNNING ACTIVITY IN THE RAT. R. A. Dhume and M. G. Gogate. Dept. Physiology. Goa Medical College. Goa.

While it is generally accepted that light-dark cycles (LD cycles) are the major synchronizers of cicardian rhythms, a few other environmental cues have been shown to be capable of entraining the same. Many reports are available to show that the feeding time synchronizes running activity in rats. So far it is not clearly reported whether or not periodic presentation of water is capable of entraining the cicardian running activity in rats. The present work is therefore designed to study the influence of periodic presentation of water to the animal having free access to food and kept in Day/Night environment (12 : 12 LD



cycles). Five mature male albino rats were used for the study. The 24 hour activity shift patterns of incentive drives for food and water were recorded with the help of maze-cum-activity cage with automatic recording system fabricated in the laboratory and described elsewhere*. It was observed that activity pattern was shifted towards the drinking period with bursts of running preceding water presentation.

*Abstracts of XXIV Annual Conference of A.P.P.I. December 1978

37

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STUDIES WITH SCORPION VENOM ON MUSCLE ACTIVITY. B. S. Gajalakshmi, B. Vijayalakshmi and M. Subramaniam. Dept. Physiology. Stanley Medical College. Madras.

Very limited studies have been carried out on the effects of scorpion poison on muscle activity. Two of the commonly known offending species, Buthus tamulus and Palamneus gravimanus are generally responsible for the stings in human beings and among them the most poisonous one is Buthus tamulus. The aim of the present study is to find out the changes in skeletal and plain muscle following injection of fresh venom in graded doses. The venom was injected into the dorsal lymph sac of the amphibian. Neuromuscular block was produced with Tubocurarine and when the skeletal muscle was directly stimulated, there was an increase in the contractions. The excitability, responses with contractility and fatiguibality of muscular tissues show great diversity in their graded doses of scorpion venom.

The effect of scorpion venom on guinea pig's ileum was recorded in graded doses at intervals of 10 minutes and found to be dose dependant. After pretreatment with 4/ug of atropine per ml, the effect of scorpion venom on the gut was completely blocked. Obviously the effect on plain muscle is mediated through parasympathetics, since it is effectively blocked with atropine. Buthus tamulus venom is more potent than the Palamneus in its action on muscle tissue. Many of the observations will be discussed briefly.

38

INTEGRATED TEACHING IN HUMAN REPRODUCTION, FAMILY PLANNING AND POPULATION DYNAMICS AT PRE CLINICAL LEVEL.' S. K. Ganeriwal, B. V. Reddy, G. S. Dhekne, V. R. Athawale and S. M. Chhatre. Dept. Physiology. Dr. V.M.M.C. Solapur, Maharashtra.

Integrated Teaching Programme in Human Reproduction, Family Planning and Population Dynamics was conducted at pre-clinical level. The various faculties participated were Anatomy, Physiology, Biochemistry, Preventive & Social Medicine, Obstetrics & Gynaecology and Paediatrics. Sixtyone students of the Ist M.B.B.S. 3rd Semester attended and took active participation in the course. The duration of the programme was for five days, six hours a day. The curriculum of teaching programme was taken from recommendations of W.H.O. (1977). Various audio-visual aids like overhead projector, slides, tapes, films etc. were used to make a proper impact of the training programme. In uddition to the traditional methods of teaching, students were introduced to an

atmosphere of workshop, where they were given full chance to participate individually, and in groups. They also learnt the techniques of group dynamics through various games. The programme was objectively tested by exposing the students to a pre-test and a post-test.

The result of the two methods namely the "Conventional methods" of teaching vis-a-vis the "group activity" are compared. The students have highly appreciated the integrated method of teaching more so in the form of group activity as revealed from their feed backs.

39

SHORT TERM EFFECT OF BILATERAL ADRENALECTOMY AND SUBDIAPHRAGMATIC VAGOTOMY ON HISTAMINE CONTENT OF STOMACH IN PYLORUS LIGATED RATS. A. K. Ganguly. Dept. Physiology. Govt. Medical College. Surat, Gujarat.

We have reported earlier that a fall in gastric tissue histamine concentration occurs in albino rats exposed to stress of pylorus ligation, which could be prevented by subdiaphragmatic vagotomy indicating that gastric response to vagal stimulation could be due to histamine released from the stomach wall. This view is further supported by our observation of fall in gastric tissue histamine concentration, due to direct stimulation of vagus nerves. Our earlier experiments on gastric mucosal mast cell population indicated that adrenals also influence gastric physiology through release of histamine from the stomach wall. The present experiment was planned to study the effect of bilateral adrenalectomy and subdiaphragmatic vagotomy associated with bilateral adrenalectomy on gastric tissue histamine concentration. The result shows that bilateral adrenalectomy under the acute experimental situation, planned, could not prevent the fall in gastric tissue histamine concentration due to stress of pylorus ligation; on the other hand, when pylorus ligation was associated with both bilateral adrenalectomy and subdiaphragmatic vagotomy, the gastric tissue histamine concentration was maintained within normal limits. The result will be discussed.

40

LONG TERM EFFECT OF BILATERAL ADRENALECTOMY AND SUBDIAPHRAGMATIC VAGOTOMY ON GASTRIC TISSUE HISTAMINE CONCENTRATION IN ALBINO RATS. A. K. Ganguly, K. Somasundaram, V. K. Chawla and R. H. Majithia. Dept. Physiology. Govt. Medical College. Surat, Gujarat.

Our earlier experiments on mast cell population indicate that both vagal and adrenal pathways act on gastric glands possibly by releasing histamine from stomach wall. In these experiments, mast cell population was studied one to two weeks after subdiaphragmatic vagotomy or bilateral adrenalectomy. But our another observation shows that bilateralectomy could not prevent the fall of gastric tissue histamine concentration in vagus intact pylorus ligated rats when the experiment was planned on the same day of bilateral adrenalectomy whereas, subdiaphragmatic vagotomy could. This led us to plan the present



experiment to study the effect of bilateral adrenalectomy or subdiaphragmatic vagotomy on a long term basis on gastric tissue histamine concentration. From the result, it can be seen that 14 days after the operation of mock subdiaphragmatic vagotomy or subdiaphragmatic vagotomy or mock bilateral adrenalectomy, there was not much alteration in gastric tissue histamine concentration, whereas, 14 days after bilateral adrenalectomy, the gastric tissue histamine concentration increased to two and half times the basal level, thus indicating that following bilateral adrenalectomy, a rise in synthesis and storage of histamine took place in the stomach tissue.

41

EFFECT OF EXOGENOUS HISTAMINE ADMINISTRATION ON GASTRIC TISSUE HISTAMINE CONCENTRATION IN ALBINO RATS. A. K. Ganguly, K. Somasundaram, A. K. Mathur and K. B. Solanki. Dept. Physiology. Govt. Medical College. Surat, Gujarat.

That histamine is a potent stimulator of gastric glands is known. It has been suggested that about fifty percent of total body histamine is located in the stomach wall. We have demonstrated earlier that in stressful situations, vagal and adrenal pathways act on gastric glands by liberating histamine from gastric mucosal mast cells in albino rats. It is well known that antihistaminics like Mepyramine maleate, while blocking the different systemic effects of histamine, does not interfere with the action of histamine on gastric glands. In order to elucidate the mechanism of action of exogenously administered histamine on gastric glands the present experiment was planned. The result shows that exposure of the animals to stress of pylorus ligation, whether pretreated with Mepyramine maleate or not, cause about fifty percent reduction in gastric tissue histamine concentration in comparison to the control level of 12.73 ug per gram of tissue. The result also shows that exogenously administered histamine produced further fall in gastric tissue histamine concentration in comparison to pylorus ligated animals, the fall being more with increased dose of exogenously administered histamine, indicating thereby that exogenously administered histamine also acts on gastric glands by liberating endogenous histamine from the stomach wall.

42

CIMETIDINE AND GASTRIC TISSUE HISTAMINE CONTENT IN ALBINO RATS. A. K. Ganguly, K. Somasundaram, K. B. Solanki and A. K. Mathur. Dept. Physiology. Govt. Medical College. Surat, Gujarat.

That stress of pylorus ligation alters the gastric physiology by causing liberation of histamine from the stomach wall as a result of vagal and adrenal hyperactivity has been demonstrated by us. Cimetidine, a H_2 receptor blocker has been shown to block the histamine action on gastric glands. We have observed that exogenously administered histamine brings about a fall in histamine content of stomach tissue in albino rats. The present experiment

was planned in order to study the effect of Cimetidine on gastric tissue histamine concentration in histamine treated pylorus ligated and 48/80 compound treated rats.

It can be seen from the result that pylorus ligation for two hours could cause fifty percent fall in gastric tissue histamine concentration in albino rats irrespective of pretreatment of the animals with a low dose of Cimetidine or saline. A further fall in gastric tissue histamine concentration was observed when the pylorus ligated animals, pretreated with a low dose of Cimetidine were injected with 200 ug of histamine. On the other hand, when the pylorus ligated animals, pretreated with a high dose of Cimetidine were injected with 200 ug of histamine, not only the fall in gastric tissue histamine concentration was prevented, the value approached towards that of normal animals. The result therefore suggests that Cimetidine in higher dosage not only acts as a H_2 receptor blocker, it can prevent the release of histamine as well. This observation is further confirmed by the fact that the fall in gastric tissue histamine concentration following injection of 48/80 compound, a histamine releaser was not only prevented by Cimetidine, there was a rise in gastric tissue histamine concentration.

43

EFFECT OF ADMINISTRATION OF 48/80 COMPOUND ON THE RELEASE OF GASTRIC TISSUE HISTAMINE IN ALBINO RATS. A. K. Ganguly, K. B. Solanki, A. K. Mathur and K. Somasundaram. Dept. Physiology. Govt. Medical College. Surat, Gujarat.

41/80 compound is known to cause a rapid release of histamine principally from the mast cells. It has been used extensively in determining the importance of histamine in various tissue responses and specially in studies of inflammation and allergy. We planned to study the effect of administration of 48/80 compound in relation to different dosage and time schedule on gastric tissue histamine concentration.

From the result it can be seen that eighteen hours after one injection of 1 ug per gram body weight of 48/80 compound, there was not much alteration in gastric tissue histamine concentration in comparison to the control value of 12.73 ug per gram of tissue, whereas, eighteen hours after the injection of the compound in the doses of 2 and 4 ug per gram body weight respectively, there were significant rise in gastric tissue histamine concentrations, the rise being more with injection of 2 ug per gram of body weight.

A similar rise in gastric tissue histamine concentration was observed in animals, eighteen hours after the last dose following two injection schedules each of 1, 2, and 4 ug per gram of body weight respectively. On the other hand, 3 hours after one injection of the compound in the dosage of 4 ug per gram body weight, a highly significant fall in gastric tissue histamine concentration was observed. The result will be discussed.

INFLUENCE OF ASPIRIN ON GASTRIC TISSUE HISTAMINE CONTENT IN ALBINO RATS. A. K. Ganguly, A. K. Mathur, K. B. Solanki and K. Somasundaram. Dept. Physiology. Govt. Medical College. Surat, Gujarat.

Aspirin is known to produce alteration of gastric functions so much so as to produce bleeding and ulceration of the stomach mucosa; but how exactly aspirin brings about these manifestastion is not properly understood. We have provided evidences to show that vagal and adrenal pathways act on gastric glands by liberating histamine from the stomach wall. A similar mechanism of action has been observed for exogenously administered histamine and 48/80 compound. We thought that it might be interesting to study the effect of aspirin administration on histamine content of gastric tissue in albino rats.

From the result it can be seen that aspirin in two different dosage schedules could cause a fall in gastric tissue histamine concentration within six hours after oral administration, the fall being greater with higher dose of aspirin. A similar fall in gastric tissue histamine concentration in pylorus ligated rats was also observed when pylorus ligation was associated with aspirin administration.

45

EFFECT OF VITAMIN C ON NORMAL SERUM CERULOPLASMIN LEVELS. P. S. Gokhale, A. N. Sontakka and L. V. Vad. Dept. Physiology. B. J. Medical College. Pune, Maharashtra.

Vit. C is said to decrease the raised serum ceruloplasmin levels in cases of schizophrenia. This led us to find out the effect of Vit. C on normal serum ceruloplasmin levels.

28 male subjects between the age group of 16–18 yrs. were chosen. In all, two samples of blood were taken from each volunteer and the serum ceruloplasmin estimated. First sample gave us normal ceruloplasmin levels. Later massive doses of Vit. (500 mg. bd.x15) were given to the subjects and second sample of blood collected and analysed. The estimation was done by oxidation of paraphenylenediamine hydrochloride and the results were analysed and will be presented.

46

MODULATION OF FOWL'S CLOACAL TEMPERATURE RHYTHM BY ALTERING THE FOOD COMPOSITION. V. Gopal and R. Srinivasan. Division of Neurophysiology and Behaviour. Dept. Zoology. Madras University Postgraduate Centre. Coimbatore, Tamilnadu.

The light and dark rhythm is so far the only known external stimulus capable of developing in warm blooded animals an exact 24 hrs rhythm of body temperature. Our previous series of investigations have shown that meal-timing can override the effect of LD cycles and modulate the body temperature rhythm. The present attempt was made to evaluate the effects of the different types of diets on the circadian pattern of cloacal temperature, pattern of locomotor activity, food and water intake activity. Under natural light dark schedule of 12:12 hrs, the fowls wcre provided with four different composition of diets. It consisted of 1. Balanced diet (TAPCO feed); 2. Carbohydrate (Ragi); 3 Fat (Ground nut); and 4. Protin (Egg). Every three hours, their cloacal temperature, food and water consumptions were measured. The locomotor activity and feeding activity (Food and water) were recorded automatically and the intensity of frequency were evaluated statistically. The results indicate that the bouts of activity recorded automatically for different types of food were different from each other. The patterns of temperature curve also was different from one type of food to another. The experiments throws light on the importance of nutritional effect on the physiology and behaviour of fowls.

47

FISH ACTIVITY RECORDER. V. Gopal and M. Palanisamy. Division of Neurophysiology and Behaviour. Dept. Zoology. Madras University Postgraduate Centre and PSG College of Technology and Polytechnic. Coimbatore, Tamilnadu.

It is customary to use a tilting set up, or photocell arrangement to record the locomotor activity of animals. In the tilting set up the animal will move over a solid surface tilting of which can close a switching circuit. In the photocell arrangement, the crossing of anim al will intercept the light which will trigger the circuit. Since the light is an important factor that modifies the circadian locomotor activity, the use of light source will interfere with the experiment. Fish being a swimming aquatic animal, tilting of solid base will be a problem. To circumvent these two main problems the present circuit was evolved utilising the ultrasonic transmitter principle.

Ultrasonic emitter and a receiver is fixed on the sink walls just below the water surface of the fish chamber. The emitter and receiver uses a peizo-electic crystal as ultrasonic transducer. The emitter is inductively coupled to the oscillator. The ocillator is tuned to ultrasonic frequency. The emitter is unductively coupled to the oscillator to radiate standing wave patrern. The output of the receiver changes when the fish comes between the emitter and receiver. Duc to the disturbance the change in the output of the receiver triggers the schmitt trigger. The output from the Schmitt trigger is given to RC combination to form triggering pulse. The triggering pulse is applied to the monostable multivibrator.

Now the pulse V_1 is put into the input of the monostable. The transistor T_1 begins to turn on when the base to emitter voltage reaches approximately 0.6 volt. As T_1 turns on, the collector voltage of T_1 drops and hence the base voltage of T_2 drops, and the transistor T_2 is driven toward cut off. Positive feed back acts to accelerate the process and soon the transistor T_2 is completely cut off and T_1 is saturated. However this situation does not persist indefinitely. The capacitor 'C' will change up with a time constant $T=RD_2C$. The base to emitter voltage of T_2 reaches a paoximately 0.6 volt, the monostable multivibrator will switch back to the stable state where T_2 is saturated and T_1 is cut off; the output of the monostable multivibrator is given to the recorder.

CIRCADIAN INFLUENCE OF REPRODUCTIVE CYCLE ON SOUR TASTE PERCEPTION IN INDIAN WOMEN. V. Gopal and Savithri Natarajan. Division of Neurophysiology and Behaviour. Madras Univ. PG Centre. Dept. Zoology. Coimbatore, Tamilnadu.

In view of abnormal taste behaviour observed during pregnancy a series of taste perception analysis was carried out on Indian women during a complete series of reproductive cycle starting from ovulation through pregnancy and delivery. Different concentrations of acetic acid solutions representing sour taste were prepared and tested to find out the taste threshold. Other taste modalities served as controls.

Periodic analysis of taste detection threshold revealed that (1) pregnant women are more sensitive (low threshold) to sour taste than their normal age mates; (2) sour taste perception sensitivity decreases (high threshold) after delivery; (3) on the day of menstruation there is a definite lowering of sour sensitivity (high threshold) which starts declining slowly 2 weeks prior to menstruation, i. e. approxmiately around the day of ovulation.

Along with our electrophysiological observations that gustatory neural transmissions are either facilitated or inhibited by hormones, the present series of experiments seem to suggest a neuroendocrine interplay of hormones and taste perception. The results are discussed in the background of our

neurophysiological investigations in acute animal preparations which reveal that the sour taste receptors are more resistant to various drugs than the salt, sweet and bitter taste receptors.

49

STUDIES ON THE DIURNAL RHYTHM IN THE TEMPERATURE REGULATION IN CALOTES VERSICOLAR. V. Gopal and Kulandaivel. Dept. Zoology. Madras Univ. PG Centre. Coimbatore, Tamilnadu.

Homeotherms are able to maintain the body temperature constant. However recent studies indicate that there are fluctuations in their body temperature. Likewise poikilothermic animals are considered to change their body temperature in accordance with environmental temperature. The following experiments were initiated to know whether the body temperature of poikilothermic sails with environmental temperature or do they have their own physiological control against the environment reflecting a rhythm in their body temperature.

Groups of calotes were selected and acclamatised to the laboratory conditions. Environmental and cloacal temperature were observed simultaneously at an intervel of three hours for three days continuously. Averages of the body temperature worked out and compared with that of environment. The comparision signifies that the difference between the body temperature and the environmental temperature is minimum during 08.00 hrs and it is maximum during 14.00 hrs and 20.00 hours. The maximum and minimum deviations were observed at the same hours everyday irrespective of fall or raise of environmental temperature, there by reflecting a rhythm.

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DISRUPTION OF OESTROUS RHYTHM AFTER ELECTRICAL ABLATION OF ME-ARCUATE NUCLEUS OF THE BRAIN IN THE RAT. V. Gopal and C. V. R. Indira. Division of Neuro physiology and Behaviour. Dept. Zoology. Madras Univ. PG Centre. Coimbatore, Tamilnadu.

Various hypothesis such as single oscillator and multioscillator models have been proposed to explain the mechanism of physiological rhythms in the control of animal behaviour. With a view to locate the neural mechanism involved in the control of physiological rhythms, investigations on the problem of localization of functions in the central nervous system was carried out by electrical ablation and stimulation procedures coupled with sterotaxic instrumentation techniques. One such problems selected for our study is the effect of brain lesions of the circadian oestrous rhythm.

Female rats of the same age group were housed in individual cages, were fed ad libitum and kept under natural light-dark conditions. The rats with regular oestrous cycles were screened for lesion technique. With the use of the threedimensional co-ordinate system provided by the sterotaxic instrument the skull of the animal is placed in a standard position ; the electrode is inserted into the specific area of the brain with the help of the sterotaxic brain atlas, Anaesthetised rats were lesioned bilaterally through implanted electrodes in the Median Eminence-Arcuate (ME-ARC) area of the brain and the vaginal smear observations was compared before and after lesion.

The result reveal that median arcuate nucleus is the centre responsible for the circadian oestrous rhythm controlling the reproductive cycle. The results are discussed in the background of neural mechanism of circadian rhythm (Biological-clock).

51

EFFECT OF INVERSION OF SLEEP AND WAKEFULNESS AND FOOD HABITS ON HUMAN TEMPERATURE RHYTHM. V. Gopal, K. Nagarajan, R. Srinivasan, Rathna Gopal, A. R. Rajavel and C. V. R. Indira. Division of Neurophysiology and Behaviour. Dept. Zoology. Madras Univ. PG Centre. Coimbatore, Tamilnadu.

Irrespective of the extreme variations that may occur in environmental temperatures, human subjects being homeotherms are able to maintain body temperature constant. However that constancy is not exhibited through out the day. It shows a rise and fall for approximately 24 hrs due to which we say that body temperature follows a rhythmic circadian pattern. Since the minimum temperatures are observed during sleep or resting period and the maximum is seen when awake or the active period, muscular activity has been considered as the important factor in causing the rhythm.

The present study was therefore initiated to find out the influence of inversion of sleep and wakefulness and food habits on human temperature rhythm. The results obtained indicate that the temperature rhythm can be phase-shifted by shifting sleep and wake-fulness schedule. Also shifting food schedule can phase shift the temperature rhythm. Wakefulness coupled with food intake had additive effect on the rise of body temperature rhythm whereas sleep coupled with no food has additive effect on the decline of temperature rhythm. The results are discussed in the background of the body temperature pattern of night shift workers.



INVERSION OF BODY TEMPERATURE PATTERN DURING OESTROUS CYCLE BY CONSTANT LIGHT. V. Gopal and C. V. R. Indira. Division of Neurophysiology and Behaviour. Dept. Zoology. Madras Univ. PG Centre. Coimbatore, Tamilnadu.

In the scientific literature of this century, the reproductive cycles of many species are described in detail. But there is relatively little experimental data to prove the relationship of body temperature to the circadian reproductive cycle depending on a particular environmental signal. Studies on the effect of light upon persistent daily rhythm reveal many of the important properties, and constitute an important experimental means of adducing the nature of the mechanisms involved. As early as 1960 Aschoff has investigated in considerable detail this aspect of daily rhythm and reported that continuous illumination decrease the spontaneous frequency in light-active organisms. This has prompted us to carry out the following investigation. Female rats were screened for the regularity of the oestrous cycle under standardised conditions. Observations of body temperature and vaginal smears were made on groups or healthy female rats kept under constant light. The temperature rhythm and oestrous cycle are disturbed leading to constant oestrous (CE) syndrome and altered due to constant illumination, Frequency of oestrous cycles are decreased by the prolongation of certain phases, specifically at oestrous stage. Correlation between body temperature and oestrous stages shows a variation between different stages of oestrous cycle. The inversion of body temperature pattern at oestrous phase by the constant light conditions are discussed.

53

THE EFFECT OF DIETHYL CARBAMAZINE ON FROG RECTUS ABDOMINIS MUSCLE. H. N. Gopalakrishna and E. Shamareddy. Dept. Pharmacology. Kasturba Medical College. Mangalore.

It has been reported that Diethyl carbamazine has nicotine like action on autonomic ganglia. The present study was undertaken to find out whether Diethylcarbamazine has nicotinic action on skeletal muscle or not. We tested its effect on isolated Frog Rectus abdominis muscle preparations. Diethylcarbamazine produced contracture of the muscle like acetylcholine and it is dose related. It potentiated the action of acetylcholine. The contractile response to Diethylcarbamazine was blocked by d-tubocurarine in the dose that could block the acetylcholine response. The result of the findings will be discussed.

54

THE PHYSICAL WORKING CAPACITY OF INDIAN YOUNG MEN AND WOMEN WITH SPECIAL REFERENCE TO BODY COMPOSITION. B. R. Goyle. Physiology Research Cell (DGAFMS). Darjeeling, W. B.

A sample of 42 Indian Naval men and 19 nursing women students aged 18-25 years were used to determine maximum Oxygen uptake (VO₂ max) and percent body fat values. Maximum Oxygen uptake was measured on a cycle ergometer



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and body density measurements were accomplished by Pascale et al (1956) and Sloan et al (1962) equations for men and women respectively and percent body fat was derived by using Brozek et al (1963) formula. Weight Index (W/H_2) was obtained by dividing the actual weight of the subject in kg by his square height in meters.

The average $VO_2 \max \times ml \times min^{-1}$ STPD, HR max beats $\times min^{-1}$, VO_2 , max $\times ml \times min^{-1} \times kg^{-1}$ and kg^{-1} (LBW) for these men and women were 2100 ± 491 , 1197 ± 353 ; 186 ± 13 , 174 ± 29 ; 35.7 ± 9.4 , 23.2 ± 6.4 ; 40.2 ± 9.6 , 27.7 ± 7.5 respectively. The mean percent body fat and weight index of men and women were 10.8 ± 1.8 , 21.3 ± 1.9 and 16.54 ± 1.92 , 21.77 ± 2.63 respectively, The VO₂ max values for this sample of Indian men are comparatively smaller than those reported by earlier workers for Indians while the percent body fat values for both men and women compare favourably with those estimated by the method of densitometry by other workers.

55

PHARMACOLOGICAL STUDIES OF BOUVARDIN (NSC 259968) A NEW ANTINEOPLASTIC AGENT DERIVED FROM BOUVARDIA TERNIFLORA. R. P. Gude and M. P. Chitnis. Cancer Research Institute Parel. Bombay.

Bouvardin (BVD) (NSC 259968) is a new antineoplastic agent derived from plant *Bouvardia terniflora*. Chemically, it is a cyclic hexapeptide and have been shown (Johnson & Chitnis. Proc. AACR, 19: 218, 1978) to possess good antitumour activity against lymphocytic leukemia P388 and marginal activity against B16 melanoma.

In the present studies we have investigated pharmacological action of this new drug BVD, by using standard protocols. BVD demonstrated central nervous system (CNS) depression at doses closer to LD50 (4mg/kg). Piloerection and bradycardia were noted in animals treated with LD50 dose of BVD. Similarly catatonia and ataxia progressing to paralysis was observed. On isolated smooth muscle guinea pig ileum, this drug showed neither agonistic nor antiagonistic activity towards histamine. In intact animals (cat) BVD caused transient fall in blood pressure. Studies on CNS, autonomic nervous system and skeletal muscles will be discsssed.

56

STUDY OF THE AFTER EFFECTS OF HYPOXIA AND COLD ON ANXIETY INDUCED RATS SELECTED FOR HIGH/LOW EMOTIONALITY AND ACTIVITY. R. C. Gupta and S. N. Gupta. Dept. Physoiology. SMS Medical College. Jaipur, Rajasthan.

A sample of 108 male albino rats of reactive and nonreactive strains selected for their high/low performance in the open field test was taken, each group being devided into anxiety and nonanxiety subgroups, was subjected to open field test with a two hour preexposure to low barometric pressure, low temperature and simulated high altitude and their score on ambulation and rearing was recorded. The results have indicated that LBP caused a facilitation

of ambulation in nonreactive group as compared to reactive rats while low temperature and SHA failed to differtiat. Further in the highly motivated reactive strain, only low levels of hypoxia (10000ft.) altitu de caused the maximum facilitation of ambulation while in the low motivated group (nonreactive) higher levels of hypoxia (15000ft. altitude) was required to cause a maximum effect. Similar type of results are obtained with rearing score ie. LBP facilitated the rearing score in nonreactive strain without affecting the reactive group. Increasing intensities of LBP in low motivated group improved the performance up to a hypoxia level of 15000ft., while in reactive group the performance gradually decreased.

Anxiety interacts with hypoxia in facilitating the simple motor activity ie. ambulation, both being drive inducing stimuli, while rearing being complex motor activity is decreased by higher motivation due to a combination of anxiety and hypoxia. Anxiety potentiates the inhibitacy effects of cold and SHA on ambulation These results showed that the constitutional emotionality of the subject interact effectively with the environmental conditions. The motor acticity representated by ambulation and rearing, decreased in highly motivated subjects with increasing levels of hypoxia while it was facilitated in low motivated group up to a certain extent.

57

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EFFECT OF YOGIC PRACTICES ON GLUCOSE TOLERANCE AND SERUM LIPIDS IN DIABETES. T. Gupta, S. C. Jain, R. P. Sharnma, and Swami Manuvaryaji. Central Research Institute for yoga. New Delhi.

Yogic practices have been reported to decrease the fasting blood glucose levels in both diabetics and normal subjects (Divekar et al 1978). It has also been reported thar there is a disturbed lipid metabolism in uncontrolled diabetics. To study the effect of yogic practices on both the carbohydrate and lipid metabolism, 16 diabetics and 36 healthy subjects were given a 40 days training of yogic practices.

It was found that with these practices fasting glucose, serum triglycerides and cholestrol levels decreased significantly in diabetics (p < 0.02, p < 0.05 and p < 0.01 respectively) along with improvement in glucose tolerance. Similar changes were observed in healthy subjects, though of lesser magnitude. Thus, it seems that yogic practices does influence carbohydrate as well as lipid metabolism in diabetics.

Reference : 1. Divekar, M. V., Bhat and Mulla, A. V. (1978) Effect of yoga therapy in diabetics and obesity, J. Diab. Asso. India 28:2, 75-78.

58

CARDIAC EFFECTS OF MAGNESIUM. D. Hammad, Sarla Varma and S. A. Omar. Dept. Physiology. G. S. V. M. Medical College. Kanpur, U.P.

The cardiac effects of magnesium were studied on 40 isolated spontaneously beating rabbit atria at 37°C. The magnesium was administered in Dale's bath in doses of 30,60,120,240 mili Mole. It was observed that magnesium elicited dose dependent negative inotropic and chronotropic responses on rabbit atria. Larger doses (above 240 m.M.) caused complete atrial arrest. Further, it was observed that in magnesium treated atria propranolol became more effective in blocking the positive inotropic and chronotropic effects of isoprenaline. This finding is interesting and is suggestive that magnesium could be employed either alone or in combination with propranolol in treatment of arrhythmias which are not so responsive to propranolol alone. Moreover due to its direct myocardial depressant effect Magnesium may prove to be a potent antiarrhythmic agent.

59

RELATIVE EFFICACY OF BETA AGONISTS IN STIMULATING THE PROPRANOLOL DEPRESSED RABBIT ATRIA. D. Hammad, S. A. Omar and Sarla Varma. Dept. Physiology. G. S. V. M. Medical College. Kanpur, U.P.

Propranolol, the widely used beta blocker for the treatment of hypertension, tachy arrhythmias and myocardial infarction is often associated with low heart volume failure with severe bradycardia and decreased inotropic responses of heart. It is therefore necessary to find out its antidote. Isolated rabbit atria were tested with various cardiac stimulants to see their efficacy in recovering propranolol depressed atrial performance. Propranolol 2µM produced 58.3±1.15% reduction in inotropic responses of rabbit atria. Isopronaline 8×10⁻⁶ recovered chronotropic responses by 78.18±5.83% and inotropic responses by 90.4 \pm 6.77%. Adrenaline another beta agonist produced 68.4 \pm 0.73% recovery in inotropic and 62.7 \pm 3.26% recovery in chronotropic responses of propranolol depressed rabbit atria. While noradrenaline produced only 28.7+0.85% recovery in chronotropic and 20.4+1.33% recovery in inotropic responses. Few preparations showed a further fall in chronotropic responses of atria. Combined treatment of adrenaline and isoprenaline in similar doses as before produced a 86.4+0.75% recovery in chronotropic responses of atria and a 94.4+5.83% recovery in inotropic responses of rabbit atria. It is concluded that use of noradrenaline in such treatments may be harmful while combined treatment with adrenaline and isoprenaline may be more benefical.

60

HOARDING SCORE IN ADULT FEMALE ALBINO RATS—FACTORS INFLUENING THE SCORE. Santosh Helekar, Suraj Kamat and M.G. Gogate. Dept. Physiology. Goa Medical College. Goa.

The hoarding score was determined in 8 cyclic females and its correlation with vaginal epithelial changes during oestrus cycle was studied. The females were kept in a home cage for 22 hours and water was administered ad libitum. In the morning vaginal smear was examined microscopically and the phase of cycle was determined. The animal was then allowed an access to food pellets (Hindustan Lever) kept in the food compartment connected to the home cage by an alley. The animal could hoard food pellets for 30 minutes and consume the same for subsequent 90 minutes. The procedure was repeated for 5 days in a week, the animals being allowed food ad libitum during the following two days.



The following factors were found to influence the hoarding score :

- 1) A higher score was observed at proestrus-estrus in many animals.
- 2) The time taken to hoard first 5 pellets was less in proestrus-metestrus as compared to that in diestrus.
- 3) The score was higher in the first one or two cycles but become less in subsequent cycles, though the cyclic variations in hoarding score were maintained.
- 4) Ovariectomy reduces the score and this is restored to some extent on administration of estrogen.
- 5) Unsuitable environment in the cage considerably reduced the score.

61

STUDIES ON THE CIRCADIAN VARIATION OF BODY TEMPERATURE RHYTHM DURING THE REPRODUCTIVE CYCLE IN THE FEMALE RAT. C. V. R. Indira and V. Gopal. Dept. Zoology. Madras University Post Graduate Centre. Coimbatore, Tamilnadu.

Thermogenesis in the rat is based on several physiological and biological facts, and is more complicated in the female rat because of the occurence of oestrous cycle and hormonal action. Female rats that exhibit regular cycles of oestrous were screened and maintained under standardised conditions They were fed ad libitum and exposed to normal light-dark conditions (12L:12D). Body temperatures were observed every one hour continuously around the clock for a fortnight. Simultaneously vaginal cytology was also being studied through smear preparation. The circadian pattern of temperature rhythm attained a maximum of $101.9 \pm 0.2^{\circ}$ F at 18.00 hrs and a minimum of $98.8 \pm 0.2^{\circ}$ F at 12.00 hrs. The mean of rectal temperature showed a difference between succussive phases of four days cycle and a pick of $101.5 \pm 0.9^{\circ}$ F during metoestrous $102.6 \pm 3^{\circ}$ F during diostroous, $101.9 \pm 0.6^{\circ}$ during motoestrous $102.6 \pm 3^{\circ}$ F during diostrous, $101.9 \pm 0.9^{\circ}$ F during proestrous, and $101.9 \pm 0.6^{\circ}$ F oestrous stage. The significant increase of body temperature rhythm coinciding with the dioestrous stage of the cycle, is discussed in the background of hormonal rhythm.

62

STUDIES ON FOOD DEPRIVATION (STARVATION) IN THE REGULATION OF CIRCADIAN VARIATION OF BODY TEMPERATURE RHYTHM IN THE RAT. C. V. R. Indira and V. Gopal. Dept. Zoology. Madras University Post Graduate Centre. Coimbatore, Tamilnadu.

Recent studies reveal that internal physiological readiness fluctuates rhythmically to the external stimuli, especially to light and dark cycles. Our previous series of work in human subjects has shown that food intake (Gopal et al, IUPS, Paris 1977) Can influence the body temperature rhythm. The present investigation was undertaken to find out whether food deprivation can



bring any change in the circadian variation of rectal temperature in rats. The results indicate that insulin has increased food intake as well as the amplitude of the temperature oscillations resulting in an increased peak. Food deprivation has decreased the temperature oscillation likewise the peak also has been lowered. The results were discussed in the light of insulin action, metabolism and the circadian temperature rhythm.

63

HAEMOPOEITIC CLONING IN THE SPLEEN. Bhanu Iyengar. Dept. Pathology. Maulana Azad Medical Cellege. New Delhi.

Haemopoetic cloning in the spleen has been studied in adult albino rats after producing an acute hemolytic crisis using different hemolytic agents. The morphologic study of splenic homopoeisis and its correlationship with changes in the kidneys will be discussed.

64

POST NATAL AND PRE PUBERTAL GONADAL HORMONE LEVELS IN MURRAH BUFFALO HEIFERS. G. C. Jain, G. S. Pahwa S. K. Batra and R. S. Pandey. National Dairy Research Institute. Karnal, Haryana.

Gonadal hormones were measured in Murrah Buffalo at birth and during prepubertal growth phase. Animals were grouped on age basis in 1, 2, and 3 day old for at birth hormone measurements and into 1, 2, 3, 4, 5, 6, 18, 21, 27 and 30 months of age for prepubertal hormone levels. Estradiol 17 β and progesterone concentrations in blood plasma were determined by radioimmunoassay techniques. The average progesterone levels post birth were 0.87 ± 0.26 , 0.70 ± 0.19 and 0.42 ± 0.15 ng/ml on days 1, 2 and 3, respectively. During the prepubertal development phase the progesterone levels remained steady upto 30 months of age.

The average estradiol 17 β levels fluctuated greatly during the same period ranging between 4.28 to 18.44 pg/ml. The average estradiol 17 β levels were 4.28 \pm 2.45, 4.29 \pm 1.73, 6.46 \pm 1.50 during days 1, 2 and 3 post birth, respectively. After this the estradiol 17 β levels fluctuated between 4.20 to 18.44 pg/ml from one month to thirty months of age, though the hormone steadily rose from 4.14 pg/ml to 12.78 pg./ml upto five months of age. The estrogen-progesterone ratio immediately post birth upto three days was 1:203, 1:603 and 1:65 and 1:43, 1:178, 1:105, 1:71, 1:47, 1:66, 1:90, 1:35, 1:45 and 1:167 pg/ml at 1, 2, 3, 4, 5, 6, 18, 21, 27 and 30 months of age, respectively



EFFECT OF CARTHAMUS TINCTORIUS OIL (SAFFLOWER OIL) ON SERUM PROTEINS IN HUMAN BEINGS. P. K. Jain and M. D. Munglae. M. R. Medical College. Gulbarga.

It is now well established that diets rich in essential polyunsaturated fatty acids tend to decrease serum Cholesterol. James et al (1961), Mathur et al (1960) and Jain et al (1978) showed some decrease in coagulation time after a fat rich meal, hewever Hugies & Ayers (1960) had shown no change in it. Thus it was found interesting to study the effect of this dietatory fat on serum Proteins. 25 healthy male students of age ranging from 18 to 22 years, purely vegetarians, non-smokers and from upper middle class were selected for the study. They had never taken this fat as a dietatory fat routinely in their houses and had taken Ground-nut oil fat instead. Their diet was completely substituted by the Saffower oil cooking medium for a period of one month. They were evaluated for serum-Proteins before and after one month, also after giving stress like taking sudden examinations etc.

Results showed an increase of nearly 11.57 percent in the Total Proteins after the Safflower oil. This increase was statistically significant. Probable mechanism of the action is discussed.

66

65

SERUM ELECTROLYTE CHANGES IN VARISAR. S. C. Jain, R. P. Sharma, T. Gupta and Swami Manuvaryaji. Central Research Institute for Yoga & Vishwayatan Yogashram. New Delhi.

Varisar is one of the cleansing processes suggested in yogic discipline, in which the individuals drink a large amount of water and pass it out via rectum, in a short time. In different Yoga Centres the technique varies in terms of amount, temperature and the salt content of the water consumed as well as the exercises carried out along with it.

The serum electrolytes changes in 34 subjects, doing varisar, by different methods, were studied. It was observed that decrease in Potassium level was maximum in those subjects who consumed the hypertonic saline and least in those who took water without any salt.

67

ROLE OF EPIDIDYMIS IN THE CONTROL OF FERTILITY IN GOAT. S. K. Jindal and J. N. Panda. Physiology & Climatology Division. Indian Veterinary Research Institute. Izatnagar, U. P.

Important maturation changes take place in the epididymis of mammals which eventually confer the sperm with its ability to fertilize the ovum. An attempt was made to study those changes and the basic data on epididymal sperm reserve of goats was also investigated in six sexually mature bucks. The relative distribution of sperms in the caput, corpus and cauda epididymis



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averaged 1.90, 0.66 and 6.18 billions respectively with the total epididymal sperm reserve per buck being equal to 17.5 billions. Among the maturation changes, the size of sperm head increased while the cytoplasmic droplets were progressively and gradually lost, as the sperm moved from caput to cauda part of the epididymis. The cauda sperms showed forward motility, a property conspiciously lacked by the caput and corpus spermatozoa, It is inferred that these changes are instrumental in making the sperm potentially fertile.

68

MODULATION OF GUSTATORY RESPONSES BY GONADAL HORMONES IN FEMALE RATS. R. Kanaka, S. Dua Sharma and K. N. Sharma. Dept. Physiology. St. John's Medical College. Bangalore.

The present study was carried out in cyclic female albino rats of CFTRI strain. Estrus cycle was monitored by observing the vaginal smear daily at 0900 hours. In order to assess the gustatory responses 13.5% glucose, 0.9% sodium chloride was each paired with water and given on alternate days for one hour. In addition, body weight, food and water intake was measured daily. After the control period lasting about two weeks, the rats were divided into two groups. Both the groups were subjected to a daily hormone treatment given intramuscularly. Group I received progesterone (Lutocyclin CIBA $500\mu g/day$). Group II received oestrogen (Ovocyclin P CIBA $2\mu g/kg/body$ weight/day). The treatment was continued for eight weeks and the above measurements were repeated. Results were computed to per 100 g body weight and expressed at weekly intervals.

As compared to the pretreatment level both the groups exhibited a significant increase in the body weight. However, group II rats showed a tendency to reach pretreatment level by the VIII week. The food intake decreased in both the groups except for an initial increase during the II week. The water intake decreased in group I while group II showed an increase. As compared to the control values the total fluid intake (glucose and water) decreased in both the groups from IV week onwards. The intake of (sodium chloride and water) was found to be decreased all throughout the treatment period in both the groups.

69

ROLE OF SPLEEN IN HEMODYNAMICS. V. V. Kanhere, D. C. Salgar, S. N. Shirodkar and V. A. Katti. Dept. Physiology. Miraj Medical College. Miraj.

In 1949, Rein, Mertens et al, showed that the function of failing heart in a heart lung preparation could be improved dramatically by including liver and spleen in perfusion circuit. In 1973, Liangetal, showed that sympathetic stimulation of the spleen by norepinephrine infusion in splenic artery or by stimulation of sympathetic nerve increases the cardiac output significantly. The present work was designed to confirm the cardio-tonic action of spleen after infusion of norepinephrine into the splenic artery.

Study was carried out on 15 days, Norepinephrine infusion in splenic artery showed significant increase in cardiac output as compared to rise in cardiac output after norepinephrine infusion in splenic vein.

Left ventricular work was increased significantly on arterial infusion of norepinephrine. There was no significant change in peripheral resistance on arterial infusion of norepinephrine.

This suggests that some unknown factor is released by spleen on sympathetic stimulation-which acts centrally and increases force of contraction of the heart.

70

EFFECT OF COPPER SULPHATE ON EXPERIMENTALLY INDUCED PEPTIC ULCERS. S. V. Karmalkar, D. A. Joseph, J. C. Bijlani, I. M. Vora, P. K. Behl, S. R. Prabhu and M. S. Kekre. Dept. Pharmacology & Pathology. T. N. Medical College. Bombay.

Copper sulphate has been reported to increase mucous production. This study was undertaken to determine whether copper sulphate has an effect on peptic ulceration in rats induced by pyloric ligation, and administration of reserpine and histamine. It was observed that prior administration of copper sulphate to rats produced a marked reduction in the total acidity.

71

STUDIES ON ANTI-INFLAMMATORY ACTIVITY OF DL-METHIONINE. N. K. Khanna and P. Jain.Dept. Pharmacology & Experimental Therapeutics. Dr. S. N. Medical College. Jodhpur.

Recently a number of aminoacids, such as L-phenyl-alanine (Davis et al., J. Endocrinol., 41:603, 1968), Cysteine (Thomas and West, Br. J. Pharmac., 47:662, 1973), L-tryptophan (Bailey and Shaftner, Biochem. Pharmac., 16:1175, 1967), DL-valine (Khanna and Madan, Ind. J. Exp. Biol. 16: 834. 1978). Creatine (Khanna and Madan. Arch. int. Pharmacodyn. 231:340, 1978), DL-tryptophan (Madan and Khanna, Ind. J. Med. Res. 68:708-713, 1978) and Creatinine (Madan and Khanna, 23:1, 1979) have been shown to possess anti-inflammatory activity against experimentally induced inflammatory models. In the present study we have investigated the anti-inflammatory activity of another amino-acid, BL-methionine. It is orally effective in suppressing the inflammatory responses produced by carrageenan, 5-hydroxytryptamine, nystatin, formaldehyde and crotton oil (granuloma pouch). DL-methionine inhibits castor oil induced diarrhoeal droppings. It does not produce gastrointestinal ulceration in the effective doses. The observations have been discussed and it is suggested that anti-inflammatory activity of DL-methionine may partially be mediators like 5-hydroxytryptamine and prostaglandins and also perhaps by stabilization of the lysosomal membranes.



ELECTRONE MICROSCOPIC STUDIES AND CLINICAL OBSERVATIONS ON GERIFORTE (HIMALAYA). L. K. Kothari, K. P. Singh and C. M. S. Dass. Dept. Zoology. RNT Medical College. Udaipur.

Several indigenous drugs are reputed to counteract senescence and promote physical and mental vigour in the aged. Recently, one such formulation (GERIFORTE, Himalaya) has been put under a comprehensive scientific study. It contains several plant extracts but no hormones. After establishing its safety from acute or chronic toxicity in rats, a preliminary clinical trial was carried out. Geriforte produced a favourable response and an enhanced sense of well being in 85% cases.

An EM study has now been carried out to determine whether : (i) Geriforte is free from long-term toxic effects at the cellular level, and (ii) if it can influence the normal process of ageing, in any way. Groups of adult and ageing male albino rats have been kept on Geriforte (25 to 50 mg/kg body weight)for 3 to 6 months. Electron microscopic examination has been carried out, after necessary processing, of various tissues. No evidence of any adverse effect has been observed in the liver, skeletal muscle, testis and brain. But in relation to any specific changes in collagen, nerve cell pigment etc. which are associated with normal ageing, the results so far are inconclusive.

73

EFFECT OF PROGESTERONE ON GLUCOSE TOLERANCE. G. Krishnamurthi. Dept. Physiology. Kilpauk Medical College. Madras, Tamilnadu.

Animal experiments have shown that progesterone has a biphasic effect on blood glucose level. A group of young male volunteers were submitted to glucose tolerance test before and after parenteral administration of progesterone for three successive days. A group of adult moderately diabetic male patients were subjected to parenteral progesterone and their glucose tolerance was studied. Pilot studies of glucose tolerance have been initiated in female subjects who were taking contraceptive pills either for contraceptions or for other gynaecological disorders.

The results of the studies are presented in this paper and discussed.

74

A QUANTITATIVE ANALYSIS OF THE DISTRIBUTION OF GANGLION CELLS IN THE ALBINO AND PIGMENTED GUINEA PIGS. K. Krishnaswami and Selvi C. L. Vimla Bai. Institute of Physiology & Experimental Medicine. M.M.C. Madras.

The quantitative analysis of the distribution of ganglion cells in vertebrates including man, cat, reptiles, rats, frogs etc. were done by Jocobson, Lashley and Van Buren who were able to make estimates of ganglion cell density from serial normal and tangential Sections of retina. There are, however, considerable difficulties in making these estimates.

422

In this present study whole mount preparations of pigmented and albino guinea pigs were developed which allowed direct measurement of ganglion cell density over whole of the retina. The whole mount preparations of retina of the above animals were stained with cresyl fast violet and the number of cells in whole retina was counted and plotted in a chart to get an idea of its distribution and density. In both the cases two different zones a heavily populated lower zone and sparsely populated upper zone are observed above and below the optic disc. The different density areas observed in both the cases are 2500 cells/mm²; 1875 cells/mm²; 1250 cells/mm² aod 625 cells/mm² Detailed results are presented and possible significance will be discussed.

75

ADRENOCORTICAL FUNCTION IN SLEEP DISORDERS. K. Krishnaswami and D. P. Sakunthala. Institute of Physiology & Experimental Medicine. M.M.C. Madras.

Sleep disturbance is a significant feature of most clinical descriptions of mental illness. A review of psycho-endocrine studies of adrenal function suggests that in severe depression marked changes in pituitary adrenal function occur. It is not clear whether the sleep disturbance observed in cases of mental illness is a non-specific response to stress or a meaningful relationship exists between the sleep disturbance and adrenocortical function.

The aim of the present study is to investigate the adreno-cortical function in cases of sleep disorders. Subjects with reports of insomnia or disturbed sleep patterns have been selected from the Govt. Mental Hospital Madras. From a questionaire put to them, the type of sleep disturbance involved is understood. 24 hour urinary 17-Ketosteroid and 17-Ketogenic steroids are taken as indices of adrenocortical function. Plasma cortisol is also determined. 24 hour urinary ketosteroids and ketogenic steriods are determined thrice on three 8 hour samples to see whether there is any alteration in the diurnal variation of steroid excretion.

The results are statistically analysed and correlated with urinary ketosteroids and ketogenic steroids in persons having a normal pattern of sleep as ascertained from the questionaire. The results of the study will be presented and discussed.

76

EFFECT OF EXTRACELLULAR CALCIUM ON MYOCARDIAL CALCIUM. K. krishnaswami and K. V. Kuppu Rao. Institute of Physiology & Experimental Medicine. M. M. C. Madras.

The removal of Ca⁺⁺ and its reintroduction into the perfusion medium modifies cell function and morphology of the heart severely. In the present study the effect of different extracellular calcium concentratiom on the changes in myocardial Ca⁺⁺ content-(Ca)m, contractile force and Glycogen associated with calcium paradox phenomenon were examined in isolated perfused Guinea pig hearts. After 30 minutes of normal perfusion, the hearts were perfused for



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5 minutes with various calcium concentrations ranging from 0 to 1.25 mM followed by 5 minutes reperfusion with normal medium. Perfusion of hearts at lower concentrations of calcium induced increase in (Ca)m and partial or no recovery of contractile force upon reperfusion. The mechanisms involved in the accumulation of calcium in the heart has to be further evaluated. Detailed results will be discussed.

77

URINARY 5-HIAA EXCRETION IN SLEEP DISORDERS. K. Krishnaswami and V. Krishnan. Institute of Physiology & Experimental Medicine. M. M. C. Madras.

Aminergic control of sleep-wakefulness cycle is a well established fact. In animals serotonin seems to be concerned with NREM Sleep while in human beings, it is possibly concerned with REM Sleep. In a previous study we have tried to establish a link between urinary 5-HIAA excretory pattern during a day and sleeping habits to find out about serotonin metabolism and sleeping habits. In this study, in cases of sleep disorders from Govt. Mental Hospital, Madras, we have estimated urinary and CSF 5-HIAA. Urinary 5-HIAA excretary patternduring 24 hours was determined by collecting three 8 hour urine samples. This urinary 5-HIAA excretory pattern when correlated with the type of sleep disturbance and CSF 5-HIAA levels suggests a possible relationship between the altered sleep and serotonin metabolism.

78

SLEEP AND URINARY 5-HIAA EXCRETORY PATTERN. K. Krishnaswami and V. Krishnan. Institute of Physiology & Experimental Medicine. M.M.C. Madras.

Sleep is an active process that occurs due to interaction between the brain centres. Aminergic neurons in the brain are involved in the regulation of this sleep and wakefulness cycle. Animal studies have established a link between NREM Sleep and serotonin and REM Sleep and Nor-adrenaline. Lesions in the midbrain serotoninnergic neurons leads to reduced NREM Sleep and stimulation of these neurons increases NREM Sleep. Further, CSF 5-HIAA levels increase during NREM Sleep. In man, administration of 5-Hydroxy tryptophan, immediate precursor of serotonin increases REM Sleep, and Parachlorophenylalanine, a synthesis inhibitor of serotonin reduces REM sleep. In the present study, the sleeping habits of normal healthy subjects were correlated with 24 hour urinary excretory pattern of 5-HIAA. From a questionaire answered by the subject, the sleep habits like early sleepers, or late sleepers and other dates were collected. 24 hours excretory pattern of urinary 5-HIAA was measured in three 8 hour samples. The result indicate a relationship between urinary 5-HIAA excretory pattern and sleeping habits.
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RESPIRATORY WORK DURING HYPERTHERMIC POLYPNOEA IN DOGS. S. Kumar and M. M. Khan. Deptt. Physiology, K.G's Medical College. Lucknow.

At resting body temperature of 37° C in dogs the repiratory work done was found to be 6.79×3.34 gm cm/min. It gradually increased significantly with the rise in body temperature. The increase in work was found to be linearly related to pulmonary ventilation at all body temperatures except at 40.5°C, where it was found to be significantly less. The importance of reduction in respiratory work at this temperature in the Physiology of temperature regulation in dogs has been discussed.

80

A STUDY OF CHEST COMPLIANCE DURING HYPERTHERMIC POLYPNOEA IN DOGS. S. Kumar and M. M. Khan. Dept. Physiology. K.G's Medical College. Lucknow.

Total compliance as calculated from the tidal volume and total intrapleural pressure change during respiration was found to be 54.53×30.97 ml/cm of water at 37° C body temperature. With the rise in body temperature it gradually decreased to 38.04 ml/cm at 41.5° C. Though, both the tidal volume and intrapleural pressure decreased with the rise in body temperature, the decrease in compliance was due to a greater fall in tidal volume. This is discussed as due to a reduction in lung volumes.

81

STUDY OF THE MILK LET-DOWN RESPONSE, RESIDUAL MILK AND RATE OF MILK SECRETION IN COW AND BUFFALOES. R. S. Ludri. National Dairy Research Institute. Karnal, Haryana.

An experiment was conducted on 48 Murrah buffaloes, in different stages of lactation, at 12 hourly intervals. It is reported that the milk let-down time in different buffaloes ranged from 31–318 seconds with an overall average of 134 seconds. The amount of residual milk was 2 percent of the total milk. The lower specific gravities of residual milk were attributed to the higher fat content.

In another experiment, 54 cows were milked by hand at 6, 7 and 11 hourly intervals. It is reported that in comparison to morning and evening the cows took more time to let-down her milk during noon milking. At all the times of milking the absolute and relative amounts of residual milk were-more in Sahiwal cows.

The rates of milk secretion at 6 and 7 hours of milking were almost similar but a significant reduction occurred at 11 hours. Based on the results obtained it can be suggested thus if the cows are milked at 6 hourly intervals or at three equally divided intervals of 8 hours each three may be a significant increase in milk production.



ROLE OF MIDBRAIN CHOLINERGIC MECHANISMS IN THE CARDIOVASCULAR ADJUSTMENTS OCCURING IN "AGGRESSION" MEDIATED FROM THE HYPOTHALAMUS. P. S. Maindiratta, P. S. Rao and S. K. Manchanda, Dept. Physiology. A.I.I.M.S. New Delhi.

Earlier, we' have reported that atropine in the midbrain periaqueductal gray (CGS) raises the threehold for the elaboration of somatomotor components of behaviour in aggression obtained on hypothalamic stimulation. The present study was undertaken to see the effect of atropine application in CGS on the cardiovascular responses elicited from the same hypothalamic regions. Chemitrodes were implanted in the anterior hypothalamic regions of cats of either sex. These points on electrical stimulation in the conscious animal produced on affective attack, and under anaesthesia (nembutal 35 mg/kg) increased the systemic arterial blood pressure, the hind limb blood flow and also the calculated conductances in some cases.

Bilateral microinjections of atropine sulphate (20 ug in 1 ul of 0.85% saline) in the dorsal and lateral periaqueductal gray regions reduced the rise in the hind limb blood flow in each individual experiment and the inereased conductance whenever obtained. No significant decrease in systemic arterial pressure was obtained in any experiment.

These findings suggest the role of muscarinic cholinergic action in the periaqueductal gray regions in the elaboration of hind limb vasodilation that accompanies affective attack elicited from the anterior hypothalamus. 1. Aneja, et al (1979).

Abstract presented in the Int. Symposium on Aggressive Behaviour 1979.

83

ELECTROMYOGRAPHY IN NERVE ROOT COMPRESSION. B. K. Maini, P. N. Gandhi and P.S. Maini. Dept. Physiology. Medical College. Rohtak.

Electrical studies of muscles supplied by L_4 , L_5 , & S_1 Nerve roots was conducted in 30 cases. In all of them nerve root compression was diagnosed from clinical and X-ray examination. Electrical activity was tested in all the muscles supplied by axons of these nerve roots, in the resting state and on voluntary activity. Evoked potentials were recorded only in two muscles-Tibialis Anterior and Gastrocnemius. In all the 30 cases chronaxie was prolonged and latency was either normal or prolonged. In 18-height of evoked potentials was less than half of normal while using the supramaximal stimulus. These were of severer type. In others height was either normal or less than normal but more than half of normal. In severer degrees of compression, prolonged injury potential and fibrillabean potentials were present in majority, whereas they were less frequent in milder cases. On voluntary contraction polyphasic potentials were more ++ & +++ in severer cases but less + or ++ in milder compression. Interferance pattern was either absent or reduced markedly in severer cases but normal or reduced to lesser degree in milder ones. All the severer type (18) were subjected to surgery & the diagnosis based on electromyography confirmed.

GASTRIC VARIATIONS DURING MENSTRUAL CYCLE. B. B. Maitrya, S. Modi and B. Maitrya. Dept. Physiology & Biochemistry. Sardar Patel Medical College. Bikaner, Rajasthan.

Variations in gastric acidity during estrous, menstruation, pregnancy, lactation and menopause have been described Vanzant and Alvarez observed diminished gastric secretion during menstrual period and it was attributed to hormones secreted by corpus luteum. Others also reported that menstruation appeared to be associated with increased gastric activity. McDonald noted that the concentration and the amount of acid increased during the former half, while decreased during the latter half of the menstrual cycle. As these reports lacked unanimity so this study was undertaken in 15 female students, to find out variations, if any, in gastric activity during menstrual cycle. They were subjected to gastric analysis on alternate days during the cycle. Maximum reduction in acidity was noted during the period of ovulation, peptic activity varied independently. Variations in gastric acidity during menstrual cycle seemed to be due to fluctuations in the level of estrogen occurring during that period.

85

EFFECT OF 5-HT ON BLOOD GLUCOSE LEVEL IN RABBITS. K. C. Manchanda, K. N. Singh and V. C. Saksena. Dept. Physiology and Pharmacology. Moti Lal Nehru Medical College. Allahabad, U.P.

It has become a well established fact that 5-HT occurs in significant amounts in certain endocrine structures. Moreover, there are reasons to believe that 5-HT and a catecholamine can be present concomittantly in islet cells and that these amines may functionally integrate in these cells. The reported observation of Lundquist et al (1971) that the precursor of this amine, 5-HTP produced hypoglycemia in mice pretreated with MAO inhibitor served as an impetus to the present study.

The present study provide additional information concerning a possible role of 5-HT in the regulation of insulin secretion and consequent changes in Blood glucose level. The findings were subjected to further analysis in order to delineate the precise involvement of Adrenergic mechanism vis-a-vis Serotonergic mechanism. As such procedures like Adrenalectomy, reserpinization, use of specific blocking and depleting agents of monoamines were employed. Despite the fact that there occurs species variation of response, the present study suggests that 5-HT plays important role in regulation of insulin secretion in some Species.

86

ROLE OF CATECHOLEMINES IN 5-HT INDUCED HYPERGLYCEMIA. K. C. Manchanda, K. N. Singh and V. C. Saksena. Dept. Physiology and Pharmacology. Moti Lal Nehru Medical College. Allahabad, U.P.

The effects of 5-HT on blood glucose level were studied in rabbits. Intracerebro-Ventricular administration of 5-HT resulted in a rise in blood glucose level. The hyperglycemia was not affected by bilateral vagotomy and

427

was less marked in adrenalectomized rabbits. The hyperglyclemic effect was not obrerved in rescrpinized and spinal vagotomized rabbits. It is suggested that centrally administered 5-HT stimulates the hypothalmic or Medullary accelerator neurons (Central sympathetic structures) to cause a marked release of catecholamines from peripheral stores specially Adrenal medulla. This excessive release of catecholamines is responsible for hyperglycemia in rabbits.

87

DIFFERENCES IN STEREOTYPED BEHAVIOUR INDUCED BY* AMPHETAMINE AND APOMORPHINE IN RHESUS MONKEYS. S. K. Manchanda and Mandira Das. Dept. Physiology. A.I.I.M.S. New Delhi.

Stereotypy can be induced in various species of animals by the administration of dopamine agonists. There are only a few reports about stereotyped behaviour in subhuman primates even though amphetamine induced stereotypy has been suggested as an experimental model for paranoid schizophrenia. We have studied stereotypy in the rhesus monkey, by peripheral administrations of different doses of amphetamine and apomorphine. Six items of behaviour were scored, i.e., (i) vigilance, (ii) locomotion, (iii) grooming, (iv) checking, (v) blinking, (vi) bucco-linguo-masticatory movements.

In an exposed situation allowing interaction with the surroundings outside the cage, amphetamine increased vigilance and checking, decreased locomotion and blink rate. Bucco-linguo-masticatory movements were rare or of mild intensity. But in an isolated situation the bucco-linguo-masticatory movements did not appear at all. However, with regard to other items predictable dose dependent curves could be constructed.

Apomorphine produced an initial increase in vigilance, checking and blink rate. Within 10 minutes, however, animals exhibited bucco-linguo-masticatory movements which continued with different grades of intensity for a period of 35-60 minutes depending on the dose of apomorphine. Such movements at times interspersed with incessant grooming (2 monkeys).

*This research was supported by a grant-in-aid from the Indian Council of Medical Research, New Delhi. The authours are greatful to Professor Janice R. Stevens, Oregon University, U.S.A., for her everready help and frequent discussions.

88

ROLE OF CALCIUM AND VITAMIN D SUPPLEMENTATION IN PREGNANCY. R. K. Marya, S. Rathee and V. Lata. Dept. Physiology. Medical College. Rohtak, Haryana.

Serum calcium, inorganic phosphate, heat stable and heat labile, alkaline phosphatase have been estimated in 25 controls and 75 pregnant women in labour and in cord blood. Hypocalcemia observed in the maternal blood was chiefly due to low plasma proteins levels. Serum calcium level in cord blood was significantly higher than that in maternal blood. The effect of different calcium and vitamin D intakes during pregnancy on maternal and foetal blood levels of serum calcium, inorganic phosphate and heat labile alkaline phosphatase shall be discussed.



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EFECT OF SAGO AND PEM DIETS ON THE NUTRITIONAL STATUS AND SEXUAL BEHAVIOUR IN FEMALE ALBINO RATS. J. F. Mascarenhas and M. G. Gogate. Dept. Physiology. Goa Medical College, Goa.

A comparative study of body weight, food and fluid intake, vaginal smear for determining the phases of estrus cycle and sexual behaviour in terms of lordosis quotient (L.Q.), was done in two groups, each of six young adult female albino rats. One group was fed sago ad libitum, whilst the second group was given a protein-energy restricted diet. There was no restriction of vitamins in either of the groups during the period of study. All the animals acted as self-controls.

There was loss in weight in both the groups but it was more and rapid in the PEM group. However the fluid intake was more in the sago fed animals. The estrus cycles became irregular in both the groups showing continuous diestrus or metestrus within two weeks of the regimen. The sexual behaviour also showed a marked decline.

Supplement of PUFA and other fats in the form of groundnut oil in the sago diet did not affect any improvement. However, replacement by a full diet, adequate in proteins reverted the various parameters to normal in both the groups. The possible mechanisms for the above observations will be discussed.

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EFFECTS OE UNDERNUTRITION AND OVERNUTRITION ON FEEDING PATTERN IN DEVELOPING RATS. R. Mathur, U. Nayar and S. K. Manchanda. Dept. Physiology. A.I.I.M.S. New Delhi.

Effects of undernutrition and overnutrition on food intake, body weight gain and feeding behaviour were studied in developing rats. The rats were divided three into groups. One group was undernourished from the day of birth to weaning by doubling the litter size and reducing the diet of the mother to half. The other group was overnourished by giving an intraperitoneal injection of glucose (extra calories) daily for 7-9 days after birth. The third group of animals served as control. The food intake and body weight of rats were recorded daily to determine the ratio of food intake to body weight gain (FI/BWG). The behaviour of these rats towards food after starvation of about 24 hours was also studied with the help of a maze.

The FI/BWG was significantly lower in undernourished rats as compared to controls till the age of 55-60 days. Subsequently it was significantly higher than controls. Just the reverse happened in overnourished rats, the ratio of FI/BWG was higher than controls till 55-60 days and was lower in older animals. The significance of the metabolic adjustments during development in undernourished and overnourished rats shall be discussed.

NEURO PHARMACOLOGICAL SCREENING OF SOME NEWLY SYNTHESIZED MANNICH BASES. S. Matkar, S. K. Tongia, C. P. Trivedi, R. Kaushal and R. S. Chauhan Dept. Pharmacology. M.G.M. Medical College. Indore, M.P.

The neuropharmacological screening of certain newly synthesized Mannich bases compounds viz. N (Pyrrollidino-alkyl) benzamide, N-(Pyrrollidino-methyl) benzamide (C_1), N-(Pyrrollidino-ethyl) Benzamide (C_2), N-(Pyrrollidino-propyl) benzamide (C_3), N-(Pyrrollidino-butyl) benzamide (C_4), N-(Pyrrollidino-heptyl) benzamide (C_5), was undertaken. On the basis of a preliminary pilot study, it was decided to use these compounds in the doses of 5, 10 and 20mg. per kilogram of the body-weight of animals (albino rats and rabbits) for the present investigation.

The effects of these compounds were studied on Pentabarbitone sleeping time, Locomotor activity (rotarod test), Electroshock seizure, Analgesic potentiality in albino rat and TAB induced pyrexia in rabbit.

The (C_1) reduced the pentabarbitone sleeping time in both sexes, while (C_2) , (C_3) , (C_4) , and (C_5) caused reduction of the sleeping time in male and increased in female. All the compounds reduced the duration of rotarod holding time, however (C_5) exerted the most potent action on this parameter. The maximal, electroshock seizure was unaltered by all the compounds. The minimal electroshock seizure threshold was raised by (C_2) , (C_3) and (C_4) in descending order of potency. None of the compounds showed any significant analgesic effect. The TAB induced pyrexia was significantly reduced by the compounds (C_1) and (C_3) , the others being less effective.

92

A COMPARATIVE STUDY OF PHYSICAL FITNESS ASSESSMENT BY CERTAIN SIMPLE METHODS. H. N. Mehratra, V. K. Negi and R. Gupto Dept. Physiology, L.L.R.M. Medical College. Meerut, U.P.

A study of assessment of Physical Fitness by using certain simple recovery tests is being conducted on Medical students of L.L.R.M. Medical College, Meerut with the objective to elucidate their health status. A complete Medical Examination is done before the subjects are put to physical fitness tests in order to exclude those cases in whom such tests are contraindicated. In the causes so far studied it is revealed that a high percentage of students have poor health status. Curiously enough a good percentage of students could not even continue the effort necessary to complete the test although the effort required was of submaximum intensity. Significance of the results will be discussed.

93

EFFECT OF ORAL CONTRACEPTIVES ON BLOOD GLUCOSE LEVEL S. Mehrotra. P. Varma, and S. Tandon. G.S.V.M. Medical College. Kanpur, U.P.

A standard oral glucose tolerance test was performed on 60 subjects who had been taking combination type of oral contraceptive for a prolonged period of

430

time ($\frac{1}{100}$ to 6 years) (Norethindrone 10 mgm + Mestranol 0.06mgm). The average age was 34.2 years, average weight 59.8 Kg. The blood was analysed for its glucose content by Nelson's & Somogyi method at O, $\frac{1}{2}$,1,2 & 3 hours. The results showed that with combination type of oral pills 19.6% had normal curves, 36.2% abnormal border line curves and 44.2% abnormal glucose curves,

The normal group had fasting glucose values less than 110mgm %, a peak value less than 160 mgm% and a 2 hour value less than 120mgm% and a 3 hour less than 110 mgm%. To be classified as "Abnormal" an individual must either have had a fasting glucose level greater than 120 mgm% or peak value greater than 160 mgm% and a 3 hour glucose value greater than 120 mgm%.

In order to determine whether any of the characterizing data were significant in producting the abnormal glucose results, many correlation analysis were performed between the glucose results. There was no defenite statistically significant correlation between blood-glucose and weight, age, family-history of diabetes etc. Remarkable difference in the incidence of abnormal test results and combination type of drug therapy was found (P = < 0.01).

94

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ad of **ROLE** OF NUTMEG IN INHIBITING PROSTAGLANDIN BIOSYNTHESIS. Veena Misra R. N. Misra and W. G. Unger. Institute of Opthalmology. London.

The dried kernels of the seeds of Myristica fragrans (Nutmeg) were chemically fractionated and the fractions were studied for their effect on prostaglandin biosynthesis in rats. Indomethacin was used as a reference drug. It was found that the petroleum either fraction and subfraction obtained in silicic acid column with 90 per cent benzene and 10 percent chloroform had marked inhibitory effect on the biosynthesis of prostaglandins on the rat kidneys, when administered orally.

95

EFFECT OF PIMOZIDE INFUSION IN FO 3RD VENTRICLE ON MALE SEX BEHAVIOUR IN RATS. S. Mitti Mohan and S. K. Manchanda. Dept. Physiology A.I.I.M.S. New Deihi.

Our earlier studies demonstrared that infusion of monoamine oxidase inhibitor nialamide into 3rd ventricle increases the male sex behaviour (1) and 5–OH tryptophan (5–HTP) a serotonin precursor abolishes it (2). Nialamide increase the brain levels of all monoamines and 5–HTP specifically raises brain serotonin. The present study was aimed at exploring the role of dopaminergic tone by infusing pimozide a dopamine receptor blocking agent into 3rd ventricle.

Sex behaviour of ten male rats (240–260g) with canulae implanted in the 3rd ventricle was evaluated in the presence of ovariectomized females treated with estrogen and progesterone as reported earlier (1, 2). It was observed that 15 min after the infusion of $10\mu g/Kg$. of pimozide in $10\mu l$ of vehicle into the 3rd



FFFECT OF LESION OF CAUDATE NUCLEUS ON SEXUAL BEHAVIOUR OF MALE RATS. V. K. Mulgaonter and M. G. Gogate. Dept. Physiology. Goa Medical College. Goa.

Sexual behavior was studied in eight sexually active male rats when allowed ro mate with ovariectomized female rats brought to heat by priming with oestrogen-progesterone therapy. The same female partner was constantly kept for a given male rat after a training schedule of fifteen days and subsequently. The animals were housed in an artificial dark-light schedule (light 5 P.M. to 8 A.M.) with water and food administered ad libitum. Of these eight rats, five rats in the experimental group were subjected to bilateral electrolytic lesion of caudate nucleus and the remaining three were sham operated. All the eight animals acted as self controls. The behavior was recorded in a dimly-lit room in a specially constructed cage.

The responses of the male rats such as contact latency, number of mounts, sniffing at female rat and genital grooming were visually monitored and recorded simultaneously on a moving kymograph with the help of vibrating reeds modified for the purpose.

These records were analysed and the results indicate the possible inhibitory role of caudate nucleus in the regulation of sexual behavior in male albino rats.

99

INFLUENCE OF FEEDING AND FOOD DEPRIVATION OVER THE CIRCADIAN VARIATION OF OXYGEN CONSUMPTION RHYTHM IN A VERTEBRATE POIKILOTHERM (TILAPIA MOSSAMBICA). K. Nagarajan and V. Gopal. Dept. Zoology. Madras University Post Graduate Centre. Coimbatore, Tamilnadu.

It has been reported that food has the enhancing influence over the body temperature rhythm in homeothermic animals such as fowl (Srinivasan & Gopal, 1977), Rat (Indira and Gopal, 1977) and Humans (Gopal et al. 1977). To investigate whether any such influence exists in poikilotherms this preliminary study was carried out in *Tilapia mossambica*. 1. When fed ad libitum with goat-liver pieces at 06.00 hrs, there occur two distinct peaks, one at 12.00 hrs and another at 24.00 hrs in the circadian pattern of oxygen consumption in the natural day and night conditions. 2. In starved fish also there occur two peaks but with decreased amplitude. The present experiments reveal that the circadian oscillation of oxygen consumption of *Tilapia mossambica* can be modulated by food. The significance of oxgyen consumption will be discussed in the light of circadian rhythm.

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PERIPHERAL HAEMATOLOGICAL RESPONSE TO CHRONIC MICROWAVE EXPOSURE IN RABBITS. K. S. Nageswari, V. M. Bhatnagar, S. Varma and H. C. Tandon. Dept. Physiology. G.S.V.M. Medical College. Kanpur, U.P. 102

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Increasing use of microwave equipment and their possible hazards to the professionally employed and general public generated keen interest in this field. In the present investigation 6 conscious rabbits of either sex (1.5–1.9 Kg.) were kept individually in polysterine cage and exposed daily for one hour to continuous microwaves of 2.4 GHz at 3.5 mw/cm² power density for 2 months by using AILTECH HIGH POWER MICROWAVE SOURCE. There was no significant increase in the rectal temperature during experiment. In each case, control and post irradiation (after 2 months) blood samples were collected from ear veins into vials containing EDTA and analysed for haematological changes. It was observed that chronic microwave exposure of the power density used did not alter haemoglobin (gdl-¹); haematocrit(%), total leucocyte count (cumm-¹). However differential leucocyte count revealed decline in monocytes from 1.83+0.16% to 1.33+0.21% (P<0.05). The erythrocyte count declined from 4.71+0.21 millions/mm³ to 4.38+0.19 millions/mm³ (P<0.05). Mean corpuscular haemoglobin changed from 28.88+1.13 pg to 30.59+1.06 pg (0.05 < P > 0.1). The other absolute values remained unchanged. The results will be discussed.

101

REGULATION OF FEED INTAKE IN BUFFALOES-STIMULATION OF 'GLUCORECEPTORS' IN CENTRAL NERVOUS SYSTEM WITH 2-DEOXY-D-GLUCOSF. O. P. Nangia and S. L. Garg. Dept. Physiology. College of Vety. Seiences. Haryana Agricultural University. Hissar, Haryana.

The glucose analogue 2-deoxy-D-glucore (2-DG) is a competitive inhibitor of glucose metabolism and when injected it interfers with the use of glucose by cells. As a result, the hypothalamic cells (gluco-receptors) which are particularly sensitive to glucose deficiency stimulate food intake through glucostat mechanism in many species. The stimulation of food intake by 2-DG can, thus be used as a test for the presence of a glucostatic control of food intake.

The glucose concentration is much lower and dependence upon glucose for energy needs is smaller in ruminants as compared to non-ruminants. Therefore the present investigations were carried out to evaluate the sensitivity of ruminant CNS cells to glucoprivation by injecting 2-DG intravenously and the effects on blood glucose and meal size at different post feeding intervals were followed. The 2-DG injections were given to buffalo calves prior feeding, at $\frac{1}{2}$ hour post feeding (partially satiated) and at 3 hour post feeding (almost satiated). The food intake and blood glucose levels were also recorded in these animals by injecting glucose solution intravenously in different doses. The studies on limited number of animals showed that 2-DG did not have stimulating effect on food consumption. Similarly blood glucose level was not having significant role in controlling feed intake in buffalo calves. These results suggest that a functional glucostatic control may not exist in buffaloes. CIRCADIAN VARIATION IN TASTE DETECTION THRESHOLD IN HUMAN SUBJECTS. Savithri Natarajan, V. Gopal and Rathha Gopal. Dept. Zoology. Madras University P. G. Centre. Coimbatore, Tamilnadu.

Rhythmicity, an innate feature of living organisms is exhibited in various physiological processes. Blood constituents such as cosinophil, electrolyte, haemoglobin, glucose etc., exhibit such rhythmicity. With a view to find out whether any such rhythmicity exists in taste threshold detection, an attempt is made in present study. By "fixed step" or frequency psychophysical method. Taste threshold sensititivity tests for a group of human subjects during different hours of the day and night have been carried out for three classical tastes. Solutions of different concentrations of glucose, Na Cl and acetic acid were prepared to represent the three taste qualities such as sweet, salt and sour respectively. Following intermittent distilled water rinsing, an ascending order of various concentrations of the same solution were tested until the subject was able to detect the taste of a particular concentration and assigned as taste detection threshold.

Results obtained so far indicate that (i) there is individual variation in taste detection threshold (ii) there is a significant variation in taste sensitivity during different hours of the day for sweet and salt tastes, thus expressing a rhythmic pattern; (iii) for sour taste there is not much variation (iv) food intake seems to influence the sensitivity for sweet and salt. Sensitivity was high (low threshold) before breakfast (08.00 hrs) and low (high threshold) immediately after. The taste sensitivity slowly increased (low threshold) till lunch at 13.00 hrs, following which the threshold was again raised. This raised threshold slowly declined increasing the taste sensitivity steadily till dinner. Immediately following dinner, again there was a decrease in taste sensitivity. This was followed by a slow increase in sensitivity. A plateau during sleep was observed. This plateau remained steady until breakfast next day to repeat the cycle again. The rhythmic variation in taste sensitivity is discussed in the background of rhythmic variation of blood constituents like glucose etc.

103

102

MEASUREMENT OF METABOLIC RATE IN ALBINO RATS : EFFECT OF SHORT AND LONG EXPOSURE OF COLD ON THE METABOLIC RATE. S. Nayyar, A. S. Chakrabarty, O. P. Bhatnagar and S. K. Lal. Dept. Physiology. Maulana Azad Medical College. New Delhi.

A method has been standardised for the measurement of metabolic rate in albino rats by a "Closed Circuit technique". The CO_2 exhaled out is absorbed by baryta water and its amount is estimated by titration with N/10 HCl, with phenolphthalein as indicator. Experiments were carried out to find out the influence of cold exposure on the metabolic rate. The rats were exposed to 15°C in two phases i.e. short (for 4 hours) and long (for 18 hrs.). The result showed that short exposure produced a significant fall in metabolic rate; while long exposure could not produce a significant change in metabolic rate; compared with the same at ambient temperature.

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SUPERSENSITIVITY OF RABBIT ATRIA TO CATECHOLAMINES SENSITIZED BY HIGH ENVIRONMENTAL TEMPERATURE. S. A. Omar, Sarla Varma, S. A. H. Rizvi and D. Hammad. Dept. Physiology. G. S. V. M. Medical College. Kanpur, U.P.

Positive inotropic and chronotropic responses of isolated rabbit atria to increasing doses of catecholamines were studied at 37°C & 40°C. It was observed that responses of adrenaline and nor adrenaline were markedly potentiated at high environmental temperature as indicated by shift of dose response curve to left side (increased potency). Maximum dose of adrenaline 5×10^{-5} M produced 198.7±13.3% increase in chronotropic and a $311\pm21.73\%$ increase in inotropic responses of rabbit at 37°C. Similar dose produced a $361.3\pm12.01\%$ increase in chronotropic and a $397\pm0.53\%$ increase in inotropic responses of rabbit at 40°C.

Similar increase in responsiveness of isolated rabbit atria was observed with Noradrenaline also. The results suggest that there is a supersensitivity of rabbit atria to catecholamines and may be the possible mechanism of cardiotoxic effects of heat stroke and heat exhaustion.

105

DERMATOGLYPHIES IN CONGENITAL HEART DISEASES. I. S. Paintal. Dept. Physiology. Seth. C. S. Medical College. Bombay, Maharashtra.

Several congenital anomalies are known to have genetic basis. The study of dermatoglyphies may bring out significant association of the ridge type among them. Dermal ridge pattern analysis is now recognised as a useful technique for screening patients for chromosomal disorders and more generally for investigation of developmental disorders.

The dermal ridge pattern is Polygenetic in nature, is well established and also that number of chromosomal abnormalities and gene mutation are associated with congenital heart diseases. Hence, it is thought worth while attempting to correlate, if any, the ridge pattern with congenital heart diseases. The ridge counts and atd < of 100 cases of congenital heart diseases were

compared with the same number of normal subjects. The deviation from the normal in cases of congenital heart diseases is found to be statistically significant.

106

SOLID-STATE MICROELECTRODE ETCHING APPARATUS. *M. Palaniswamy* and *V. Gopal.* Dept. Zoology. Madras University Post Graduate Centre, Coimbatore.

The metal electrode etching apparatus described in this paper will automatically etch the metal electrode to a desired diameter. The significant feature of its design is that it will not require any manual control in the course of operation. The direction of any manual control in the course

436

of operation. The direction of etching current flow in the electrode changes in each cycle of operation automatically. Hence the polarization of electrode is avoided. The automatic production of electrode ensures excellent tapering. An oscillating carriage is coupled to its driving motor by a simple cable and pullcy system. The electrode holder shaft is attached to the carriage. The up and down oscillating movement of the carriage and hence the electrode holder is achieved by changing the polarity of the motor supply.

The control circuit consists of timer, which supplies trigger pulses to bistables 1 and 2. The bistable output Q and Q is applied to Transistors S_1 and S_2 . Now the motor rotates in such a way that the carriage moves in upward direction. The next pulse from the timer changes the state of bistable 1. The state of motor control circuit is also changed. This change makes the motor to rotate in the opposite direction to the previous to the second pulse. The amplitude of oscillation is controlled by the duration of timing pulse. The pulses from timer is also applied to the bistable No. 2. The output Q of the bistable is used to drive the transistor S_3 . A single pole double through relay R is connected to the Collector of the Transistor S3. When the state of Transistor S_3 changes, the relay contact positions are changed. These contacts are connected to the etching electrode in such a way to alternate the etching current in each cycle. The apparatus is entirely a new version designed primarily for the use in the preparation of microelectrodes and can also be utilised for any other scientific purposes which demand an automatic up and down or lateral movement.

107

EFFECT OF β-ADRENERGIC BLOCKADE IN ISCHAEMIC KIDNEY OF DOGS — A MORPHOLOGICAL APPRAISAL. A. Panda, A. C. Mahakur, S. N. Panda and C. L. Subudhi. Dept. Phiysiology. Divn of Nephrology & Urology. Berhampur, Orissa.

After the demonstration of intravenal vasoconstriction as a major factor in the production of acute renal failure the role of sympathetic system was implicated in the pathogenesis of acute renal failure. Numerous attempts were made to overcome this vascular component. \propto Blockade was reported to be noneffective in decreasing the ARF. In this study we have attempted to evaluate the effect of Propranolol (β -block) in acute ischaemic kidney.

The experiments were conducted in 18 dogs. Intraperitoneal pentothal was used as anaesthesia in the dose of 35 mg/kg body weight. Blood pressure was constantly monitored. Intravenous drips were started through femoral vein. In 1st Group—Propranolol in the dose of 1 mg/kg/hr in saline was started and run for 15 min, renal artery was clamped for 60 min. The infusion of propranolol continued for 20 min. after releasing the clamp. Biopsies just before and after the clamp at the end of the experiment were taken. In the 2nd group–Infusion of propranolol was started after clamping but continued for 35 min. after the clamp was released. In the control group—Only saline was infused. The biopsies were taken as in 1st model. The morphology was compared in different groups.

It appears that damage done by ischaemia was less by β -blockade and still better if it is used before & after the ischaemic period.



STUDIES ON PRODUCTIVE BEHAVIOUR OF CROSSBRED COWS RAISED AT B.H.U. DAIRY. D. N. Pande and B. K. Das. Faculty Agriculture. Banaras Hindu University. Varanasi, Uttar Pradesh.

Experiments were conducted to study the production behaviour of Holstein Friesian X Sahiwal (HFX S) crossbred females raised at the Dairy Farm of Banaras Hindu University as well as for progeny testing of the Friesian bull used in the process of cross breeding. It was concluded that (1) the crossbred animals attain early puberty, mature more quickly and produce more milk than Sahiwals, (2) their lactational performance is significantly higher than Sahiwals, (3) these crossbreds can thrive well in the local climatic condition of Varanasi region in eastern U.P., (4) the significantly reduced age of first calving in crossbreds is an important economic dairy trait related to the life time production with dairy cows, (5) the Friesian Sire used for crossbreeding in these experiments has got good genetic potentialities for the transmission of milk traits into his offsprings.

Further a comparative study of the lactational performance of different breeds of cattle and buffaloes of B.H.U. Dairy revealed that the milk yield of crossbred cows was significantly higher than all the breeds of Indian cattle and buffaloes included in this study. Milk yield of Haryana cows was the lowest. The amount of milk obtained from Sahiwal cows was significantly higher than Haryana breed. There was no significant difference between the lactational yield of Sahiwal Cows and Murrah buffaloes.

109

STUDY OF RELATIONSHIP BETWEEN SECRETOR/NON-SECRETOR STATUS AND ULCER FORMATION. *M. S. Pansare* and *A. P. Deshpande*. Dept. Physiology. B. J. Medical College. Pune, Maharashtra.

It has been suggested (Aird et al 1954) that secretor saliva helps as a protector to gastric mucosa and hence the secretor people are less prone to gastric ulcers. To verify this finding the following work was done.

The female rats, weighing 150 to 250 gms, were taken. They were kept fasting for twelve hours. They were subjected to light ether anesthesia. Pyloric ligation was done by the method used by shay & co-workers, modified by Yasuoishi. One group was injected in stomach with one cc. of secretor saliva and other group was injected with one cc of non-secretor saliva. The ulceration was studied after six hours. The gastric juice was collected and analysed for free and total acidity. The results are analysed and discussed.

110

A POSSIBLE ROLE OF LYSOSOMAL ENZYMES IN EMBRYO-UTERUS INTERACTION IN THE RABBIT. Bibhas C. Paria, Jayasree Sengupta and S. K. Manchanda. Dept. Physiology. A.I.I.M.S. New Delhi.

Blastocyst implantation involves adhesions and invasion of uterine epithelium by the trophoblastic knob tissues. It is likely that lysosomes may play an essential role in embryo-uterine interaction. In the present study we have



estimated activities of enzyme markers of lysosomes such as, acid phosphatase, non-specific esterases, B-glucuronidase and amino acid arylamidase in implantation, inter-implantation zones and in pseudopregnant uteri of rabbits. The present investigations will help to clarify the extent of lysosomal participation during ovum implantation and the role of embryo estrogen in the regulation of these events.

Rabbits of mixed breed, mostly New Zealand white, were injected with follicle stimulating hormone for three days and they were then mated with two fertile bucks. After mating 25 I.U. HCG was given. The day of mating was designed as day O of pregnancy. On day 1 *post coitum* (P.C.) rabbits were bilaterally ovariectomized and maintained on daily progesterone therapy. 200 µg of CI628 citrate, an antiestrogen, was injected into one uterine horn and the other received saline vehicle only. The rabbits were killed on day 7½ P.C. and uterine regions bearing implants and also the interimplantation zones were dissected out and kept for enzyme assays. In another experiment, rabbits were injected with HCG to induce pseudopregnancy and they were then subjected to the same experimental design as described above for pregnant dose. The results indicate that there is a change in lysosomal enzyme pattern at the site of implantation. Furthermore, these enzymes activities are influenced by oestrogen released locally from the blastocysts.

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INTRODUCING GERIATRICS IN MEDICAL EDUCATION IN INDIA. J. D. Pathak. Medical Res. Centre. Bombay Hospital. Bombay.

Medical education to be useful ought to take note of changing needs of the society. The population of elderly people is steadily increasing in our country. At the last census (1971) it was more than 6% of the total population. Better understanding, education and proper preventive measures will save the country of the many difficulties, it will have to shoulder otherwise in future for this group of population. Yet neither in physiology nor in any other medical subjects even reference is

Yet neither in physiology nor in any other medical subjects even reference is made to the medical aspects of aging. It is high time geriatrics is introduced in our country.

- (a) Introduction of relevent aspect of aging in various subjects taught at the undergraduate stage; working knowledge and demonstrations of geriatric cases in the internship period.
- (b) Postgraduate diploma or degree in the subject; Research.
- (c) Refresher courses for practitioners.
- (d) Education and enlightenment of the general public in suitable fields.

112

ASCORBIC ACID EXCRETION IN URINE AFTER LARGE INTAKES. J. D. Pathak and S. D. Joshi. Medical Research Centre. Bombay Hospital. Bombay.

Elimination of Ascorbic Acid (Vit.C) in 24 hrs. urine was studied in 15 healthy men who were given for several days large doses of Vit. C from 1-8 grms per day by mouth. They excreted averagely 21-16 mgs. on their usual diet. Peak urinary excretion was achieved within 48 hrs. & sustained so long as the large intakes were continued, but fell precipitately in 24 hrs. on discontinuation. No long term storage of AA occurred in the body even

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after huge amounts were taken for a long time. AA eliminated in 24 hrs. urine was exponentially increased with larger intakes, but this amount was at most 1/3 of the dose.

In 8 experiments the urine was estimated for dehydroascorbic acid form. No significant amounts were recovered in the urine (hardly 5% of AA excreted). The larger amounts ingested seem to be utilised/converted to some other form in the body possibly governed by a regulatory mechanism.

Plasma AA value on their usual diet was 0.92+0.13 mgms% (range 0.77-1.20), but was not proportionately increased with large doses. The plasma AA contents, intakes or eliminations were not correlated.

113

EFFECT OF EXERCISE ON MAGNESIUM IN BODY FLUIDS. Hemlata P. Pispati, Shubhangi. S. Pathak, J. V. Bhatt and Jai J. Engineer. Dept. Physiology & Biochemistry. T. N. Medical College. Bombay, Maharashtra.

Magnesium is present in all living cells and is known to serve as an activator of a spectrum of enzymatic reactions.

The exact role of magnesium in health and various disease states is currently being unraveled and many aspects of magnesium metabolism remain illdefined The relationship of hypomagnesemia has recently received considerable attention. It is now recognized that low values are encountered in a number of clinical situations and may produce serious consequences unless measures are taken to restore magnesium levels to normal.

The present study was undertaken to see the effect of a physiological factor like muscular exercise on magnesium. Moderate exercise had been shown to reduce the renal output of magnesium. Hence a study of changes in serum magnesium and urinary output of magnesium after giving a moderate exercise (till heart rate=150/for 3 minutes) by bicycle ergometer, was done in

26 healthy medical students in the age group from 18-20 years.

The level of serum magnesium was found to be increased with decreased urinary output of magnesium. The result may be of some help in clinical medicine, to restore magnesium levels to normal.

The statistical significance of the result will be discussed.

114

ROLE OF THE CEREBELLUM IN THE ALTERED BREATHING PATTERN DURING THE STIMULATION OF SYMPATHETIC AFFERENTS. N. R. Prabhakar, W. Marek and H. H. Loeschcke. Institut Fur Physiologie. Ruhr Universität Bochum/West Germany.

Continuous electrical stimulation of the cut central ends of the mesenteric plexus, renal or splenic nerves $(2-6 V, 10-20 \text{ imp s}^{-1} \text{ and } 2 \text{ ms})$ in spontaneously breathing, anaesthetized cats resulted in an initial brief arrest of respiration in an inspiratory position, followed by an increase in tidal

volume and respiratory frequency. The initial inhibition of respiration was accompanied with a complete inhibition of the phrenic nerve activity and a marked increase in the external intercostal muscle activity. Bilateral splanchnicotomy abolished these responses. Stimulation of the mesenteric plexus in inspiration with *short trains* (300–500 ms, 10 sec⁻¹) of electrical pulses lead to a complete and maintained inhibition of phrenic nerve activity with a simultaneous increase of external intercostal muscle activity. The tidal volume, however, was reduced by about 20% only. After cerebellectomy, the inhibition af the phrenic nerve activity was reduced and the increased intercostal muscle activity was no longer seen. Thus the cerebellum seems to be involved in the altered breathing pattern during the stimulation of the sympathetic afferents.

Supported by Deutsche Forschungsgemeinschaft. SFB "Bionach" 114

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SEASONAL VARIATION OF BMR AT AHMEDABAD. R. Prajapati, M. Pujara, Tarun Das and H. Jana. Dept. Physiology. Smt. N.H.L. Municipal Medical College. Ahmedabad, Gujarat.

Ahmedabad is a city in the west coast of India (latitude 23° and longitude 72°). It has got fairly extreme climate, summer covering the major portion of the year interspersed with monsoon and winter. Ambient temperature varied from 8.6°C to 44.8°C and relative humidity from 26% to 100%

Fifteen medical students of age goup 18-26 years were the subjects for the BMR estimation in all three prominent seasons of Ahmedabad-summer, monsoon and winter. Closed Circuit Benedict-Roth apparatus was used for the experiment. Accuracy at the 5% level was strictly observed between the two observations in a day and between the averages of observations on consecutive days. R.Q. 0.82, representative of the mixed diet, was assumed as carbon dioxide was not determined in the experiment.

Oxygen consumption and BMR in winter were significantly higher in comparison to those during summer (p<0.001) and monsoon (p<0.001). Further these parameters were similar in summer and monsoon. In the face of conflicting reports from the continent and from the rest of the world regarding the seasonal variation of BMR, increased BMR in winter at Ahmedabad has been discussed in light of the recent observations on metabolic studies in different seasons.

116

EFFECT OF ACTUAL EXERCISE AND OF EMOTION OF EXERCISE ON BLOOD PICTURE IN WAKING AND IN HYPNOSIS. M. Pujara, R. B. Prajapati, Tarun Das and H. Jana. Dept. Physiology. Smt. N.H.L. Municipal Medical College. Ahmedabad, Gujarat.

Hypnosis has been reported to be of value in improving physical performance in individuals. Young male subjects performed submaximal exercise in waking and in hypnotic trance state. Also these subjects imagined the exercise in



waking and were given suggestions of the exercise in the hypnotic trance state. Studies of blood picture in this investigation revealed significant increase in red cell count after actual exercise and significant high monocyte count after imagined exercise in the waking state. In the hypnotic trance state, on the other hand, clotting time decreased significantly after actual exercise and the level of Hb and lymphocyte count were significantly high after actual exercise. Total leucocyte count after actual exercise in trance was significantly higher as compared to that after suggested exercise in trance.

In experiments involving hypnosis subjects felt more pleasant while relaxing on bed, having exercise and during finger pricks and venepunctures than in experiments in the waking state. The extent of increase in red cell count, PCV and ESR in response to muscular exercise in the trance state was less as compared with that in waking state.

117

EFFECT OF CHEMICAL STIMULATION OF HYPOTHALAMUS ON BLOOD PRESSURE IN CATS. S. Puri, A. S Chakrabarty, and S. K. Lal. Dept. Physiology. Maulana Azad Medical College. New Delhi.

The effect of chemical stimulation of the hypothalamus on blood pressure in cats was carried out with the help of chemitrodes, stereotaxically implanted in the various areas of hypothalamus, Noradrenaline $(10 \ \mu g)$ or isoprenaline $(10 \ \mu g)$ was microinjected before and after microinjection of respective blockers. The present investigation shows that noradrenaline increased blood pressure when injected in the lateral and posterior hypothalamus. On the contrary noradrenaline when injected into the anterior and dorsomedial hypothalamus decreased blood pressure. The effect of noradrenaline was blocked by phenoxybenzamine. Isoprenaline also decreased blood pressuse when injected into anterior and dorsomedial hypothalamus. The effect of isoprenaline was blocked by practalol. The present study shows that posterior and lateral hypothalamus contain alpha adrenoceptors producing a pressor response while anterior and dorsomedial hypothalamus contain both alpha and beta adrenoceptors producing a depressor response.

118

PRESENCE OF DEPRESSOR ALPHA AND BETA ADRENERGIC RECEPTORS IN THE HYPOTHALAMUS CONCERNED WITH CONTROL OF ARTERIAL BLOOD PRESSURE. S. Puri, A. S. Chakrabarty and S. K Lal. Dept. Physiology. Maulana Azad Medical College. New Delhi.

We reported earlier (1) the presence of alpha adrenoceptors in the posterior and lateral hypothalamus producing pressor responses. Further studies were carried out to find out the role of various hypothalamic adrenoceptors in controlling blood pressure. The effect of electrical stimulation of the hypothalamus on blood pressure was studied before and after microinjection of Phenoxybenzamine (20 μ g) and practalol (20 μ g), Chemitrode was

stereotaxically implanted in cats for both electrical stimulation and micro injection of alpha and beta blockers. Some of the depressor responses due to electrical stimulation of anterior and dorsomedial hypothalamus were blocked by phenoxybenzamine, while others were blocked by practalol. The present investigation thereby demonstrates the presence of alpha and beta receptors in the anterior and dorso medial hypothalamus mediating depressor responses. Reference :

1. S. Puri, A. S. Chakrabarty & S. K. Lal

Hypothalamic alpha adrenergic receptor concerned with control of arterial blood pressure, Indian J. Physiol., Pharmac., 22, 19, 1978.

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EFFECT OF DIESEL SMOKE ON LUNG SURFACTANT ACTIVITY IN ALBINO RATS. U. C. Rai, V. Srinivasan, A. Srinivasa Rao, B. Krishnan and S. Sreepathi Rao. Dept. Physiology and Physics. Jipmer. Pondicherry.

Effect of diesel smoke on lungs is well documented both in experimental animals and on human beings. But hardly any published data is available on the effect of diesel smoke on lung surfactant activity which is known to play an important role in maintaining the patency of alveoli. The present study was done to define the role of diesel smoke on lung surfactant activity of albino rats. Random selection of the rats weighing 120 to 140 gms of either sex was done for control and test group. The test group animals were exposed to diesel smoke for 15 minutes once every day for a period of 90 days. After that the rats were sacrificed and lung tissue was removed for lung surfactant studies. The surfactant activity of the lung was estimated by measuring maximum and minimum surface tension of the lung extract using a modified Wilhelmy type of surface tension balance. It was observed that in the experimental group the maximum and minimum surface tensions of lung extract were increased as compared to the controls indicating that the surfactant activity is decreased.

120

INTAKE REGULATIONS OF MALE AND FEMALE RATS. B. S. Rao and K. N. Sharma. Dept. Physiology. St. John's Medical College. Bangalore.

Rats fed adlib (Gr I) and kept on 3 hr diet (Gr II) showed distinct male and female intake responses on mixed diet and solution tests. Mixed diet tests showed that Gr I female intakes (cal/100gm body weight) on stock (20.20 \pm 0.92), sucrose (22.26 \pm 1.33), saccharin (21.94 \pm 0.84) and salt (19.81 \pm 0.55) diets were similar whereas male intakes on sucrose (19.63 \pm 1.28) and saccharin (19.71 \pm 1.15) were increased and salt (12.52 \pm 0.47) decreased as compared to their intake on stock diet (16.16 \pm 0.51). Quinine depressed Gr I male intake (5.66 \pm 0.45) more than it did female intake (8.87–0.63). Gr II

male and female intakes showed patterns identical to their Gr I counterparts, excepting for diminished intake on all diets. Solution tests showed that Gr I male intake (ml/100 gm bw) on glucose (3.19 ± 0.18) and saccharin (3.36 ± 0.19) were similar whereas female glucose intake (3.55 ± 0.26) was increased over saccharin intake (2.55 ± 0.18) . On quinine both male (0.57 ± 0.07) and female (0.66 ± 0.06) intakes were suppressed, suppression in male being slightly greater. Gr II male and female ingestion patterns parelleled Gr I male and female patterns with difference that intakes of either sexes increased on glucose and saccharin and decreased on quinine. In summary female intake was calorically regulated whereas male intake was taste regulated.

121

VENTILATORY FUNCTION TESTS IN ADULTS. J. Subba Rao, K. J. R. Murthy, Sikandar Hussain, P. S. R. Raju and M. Prakasham. Gandhi Medical College. Hyderabad, A. P.

One hundred and seventy subjects (106 male and 64 females) belonging to different socio-economic groups and working in same environment (Hospital for Diseases of Chest and T. B., Hyderabad, A. P.) were studied for the Ventilatory Functions. Age groups studied were, 5 years intervals, from 21–50 years. The Ventilatory Functions studied were Forced Vital Capacity (FVC), one second Forced Expiratory Volume (FEV₁), Maximum Voluntary Ventilation (MVV), Forced Expiratory Flow Rate (FEF), Mid Expiratory Flow Rate (MMV), Peak Expiratory Flow Rate (PEFR), Mid Expiratory Flow Time (MMFT) and Forced Expiratory Time (FET). Results were compared with other Indian and Western studies. The indices were found to be dissimilar. The values were in general less than the Western figures but they were higher when compared to one Indian study (Kamat et al) and lower than the other Indian study. (Singh et al).

122

GASTRIC MOTOR RESPONSES ELICITED BY PHENYLDIGUANIDE. K. S. Rao. Dept. Physiology. Institute of Medical Sciences. B.H.U. Varanasi.

In rats under pentobarbitone anaesthesia, phenyldiguanide (pdg) reduces intragastric pressure (igp) on atrial injection whereas an aortic injection increases igp, lasting for several minutes. Intracarotid injections are without effect. Atropine lessened the gastric motor response to atrial pdg but not to aortic pdg. Vagotomy abolishes the responses to both atrial and aortic pdg. Guanethedine and spinal transection abolish the response to atrial pdg only. It is inferred that pdg acts by stimulation of non-medullated vagal afferents. The efferent pathways for pdg evoked gastric relaxation traverse via sympathetic nerves and efferent system for the gastric contraction involves a non-cholinergic, non-adrenergic excitatory mechanism.



RESPIRATORY RESPONSES TO TRACHEAL DISTENSION. S. V. Rao, F. B. Sart' ambrogio and G. Sant' ambrogio. Dept. Physiology & Biophysics. UTMB. Galveston.

In ten dogs, anaesthetized with pentobarbital (30 mg/kg) and spontaneously breathing through an endotracheal tube, short segments (3 cm) of either intrathoracic (ITT) or extrathoracic trachea (ETT) were distended by overinflation of the sealing cuff within the first half of inspiration and maintained for at least the next cycle. Phrenic electroneurogram, its integral, arterial pressure and end-tidal Co₂ were recorded. Distension of the ITT led to a significant (P<0.05) prolongation of expiratory duration (Te=219% of control) in 9 of the dogs, ETT distension prolonged Te in 6 of the dogs (206%). An inhibition of inspiration was found in 8 dogs resulting from either a shortening of inspiratory time (Ti=48% of control) together with a reduction of peak phrenic amplitude (PPA=48%) or as an initial decrease of the phrenic discharge which immediately resumed. After vagotomy distension of ITT shortened Te (58% of control) in 7 dogs, while the same challenge was ineffective when given through ETT. No significant effects were elicited on Ti and PPA by ITT and ETT distensions. Some of these results can be interpreted in the light of known behavior of tracheal stretch receptors, and indicate also the presence of extravagal influences. (Supported by NIH grant Rool-HL-20122-02).

124

ANALGESIA FOLLOWING MORPHINE MICROINJECTION INTO ANTERIOR CEREBELLUM OF RATS. A. K. Ray and P. K. Dey. Dept. Physiology. Institute of Medical Sciences. B.H.U. Varanasi, U.P.

There is now considerable evidence that sites for antinociceptive action of morphine is located in several regions of the brainstem: thalamus, hypothalamus, periaqueductal gray matter, floor of the IV ventricle and ventral surface of brainstem. We now report that anterior cerebellum is another site of analgesic action of morphine in rats. Microinjection of 10ug of morphine in 1 μ l through a chronically implanted stainless steel cannula into culmen/culmen & lobus centralis of anterior cerebellum produces profound analgesia tested by tail-flick method. The analgesia occurs within 15 minutes and reaches to peak response around 30 minutes. But the same microinjection of morphine into lobus simplex, declive or uvula of posterior cerebellum does not produce analgesia.

Anterior cerebellum also exerts remarkable modulating influence on analgesia induced by intraperitoneal injection of morphine (10mg/kg). Rats in which anterior cerebellum was removed by microsuction technique, the i.p. injection of morphine produces analgesia in them, but the duration of analgesia is greatly shortened compared to control morphine injected rats. While the ablation of posterior cerebellum does not produce any attenuation of morphine analgesia, rather a tendency of prolongation of analgesia is apparent. It is interesting to note that cerebellar ablation *per se* does not modify the nociceptive response in animals.

445

EFFECTS OF EXCESS OR LACK OF Na⁺ K⁺ or Ca⁺⁺ IONS ON THE ACETYLCHOLINE TURNOVER FROM THE PERFUSED OR/AND VAGAL STIMULATED FROG HEART. Y. Venkata Reddi. Dept. Physiology. Andhra Medical College. Visakapatnam. A.P. 12 E

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Experiments conducted with excess or lack of Na⁺, K⁺ or Ca⁺⁺ ions in oxygenated Eserinised Clark's Solution (ECS) perfusion with or without vagal stimulation revealed interesting features in Acetylcholine (Ach) turnover from perfused or/and vagal stimulated frog heart, when compared to control. Isolated frog heart with or without vagal nerves was perfused through Syme's cannula with normal or Na⁺, K⁺ or Ca⁺⁺ excess or lack ECS; when the perfusate was collected during 10 min normal ECS and later 30 min with varying ions (at intervals of 10 min) without or with vagal stimulation. The Released Ach in perfusate, Free (F) (after mincing of heart in cold) and Bound (B) (acid extracted) Ach were bioassayed in cat's arterial blood pressure.

pressure. The perfusate of normal heart contractions in all experiments unassociated with vagal stimulation showed occasional traces of Ach Perfusions with varying ions increased the Released Ach during perfusion period and decreased F, B and Total Ach values at various levels, compared to control. Perfusions associated with vagal stimulation decreased the Released Ach during perfusion period and increased the latter Ach values at various levels. The effects of various ions controlling membrane permeability and enzymatic system in cholinergic transmission at vagal nerve endings in heart are discussed to assess the function of heart.

126

PRANAYAMA AND SOME CARDIO RESPIRATORY PARAMETERS IN MEDICAL STUDENTS. S. A. H. Rizvi, P. Varma, A. Maini and S. Varma, Dept. Physiology. G. S. V. M. Medical College. Kanpur, U.P.

The previous study on Yoga on Physiological parameters have been conducted with small number of volunteers and individual yogis. Scanty conducted femoles are exailable.

In the present study young volunteers of either sex (n=40, 18-21 years) were trained in Pranayama (30 minutes per day for six months) following which changes in heart rate, blood pressure, respiratory rate, breath holding time, vital capacity, tidal volume and respiratory functions viz. IRV, ERV, M.V.V. and timed vital capacity (FEV₁) were measured and compared with control results in same performer.

The results show increased capability of chest expandibility by 33-36% in either sexes which was associated with significant improvement in vital capacity FEV₁ and breath holding time showing improved lung compliance and respiratory muscle functions. The basal respiratory rate showed decrease in tidal volume.

However, no significant changes were observed on heart rate and blood pressure.

It seems training with pranayama alone improves parameters related to respiratory functions only. The results will be discussed.



EFFECTS OF GLUCOCORTICOID THERAPY ON CALCIUM, PHOSPHORUS AND MAGNESIUM METABOLISM. S. N. A. Rizvi. Dept. Medicine, Maulana Azad Medical College. New Delhi.

Twenty-five (25) patients of varied aetiology were selected for the study. Serum calcium, phosphorus, magnesium, alkaline phosphatase and 24-hour urinary calcium, phosphorus and magnesium along with radio-active Ca⁴⁵ and Sr⁸⁵ tracer studies including calcium balance were carried out before the start of oral prednisolone given in the doses of 60–120 mg/day. At the end of 4 weeks therapy all parameters were restudied. Calcium balance studies were performed in 10 patients after supplementation of oral vitamin D along with steroid therapy to see the effect of Vitamin D on calcium absorption at gut level. Significant reduction in the levels of serum calcium and phosphorus and increase in urinary calcium, phosphorus and magnesium were observed after 4 weeks of prednisolone therapy ($p = \angle 0.001$). Radioactive tracer studies also revealed a marked increase in the endogenous as well as the total faecal calcium ($p = \angle 0.005$). Reversion of negative calcium balance to normal after vitamin D suggested that prednisolone influences the absorption of calcium and phosphorus through antagonisnm to vitamin D.

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CONSEQUENCES OF VITAMIN D DEFICIENCY AMONGST POORER SECTION OF COMMUNITY IN NORTH INDIA. S. N. A. Rizvi, H. Vaishnava and P. S. Gupta. Dept. Medicine, M.A.M.C. New Delhi.

1989 cases of osteomalacia were studied over a period of 17 years. 88% cases were due to the lack of dietary vitamin D and insufficient exposure to sun light. Majority of cases belonged to age group between 13-35 years. Females predominated over males. All lived in the slums of old Delhi and were deprived of sunlight and dietary vitamin D (30 units $\pm 18/day$) was low. Their dietary intake of calcium, phytate, oxalate and fibre contents were comparable to the control group.

Bone pains and generalized aches were the common presenting symptoms in 90% cases (1575 cases), other symptoms such as waddling gait (30%), tetany (9%), deformities (7%) and fractures (5%) were also recorded. Serum calcium was low ($\angle 8 \text{ mg}\%$) in 75% cases, phosphorus ($\angle 3.0 \text{ mg}\%$) in 200%

Serum calcium was low ($\angle 8 \text{ mg}_{\circ}$) in 75% cases, phosphorus ($\angle 3.0 \text{ mg}_{\circ}$) in 80% cases, but alkaline phosphatase was raised in about 95% cases. All patients showed evidence of low urinary calcium excretion ($\angle 50 \text{ mg}/24 \text{ hr}$). Calcium infusion performed in all the cases suggested less than 31 percent excretion of calcium in 12-hour urine out of total calcium (15 mg/kg) infused. In a survey conducted on families of 600 patients (vitamin D deficiency osteomalacia); it was found that 1734 family members including children (39%) were the victims of subclinical or biochemical vitamin D deficiency.

Results of therapy with high dose vitamin D were rewarding. All biochemical parameters returned to normal within 4 weeks to 1 year of therapy. All patients were given a maintenance dose of vitamin D (5,000 units/day) for 6-12 years. None showed evidence of vitamin D intoxication at any time.

RETROGRADE AXONAL TRANSPORT OF HRP IN SCIATIC NERVE OF DEVELOPING RATS. Sabita Roy, G. Gopinath, U. Nayar and S. K. Manchanda. Dept. Physiology. A.I.I.M.S. New Delhi.

The finding that axons are capable of taking up exogenous proteins and transporting them in a retrograde direction to the nerve cell body has an important implication for the understanding of certain puzzling neurobiological phenomena such as the trophic influences of end organs on the nerve cell body, the signal for chromatolysis after axonal lesions and how certain toxins and neurovirulent viruses spread from the periphery to the central nervous system (Kristensson and Olsson, 1971). ir

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The present study has been taken up to find out the rate of axonal (retrograde) transport in the peripheral nerves of developing rats. Since the enzyme Horse Radish peroxidase (HRP) is the most effective agent traceable both by light and electron microscopy, it has been used to determine the axonal transport. Developing rats of ages 10,15 and 21 days were used as they represent the period in the development of the barrier system of the perineurium, structural and functional maturation and myelination in the rat sciatic nerve. Rats were anaesthetized with ether and 10 μ l of 20% HRP (Sigma Type VI) was injected into the gastrocnemius muscle using a 10.00 lambda Hamilton syringe. The animals were allowed to survive for 24 hrs. to 72 hrs. The sciatic nerve was exposed from the injection site to the spinal cord and measured. The animal was sacerificed by intra-cardiac perfusion of 1.5% Glutaraldehyde in phosphate buffer (7.4 pH). The segments of the spinal cord were exposed by tracing the sciatic nerve and were cut out and processed for HRP demonstration in the ventral motor neurons. The details and relevance of the technique and preliminary observations shall be presented.

Reference

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130

EFFECT OF STEROIDS ON ISTHMIC AND AMPULLARY MOTILITY OF RABBIT OVIDUCT. Ratna Roy Chowdhury, S. K. Manchanda and U. Nayar. Dept. Physiology. A.I.M.S. New Delhi.

We have earlier reported the HCG induced post-ovulatory motility pattern in the oviductal isthmus in the rabbit and demonstrated the existence of 3 phases of motility, i. e., receptive relaxation, increased isthmic motility and restitution (1). By using similar techniques, we wish to report in this paper that low doses of estradiol benzoate $(25 \ \mu g)$ and progesterone $(2.5 \ mg)$ decrease the motility of both the isthmus and the ampulla of the rabbit oviduct leading to the complete abolition of increased isthmic motility resulting from HCG induced ovulation. Ovum placement studies indicate that these postovulatory inhibitory phases of the ampulla and the isthmus are closely related with the

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rease ding G ory he increased rate of ovum transport. Chronic subcutaneous implantation of silastic capsules which release norethindrone acetate at a fairly constant rate over a period of months also markedly inhibited the isthmic motility. In 2 out of 3 experiments the ampullary diameter also showed a significant increase indicating the possibility of excessive secretions in the ampulla. (1) Manchanda, S. K., Roy Chowdhary, R., Sengupta, J., and Guha, S. K. Post-ovulatory motility pattern of the rabbit oviduct and effect of estradiol benzoate. In : Recent Advances in Reproduction and Regulation of Fertility Ed. G. P. Talwar, Elsevier/North-Holland Biomedical Press, Amsterdam, New York, Oxford, pp. 201-210, 1979.

131

E. E. G. CHANGES IN HIGH ALTITUDE NATIVES DURING SOJOURN AT PLAINS AND ON RETURN TO HIGH ALTITUDE. W. Selvamurthy, S. K. Saxena, N. Krishnamurthy and H. S. Nayar. Defence Institute of Physiology & Allied Sciences. Delhi Cantt.

The study was conducted on 20 healthy subjects between the age of 20-30 years to evaluate the changes in EEG pattern of high altitude natives (HAN) during sojourn at plains and on return to high altitude (HA). EEG was recorded on a 8 channel GRASS Electroencephalograph during resting, voluntary hyperventilation and photic stimulation, by the 10-20 International system of electrode placement set for A-P temporal run. The natives living at an altitude of 3500m were brought to the plains and the EEG was recorded periodically during their stay at plains for a period of 2 months and thereafter on return to High Altitude (3500m) for a period of 5 weeks. The quantitative analysis of EEG (Occipital) was done to measure alpha index and average amplitude, in addition to the observation on the qualitative changes. The mean AI was 55% at HA which decreased to 48%, 36% and 34% on days 21-35 and 56 respectively during this stay at plains. It changed to 40%, 30%, 34%, 39% and 43% on days 1,7,14,21 and 28 respectively after return to HA. The average amplitude of EEG (occipital) was 29.5 µv at HA which decreased to 19.4 µv on days 56 during sojourn at plains and changed to 23.2 µv, 16.5 µv, 20.7 µv, 23.3 µv and 25.4 µv on days 1,7,14,21 and 28 respectively after return to HA. These results indicate that there is cerebral cortical desynchronization in HAN during sojourn at plains due to shift of autonomic balance towards relative sympathetic dominance. On return to HA the natives show gradual build-up of EEG due to build-up of parasympathetic tone.

132

HYDROSTATIC WEIGHT OF SPERMATOZOA. R. N. Sen, D. Chakrabarti and J. L. Chakrabarti. Dept. Physiology. Calcutta University. Calcutta.

Weight is a physical parameter. Identifying a sample by this parameter needs consideration of the specific purpose to which this quantity is applied. All too frequently wet weight is applied. Dry weight though more useful has its own

limitations. A new character of weight as conceived by Linderstr ϕ m-Lang (1940) and termed 'reduced weight' is independent of water content of the sample and has been used in a variety of biological studies. This in fact is the weight of a substance in water and may be termed as 'Hydrostatic weight'.

A new simple method for calculation of 'hydrostatic weight' of bovine spermatozoa in its own seminal plasma has been reported here. The specific gravity (absolute density) of whole semen and seminal plasma is determined with micropycnometer. Spermatocrit value is determined with haematocrit tube. The 'hydrostatic weight' is then determined by use of the following formula :

ditering and	Г 1(1	spermatocrit value
Sp. Gr. nea	at— sp. gr. pl. \times (1 –	10
=	Total count/ml.	1000

Hydrostatic weight of spermatozoa in its own plasma so derived is 8.77 ± 0.38 (10⁻⁸ mg).

Hydrostatic weight of sperm is an important character necessary for interpreting correctly the flow behaviour & rheological characters of semen.

133

Hydrostatic weight

SERUM PROTEIN BOUND IODINE T, HYROXINE AND TRIIODOTHYRONINE LEVELS DURING NEONATAL PERIOD IN BUFFFALO CALVES. M. S. Setia and P. N. Varman, Dept. Physiology. Punjab Agricultural University. Ludhiana.

Pattern of thyroidal hormones was studied in buffalo calves ranging in age from zero day to 12 weeks. The serum protein bound iodine (PBI) was determined by using a modification of the method of Barker and Humphery (1950) and thyroxine (T_4) and triodothyroxine (T_3) were analyzed by radioimmunoassay. The values for PBI, T_4 and T_3 were 14.5, 13.9 and 0.50 at birth ; 6.7, 6.4 and 0.22 in one week and 4.6, 4.2 and 0.08 $\mu g/100$ ml in 12 week old calves respectively. The values were highest atbirth and there was a significant decrease during the first week. The T_4/T_3 raito was found to be minimal (27.8) at the day of birth but it increased to 29.0 in one week and to 52.5 in twelve weeks old buffalo calves. The result was also expressed according to the stage of rumen development. The specific pattern of thyroidal hormones during early neonatal period in buffalo calves suggest that both T_4 and T_3 play a crucial role in metabolic and functional adaptation of the new born calf to its newer environment.

134

EFFECT OF SILVER, GOLD AND MERCURY COLLOIDS ON ERYTHROCYTE AND IRON METABOLISM. D. C. Sharma, M. Sharma, A. S. Rathore, O. P. Gupta, M. K. Dube and M. M. Simlot. Dept. Physiology & Biochemistry, R. N. T. Medical College. Udaipur, Rajasthan.

The effect of intraperitoneal administration of silver, gold and mercury colloids on erythrocyte and iron metabolism was investigated in albino rats at four

doses. In addition, changes in the morphology of liver, spleen, kidneys, erythrocytes and bone marrow were also seen. These metal preparations were found to produce hypoferremia, induce hyposiderosis in bone marrow, cause anemia, and bring about compartmental redistribution of existing non-heme iron. However, these colloids had no effect on the number and morphology of circulating erythrocytes.

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INVOLVEMENT OF PROSTAGLANDINS IN STRESS-INDUCED INCREASE IN BLOOD-BRAIN BARRIER (BBB) PERMEABILITY IN RATS. H. S. Sharma and P. K. Dey. Dept. Physiology. Institute of Medical Sciences. B.H.U. Varanasi, U.P.

Various kinds of stressors cause increase in BBB permeability in rats (1, 2), but the mechanism (s) responsible for such increase in cerebrovascular permeability is not known.

Prostaglandins are known as the first mediators of stress. Injection of indomethacin (an inhibitor of prostaglandin synthesis) inhibits corticotrophin secretion in response to stress and tail-vein injections of prostaglandin E_1 in rats stimulate the hypothalamopituitary-adrenal axis in rats (3).

In order to find out the possible role of prostaglandins in stress-induced increase in BBB permeability, 16 rats (55–99g) of either sex were treated with 10 mg/kg indomethacin (ip) 30 min prior to induction of stress. 10 rats (60–99g) were immobilized for 9 hr in prone position and after 4.5 hr of immobilization, another dose of 10 mg/kg indomethacin was injected. 6 rats (60–70g) were subjected to forced swimming for 30 min.

25 rats (45-80g) served as non-treated control. 18 rats were immobilized for 6.12 to 9.17 hr and 7 rats were put to swimming exercise for 30 min. After termination of stress, under urethane anaesthesia, Evans blue (2%, 3 ml/kg)was injected into right jugular vein. After perfusion by 0.9% saline followed by 10% formalin, brains were removed and examined for the penetration of Evans blue dye in the cerebral tissues. 13 out of 18 immobilized and all 7 rats subjected to swimming exercise, showed extravasation of Evans blue in cerebral cortical tissues in control group. No increase in permeability was observed in 7 out of 10 immobilized rats and in 6 rats subjected to swimming exercise pretreated with indomethacin.

These results suggest that prostaglandins may be responsible, up to a certain extent, in stress-induced increase in BBB permeability. *Reference*

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ACUTE BODY TEMPERATURE RESPONSES OF CONSCIOUS RATS EXPOSED TO CENTRIFUGATION AND COLD. J. D. Sharma. School of Environmental Science. Jawahar Lal Nehru University. New Delhi.

A definite drop in colonic temperature (T_{co}) is observed in rats subjected to centrifugation (corresponding to 1.6G) kept in the G_y and G_z postitions (with respect to heart displacements); at ambient temperature (T_a) , 21°C. The magnitude of the drop in T_{co} increased considerably at a low ambient temperature $(T_a=10^{\circ}C)$, and is related to the position of the head in relation to the axis of rotation.

The thermoregulatory system is obviously affected and is perhaps related to fluid shifts, causing maximal brain hypoxia in the G_z positions, and less so in the G_y positions. Cold exposure, greatly enhances the drop in T_{co} in all positions. Fluid and blood redistribution will have a tendency to cause central hypoxia including hypothalamic hypoxia in G_z , and a lesser displacement in the G_y positions, as is reflected in the pattern of T_{co} drop and thermoregulatory loss.

The initial short term exposure to cold pari-passu centrifugation induces redistribution in body-fluids, and the synergistic effect of loss in thermoregulation seen in this combination of stresses.

137

PSYCHOPHYSIOLOGICAL MANIFESTATIONS OF YOGIC PRACTICES IN STATES OF ANXIETY AND DEPRESSION. Shrikrishna, Anandi Lal, Baldev Singh, J. S. Neki and G. S. Chhina. Dept. Physiology. A.I.I.M.S. New Delhi.

Practice of Yoga has been suggested to produce physical and mental homeostasis. This claim was assessed in 16 subjects suffering from anxiety and depression, by recording their physiological and psychological responses, just before and after the two months trainng in Yogic practices. Cardio-respiratory parameters and palmar G.S.R. of the subjects was recorded polygraphically, while the psychological rating for the state of anxiety and depression was done using Hamilton scales (Hamilton, M. 1959 and 1960). The Yogic training consisted of some simple Asanas, Pranayamas and concentration on breath, daily in the morning for two months. As a result of Yogic practices the palmar G.S.R. showed an increase, but the other cardiorespiratory parameters were not influenced after two months training. At the same time, both the anxiety and depression rating showed a significant decrease which corresponded with the subjective feeling of improvement.

Thus the Yogic practices seem to beneifit in anxiety and depression possibly by changing the autonomic responses and behavioural states of the individual. *References*:

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EFFECT OF BIOSTIMULATOR ON THYROID STATUS (i) IN VITRO UPTAKE OF TRIIODOTHYRONINE (T₃-125 I) By RESIN D. C. Shukla, J. K. Pandey and B. B. Mahapatro. Physiology and Climatology Division. I.V.R.I. Izatnagar, U.P.

Increasing feed cost and protein shortage for the farm animals are real limiting factors in the development of livestock industry. These limitations could, however, be overcome by increasing the feed conversion efficiency in the livestock. Biogenic stimulators seem to have promising potential for increasing feed conversion efficiency or the metabolism in the livestock. Since thyroid plays a key role in the metabolism of the body, an attempt was made to study the impact of biostimulator (prepared from buffalo spleen and liver) feeding on the thyroid activity of male kids maintained at two nutritional levels. The thyroid status was judged on the basis of *in vitro* uptake of labelled triiodothyronine (T_3 -125 II) by resin, at preselected appropriate intervals, post-biostimulator feeding.

The study indicated higher resin uptake in the biostimulator treated kids as compared to that observed in the control. Minimum and maximum values of the uptake were recorded as 8.16 and 27.15 per cent, respectively. The differences in the uptake values between the control and experimental kids were found to be highly significant ($P \angle 0.01$). Highest resin uptake was recorded in the kids fed with biostimulator and maintained at low plane of nutrition. This indicated a favourable effect of the biostimulator in the thyroid activity. There was an apparent protective or stimulatory influence of the biostimulator on the thyroid activity particularly under poorly fed condition.

139

EFFECT OF BIOSTIMULATION ON THYROID STATUS (ii) HISTOLOGICAL CHANGES IN THYROID. D. C. Shukla. K. P. Agrawal and B. B. Mahapatro. Indian Veterinary Research Institute. Izatnagar, U.P.

The effect of biostimulator feeding on the histological changes in the thyroid was studied which substantiated the previous findings. The histological observations were recorded on the thyroid gland tissues collected after slaughter of kids at the end of experiment. The average size of the follicles measured were 66.86, 64.99, 53.62 and 59.68 microns in Groups I, II, III & IV respectively. Follicular epithelium was also measured for its height. These histometric observations indicated that the thyroid glands from the kids treated with biostimulator were comparatively more active than that of the corresponding controls, however these differences were statistically not significant. Significant differences in the cell characters, were however, noticed amongst the different experimental groups. The cytoplasm of the epithelial cell was comparatively more vacuolated in the treated groups. The nature of granules in the cytoplasm was also different in the control and treated groups

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indicating higher activity of thyroid gland in the biostimulator treated animals. In general, the lumina of the thyroid follicles was found to be filled up with the colloidal material having basophillic nature to a varying degree. These changes are obviously indicative of higher activity of the thyroid glands of biostimulator treated kids.

140

EFFECT OF VOLUNTARY RETENTION OF URINE ON

NEUROHUMOURS. Madhu Shukla, S. N. Tripathi, P. K. Dey and Pratibha Shukla. Dept. Kayachikitsa & Dept. Physiology. Institute of Medical Sciences. B.H.U. Varanasi, U.P.

From review of Indian medicine literature it is obvious that ancient Indian physicians have strongly emphasized the effect of supression of natural urges in etiology of several types of diseases. But no scientific work in this regard has been done, particularly in human subjects.

The enunciation of these concept may have a greater implication in stress disorders. Rise in blood pressure and respiration rate by distension of bladder in experimental animals has recently been reported (1). The state of autonomic receptor function in relation to lower urinary tract has been described (2). In present study neurohumoural changes regarding the retention of urine has been examined in 26 almost normal human volunteers. Acetylcholine, catecholamine and serotonin (5-HT) in blood samples after voiding urine early in the morning (8.00 A.M.) and 5-hydroxyindole acetic acid (5-HIIAA) and catecholamines were estimated in urine. Then volunteers were served 1-2 liter of tap water to drink and instructed to hold urine as much as possible. After that blood samples were collected and they were permitted to pass urine. Simultaneously, blood pressure, pulse rate and respiration rate have also been

recorded. Difference in blood and urinary neurohumours before and after retention of urine has been found statistically significant. These findings have been

discussed in the light of available literature.

References :

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141

IMMUNO SUPRESSIVE ACTION OF ALBEZZIA LEBBEK IN COMPARISON TO EXOGENOUS CORTISONE IN RABBITS. Pratibha Shukla, L. C. Jaiswal, C. M. Tewari, P. C. Sen and S. N. Tripathi. Dept. Kayachikitsa, Institute of Medical Sciences, B.H.U. Varanasi, U.P.

A. lebbek is a renowned drug for the treatment of bronchial asthma and several allergic diseases. Recently, we have observed that along with the relief in symptoms of bronchial asthma there is rise in plasma cortisol (Tripathi et al,



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1978). Experimental evidences have been collected indicating that it helps in the corticosteroidogenesis and thus it is able to prevent histamine induced bronchospasm (Tripathi et al, 1979). The corticosteroids and ACTH are known to modify the clinical course of

hypersensitive diseases. Hence the present study has been done to assess the effect of A. lebbek on antibody titer in sheep RBC sensitized rabbits. In this experiment 15 rabbits were divided in 3 groups: a) control b) treated with cortisone, and c) treated with A. lebbek for 13 days orally. After 24 hrs of drug administration all 3 groups were immunized with 5% sheep RBC suspension (0.5 ml) subcutaneously. 2nd immunization was done after 10 days in same dose. Blood samples were collected before immunization, 8 days after 1st immunization and 3 days after 2nd immunization to find out the agglutination titer for sheep RBC.

The supression of antibody titer has been observed both in the cortisone as well as *A. lebbek* treated group. These observations have been discussed in the light of present knowledge.

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A STUDY OF VASOGENIC CONTRACTION OF DENERVATED DOG'S SPLEEN. S. N. Shukla, R. V. Thapliyal, S. Agarwal and H. N. Mehrotra Dept. Physiology. L.L.R.M. Medical College. Meerut, U.P.

The mean rise of blood pressure after arterial occlusion of a denervated splenic preparation was 21.8mm of Hg. The 't' value was 10.9 and 'P' 0.001 (highly significant).

The mean rise of blood pressure with splenic artery occlusion keeping the splenic nerve intact was 24.0 mm of Hg. 't' =11.706 and 'P' 0.001. The rise of blood pressure after denervated splenic artery occlusion is almost of the same magnitude.

Since the nervous factor which was responsible for the splenic contraction and release of noradrenaline from nerve terminals, has been excluded in the denervated spleen, it seems possible to postulate that spleen releases some factors in response to local hypoxia which is independent of nervous influence and which effects the blood pressure to almost the same magnitude.

143

CARBAMAZAPINE IN EXPERIMENTAL CARDIAC ARRHYTHMIAS. K. P. Singh, K. C. Somani and N. S. Pancholi. Dept. Pharmacology. R.N.T. Medical College, Udaipur,

A large number of compounds pharmacologically and chemically unrelated have been studied for their ability to attenuate cardiac arrhythmias. The present communication deals with the effect of Carbamazapine in experimental cardiac arrhythmias in dogs.

Various techniques employed for induction of arrhythmias include—i) Acetyl choline and Aconitine induced auricular fibrillation, ii) Hydrocarbon-epinephrine & Pentothal sodium barium chloride induced Ventricular tachycardia.

In all experiments carbamazapine was given in a dose of 5mg/Kg I.V. It reduced fibrillation time in Acetylcholine induced auricular fibrillation and reverted aconitine induced auricular fibrillation to normal sinus rhythm. Ventricular tachycardias produced by Hydrocarbon epinephrine & Pentothal sodium Barium chloride were also reverted to normal sinus rhythm. Results obtained will be discussed in the light of available literature.

144

CHANGES IN BRAIN LIPIDS IN RATS FROM BIRTH TO MATURITY. L. N. Singh and J. N. Panda. Division of Physiology & Climatology. Indian Veterinary Research Institute. Izatnagar, U.P.

Total lipids and phospholipids in medulla, cerebral cortex, cerebellum and hypothalamus were estimated from 1st day upto 80 days after birth in rats. Neutral lipid levels were calculated from the difference.

The four areas of brain showed almost similar total lipid contents upto 6th day after birth, thereafter the level increased gradually upto 65th day. From 18th day onwards, the total lipid content of the medulla was greater than that of the other areas of the brain. The total lipid levels in all the brain areas increased $2\frac{1}{2}$ to 3 folds from birth to maturity.

The phospholipid contents started increasing after 12th day and reached to their maximum on 24th day in all the brain areas. Medulla again showed the highest levels of phospholipids.

The neutral lipids significantly increased between 6th and 12th day and thereafter remained almost unchanged up to 80th day in all the brain areas except medulla which showed gradual increase up to 35th day.

The neutral lipid/phospholipid ratio showed wide variations during 1st 24 days in all the four areas of brain. However, the ratio was almost same in the new born and adult animal.

145

AGE CORRELATED CHANGES IN PROTEIN AND NUCLEIC ACID LEVELS IN BRAIN. L. N. Singh and J. N. Panda. Division of Physiology & Climatology. Indian Veterinary Research Institute. Izatnagar, U.P.

Four major areas of rat brain namely—medulla, cerebral cortex, cerebellum and hypothalamus were analysed for total proteins, DNA and RNA from 1st day upto 80th day after birth. A gradual increase in the total protein levels after 6th day in all the four areas of the brain was noted. On the 65th day the protein content was almost twice that of the first day values, in all the brain areas. No significant difference was observed between the brain areas in the total protein levels.



The DNA level showed slight decrease on 6th day in medulla, cerebral cortex and hypothalamus and this level was almost constant throughout the 80 days period. Cerebellum on the other hand showed three-fold increase in the DNA content from 6th day onwards reaching a maximum on 12th day. Even on the 80th day the DNA content of the carebellum was three times that of medulla, cerebral cortex and hypothalamus.

Greater variation was observed in RNA content of the four brain areas after 18th day of age. The rise in RNA levels was seen between 8th and 18th day and between 24th and 50th day. The level decreased significantly on 65th day and remained low up to 80th day.

Protein to DNA ratio was low in medulla, cerebral cortex and hypothalamus at birth but increased gradually upto 24th day whereas in cerebellum, the ratio decreased significantly after 6th day.

The RNA/DNA ratio in all the brain areas increased between 8th and 18th days and betweem 18th and 50th days. This increase was less marked in cerebellum as conpared to other areas of the brain.

146

EFFECT OF SALINE WATER INTAKE ON SOME PHYSIOLOGICAL PARAMETERS AND BLOOD CONSTITUENTS IN FOUR DIFFERENT SHEEP BREEDS OF RAJASTHAN DESERT. Narinder Singh and G. C. Taneja. Central Arid Zone Research Institute. Jodhpur, Rajasthan.

Sixty four adult ewes of 2 to 4 years of age, similar body weights and breeds of Marwari, cross (Russian Merino x Marwari), Chokla and Pugal breeds were used for these studies. The animals in each breed were further subdivided into four subgroups of four animals in each group forming a total number of sixteen subgroups were available for experimental purpose. One of the sub groups of each breed was offered only tap water to drink, whereas the rest of the three subgroups of each breed were offered the same tap water to which sufficient sodium chloride was added to an extent of 0.5, 1.0 and 1.5 per cent respectively. Genetic difference for salt tolerance was observed among the breeds studied. The Marwari breed was the best salt tolernt when compared to other breeds studied. The results indicated that safe limit of salt tolerance in Marwari and Pugal breeds of sheep was in the range of 1.0 to 1.5 per cent whereas in case of cross and Chokla the range of salt tolerance was 0.5 to 1.0 per cent.

147

EFFECT OF PROLONGED SALINE WATER INTAKE ON BODY WEIGHT WOOL PRODUCTION AND ITS QUALITY IN MARWARI SHEEP OF RAJASTHAN DESERT. Narinder Singh. Central Arid Zone Research Institute. Jodhpur, Rajasthan.

An experiment was conducted on forty healthy Marwari ewes aged 3 years allocated to 4 treatments: Control (tap water), 0.5 per cent, 1.0 per cent and 1.5 per cent sodium chloride in the drinking water. The experimental animals were grazed for nearly 8 hours every day on a natural pasture comprising the



following predominant grass species: Aristida funicutuata, Eleusing compressa and Cenchrus setigerus. The stocking rate followed throughout the year was four sheep per acre. When not grazing, the animals were kept within a wire-pen. Changes were recorded in body weight, wool production, wool quality (Fibre diameter, Percentage medullated fibre, Staple length, crimp) and Fleece density on neck, wither, back, shoulder and mid-side. The results showed no significant changes in body weight, wool production and wool quality. It was also concluded that sheep can subsist well on drinking water containing upto 1.5 per cent sodium chloride for periods upto 2 years.

148

LUNG INFLATION REFLEXES. V. Sinha, S. Kumar, D. N. Khanna and N. Shukla. Dept. Physiology. K.G.'s Medical College. Lucknow.

Effect of inflatoin of lung on respiration rate was studied at rising body temperatures in anaesthetised dogs. At a body temperature of 37° C, 83.4% of dogs showed inhibition and 16.6% showed augmentation of respiration rate. With the rise in body temperature the percentage of dogs showing inhibition of respiration gradually decreased to a lowest of 8.3% at 40°C, and those showing acceleration on inflation of the lung increased to a maximum of 50% Above 40°C body temperature the percentage of dogs showing inhibitory response once again increased whereas that of dogs showing acceleration did not significantly alter. As the inhibitory response was being replaced with acceleratory response a temperature zone of no response was also usually between 40-42° C. The possibility of temperature modifying the discharge of receptors, or of some receptors discharging at Higher temperatures, has been discussed. Possibility of failure of central temperature regulatating mechanism at 42-43°C is also discussed

149

FURTHER STUDIES ON SODIUM AND POTASSIUM IN SEMINAL PLASMA OF NORMAL AND SUBFERTILE GROUPS. K. P. Skandhan and B. N. Mazumdar. Dept. Physiology. B. J. Medical College. Ahmedabad, Gujarat.

Sodium and potassium were estimated in seminal plasma of normal subjects. oligospermic, oligoasthenospermic, asthenospermic and azoospermic patients. The disturbance in the ratio of these elements in seminal plasma was found among pathological samples. These results corroborated with our earlier findings.

150

ROLE OF VARIOUS FACTORS ON MENARCHE. K. P. Skandhan, A. K. Pandya, S. Skandhan and Y. B. Mehta. Dept. Physiology & Pathology. Govt. Medical College, Surat.

Menarche is a multifactorial phenomenon. This varies from place to place and race to race. The menarcheal age of the girls of our locality was found as 14.37 years. Various influencing factors on the phenomenon were emphasised. Socioeconomic class was found to have a positive role in this. Food habit, religion and locality (rural/urban) seemed to have substantial effect on this.

151

SYNCHRONISATION OF MENSTRUATION. Skandhan K. P., A. K. Pandya, S. Skandhan and Y. B. Mehta. Dept. Physiology & Pathology. Govt. Medical College. Surat.

Menstrual synchrony was found among residentials (hostelers) and 'friends of ladies' institution. This value (84.21%) was much higher when the same was compared to non-residentials (57.66%). Synchronisation of menstruation may be due to the action of female pheromone. Probably the less percentage of synchronisation among non-residentials may be because of interference of another hypothecal male pheromone.

152

CARDIAC OUTPUT DURING EARLY POSTNATAL LIFE IN BUFFALO CALVES. S. P. S. Sodhi and P. J. S. Rattan. Dept. Vety. Physiology. College of Veterinary Science. Punjab Agricultural University. Ludhiana.

The size of the heart normally increases from birth onward and this change also produces alterations in the haemodynamics of the young ones. Information on these aspects of the buffalo species is not available in the literature. The cardiac output studies were undertaken in 35 apparently healthy male buffalo-calves ranging in age from 0 to 6 days (Group-I) 7 to 13 days, (Group-II), 14 to 20 days (Group-III), 21 to 28 days (Group-IV), 1 to 2 months (Group-V), 2 to 3 months (Group-VI) and 3 to 4 months (Group-VII). The average cardiac output expressed as ml/kg body weight/min. was 118.77 ± 21.47 , 97.27 ± 32.37 , 72.39 ± 6.82 , 84.40 ± 29.26 , 82.75 ± 14.34 , 107.75 ± 20.87 and 123.99 ± 12.40 in Groups 1, II, III, IV, V, VI and VII respectively.

The differences between group-I and IV, I and V and between III and VI were significant ($P \ge -0.05$) and between I and III., III and VII ; IV and VII and between V and VII highly significant ($P \ge 0.01$).

The data revealed a significantly lower cardiac output in 3 weeks old as compared to one week and 4 months old calves. The higher values in one week old calves was mainly due to the increased heart rate/min. whereas, in 4 months old calves, it was due to the higher stroke volume. EFFECT OF ARTIFICIAL HYPERTHERMIA ON PROSTAGLANDIN EI CONCENTRATION IN BRAIN, KIDNEY AND LUNG TISSUES IN EXPERIMENTALLY INDUCED PROTEIN DEFICIENT ALBINO RATS. K. Somasundaram, S. S. S. Sharma and M. V. S. Achar. Dept. Physiology. Govt. Medical College. Surat. and M. P. Shah Medical College. Jamnagar, Gujarat.

That the heat tolerance decreases in protein dificiency is well known. The present experiment is planned to evaluate the PGEI concentration in brain, kidney and lung tissues in normothermic protein deficient and hyperthermic protein deficient rats.

Rats were maintained on protein deficient diet for 40 days in order to produce protein deficiency. Hyperthermia was produced by exposing the animals to 50°C for 15 minutes. Rectal temperature was recorded in well nourished and protein deficient rats before they were sacrificed. Immediately the brain, kidney and lung tissues, were removed and processed for extraction and estimation of PGEI. The rectal temperature of the protein deficient rats exposed to 50°C was recorded before and after the heat exposure and a similar procedure was followed for estimation of PGEI. The results were compared with results obtained in hyperthermic well nourished group. The result indicates that there is a decrease in PGEI concentration in brain, kidney and lung tissues of protein deficient rats when compared with well nourished rats at normal temperature. When exposed to hyperthermia, the PGE1, concentration in these tissues is increased in protein deficient rats, whereas in control animals the PGEI concentration increases only in kidney, while there is decrease in lung and brain tissues. The results are discussed.

154

IMPROVEMENT IN PULMONARY FUNCTION AFTER ISOPRENALINE INHALATION IN SMOKERS. S. Sood, K. K. Mahajan and B. K. Maini. Dept. Physiology. Medical College. Rohtak, Haryana.

The pulmonary functions FVC, EFR 25-50%, 25-75%, 50-75%, 75-85% of vital capacity, FEV1, FEV1%, MVV, PFR and total respiratory compliance were studied in 48 asymptomatic smokers and 25 healthy non smokers before and after isoprenaline aerosole inhalation.

All pulmonary function parameters except FVC are significantly reduced in smokers. The effects are more pronounced on flow rates. The pulmonary functions are influenced by the duration and quantity of smoking (pack years). Smokers show highly significant improvement after isoprenaline inhalation in all pulmonary function parameters except FVC though the improvement is less in smokers with longer duration of smoking and more pack years.

It is probable that smoking causes changes in lungs which are reversible to begin with but become irreversible later on, depending upon the amount and duration of smoking.

155

THORACIC ELECTRICAL IMPEDENCE OF RATS POISONED WITH PARAQUAT. R. K. Srivastava, S. K. Sharma and A. S. Sachan. Defence Research & Development Estt. Gwalior.

Thoracic Electrical Impedence (TEI) was measured in rats before and after treatment with paraquat (30mg/kg i. v.). Four electrodes made of metal strips and mounted on insulated flexible bands were fixed on the closely shaven neck and thoracic regions of the body. The signals to the body were delivered from a 20 Kc. Oscillator by electrodes I1 & I2 and other two electrodes viz $E_1 \& E_2$ were used to record the response. The animals anaesthetised with pentobarbital sodium were immobilized in supine position. TEI was recorded for 30 mts at an interval of 5 mts for each rat. Percent increase in TEI after treatment with paraquat was taken as an index of shift of the fluid in the thorax vis a vis development of pulmonary oedema. Mean TEI prior to paraquat treatment was 113.0 ± 3.6 which was increased to 164 ± 6.6 after treatment (P $\angle 0.001$) The % increase was 46.8. The enhanced TEI was associated with increased lung body weight index (LBI) and accummulation of fluid in the alveoli as evidenced by histopathological studies. It is thus seen that the TEI technique, which is being hitherto used for detecting pulmonary oedema in man & larger animals can also be used satisfactorily in rats. Furthermore, it being a monivasive technique, follow up studies can be done in the same animal.

156

STUDIES ON THE FACTORS INFLUENCING URINE OUTPUT UNDER SIMULATED ALTITUDE IN RATS. R. Subramanian and H. H. Siddiqui. School of Environmental Sciences, Jawaharial Nehru University, New Delhi and Dept. Pharmacology. A.I.I.M.S. New Delhi.

In an early study it was noted that mild hypoxia couses diuresis in rats and severe hypoxia antidiuresis. Antdiuretic hormone plays important role in causing diuresis on antidiuresis under hypoxia. Several factors during hypoxia, which occur within the body plays a role in the changes in urine output such as body temperature, vagal tone, adrenal secretions, water content of the body, blood pressure etc. Influence of these fectors on urine output under hypoxia was studied. The result indicates that hypoxic hypothermia causes antidiuresis. Bilateral vagotomy causes significant rise in urine output. Bilateral adrenalectomy did not abolish the hypoxic diuresis. There was a progressive fall of blood pressure during graded hypoxic stress. These studies may explore the mechanism of changes in ADH secretion under hypoxia and also to some extent the eticlogy of high altitude pulmonary oedema.

The results obtained will be discussed.
NEUROCHEMICAL CORRELATION OF AMINES IN THE STEREOTYPED BEHAVIOUR OF RAT. N. Suthanthirarajan, R. Chandramouli and Sarada Subrahmanyam. Dept. Physiology. P. G. Institute of Basic Medical Sciences. Taramani, Madras.

It is generally believed that dopaminergic mechanisms play an important role in the stereotyped behaviour. Though much work has been done on dopaminergic mechanism, littlle is known about the role of other neurotransmitters involved in the stereotyped behaviour. In the present paper an attempt is made to study the correlation of different neurotransmitters like dopamine, norepinephrine and 5-hydroxy tryptamine in the different regions of the brain of rats when they are exposed to stereotyped behaviour. Male albino rats (200-250 gm) were used. They were divided into three groups. Group I received normal saline intraperitoneally which served as control. Group II received d-amphetamine in the dosage of 1.5g/kg. The IIIrd group received d-amphetamine in the same dosage as in group II along with chlorpromazine (0.3-0.5mg/kg). The motor activity and exploratory behaviour were rated by using a Photoactometer. The animals were sacrificed immediately and the different regions of the brain were taken for the assay of NE, DA and 5-HT by fluorometric method. It was observed that the d-amphetamine treated group showed an increase in the motor and exploratory activities and an increase of DA, and NE in amygdala and 5-HT in the striatum. The IIIrd group showed no change in the stereotyped motor behaviour and the DA, NE and 5-HT content in the different regions of the brain did not show any change.

158

SOME PHARMACOLOGICAL STUDIES OF METHYLENE—BIS— SALICYLAMIDE—A PRELIMINARY REPORT. S. K. Tandan and V. K. Vijjan. Division of Pharmacology and Toxicology. Indian Veterinary Research Institute. Izatnagar, U.P.

Salicylamide is a known analgesic, antipyretic and anti-inflammatory agent. However, it has shorter duration of action and produces sedation in therapeutic doses. Hence, it was thought worthwhile to search for a derivative of salicylamide which is more potent and free from these side effects. With this in view, Methylene-bis-salicylamide (MBS) was synthesized by the method of Einhorn (1905) and studied for its analgesic activity, strychnine antagonism and for acute toxicological manifestations.

In the present investigation, writhing movements (acetic acid method) and tail clip response in mice were used as analgesic parameters. The activity of MBS was compared with that of salicylamide and aspirin. Though, on dose basis, MBS was less potent, its duration of action was observed to be prolonged. Further, on equianalgesic doses, MBS was free from sedative side effects as observed with salicylamide. In strychnine antagonism, 30% of mice were found to be protected by MBS. Preliminary toxicity studies carried out in mice with MBS (1.0, 1.5, 2.0, 2.5 and 3.0 gm/kg, orally) revealed no untoward toxic symptoms or mortality except sedation and ataxia at higher doses. The results will be presented and discussed.

462

EFFECT OF ESTROGEN ON ISOLATED PERFUSED RABBIT HEART. H. C. Tandon, R. C. Pandey and V. M. Bhatnagar. Dept. Physiology. G.S.V.M. Medical College. Kanpur, U.P.

In the present study, effect of estrogen on cardiac performance and coronary outflow was investigated in six male rabbits (1.5-2 kg). Animals were rendered unconscious by stroking. The heart was removed quickly and mounted on Langendorff apparatus for coronary perfusion at constant pressure (80mm Hg). Two perfusion bottles containing Ringer Solution in one and 4 ng/ml estrogen in Ringer solution in the other respectively, were connected to heart cannula through a glass 'Y' to be alternately used for estrogen administration and withdrawal. The coronary outflow was periodically determined with a measuring cylinder (control outflow: 5-7 ml/min). Heart contractions were kymographically recorded.

The estrogen administration resulted in positive inotropic effect. Conversely: estrogen withdrawal exhibited immediate suppression of cardiac contractility tapering to cardiac standstill within 90-110 sec of its discontinuation. During this phase, the coronary outflow was greatly diminished (0.5-1ml/min). Contractions resumed within 3-5 min of estrogen withdrawal, but amplitude never attained the preceding control level. The results were reproducible in 3 consecutive trials in each experiment. The possible role of physiological level of estrogen in maintenance of normal coronary flow and cardiac performance is suggested.

160

MITIGATION OF CARDIAC ARRHYTHMIAS BY LUNG INFLATION. H. C. Tandon, R. D. Srivastava, R. C. Pandey and V. M. Bhatnagar. Dept. Physiology. G.S.V.M. Medical College. Kanpur, U.P.

The present study was conducted on 6 mongrel dogs of either sex (12–18kg), anaesthetised with alpha chloralose (80–100mg/Kg I.V.). The femoral arterial pressure was monitored with a mercury manometer on smoked kymograph and ECG was simultaneously recorded in Lead II.

Two synchronously adjusted positive pressure respirators were connected in parallel through a metal 'Y' to tracheal cannula. During control ventilation, tidal volume was set at 20 ml/kg and stroke rate at 18/min in one pump (Pv) and the other one (Pi) switched on only when greater inflation was desired. The suitable adjustments in Pi were made to obtain total tidal air between 740-820 ml.

The persistence of ventricular arrhythmias produced by ligating anterior descending branch of left coronary artery for atleast two mins was deemed necessary prior to inflation manoeuvre by switching on Pi to raise tidal volume as predescribed, for 30 and 60 secs.

This manoevre resulted in significant and transient hypotension, together with complete mitigation of arrhythmias proportionate to degree and duration of inflation. The sinus rhythm persisted for a maximum of 20 mins after termination of inflation. Furthermore, the frequency of ectopics remained remarkably suppressed on their reappearance.

463

APPLICATION OF DRUG LIQUID MICROSPHERE ON MICROVASCULAR BED DURING INTRAVITAL MICROSCOPY. H. C. Tandon, R. D. Srivastava, R. C. Pandey and V. M. Bhatnagar. Dept. Physiology. G. S. V. M Medical College. Kanpur, U.P.

A technique for local drug application through liquid microsphere (LMs) on microcirculation of rat skeletal muscle used as experimental model has been developed.

In vivo spinotrapezius muscle was prepared for transillumination on special microscope stage in urethane anaesthetised Sprague Dawley rats (80-100 g) and superfused with modified Kreb's solution. The drug ejection assembly, comprised of micrometer syringe connected through polyvinyl tubing to hub holding glass micropipette (outer tip size 1-3 um), was filled with test solutions. The formation of LMS under microscope could be precisely controlled between 14-140 um and applied by micromanipulator movement on different sections of arterial and venous bed, and the volume of LMS and its content of drug could be calculated for agonist-and antagonist study. The LMS application is superior over other methods in that both ionisable and non ionisable compounds could be used, and, the local parameters like pH and osmolarity remain unaltered during drug application. The vascular diameters were measured by precalibrated micrometer eyepiece and the method could be used in vascular receptor study for putative transmitters.

162

AN ATYPICAL RESPIRATORY RESPONSE TO VAGAL-BLOCK DURING EXERCISE IN HYPERTHERMIC DOGS. S. N. Tandon, S. Kumar and R. Saxena. Dept. Physiology. K. G's. Medical College. Lucknow, U.P.

Cold-blocking the vagi at rising body temperatures is known to produce reversal of the Hering-Breuer reflex at about 40°C body temperature. During exercise plus temperature stimulation of respiration, the respiration rate and minute ventilation increased but the tidal volume decreased. Cold-blocking the vagi during exercise at rising body temperatures produced a decrease in respiration rate and minute ventilation and an increase in tidal volume, except at 40°C body temperature when vagal block increased the respiration rate. The possibility of the role of lung irritant receptors or some yet unknown receptors has been discussed to be responsible for this peculiar respiratory response at 40°C body temperature in dogs.

163

DEVELOPMENT OF BRAIN WITH AGEING. B. K. Tiwari and M. C. Pant. Dept. Biochemistry. L. L. R. M. Medical College. Meerut, U.P.

Brain growth is exhibited by an increase in its DNA and protein contents and weight. Our data show that rat brain weight increases continuously from the day of birth upto 485th day of age and then starts declining, Similarly, the protein content of rat brain continuously increases upto 485th day and then

starts decreasing. When this growth of brain is evaluated in terms of DNA changes, the following conclusions are derived. In the period from 14th day upto 120th day of age, DNA per unit brain weight shows decreasing trend whereas brain weight and protein content show simultaneously increasing trend. This indicates that the brain growth is occurring during this period by cell enlargement, i.e., hypertrophy and not by cell multiplication. In the subsequent period of life, i.e., around 485th day of age, DNA per unit brain weight exhibits an increase associated with the increase in protein content and brain weight. This indicates that in this period, cell division in brain also becomes active and adds to brain growth (i. e., hyperplasia) in addition to cell enlargement on account of increasing protein content (hypertrophy). As the amount of DNA per unit weight is an indication of cell division under physioioglcal conditions.

In very old rats (900 days) brain growth stops and goes to negative side as is shown by decreased brain weight, protein content as well as DNA content. This could be due to decreased biogenetic processes, gradual increase in death rate and dehydration of brain cells, and disintegration of brain constituents.

164

BIOGENIC AMINE CHANGES IN C.S.F. OF SCHIZOPHRENICS BEFORE AND AFTER ELECTROCONVULSIVE THERAPY. M. A. Udayakumar, T. S. Subrahmanyam, P. S. V. Ramanamurthy and P. S. R. K. Haranath. Dept. Pharmacology & Psychiatry. Kurnool Medical College. Kurnool, and National Institute of Nutrition, Hyderabad. A. P.

To determine the actual content of biogenic amines in the CNS of schizophrenic patients and to know the nature of changes following ECT, lumbar c.s.f. was collected before and 5 min after a session of ECT in 30 schizophrenic patients. In 13 of them, a 3rd sample was collected 2 to 3 days later. Dopamine, noradrenaline and 5-hydroxytryptamine concentration of c.s.f. was estimated spectrofluorimetrically according to the method described by Ansell and Beeson (1968). After ECT the dopamine concentration decreased by 5 to 65 ng/ml from the control value. 5 Hydrooxytryptamine increased by 0.4 to 10.6 ng/ml and noradrenaline also increased from 4 to 70 ng/ml. After 2 to 3 days, the concentration was either similar to 2nd sample or in some instances tended to return back to control values.

Reference

Ansell, G. B. and Beeson, M.F. (1968). Analytical Biochemistry, 23:196-206

165

EFFECT OF ANTIANDROGENS IN THE ACCESSORY SEX GLANDS OF CASTRATED RATS. E. Umapathy and U. C. Rai. Dept. Physiology Jawaharlal Institute of Postgraduate Medical Education and Research. Pondicherry.

Treatment of adult castrated male rats with the antiandrogens e.g. cyproterone, cyproteroneacetate and medroxy-progesterone acetate, and with androgens e.g. testosterone propionate brought about characteristic changes in the lipid



profiles of accessory sex glands. Cholesterol and glyceride fractions increased in caput-epididymis under the influence of antiandrogens, while they decreased by the androgen-treatment. Anti-androgens, especially medroxy-progesterone acetate, brought about an increase in glycerides in cauda epididymis, while testosterone elicited an opposite effect. Phospholipids were depleted under antiandrogenic influence in seminal vesicle, while they were elevated by testosterone treatment. In prostate, esterified cholesterol was decreased under antiandrogenic influence, while testosterone elicited an increase in this fraction. The characteristic changes will be discussed in relation to tissue specificity and androgenic involvement in the metabolism. A comparison has been defined between the effects of antiandrogens and androgens in the lipid pathways in aceessory sex glands. The results are discussed in the light of sperm needs, accessory sex glands milieu-and their physiologic role in sperm maturation.

166

INFLUENCE OF ANTIANDROGENS ON TESTES AND ACCESSORY SEX GLANDS OF MICE. E. Umapathy and U. C. Rai. Dept. Physiology. Jawaharlal Institute of Postgraduate Medical Education And Research. Pondicherry.

Reports regarding the effects of anti-androgens on testis and accessory sex glands in rats are abundant. However, studies relating to the changes in testicular histology and the morphometric details under the influence of antiandrogens are scanty. In the present studies an attempt has been made to study these aspects. Adult male mice were treated with cyproterone, cyproterone acetate and medroxy-progesterone acetate for 15 days. A marked inhibitory effect on tubular diameter, cell volume and cell circumference of testes of experimental animals was observed. Antiandrogens brought about remarkable alterations in epididymal morphology, which showed distinct regional variations. Lactate dehydrogenase, acid and alkaline phosphatase contents in accessory sex glands were depleted. These changes are correlated to the decreased availability of androgens and the physiologic importance of the same will be discussed.

167

ELECTROCARDIOGRAPHY AND DISORDERS OF THE HEART IN BUFFALO. R. C. Uphadhyay and M. V. N. Rao. Dept. Nutrition and Physiology. N.D.R.I. Karnal.

Electrocardiographic studies on 286 buffaloes of different age groups were carried out to understand normal and abnormal patterns. Twenty nine cases of wandering Pacemaker, nine cases of first degree and seventeen cases of second degree partial atrio-ventricular heart block (PAVB) were observed. The occurrence of wandering Pacemaker and PAVB was more frequent in males under 2 years as compared to adult and females. The paper also describes observations on the patterns, configuration and incidence of P, QRS and T waves in horizontal plane, comparing healthy buffaloes with arrhythmia.



168

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INFLUENCE OF CAROTID AND AORTIC DEPRESSOR NERVE STIMULATION ON CENTRALLY INDUCED CARDIO-VASCULAR ACTIONS. Sarla Varma. D. Hammad and S. A. H. Rizvi. Dept. Physiology. G.S.V.M. Medical College. Kanpur, U.P.

Pressor and depressor responses were recorded by stimulation of hypothalamic areas by placing bipolar electrodes stereotaxically in anaesthetized dogs. Central cut end of vagus and sinus nerve was stimulated by different current strengths. Low voltage stimulation of vagus produced depressor response and medium or high voltage stimulation elicited marked pressor effects. Activation of sinus nerve with low medium and high voltage stimuli elicited only depressor responses. The magnitude of response was directly proportional to the current strength used. The fall in blood pressure induced by vagal stimulation became more marked when anterior hypothalemic area was simultaneously stimulated. Whereas stimulation of posterior hypothalmus when combined with low grade vagal stimulation reduced the depressor effect of latter's stimulation. The pressor responses of high voltage vagal stimulation were potentiated by simultaneous stimulation of posterior hypothalamus and decreased by simultaneosly stimulating anterior hypothalamic areas. Depressor effects of carotid sinus nerve stimulation were augmented or inhibited by simultaneous stimulation of anterior and posterior hypothalamic areas respectively.

These results indicate that central nervous system can modulate the cardiovascular effects arising from sensory input of visceral nerves.

169

MODULATION OF CARDIOVASCULAR EFFECTS BY MUTUAL INTERACTIONS BETWEEN CENTRAL AUTONOMIC ACTIVATION AND SOMATIC AFFERENT INPUT. Sarla Varma, D. Hammad and S. A. Omar. Dept. Physiology. G.S.V.M. Medical College. Kanpur, U.P.

In adult anaesthetized dogs pressor and depressor responses were elicited by electrical stimulation of anterior and posterior hypothalamic areas by placing bipolar electrodes stereotaxically. Pressor and depressor responses were also demonstrated by stimulation of central cut ends of sciatic and phrenic nerves separately with different strengths of current. When stimulation of anterior hypothalamus was combined with stimulation of sciatic nerve, the pressor response elicited by the latter nerve activation was modified to a depressor effect, and the depressor response was greatly augmented. Phrenic nerve stimulation exhibited only depressor responses with all grades of stimuli used. These responses were also exaggerated by simultaneous activation of anterior hypothalamic area and phrenic nerve. Combining stimulation of posterior hypothalamus with sciatic nerve and phrenic nerve respectively, augmented the pressor responses and reduced the depressor responses elicited by sciatic nerve and phrenic nerve activation. In some experiments it was observed that the depressor response of hypothalamic stimulation was greatly reduced when sciatic nerve was stimulated simultaneously. These results suggest the presence of mutual interactions between somatic afferent input and central autonomic impulses to modulate the cardicvascular responses.

170

VENTILATORY FLOW-VOLUME LOOPS. Vaseer Jaspal, S. V. Rao and R. P. Bhargava. Dept. Physiology. Gandhi Medical College. Bhopal, M.P.

20 normal healthy male medicos-mean age 24.9 yrs., with S.D. 5.63, and mean height 170.1 cm. with S.D. 4.04, were subjected to some ventilatory flow studies.

Flow-volume loops were constructed by replotting the vital capacity segmental values obtained by spirometery in Toshniwal's Expirograph on a rapidly moving paper of mean speed 118 mm/sec., wrapped round a kymograph shaft. Values derived from these loops were PEFR, MMEFR, PIFR and MMIFR (L/sec) their mean and S.D. being 8.49, 1.86; 5.5, 1.17; 6.59, 1.51 and 6.04, 1.42 respectively. MMEFR was calculated from the FVC tracing, mean being 3.64, S.D. 0.76 and PFR (Peak flow rate) by Wrights Peak Flow Meter—its mean and S.D.—9.44, 0.78.

t-test was applied for PEFR from Flow-volume loop and PFR by Wrights Peak Flow Meter. t was 4.32, P<0.05, (df=19) which was highly significant, and for MMEFR (from Flow-Volume loop) and MMEFR (by Spirometery) t=1.125, P>0.05 being insignificant.

The Flow-Volume Loop constructed by this simple method gives very useful information.

171

EFFECT OF MODERATE INTERMITTENT AND CONTINUOUS EXERCISE ON BLOOD GLUCOSE IN MATURITY ONSET DIABETICS. N. P. Singh-verma, N. K. Bhardwaj, A. S. Chakrabarty and S. K. Lal. Dept. Medicine and Physiology. Maulana Azad Medical College and Associated Loknayak Jai Prakash Narain and G.B. Pant Hospitals. New Delhi.

The aim of the present investigation was to compare the effect of long intermittent and short continuous exercise on blood glucose in maturity onset diabetics and to evaluate the role of exercise in the management of maturity diabetes. Glucose tolerance test was carried out in thirty diabetics before the start of the experiment, after one month of insulin and after one month of intermittent exercise and insulin as described previously. The result indicated that one month of intermittent exercise had no significant effect on the glucose tolerance. Continuous moderate exercise was carried out in ten diabetics and identical controls with the help of bicycle ergometer. Blood glucose was determined every 5 minutes after the start of continuous exercise till 15 minutes and then 5, 10, 15 and 60 minutes after the cessation of exercise. The result showed two types of responses. In the diabetics who had blood glucose less than 210 mg%, there was a progressive decrease in the blood glucose level throughout the period of exercise. During the subsequent period of rest the blood glucose rose gradually and assumed more or less the pre-exercise level. On the other hand in the remaining diabetics who had a blood glucose level more than 210 mg% there was no appreciable change.

468

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NON PRESCRIPTIVE DRUG USE IN GORAKHPUR. J. L. Agarwal, C. D. Pande, P. Seth, S. Agarwal, S. I. B. Rizvi and S. Bhusan. Dept. Physiology and For. Med. B.R.D. Medical College. Gorakhpur, U.P.

The present study is an attempt to find out the prevalence of drug abuse in this region. High rate of competition, insecurity about future and job in modern society and escaping the realities of life are some of the major causes of drug abuse.

Among the drugs being abused, Diazepam preparations, Cannabis, alcohol and methaquinolone preparations are the commonest. Most of the persons stated that the consumption is occasional, effected by the situation, and majority harbour the view that the occasional non medical or non-prescriptive use of drug is not bad.

173

ENDEMIC GOITRE IN SCHOOL GOING CHILDREN AND ITS FUNCTIONAL STATUS. J. L. Agarwal, P. Seth, S. Agarwal, S. I. B. Rizvi, S. Bhusan and A. K. Sisodia. Dept. Physiology and Biochemistry, B.R.D. Medical College. Gorakhpur, U.P.

Sixty years ago, David Marine, one of the pioneers of mass prophylaxis of endemic goitre claimed that "Simple goitre is the easiest of all diseases to prevent...It may be excluded from the list of human diseases as soon as society determines to make the effort". Goitre can cause a threat to physical, social and economical well being. In India about 9 million persons were said to be suffering from goitre in 1952. In recent years it was thought that due to improved socio-economical and hygienic factors the prevalance of endemic goitre is not changed to a great extent. There is a high incidence of persons with retarded intellectual development and deafness due to low content of iodine in diet. We are ignoring the threat caused by goitre because the incidence of large visible goitre has declined. We are unaware of its impact on the physiological and biochemical parameters on the body.

In the present study we have studied the prevalance of endemic goitre in school going children (40-50%) who are most susceptible to low iodine diet. Various physiological and biochemical parameters were also studied so as to determine their functional status.

174

STUDY OF EXCITABILITY OF INTRA-LIMBIC INTERACTIONS DURING DIFFERENT PHASES OF THE ESTRUS CYCLE IN RAT. N. Bagga, G. S. Chhina and B. Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

Although hippocampus and amygdala are known to inhibit and facilitate the LH release respectively, the mechanisms are related to alterations in their mutual or hypothalamic interactions. The role played by the interactions of

469

amygdala, hippocampus, septum and preoptic area was, therefore, investigated firstly by producing lesions in the limbic structures and secondly by recording of evoked responses from the regions named above on stimulation of each of the areas one after the other. The susceptibility of the preoptic area evoked responses to the amygdalar cholinergic inputs was further investigated as a first step to determine the neurotransmitter involved in the interactions among these regions of the brain.

Amygdalar and septal lesions produced a brief disruption of the estrus cycle which reverted to the pre-lesion pattern within about the period of 6-7 cycles. During the disturbed phase, diestrus was the most predominant phase of the cycle. The septal inputs to hippocampus were most effective in proestrus while amygdalar inputs evoked maximum activity in estrus phase. Even the hippocampal inputs to amygdala were most effective in estrus. Thus amygdalo-hippocampal interactions were facilitated in the estrus phase and septo-hippocampal interactions in proestrus. Amygdalar inputs to preoptic area were found to be sensitive to cholinergic mechanism as atropine sulfate blocked them, although their dependence on other neurotransmitters could not be ruled out. However, these responses were not influenced by mecamylamine hydrochloride application to preoptic area.

The investigations point out the differential sensitivity of interactions amongst the limbic hypothalamic inputs in different phases of the estrus cycle while the neurotransmitter mechanism in the organisation of these interactions needs to be further investigated.

175

TASTE SENSITIVITY TO PHENYL THIO CARBAMIDE (PTC) AND GLUCOSE IN DIFFERENT PHASES OF MENSTRUAL CYCLE. S. Bhatia, K. N. Sharma, V. Mehta and P. Khurana. Dept. Physiology. University College of Medical Sciences. New Delhi.

Taste sensitivity to PTC and gustatory responses to glucose have been estimated in different phases of menstrual cycle in Indian females. Taste sensitivity to PTC was investigated as per method of Harris and Kalmus. The magnitude estimation and hedonic indices to glucose response were calculated on a 7-point and a 6-point scale respectively. Seven dilutions of the test solution, ranging from 0.0325 M to 2.0 M were used for each category scale under conditions of overnight fasting and after breakfast. The intensity ratings increased with the increase in strength of glucose solutions. As for the pleasantness, the scores were higher during ovulatory phase as compared to other phases for higher concentrations (2.0 M to 0.25 M), but lower concentrations (0.125 M to 0.032 M) were more acceptable during pre-menstrual phase. The maximum pleasantness peak was shown for 1.0 M solution in all phases of menstrual cycle. The PTC response was also dynamic and related to menstrual phases, showing 90% of the subjects as tasters during ovulatory phase, which however decreased to 50% subjects during menstrual phase.

THERMAL SENSITIVITY OF POLYSYNAPTIC REFLEX RESPONSE IN CATS. Neena Bhattacharya. G. S. Chhina and Baldev Singh. Dept. Physiology A.I.I.M.S. New Delhi.

Having observed the thermal responsiveness of monosynaptic reflex response in cats (Bhattacharya et al 1976), changes in polysnyaptic reflex response (PR) were investigated under the similar conditions. To accomplish this, body temperature of cats was raised to 39-41°C under chloralose anaesthesia and (PR) recorded for every 1°C rise of temperature. Using C4 camera and Type 565 Tecktronix oscilloscope, from the nerve to gastrocnemius soleus group of muscles on stimulation of main sciatic trunk. The amplitude of PR at 37 ± 0.5 °C ranged betwehn $50-100 \mu$ volts which decreased by about 50% at 38°C. The response was unelicitable above 39°C. Reversing the body temperature to normothermic levels, produced a partial recovery of the response. The sensitivity of PR to hyper-thermia was found to be greater than the MR although the general trend of the supression of reflex activity remained unaltered. The possible functional implications of this neuronal response shall be discussed.

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177

INFLUENCE OF NOISE SPECTRA ON THE DEVELOPEMENT OF TEMPORARY HEARING LOSS AND ITS RECOVERY. R. C. Chaturvedi, R. M. Rai, R. K. Sharma and H. S. Nayar. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

The effect of noise spectra on the development and recovery of temporary hearing loss has been studied in 38 healthy audiometrically normal subjects. 20 subjects were exposed to white noise, 1 and 1/3rd octave band widths and pure tone of lkHz noises of 100 dBA intensity, and 18 to white noise (100 dBA) and also the same white noise mixed with lkHz components of 75,85 and 95 dBA on different days for $\frac{1}{2}$ hr. The hearing loss and recovery was assessed by monitoring audiometry just after noise exposure and after 20,60,90 and 120 min of cessation of noise.

In the first study it was observed that the white noise has produced a maximum TTS_2 (Temporary Threshold shift after 2 min of cessation of noise) of 26.15 dB at 4 kHz, whereas the noises of 1 and 1/3rd octave band widths and puretone of 1kHz affected maximally the frequency of 1.5 kHz, producing TTS_2 of 13.45, 15.17 and 21.0 dB respectively. The second study revealed that in all exposures maximal effect was observed at 4kHz and inclusion of 1kHz components in white noise modulated the effect by affecting the frequency of 1.5 kHz also. TTS_2 values at 4 and 1.5 kHz ranged between 20.77 to 22.47 dB and 8.83 to 17.33 dB

respectively. Recovery from TTS was more in the begining and decreased later on, and in some cases it was incomplete even after 2 hr. The probable mechanism involved in the development of temporary hearing loss due to different noise spectra and its recovery process is discussed.

178

CHANGES IN AUTONOMIC BALANCE (A) DURING EXPOSURE TO AMBIENT HEAT (44°C). G. S. Chhina, L. Rai and B. Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

Having reported the results of the study of the stability and reliability of 'autonomic balance' in human subjects using a battery of autonomically mediated physiological responses (Chhina G.S. et al, 1977), the effects of heat exposure (44°C) on autonomic balance were investigated. This was done by making measurements of ANS functions on fifteen adult human male subjects at a room temperature (Ta) of $27.73\pm0.58^{\circ}$ C and comparing these with responses obtained at a Ta of 43 $84\pm0.64^{\circ}$ C. Scores of autonomic balance (\overline{A}) were derived from standardized weighted data. The mean composite score of autonomic balance for these subjects at 28° C was 53 37 and at 44°C was 41.86. The difference was statistically significant (p<0.001). The decrease in numerical estimate of 'autonomie balance' was of the magnitude of one standard deviation below the population mean and was in the direction of sympathetic dominance. Significant differences in the decreased measures were obtained for five out of the seven variables included in the 'Normative Regression Equation'. Thus, during heat exposure the subjects showed less salivary output, high log palmar skin conductance and low volar skin resistance.

The study has revealed that the overall shift in the autonomic balance score as measured by using the 'Normative Regression Equation' could be regarded as an index of physiological responsiveness to physical heat "stress". Reference :

Chhina, G.S., Rai L., Singh B. and Ramachandran, K. Stability of Measurement of Autonomic Balance in two Successive Seasons. Ind. J Physiol. Pharmacol. 22(2), 163, 1978

179

A SIMPLE DYNAMIC LUNG FUNCTION TEST TO ASSESS THE FUNCTION OF SMALL AIRWAYS. B. V. Deshkar and V. H. Jade. Medical College. Aurangabad, M.S.

Analysis of single forced expiratory curve is quite commonly used as dynamic lung function test in physiology and also in clinical practice. It has been accepted that the more fruitful approach has been to analyse

maximum expiratory flow volume curve, which is simply a forced expiratory spirogram replotted to show flow as a function of lung volume. Analysis has shown that flow rates at low lung volumes (less than 40% VC) predominantly reflect the function of small airways.

Here a test which is based on volume flow rates of 1 lit/sec and 5 lit/sec is being advocated since flow rates at low lung volumes predominantly reflect the function of small airways.

There is no necessity of replotting complete volume flow curve. On the force expiratory curve these two points can be marked by drawing tangents and these flow rates can be expressed at volume in % V.C.

Forced expiratory curves were recorded of 50 healthy volunteers in the age group 15-45 years and compared with that of 20 subjects of the same age group suffering from conditions in which especially small airways are likely to be affected more (chronic smoking habits, chronic bronchitis etc.) The observation and the clinical significance of the test will be discussed.

180

4-NITRO-4'-ISOTHIOCYANE-DIPHENYLAMINE-A NEW ANTHELMINTIC IN HOOKWORM INFESTATION-P. S. Gupta, D. S. Gambhir, S. Oswal and Nirmal Kumar. Dept. Medicine Maulana Azad Medical College and associated J. P. and G. B. Pant Hospitals, New Delhi.

4-Nitro-4' isothiocyane diphenylamine (GO 9333-Ciba Giegy) has been found to be very effective against human hookworms in experimental studies. In this clinical trial 103 patients of hookworm infestation were included. 61% patients had a N. Americanus infestation while 39% harboured A. duodenale. After carrying out detailed clinical examination and laboratory investigations, the patients were divided into 7 groups and each group was given a different dosage schedule of the drug. The patients were monitored for side effects of the drug. The efficacy of each regimen was evaluated by calculating the percentage reduction of hookworms ova in stools on the 14th day of the drug administration.

The ideal dosage schedule appeared to be 30 mg. per kg. body weight, as it offered the most potent form (100% reduction of ova count) of anthelmintic effect against both the species of hookworms. This dose was also comparatively well tolerated.

181

THE EFFECT OF PREGNANCY ON THE BLOOD FIBRINOLYTIC ACTIVITY. S. B. Gupta, Rajesh Misra, S. Sharma, K. Gupta and B. B. Sharma, Dept. Physiology. S.N. Medical College. Agra, U.P.

The effect of pregnancy on the blood fibrinolytic activity was studied on 60 healthy pregnant women. These women were divided according to trimesters. It was seen that the euglobulin lysis time rose to 346 minutes in the first

trimester, 390. 83 min. in the second trimester and 395.91 minutes in the third trimester as compared to 271 minutes in the controls. The rise in euglobulin lysis time thus showed that there is a significant decrease in the fibrinolytic activity during pregnancy and it was lowest in the third trimester. Along with the rise in euglobulin lysis time an associated rise in plasma fibrinogen concentration, was also observed. The results will be discussed in the light of literature available.

182

BODY FLUID COMPARTMENTS IN RABBITS ON ACUTE HYPOXIC EXPOSURE. S. C. Jain, M. V. Singh, S. B. Rawal and H. S. Nayar. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

Body fluid compartments were studied in rabbits divided into three group control, exposed to acute hypoxia and exposed to hypoxia after oral treatment with 250 mg acetazolamide. Total body water, extracellular body water and plasma space were determined using the triple radiotracer methodology. Total body water decreased insignificantly with no change in extracellular body on exposure to hypoxia. Plasma volume and blood volume showed a significant decrease with a significant increase in haematocrit On treatment with acetazolamide, further insignificant decrease in total body water, extracellular water, plasma space and blood volume were noticed on altitude exposure. The results have been discussed in relation to suggested use of acetazolamide on induction to high altitude.

183

MAPPING OF AREA IN THE LOWER BRAIN STEM INVOLVED IN THE GENESIS OF CORTICAL RECRUITMENT—LIKE RESPONSE. V. Mohan Kumar, N. Bhattacharya, G. S. Chhina and Baldev Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

Presence of EEG synchronizing area (S.A.) in the caudal brain stem (C.B.S.) is now well established, but there is no clear cut study on its anatomical mapping. Therefore localization of S.A. and C.B.S. was done by 5/sec low frequency electrical stimulation.

Study was conducted on flaxedilized, artifically ventilated encephale isole cats. Pressure points and wound edges were infiltrated with novocaine. Cortical EEG was recorded in these animals and changes produced by low frequency stimulation of C.B.S. were observed, by delivering stimulating current through bipolar electrodes introduced stereotaxically which were moved vertically in the steps of one millimeter.

A total of 180 points have been explored so far in 12 cats from C.B.S. Thirteen points lying roughly between the stereotaxic coordinates of H-6 to -9, P 7 to 10.5 and L 1.5 to 5, gave rise to recruitment like response. The criteria used in this study as index of stimulus bound recruitment were that EEG waves follow

the frequency of stimuli, have higher amplitude than the average ongoing activity and a tendency for amplitude modulation. Rest of the points did not show any significant change in EEG.

Points which gave recruitment like responses were situated in the ventral regions of the medulla.

184

COLD TOLERANCE IN THE ELDERLY INDIVIDUALS. Lazar Mathew, S.S. Purkayastha, A. Jayashankar, J. Sengupta and H. S. Nayar. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

Studies were carried out on 3 groups (15 each) of healthy men belonging to the age of 20-25, 40-25 and 55-60 years, to evaluate their responses to an acute cold stress. They were made to relax in a thermoneutral room $(27\pm1^{\circ}C)$ for 1 hour; thereafter their resting heart rate, blood pressure, ventilation, oxygen consumption, oral and mean skin temperatures and peripheral temperatures were measured. Then they were exposed to $10^{\circ}C$ in a cold chamber, wearing shorts and vests, for 2 hours. The above parameters and shivering were recorded at 30 minute interval during cold exposure. However older men (55-60 years) could not continue in the cold chamber for more than one hour. The results showed significantly higher oxygen consumption and shivering, and larger fall in body temperature during cold exposure in the older men, as compared to other groups, thereby showing poor cold tolerance in them. The The middle aged men also showed reduction in tolerance to cold stress as compared to the youngsters. The mechanisms for the observed responses will be discussed.

185

THE EFFECT OF ORAL INGESTION ON IMMEDIATE METABOLIC RATE IN HUMANS. Veena Mehta, K. N. Sharma and S. Bhatia. Dept. Physiology. University College of Medical Sciences. New Delhi.

The immediate metabolic effects of oral ingestion have been studied in young adult males of 17 to 25 years age. After a general clinical examination of the individuals to exclude any obvious pathology, their height, weight and nutritional status was assessed and the basal 0_2 consumption determined and metabolic rate calculated. 0_2 consumption and metabolic rate were determined again after 5 and 15 minutes of the test meal of 200 ml. milk. Differences in the immediate response of the individual to different types of food stuffs were studied. Two types of patterns were observed : in one group the basal metabolic level (42.75 ± 3.7 cals/m²/hr), increased by 11.76±0.91% at 5 min and showed a further increase to 21.34±6.3% at 15 min. interval. The other group showed a decrease of 7.5%-29.5% at 5 min. with no significant change from the basal values at 15 minutes interval.

STUDY OF PALMER CREASES IN RELATION TO ABO BLOOD GROUP. A. Mitra and A. B. Mitra. Dept. Physiology and Dept. Cytology Research Centre. Maulana Azad Medical College. New Delhi.

The palmer creases have often been thought to be secondary to early flexional developing hands. However, the association of unusual palmer creases with some genetic abnormalities indicates the possibility of genetic basis of the palmer creases variations. Palmer creases and blood groups of 200 individuals were studied. On the basis of the distribution of different creases like PTC, DTC and TC five groups have been made. In all the blood groups majority of the palmer creases belong to group-I. Bilateral asymmetry was also noticed. Palmer creases of some diabetic patients have also been studied. Observation of this preliminary study will be discussed.

187

METHIONINE INDUCED SUPPRESSION OF GONADAL FUNCTION. A. K. Mukhopadhyay and R. Rani. Dept. Physiology. Institute of Medical Sciences. B.H.U. Varanasi, U.P.

Effect of dietary excess of methionine-an essential aminoacid, on the reproductive function of rat has been investigated. Rats of CF strain (average body weight 160±25 g) were fed on a diet (Hind Lever, protein content 18%) ad libitum with (experimental) or without (control) 4% dlmethionine for a period of 21 days. At the end of experiment, the animals were sacrificed and the effects on various reproductive organs were evaluated. In experiments using female rats, it was observed that there were significant reductions in weights of ovary and uterus in animals of experimental group and that animals fed on methionine supplemented diet had turned anestrous whereas the rats of control group exhibited uninterrupted cycle. Similarly in case of male rats, feeding on methionine-rich diet produced a significant decrease in weights of prostate and seminal vesicles though the testicular weight remained unchanged. Further, morphological studies of reproductive organs indicate gonadal malfunction in animals receiving methionine in excess. The results obtained, therefore, indicate that derangement of gonadal function occurs following ingestion of dietary methionine in excess.

188

PHYSIOLOGY FOR THE CLINICIAN-POSTER PRESENTATION. Prakash K. Paintal. Dept. Physiology. M.A. Medical College. New Delhi.

Acquisition of knowledge and skills for solving the problems of ill health is the aim of medical education, its foundation is laid in the preclinical courses-Physiology being one of them. It has been increasingly felt by students and clinicians alike, that the present courses in Physiology are oriented towards the

training of a research physiologist rather than at providing background for a basic doctor in form of basic concepts and principles as applicable to the problem solving requirements of a clinician (Report of Chicago Medical Centre). Present communication is an endeavour to emphasise the clinical relevance of physiology through definition of instructional objectives and display of relevant information through visuals in form of *posters*. The procedure for preparation of visual presentation consists of highlighting the concepts and principles of organization and function along with their clinical relevance. These are depicted in the form of a flow chart thereby emphasizing their significance towards the problem solving requirement.

The anticipated benefits of the posters thus prepared in the form of a revision aid, to the different categories of students—preclinical, clinical, graduate and to the clinician, along with respective limitation will be discussed.

189

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DETERMINATION OF AUTONOMIC PATTERNS IN HUMAN SUBJECTS. L. Rai, G. S. Chhina and B. Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

In view of the participation of wide variety of physiological responses in the expression of autonomic activity in the body, there is a need to find a simple expression reflecting the quantitative level of sympathetic or parasympathetic trends. This was attempted by using Principal Components Method of factor analysis (Hotelling 1957) for processing the data of autonomically mediated responses in 58 human subjects at a Ta of $26.97 \pm 0.28^{\circ}$ C, which formed the basis for the isolation of autonomic factor. The analysis of the multivariate patterns of the physiological data was carried out using method of Wenger (1957), by plotting individual profile of standard scores for physiological variables for each subject and counting number of deviations of 1/2 sigmia or more with reference to the normative mean in a sub-set of five variables comprising of salivary output, diastolic blood pressure, heart rate, log palmar skin conductance and volar skin resistance. The selection of variables was based on their correlation with autonomic factor. Each profile so determined was classified according to the pattern of deviation exhibited as sympathetic (S), parasympathetic (P), with deviations consistently indicating relative sympathetic or parasympathetic respectively and mean (M) with deviations less than 1/2 sigma from the normative means. All profiles which did not fall into one of these three categories were placed in a category of mixed (mix) patterns. Using this methodology, the frequency distribution of autonomic pattern of P.M. S and Mix expressed as percentages in the normative sample was found to be 20'7, 17.3, 27.6 and 34'5 respectively. The observations suggest that pattern analysis furnishes a logical description for only two-thirds of the population as majority of the subjects fall within the mixed pattern. The latter provides the explanation of low coefficients of correlation among various autonomic parameters upon which the factorial study was based. The results

show a similar trend as reported earlier in American population of adults and childern (Wenger, 1957). This provides a simple way of expression of trends of autonomic functions but would need ratification from a larger sample of subjects.

References:

Hotelling, H. The relations of the newer multivariate statistical methods to factor analysis B.J. Stat. Psych. 10: 69-79, 1957. Wenger, M.A. Pattern analyses of autonomic variables during rest. Psychosom. Med. 19: 240, 1957.

190

RELATIONSHIP BETWEEN AMBIENT AND SKIN TEMPERATURE IN DEVELOPING RATS. U. Sachdeva, G. S. Chhina and Baldev Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

Inadequacies in Thermoregulation persist for varying time periods in the early phase of life in young mammals. The sequence of response leading to maturation of adult pattern has not been established in different species. Therefore, thermoregulatory responses of rats from birth to day 21 were studied by determining the alterations in their skin temperatures on exposure to ambient cold $(13-20^{\circ}C \text{ and } 21-23^{\circ}C)$ and heat $(41-43^{\circ}C)$. The animals were maintained at 27--30°C room temperature. The normal skin temperature (Ts) of the growing rats upto day 9 was 26-29°C. It varied from 30-31°C from day 10 to 15 and finally stabalizes by day 15 at 32-33°C. Exposure to the ambient temperature (Ta) of 18-20°C and 21-23°C produced a rise of 2.5 to 3.5°C in Ts upto the age of 15 days. The increase was more marked on exposure to 21-23°C as compared to 18-20°C. From day 15 to 21 exposure to cold Ta showed a decrease in Ts by 2°C. Exposure to 40-41°C produced a rise in Ts of 9—10.5°C upto day 7 however after day 8 the Ts did not rise but gradually decreased. By day 21 the rise was only 2°C from the initial temperature. Further more the time of recovery of cutaneous temperature to pre-exposure level occured in 45 minutes at day 2 and in 5 minutes after day 15. Thus in the developing rats thermogenesis occurs in cold Ta which enables them to increase Ts but after day 15 Ts fall may be due to the improved physical thermo insulation and physiological vasoconstrictive response from regulation of body temperature. Where as at higher Ta the rise in Ts may be due to increased heat gain due to thinner shell and restricted heat conductivity, after day 8 when epidermal thickening, growth of hair and vascular responses appear the heat gain is less and heat dissipation responses are more which lead to the fall in the Ts.



MYOCARDIAL METABOLISM DURING ISCHAEMIA : RESPONSE TO OXYFEDRINE. S. D. Seth, M. P. Gupta, L. M. Srivastava and S. C. Manchanda. Dept. of Pharmacology, Biochemistry and Cardiology. A.I.I.M.S. New Delhi.

The effects of Oxyfedrine (OXY), a β agonist drug, in isoproterenol (ISO)induced myocardial necrosis was studied in rats. OXY was given for 5 days before and 2 days during ISO administration and animals were sacrificed 48 hours after first injection of ISO. Propranolol (P) (1 mg/kg 1 m) was used as standard drug and the schedule of treatment was same as for OXY. The biochemical changes were also collaborated with histopathological examination. ISO administration in rats caused typical infarct—like cardiac lesions which were associated with reduction of myocardial glycogen (G) and creatine phosphate (CP) and an increase in lactate (L), while the serum lactic dehydrogenase (LDH), Creatine phospho kinase (CPK) and serum glumate Oxalacetate transferase (SGOT) were raised. OXY treatment increased the G and CP and normalized the myocardial lactate content of the infracted muscle. The raised levels of serum CPK, LDH and SGOT after ISO administration were also normalized. Treatment with P also produced similar effects but the CP increase and L reduction were significantly less than OXY treated group. Macroscopically and microscopically the myocardial lesion were significantly reduced in OXY treated group. The results of the investigation suggest that OXY reduces ISO-induced myocardial necrosis by causing a marked reduction in lactate and an increase in CP in Cardiac muscle.

192

A STUDY OF THE MUCOSAL TO SEROSAL TRANSFER OF NUTRIENTS FROM THE VARIOUS PARTS OF SMALL INTESTINE IN ADULT ALBINO RATS. R. K. Sharma. Dept. Physiology. Inst. Sci., B.H.U. Varanasi, U.P.

The mucosal to serosal transfer rates for nutrients like glucose and aminoacids were studied from different segments of small intestine in male adult albino rats. The in-vitro recirculation technique with oxygen bubble in circulation was used for the purpose. The four segments representing the whole length of small intestine, beginning from the ligament of Treitz to the ileocaecal junction were named as proximal jejunum (PJ), mid jejunum (MJ), mid ileum (MI), and distal ileum (DI); each of the segment representing nearly 25 percent of the gut length. The patterns for rates of transfer of glucose, water and L-tryptophan from mucosa to serosa from differen segments of small intestine were identical : PJ>MJ>MI>DI. The pattern of serosal transfer of L-tyrosine from different segments was, however, somewhat different : $PJ>MJ \ge MI>DI$. The effect of the amino acids L-tyrosine and L-tryptophan over the serosal transfer of glucose and water was also studied. Whereas L-tyrosine adversely affected the serosal transfer of water and glucose from all the four segments of small intestine, L-tryptophan showed no such effect.

EFFECT OF BRAINSTEM RETICULAR FORMATION INPUTS ON THE UNITS IN THE VENTROMEDIAL HYPOTHALAMIC AREA (VMHA). Sudit. K. Sikdar, V. Mohan Kumar, G. S. Chhina and B. Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

The effects of reticular formation on certical arousal and synchronization are well known, but its interaction with subcortical structures like ventromedial hypothalamic area (VMHA) are not worked out. In view of this, the electrical stimulation of caudal (CRF) and rostral (RRF) reticular formation at 5/sec low frequency (LF) and 100/sec high frequency (HF) were studied on VMHA units in encephale-isole cats. The low frequency stimulation of CRF excited 5 units and inhibited 3 units, while RRF excited 3 units and inhibited one. HF stimulation of CRF on the other hand produced excitation of 7 units, whereas RRF excited 5 units and inhibited one. Generally convergence of influences from CRF and RRF on VMHA units was not seen, although the same unit could respond to both LF and HF, from both the CRF and RRF. Only 5 out of the total 19 reported units, did not show any of the responses described above. The responses of VMHA units were unrelated to the cortical effects of RF stimulation with the exception of 6 units. In the latter, 5 showed an increase in the rate of firing during RF induced EEG synchronization and one showed inhibition. The discharge pattern of the units was also analyzed, and correlated with their response patterns. While, 10 units showed a poisson distribution and 1 Gaussian distribution, the remaining indicated an 'Unclassified' distribution pattern. CRF seems to be interacting more with the Unclassified distribution group of units, while RRF with the poisson group. The investigations have thus brought out that the VMHA units may or may not

The investigations have thus brought out that the VMHA units may or may not show correlation to cortical arousal inputs, but the units being influenced have some indication of a differential discharge pattern.

194

A COMPARATIVE STUDY OF THE EFFECT OF NOISE IN EXPOSED AND UNEXPOSED INDIVIDUALS. A. P. Singh, R. M. Rai, M. R. Bhatia, T. N. Upadhyay, S. K. B. Patil and H. S. Nayar. Defence Institute of Psysiology and Allied Sciences. Delhi Cantt.

Resting blood pressure, heart rate, ECG, respiration rate and oral temperature of 75 subjects chronically exposed to noise and 36 non exposed subjects having similar physical characteristics and activity level were compared. Serum cholesterol. cortisol and various protein fractions were also compared in them. Audiometric study of both the group was carried out for the assessment of hearing loss due to noise exposure. The mean blood pressure, heart rate, serum free cholesterol, r-globulin and cortisol were significantly higher in exposed group as compared to non-exposed group. However no significant changes were observed in their respiration rate, oral temperature and serum uric acid values. High frequency hearing loss ranging from 15 to 25 dB was observed in the exposed group.

480

Hand blood flow and heart rate of both the group of subjects were recorded before, during and after acute exposure to 90 dBA continuous noise in the laboratory. Initial values of hand blood flow of exposed and non exposed group were 12.55 and 13.60 ml/100 ml of tissue/min respectively. The reduction and recovery in blood flow during and after noise was of different magnitudes in the two groups. The implication of changed physiological and biochemical parameters together with the different response pattern during acute exposure has been discussed.

195

EFFECT OF PROLONGED SALT WATER INTAKE ON FOOD INTAKE AND DIGESTIBILITY IN MARWARI SHEEP OF RAJASTHAN DESERT. *Narinder Singh.* Central Arid Zone Research Institute. Jodhpur, Rajasthan.

Studies on the effect of saline drinking water were conducted at the Central Arid Zone Research Institute, Jodhpur on 16 healthy ewes of Marwari breed with four ewes in each group. The following were the group treatments : Control (tap water), 0.5 per cent, 1.0 per cent and 1.5 per cent sodium chloride in drinking water. The sheep grazed for 8 hours and were in open sheds later. They were adapted to the regimen for 7 months. Metabolic and digestibility trials were conducted, using chopped sewan (Lassivrus sindicus) hay. After 7 days of pre experimental period, collections were made for 7 days of experimental period. Results : Dry matter intake (kg/100 kg body weight), as well as the digestibility co-officient of dry matter, crude protein, ether extract and nitrogen free extract were statistically similar. However, the digestibility of crude fibre was higher in the group receiving 1.5 per cent saline. The digestible energy intake and nitrogen balance were similar in the different groups. Significant increases in urine volume, fecal moisture, transfer function of kidney and urine electrolytes were recorded in all the saline-fed groups. Thus Marwari sheep tolerate upto 1.5 per cent sodium chloride in drinking water without adverse effects.

196

EFFECT OF DISODIUM CROMOGLYCATE ON PULMONARY VAGAL RECEPTOR MEDIATED REFLEXES. Savita Singh and S. K. Jain. Dept. Physiology and Cardio-respiratory Physiology. Vallabhbhai Patel Chest Institute. University of Delhi. Delhi.

The effect of intravenous injection of disodium cromoglycate (SCG) on dogs was studied on the vagally mediated respiratory reflexes namely (i) Hering-Breuer inflation reflex (testing the function of pulmonary stretch receptors ;

(*ii*) cough reflex (testing the function of irritant receptors) and (*iii*) ventilatory responses to an intravenous injection of capsaicin (to test reflex responses from type J receptors). The responses were recorded before and after the injection of SCG.

(i) At the beginning of an inspiration, lungs were suddenly inflated by connecting the trachea to a pressurised balloon contained in a wooden box. The reflex response (Apnoea) was tested at different inflation pressure (range 2 cm H_2O-20 cm H_2O) and the lungs were maintained at the new volume till animal made its first inspiratory effort. The results were expressed as inhibitory ratio (duration of reflex apnoea÷duration of previous cycle) and were found to be not influenced by S.C.G.

(*ii*) The activity of irritant receptors in the extrapulmonary airways tested by a tactile stimulus (polythene catheter) applied to trachea and carinal area was not influenced by S.C.G. in any one of the experimental dog.

(*iii*) Injection of capsaicin (5-10 μ g/kg) on the right side of heart excites type J receptors producing apnoea or tachypnoea, hypotension and bradycardia which was abolished after vagotomy. S.C.G. did not effect the reflex response. Thus it would appear that S.C.G. does not have any effect on respiratory reflexes mediated by the pulmonary stretch, irritant and type J receptors.

197

STUDIES ON THE EFFECTS OF PAROTID SALIVA DEPRIVATION ON BIOCARBONATE AND INORGANIC PHOSPHORUS CONTENTS OF RUMEN FLUID IN CROSSBRED CALVES. S. P. Singh and S. C. Sud. Dept. Physiology. College of Veterinary Sciences. Pant Nagar, U.P.

Effect of parotid saliva deprivation on the bicarbonate and inorganic phosphorus contents of rumen fluid, saliva and blood serum was studied in sahiwal Jersey crossbred male calves. As a result of 2 weeks salivary deprivation, there was a significant decrease (P < 0.01) in the bicarbonate concentration of rumen fluid while the inorganic phosphorus content were increased. The changes in saliva were also similar but they were not statistically significant. Serum bicarbonate content and inorganic phosphoru content, however, remained unaffected.

198

CENTROGENIC CARDIOVASCULAR RESPONSE TO OUABAIN AND THE ADRENOCEPTORS. S. P. Sivam. S. D. Seth, U. Nayar and S. C. Manchanda. Dept. Pharmacology, Physiology and Cardiology. A.I.I.M.S. New Delhi.

The cardiovascular response to intracerebroventricular (i c.v.) ouabain and its modification by intravenous (i.v.) administration of α and β adrenoceptor blocking agents was investigated in chloralose anesthetized, vagotomised and artificially ventilated cats. Electrocardiogram Lead II and blood pressure (BP) were monitored to assess the cardiovascular response.



Injection of ouabain in 25, 50 and 100 ug doses elicited a dose-related increase in heart rate (HR) and BP. Cardiac arrhythmias of ventricular origin developed consistently in all animals receiving 50 and 100 ug ouabain. These centrogenic cardiovascular changes are attributable to a sympatho-adrenal discharge from the central nervous system (CNS).

Pretreatment with an i.v. α -blocker (Priscol or Dibenamine) reversed the vasopressor response of i.c v. ouabain (50 ug) to a vasodepressor one. This reversal on BP is reminiscent of the 'vasomotor reversal phenomenon' of Dale. The vascular response to i.c.v. ouabain is thus mediated by both α -and β -receptors and the blockade of α -receptors unmasks the β -receptors (particularly β_1) to produce the fall in BP.

Prior administration of an i.v. β -blocker (Sotalol or Practolol or Propranolol) significantly augmented the vasopressor response of i.c.v. ouabain (50 ug). Since β -receptors in the blood vessels mediating vascular dilatation were blocked, the excess rise in BP due to α -stimulation in blood vessels became unopposed. The pre-existing β -receptor blockade on heart after i.v. β -blocker (as evidenced by the inhibition of isoprenaline-induced tachycardia) only reduced but did not totally abolish the tachycardia after i.c.v. ouabain. Moreover, the incidence of arrhythmia was not significantly altered It appears that the blockade of cardiac β -receptors is not equivalent to sympathetic denervation of heart and that the arrhythmogenic stimuli originating in CNS may travel to the heart through pathways resistant to conventionally employed antagonists like β -blockers. Further, the ability of a β -blocker to inhibit the isoprenaline-induced tachycardia (as a test of β blockade) may not accurately reflect the ability to antagonise the cardiac effects evoked by sympathetic nerve stimulation as has been done with i.c.v. ouabain.

199

GLUCOSE TOLERANCE IN THE PREGNANT PREDIABETIC WOMEN. Indu Tandon and O. P. Tandon. Dept. Gynae-Obs. and Physiology. A.I.I.M.S. New Delhi.

Early diagnosis of gestational diabetes is clinically important as besides causing increased complications of pregnancy, it is still one of the greatest killers of foetus. Glucose tolerance test (gtt) has been recommended as an essential investigation especially in women where a state of latent diabetes is suspected from the presence of prediabetic stigmas during pregnancy. A group of nineteen pregnant women in the age range of 19-36 years, having one or more clinical criterion of prediabetes war selected. These screening factors included : history of (i) diabetes in the family (ii) abortion in the past (iii) previous unexplained still birth (iv) previous child with birth weight $8\frac{1}{2}$ lbs or more (v) giving birth to congenitally malformed baby. These women belonged to similar socio-economic group and were in the third trimester of pregnancy. Standard oral gtt was done in the morning and afternoon in random order within 5 days of each other. True blood glucose values were determined at 0, 30, 60, 90, 120 and 150 mins. The results were evaluated by applying the standard criteria and

abnormal gtts were detected. Six out of nineteen cases had either one or both tests abnormal, giving an incidence of 33'3% as gestational diabetes. Considering the usual morning test only 4 cases showed abnormal gtt giving an incidence of 21%. Incorporating the afternoon test besides these four cases which were also abnormal in the afternoon, two more cases with a normal test in the morning showed abnormal afternoon gtt. Thus incidence of gestational diabetes rose from 21 to 33.3%. More cases of diabetes could be detected during pregnancy if the usual morning gtt is supplemented with afternoon test also.

200

SINGLE BREATH DIFFUSION CAPACITY (TL) AND EFFECTIVE ALVEOLAR VENTILATION OF THE LUNGS (VA) IN A GROUP OF YOUNG HEALTHY VOLUNTEERS. O. P. Tandon. Dept. Physiology. Univ. College of Medical Sciences. New Delhi.

Single breath method for determining lung transfer factor (TL) is a well recognised and standard method. Due to lack of instrumentation particularly helium and carbon monoxide analyser, TL seems to have not been worked out in a profile of Indian population. Availability with us of the Morgan Transfer test Model C provided us the facility to work on this aspect of the pulmonary function.

25 young healthy medical students belonging to similar socio economic group volunteered for this study. They were in the age group of 18-21 (Av. 19'6 years) having av. wt. 66'2 (54-80 kgs) FEV in height 1'73 (1'60-1'77 M). Normal spirometry was done at first instance to determine each case, thereafter the subject was required to exhale completely to residual volume level and to inspire a volume of test gas containing Helium, Carbonmonoxide, Oxygen and Nitrogen. The gas was held in the lungs at full inspiration for a period of time to allow equilibration of the Hc and diffusion of the CO. After breathholding period (usually less than 10 secs.) the subject was caused to exhale and a sample for analysis was taken after a dead space washout volume of usually 700 ml. The gases in the inspiratory and expiratory bags were analysed by the analyser components of the unit for He, CO and oxygen. A comparison was then made between the concentrations of He and CO in the inspired and expired gas and a calculation for TL made.

201

PHAGOCYTIC RESPONSE OF THE LEUCOCYTES DURING DIFFERENT PHASES OF THE MENSTRUAL CYCLE. O. P. Tandon, P. K. Bhardwaj and K. N. Sharma. Dept. Physiology. University College of Medical Sciences. New Delhi.

The process of phagocytosis is dependent upon intracellular enzymatic components of the leucocytes. Activity of the enzymes particularly the myeloperoxidase and hydrogen peroxidase is adversely affected by genetic or

acquired abnormalities. Protein calorie malnutrition and iron deficiency anaemia depress the ingestion power of the leucocytes. Certain other deficiency states and excess of alcohol also affect phagocytosis adversely. In rodents, sex steroids particularly female sex hormones (estrogens and progesterone) are known to enhance this process. This study is being conducted to find out if varying hormonal levels during different phases of normal menstrual cycle affect phagocytic response of the leucocytes.

In vitro suspension technique is carried out in order to assess the leucocyte phago cytic activity. Female medical students, belonging to similar socioeconomic group, having no history of recent infection, drug medication and showing normal menstrual cycle are screened out. Venous blood sample is drawn at Do-1, D6-10 and D18-D21 of the cycle. The sample is differentially centrifuged to collect leucocyte rich plasma which is then gently agitated with saline suspension of coagulase positive Staphylococcus aureus and incubated at 37° C for half an hour, leucocytes are microscopically examined to determine their phagocytic response. Pattern of this response during menstrual, follicular and luteal phase of the cycle will be discussed.

202

STUDY OF GLYCINE ABSORPTION IN RELATION TO HYPOTHALAMIC FEEDING MECHANISM. S. Thomas, G. S. Chhina, Baldev Singh and B. K. Anand. Neurophysiology Lab. of Physiology Dept. and Isotope Lab. of Biochemistry Dept. A.I.I.M.S. New Delhi.

The glucose sensitivity of hypothalamic feeding mechanisms is well known and so also their role in glucose homeostasis. This also involves the increase in glucose absorption from gut by VMH activation and the decrease by LHA. Apart from the afferent activation from small intestine of glucose even glycine stimulates some afferents. The possible role of satiety and feeding areas of hypothalamus regulating intake of glycine was studied.

In dogs with thiry-vella loop, isosmotic solution of glycine containing C¹⁴ labelled glycine was perfused and samples of intestinal contents were analysed before and after stimulation of hypothalamic regions at various intervals. The amount absorbed was determined by estimating the amount of radio activity present in the samples. The absorption of glycine was increased by VMA stimulation and reduced by LHA stimulation. The trends of glycine and glucose absorption being similar on the activation of hypothalamic areas, even this amino acid seems to be in some way complementary to the effects of glucose.

203

SOME BIOSTATISTICAL APPROACHES IN PHYSIOLOGICAL RESEARCH. S. S. Verma. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

Biostatistical approaches are being frequently applied now in various branches of biomedical sciences for proper elucidation of the phenomenon. Some workers pointed out certain biostatistical problems related to the current

development in the field of nutrition during feeding trials. Efforts have been made in this Institute to apply some of the biostatistical approaches to solve the practical problems of estimating human endurance time, maximal aerobic power, human energy expenditure at different work rates etc. Recently, we have also emphasized upon the application of certain statistical techniques for better comprehension of the phenomenon of thermoregulation and the evaluation of statistical distribution of physical work capacity. Thus it is clear that biostatistical approaches play a major role in the solution of practical problems arising in various branches of physiological research. Attempts are also being made to suggest various biostatistical techniques useful in the formation and construction of suitable models to explain other phenomena of biomedical sciences. Limitations and superiority of various approaches will be highlighted. Some applications of advanced statistical approaches in physiological anthropometry will also be discussed.

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204

A STUDY OF ANO-RECTAL PRESSURES AND ITS POSSIBLE THERAPEUTIC IMPLICATIONS. O. P. Yadava, R. C. Aranya, O. P. Bhatnagar and S. K. Lal. Dept. Surgery and Physiology. Maulana Azad Medical College and associated L.N.J.P.N. and G.B. Pant Hospitals. New Delhi.

50 normal controls and 40 patients of haemorrhoids attending the out patient and inpatient services of the Ano-Rectal Division, Department of Surgery were taken up for ano-rectal pressure studies in the Department of Physiology. Anal pressures in the control group were found to be in the range of 12 to 96 cms. of water depending on the distance from the anal verge with maximum pressure at one cm. from the anal verge (Mean of 81'0 cms of water) with 18% having high pressure. High ano-rectal pressures were recorded in 55% of patients of haemorrhoids ranging from 24 to 130 cms. of water depending on the distance from the anal verge, with maximum pressures at 1.0 and 2.0 cms. from the anal verge (Mean of 117.4 cms. of water). Treatment was rationalised on the basis of ano-rectal pressures and high pressure group patients were taken up for pressure releasing operations viz, Lateral Sphincterotomy and Lord's procedure ; and low pressure group (45%) for injection treatment with sclerosing agents and Barrons Rubber Band ligation. "Excellent" post operative short term results were found in the former group of patients as per the subjective and objective criterion laid by us. Long term follow up studies are being carried out and final results are awaited.

205

DOPAMINE RECEPTORS IN C.N.S. Ram K. Mishra. McMaster University. Hamition, Ontario, Canada.

Dopamine is an important neurotransmitter in the CNS. Its role has been demonstrated in several mental and neurological disorders. In this communication, evidence for different types of dopamine receptors is presented. Receptors were directly identified by labelling with 3H-neuroleptic drugs and by determining the activity of dopamine stimulated adenylate cyclase as previously described (Mishra *et al*, Life Sci. 23, 443, 1978). The results obtained in this study indicate the presence of two different types of dopamine receptors in CNS : (1) dopamine receptor associated with adenylate

cyclase; and (2) receptor not associated with adenylate cyclase. Future experimental studies should be concerned with : (1) whether different receptor types have differential sensitivities to different classes of antipsychotic drugs ; (2) the development of antipsychotic drugs which selectively affect *one* type of receptor ; and (3) the existence of different receptor types in different brain regions.

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206

EFFECT OF TRANSCENDENTAL MEDITATION ON ULCER AND HYPERTENSIVE PATIENTS. R. Chitra. Dept. Physiology. Kilpauk Medical College. Madras.

The effects of Transcendental Meditation on the free and total acidity (Gastric Juice) in ulcer patients are being studied.

In 10 ulcer and hypertensive patients the blood pressure and acidity are studied before and after practising the transcendental meditation for 2 months. Mild ulcer cases become alright without any treatment. 4 of the peptic ulcer patients have shown much improvement and the total acidity was reduced. Generally free acid content has been reduced. The blood-pressure was reduced in all hypertensive cases.

Further studies on the effect of Transcendental meditation in stress induced ulcer cases can be carried out.

207

EFFECTS OF TRANSCENDENTAL MEDITATION ON DIABETIC PATIENTS. R. Chitra. Dept. Physiology. Kilpauk Medical college. Madras.

The effects of Transcendental Meditation on the postprandial blood sugar level of patients with Diabetes Mellitus are being studied.

In all, the 31 diabetic patiests studied so far showed a reduction in the blood sugar level after practising Transcendental Meditation, but, the degree of reduction was variable, ranging from 5 mgm% to 40 mgm%. The subjects are made up of groups, 10 of whom meditated for 2 months. Statistical analysis showed a difference significant at 5% level. But in other 21 subjects who meditated only for one month, though there was reduction in the mean blood sugar level, the difference was not statistically significant.



208

EFFECTS OF SOTALOL ON THE SKELETAL NEUROMUSCULAR TRANSMISSION. M. Alkondon, S. P. Sivam, Sneh Lata Bhatia and P. Sen. Dept. Pharmocology. University college of Medical Sciences and All India Institute of Medical Sciences. New Delhi.

Some beta adrenoceptor blocking agents have been shown to effect the skeletal neuromuscular transmission. Presence of adrenergic receptors have also been demonstrated in neuromuscular system. In the present study, we have investigated the effect of sotalol (MJ 1999) on the neurotransmission of some in vitro skeletal muscle preparations. In the isolated rat phrenic nerve diaphragm, sotalol in small doses (25-50 μ g/ml) facilitated the response to nerve stimulation and in higher doses (100-1000 µg/ml) inhibited it. It also enhanced the blocking effect of d-tubocurarine on that preparation in a dose dependent manner (10-100-µg/ml). In isolated frog rectus abdominus muscle and chronically denervated rat diaphragm preparations, sotalol (10-1000 ug/ml) potentiated the acetylcholine-induced contractions whereas the contractile responses to potassium chloride remained unaltered. Sotalol did not modify the effect of direct electrical stimulation of chronically denervated rat diaphragm. Sotalol was found to possess anticholinesterase activity as revealed by its prevention of acetylcholine hydrolysis when incubated with rabbit serum. In view of the absence of local anaesthetic activity in sotalol, these results would show that this beta-adrenoceptor blocking agent affects skeletal neurotransmission by its two opposite actions: (i) It acts presynaptically by preventing the release of acetylcholine as evident by its effect on the responses to nerve stimulation of rat phrenic nerve-diaphragm and (ii) by virtue of its anticholinesterase activity which explains its effect on the response to Ach in chronically denervated rat diaphragm and isolated frog rectus abdominus muscle preparations.

GUEST LECTURES & SYMPOSIA

THE ANION EXCHANGE BETWEEN EXTRACELLULAR FLUID IN THE BRAIN, BRAIN CELLS AND BLOOD, AND ITS CONSEQUENCES FOR THE RESPIRATORY CONFROL. H. H. Loeschcke, Bochum, Fed. Rep. Germany.

This discussion aims to explain the respiratory drives in respiratory and metabolic acidosis. It neglects from the beginning the influence of low oxygen partial pressure and is therefore restricted to situations when Pao₂ is high. The sensors to chemical respiratory stimuli are the peripheral chemoreceptors of the aortic and carotid region and the central chemosensory structures in the medulla oblongata. The former react to $[H^{+1}(pCO_2))$ of arterial blood, the latter, however, to the local [H⁺] in the surrounding extracellular fluid. The arterial (H⁺) may reasonably well represent the stimulus to the peripheral chemoreceptors. The extracellular (H⁺) of the central chemosensory structures depends on two parameters, the local PCO₂ and the local (HCO₃⁻), As long as the local perfusion and metabolism are unchanged the local PCO₂ depends mainly on the arterial PCO₂. The situation for HCO₃, however, is more complicated. It has recently been shown that CO₂ is bound to brain cells in a similar way as to erythrocytes. If CO₂ partial pressure increases the cells take up CO2 and exchange bicarbonate against chloride ions of the extracellular fluid thus increasing extracellular (HCO_3^{-}) and buffering the extracellular fluid of the brain against pH changes. This may be expressed by an in vivo CO₂ dissociation curve of this fluid.

If, as in metabolic acidosis, arterial $[HCO_3^-]$ is altered, there is also an exchange of bicarbonate against chloride ions on the border between blood and extracellular fluid of the brain. If, furthermore, pCO_2 is altered in the arterial blood—it decreases in metabolic acidosis due to hyperventilation—in addition to the bicarbonate-chloride exchange between blood and extracellular fluid the already described exchange of bicarbonate against chloride between extracellular fluid and brain cells takes place. The resulting pH in the extracellular fluid then is determined by the degree of hyperventilation (hypoventilation in metabolic alkalosis), the exchange of HCO₃⁻ between blood and extracellular fluid and the exchange between cells and extracellular fluid. The magnitude of the central respiratory drive depends on the [H⁺] in this fluid.

A more quantitative consideration of this system shows that it regulates the extracellular H^+ of the brain much better than $[H^+]$ in arterial blood. The seemingly paradox observation of some authors that in metabolic acidosis the pH of cerebrospinal fluid may turn slightly to the alkaline side can also be easily understood from this concept. It seems that the most precise control of H^+ in the extracellular fluid of the brain is part of the homeostasis of ions in the surrounding of neurons in the central nervous system which keeps them under optimal working conditions even under the load of heavy external disturbances.

489

NEUROPHYSIOLOGY OF MUSCLE PAIN. Robert. F. Schmidt. Physiologisches Institut der Universitat, Olshausenstr, Fed. Rep. Germany.

The majority of afferent nerve fibers in mammalian skeletal muscle are thin myelinated (Group III) and unmyelinated (Group IV) afferents. Some 50% of these units appear to be responsible for the reception of noxious chemical, mechanical and thermal stimuli, *i.e.* they are nociceptors. The other receptive units with fine afferent fibers presumably are activated by non-nociceptive stimuli, such as light stretch, contractions and light local touching. They possibly play a role in the circulatory and respiratory adjustments during exercise, *i.e.* they are ergoreceptors.

The data presently available suggest that the nociceptive units are a very hetrogeneous group with diverse receptive properties. The sensitivity of an individual unit may be restricted to a single chemical substance only whereas other receptors respond to a great variety of chemical, mechanical and probably thermal stimuli. Each receptor, however, seems to have a preferred susceptibility or "dominant sensitivity" to one or the other stimulus. The sensitivity of the nociceptors can be modified by chemical means. For instance, injection of serotonin or of prostaglandin E_2 increase the receptor responses to bradykinin for long periods of time. In contrast, local i.a. or systemic application of acetylsalicylic acid blocks the bradykinin responses but leaves those to serotonin unaltered.

In the spinal cord the nociceptive afferent units exert segmental spinal reflex actions on motoneurones. At the same time they project onto various ascending pathways, such as the spinothalamic and spinocervical pathways. The significance of these findings will be discussed.

490

211

NEUROPHYSIOLOGY OF SPORTS. B. K. Anand. Family Planning Foundation. New Delhi.

The nervous system, due to its regulatory influence on the various physiological systems in the body, plays an important role in modulating the physical efficiency of an individual. The neuromuscular coordination, Cardiovascular and respiratory efficiency, thermoregulatory adjustments, reflex control of finer muscular movements and motivation which are under the control of nervous system, are factors underlying the success of a sportsman. The preparatory rseponses just before the onset of muscular activity, in sports, are primarily of nervous in origin. The motor impulses pass through the pyramidal and extra pyramidal systems from cerebral cortex and subcortical structures, which bring about neuromuscular coordination. The sub-cortical areas such as basal ganglia, red nucleus, cerebellum and vestibular nucleus regulate the finer reflex movements which are essential for certain types of sports activity. The hypothalamus, and other physiological centres located in the brainstem modulate the various visceral functions so as to provide adequate oxygen and nutrients to the muscles and systems in operation during sports. It is proposed to highlight the specific role different neurophysiological mechanisms associated with sports activity with special emphasis on competitive sports.

212

MAXIMAL OXYGEN UPTAKE CAPACITY IN INDIAN BOYS. P. K. Banerjee and S. Chatterjee. Dept. Physiology. Institute of Aviation Medicine. Indian Air Force, Bangalore and University College of Science. Calcutta.

The maximal oxygen uptake capacity $(V0_2 \text{ max})$ has been studied widely in various populations because of its excellent correlationship to athletic fitness as well as occupational work capacity. In view of the large contributions made by the naturally endowed factors in determining an individual's aerobic power, a cross sectional study of $V0_2$ max in adolescents is of great importance in finding out the degree of variation in this parameter in this age group, as it would help in defining the scope of selection for further athletes. While there have been a few studies on determination of $V0_2$ max on Indian adults, viz. athletes, army personnel and industrial workers, no such study has been reported so far for Indian boys during adolescence.

The present study reports the values of $V0_2$ max determined on treadmill for 58 boys in the age group of 13 to 19 years. The mean value of $V0_2$ max was found to increase from 1.31 l/min for 13 years old boys to 2.30 l/min for 19 years old boys, with two significant spurts of increase between 13 to 14 and 14 to 15 years. The growth parameters in terms of height and body weight also showed significant increases between 13 to 14 and 14 to 15 years. V0₂ max per kg body weight did not show significant differences between various age groups and the mean values for different age groups varied between 44.3 to 47.9 ml/min/kg.

491

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The mean value of $V0_2$ max per kg body weight for all the subjects was 46.1 ml/min/kg. This is comparable with that reported for Australian school boys but about 8–20% lower compared to those reported on American, Czech, Japanese and Swedish boys.

A simpler test of physical fitness, viz. Physical Fitness Index (PFI) by Harvard Step Test was also conducted in these subjects using an 18" stool. Highly significant correlation coefficients were observed between PFI and V0₂ max (r=0.67, p<0.001) and between PFI and V0₂ max per kg body weight (r=0.65, p<0.001).

213

EFFECT OF TRAINING FROM ADOLESCENCE PERIOD ON MAXIMUM AEROBIC CAPACITY. S. Chatterjee, C. K. Basu, S. Das and Pratima Chatterjee. Dept. Physiology. Work Physiology Laboratory. Calcutta.

The effect of regular training under the same coach has been studied on maximum aerobic capacity on six male middle distance runners. Among these six middle distance runners, three were designated as group A who started training from their age of 13 years and the other three were designated as group B who started training from their age of 17 years. After five years of regular systematic training with almost same nutritional background, the six middle distance runners were asked to come to the laboratory for determination of their maximum oxygen uptake capacity by bicycle method. Vital capicity, Maximum voluntary ventilation and Physical Fitness Index by steptest were also assessed in these subjects. The results of these tests were compared in the two groups viz. A and B. It was observed that there was no significant difference in VC, MVV and in these functions when they were expressed in terms of unit body surface area. But highly significant difference in maximum aerobic capacity was observed. The three or group A, were found to have maximum aerobic capacity 64'8, 65'0 and 60'5 ml/min/Kg. of the body wt. respectively, where/as the three of group B were found to have 50.0, 53.6 and 49.8 ml/min/kg of the body wt. respectively. The Percentage utilization of MVV as VE during maximum work and PFI were compared, significantly higher values were observed in group A than those of group B. It is therefore suggested that regular systematic training from the very adolescent age may improve more maximum aerobic capacity than those who start training from the adult age.

214

A CASE OF EXERCISE INDUCED ASTHMA. G. Kottar and Major P. S. M. Chandran.

Exercise induced Asthma (EIA) is a manifestation of Bronchial hyperactivity that poses a special problem for asthmatics engaging in competitive and recreational sports. Occasionally Exercise Induced attacks are the only clinical

manifestation of asthma for years before spontaneous attacks begin to appear. Asthmatics often find that 6—8 minutes of continuous moderate hard running causes troublesome EIA, while either very brief intense exercise or very prolonged exercise does not necessarily cause an attack.

One 27 years young male olympian athlete started complaining of "Common Cold" in Dec. 77. Subsequently he started complaining of chest pain and breathlessness on exertion in Feb. 78. The case was diagnosed as Pneumonitis. Pulmonary function tests showed no obstruction but restriction in the airway. Patient was adequately treated for pneumonitis and he became asymptomatic. In March 78 he started feeling out of breath while doing moderate hard running of 7—10 minutes duration. Clinically and radiologically lungs were clear. Blood test showed increased eosinophil count. Diagnosis of Naso-bronchial allergy was made and treated with Asthalin tablets. But his complaints persisted. Collaborating his complaints, signs and symptoms, a diagnosis of "Exercise Induced Asthma" was made in Jun. 78. The diagnosis was confirmed by Pulmonary Function Tests. Patient was placed on sodium cromoglycate and was advised to restart his training. He became asymptomatic and was back in rigorous training culminating in a Gold Medal winning performance in the Bangkok Asian Games in Dec. 78.

This case study proves the effectiveness of sodium cromoglycate in the control of EIA and also stresses the importance of avoiding unnecessary restrictions on physical activities in asthmatic and highlights the limitation in the scope of treatment of such cases with drugs which does not come under the doping regulation of the International olympic committee.

215

PHYSIOLOGICAL EVALUATION OF DIFFERENT CLASSES OF INDIAN ATHLETES. Lazar Mathew, J. Sen Gupta, A. Jayashankar, P. M. Gopinath, S. C. Lakhera and H. S. Nayar. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

Measurement of maximal oxygen uptake capacity (VO₂ max) serves as an ideal index for the assessment of endurance work capacity. The success in the athletic events, where endurance is essential like long distance running and swimming, depends primarily on the maximal aerobic power. Studies were carried out in three classes of services Athletes (long distance runners, foot ballers and swimmers) to assess their endurance capacity and lung functions, in a thermoneutral laboratory. The resting heart rate (HR), pulmonary ventilation (VE), tidal volume (VT), respiratory frequency (Rf), forced vital capacity (FVC), forced expiratory volume (FEV₁) maximum voluntary ventilation (MVV), breath-holding time (BHT) and expiratory peakflow rate (PEFR) were measured. Their VO₂ max and oxygen pulse were evaluated, using bicycle ergometer (Quinton Uniwork). For comparison, a group of non-athlete soldiers were also studied as control. The VO₂ max and O₂ pulse were significantly higher in runners than in the other athletes. The swimmers and foot-ballers had significantly higher VO₂ max and O₂ pulse as compared to the control group. The resting HR, VT and VE were significantly lower in the athletes, whereas FVC, FEV_1 , BHT, MVV and PEFR were higher as compared to the control group. The top positions in running and swimming events in a subsequent national meet were well correlated with their physiological assessment. The paper will compare this data with that of world class athletes.

216

DIVING AS A SPORT. H. S. Nayar. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

The two main problems which a diver has to face while underwater are : firstly respiratory gas exchange and secondly exposure to high pressure. The first problem is solved by either segregating the respiratory system from water or else by providing a respirable atmosphere while in water. The different types of diving are free diving, schnorkal tube diving, standard diving, self contained underwater breathing apparatus (SCUBA), swimmer's air breathing appratus (SABA) and Air/Helium or oxygen/Helium breathing apparatus. The second problem is more complicated and includes physical effects (Barotrauma) and secondary effects of diving (Decompression sickness, oxygen toxicity and Nitrogen narcosis).

The prolonged effects of remaining underwater have been studied by U.S.A. by sending sea laboratories. Some of the effects of prolonged stay are leucocytosis, erythropenia, decreased coagulation of blood, decreased heart and respiratory rates and diuresis. Absorption of glucose from G-I tract remained unaltered at 6 atmosphere pressure. At 4 atmosphere pressure, the conditioned reflexes were affected while cortical activity was disturbed at 7 atmospheres.

217

ENERGY DEMANDS IN VARIOUS CLASSES OF ATHLETES. R. M. Rai. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

An athlete is a physically active healthy man and his nutritional and energy inputs must meet all the general aspects of good nutrition. During training and actual performance of the feat his nutritional and energy requirements demand modulation to cope up with the altered requirements depending on the various classes of games and athletics, and for the excellence in performance. It is also argued that a good nutritional care from the age of adolescence or childhood shapes an individual into a better sportsman because of better muscle build up and good health.

Studies carried out on all these aspects revealed that for a physically active individual with an average daily energy output of 15.03 to 15.75 MJ (3594— 3765 Kcal) the input was 16.47 MJ (3936 Kcal)/day. The Indian diet supplying this energy comprised of 113.2 g protein, 104.0 g fat and 634.0 g/day carbohydrate. The proportional contributions of each of these nutrients to the total energy content of the food were protein 11.5, fat 24.0, carbohydrate 64.5%. The nutrient and vitamin contents derived from the food were adequate and met the recommendation of Indian Council of Medical Research.

In case of children varying in age from 11 to 16 yrs, the energy consumption varied from 13.68 to 13.94 MJ (3269–3332 Kcal), meeting well the energy expenditure maintaining good health. Protein, fat and carbohydrate provided 12.1, 36.0 and 51.9% of the required energy.

To recommend desirable prescription of energy for all sport disciplines during training, the requirement in various classes of games and athletics have been estimated and classified under five groups. The role of proportion of carbohydrate, fat and protein in athletes diet will be discussed in the paper.

218

PHYSIOLOGICAL CHARACTERISTICS OF A SUCCESSFUL MARATHON RUNNER. J. Sen Gupta and L. Mathew. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

Marathon running is considered to be the most difficult athletic event and its success demands perfect integration of many physiological systems. Anatomically, marathoners are usually short, thin and possess less fat than all other types of athletes of comparable age. Physiologically, marathon runners are characterised by (i) superior running efficiency (5-10%), (ii) highly developed aerobic capacity (25-30%), (*iii*) an ability to tolerate high rates of energy expenditure (75-85% of VO₂ max) without involving anaerobic mechanism to derive energy and (iv) greater availability and utilisation of endogenous energy sources, than other classes of athletes. For an efficient O₂ transport system, the marathoners should posses a highly developed circulatory system leading to higher maximal cardiac output and stroke output which are achieved by greater heart volume and force of contraction. Similarly, for a superior respiratory efficiency, greater total lung capacity, higher lung diffusing capacity and increased total body haemoglobin are essential. In addition, superior thermoregulatory mechanism forms an integral part of marathoner's health, performance and success. Circulatory system is, therefore, further responsible for transferring metabolically produced heat from the active tissues to the body surface for dissipation of heat by efficient sweating. The marathoners are also having a greater capacity to tolerate higher core temperature and fluid loss. Besides, recent studies on the muscle fiber typing and enzyme characteristics of marathon runners have revealed that in regard to relative distribution of ST and FT fibers, the distance runners have a marked predominance of ST fibers and few or no FTI fibers, with increased SDH and hexokinase activity. The paper will discuss and compare all these functions in successful Indian and world champion marathon runners.

219

KINESTHETIC SENSIBILITIES IN GLIDING. Jayashri Devi Sharma. School of Environmental Sciences. Jawahatlal Nehru University. New Delhi.

Gliding is a sport of skill, in manoeuvering oneself in a three dimensional freedom, with the help of a glider, and mimic as nearly as possible a bird in flight. The sensory inputs in such an integrated activity depend largely on a

combination of many factors. Some external factors are environmental cues, which are by and large visual, wind velocity and sensations produced by it, differential temperatures and pressures in the atmosphere and light angles Another important factor is the normal pilot behaviour and aptitude, involving some psychophysiological aspects of flying. Kinesthetic and proprioceptive sensations are however by far the most important in this sport. Proprioceptive sensations are described by Sherrington (1833) as those which generally include vestibular sensations and inputs from muscles and joints, which are not necessarily percieved. The most important of these is the vestibulocular reflex. This reflex becomes potentially disruptive in air craft of high speed and in aerobatic manoeuvers, and occurs very rarely in gliding. Kinesthetic sensibilities are those which concern the percieved sensations about

the static position or velocity of movement of skeletal muscles and their contractions whether isotomic or isonetric. Adaptation and training in gliding activities is therefore a more physiological dependance on the "sixth sense" as described by Bell (1900) of satisfactory data acquisition and appropriate body position. Important components of this sixth sense are sensations of muscular force, and heaviness which help in predicting more positively the co-ordinated sequence of tasks required in gliding. This sensation of muscular force is dependant upon afferent signals of tension from intramuscular receptors and centrally generated voluntary motor commands, with a largely visual feedback for correct judgement during this sport. Factors that affect kinesthetic sensibilities, and lengthen reaction times are important in improving gliding skill and in accident prevention.

220

EFFECT OF EIGHT WEEK TRAINING PROGRAMME OF PHYSICAL EDUCATION ON SELECTED PHYSIOLOGICAL VARIABLES. A. K. Uppal, R. N. Dey and T. S. Brar. Lakshmibai National College of Physical Education. Gwalior.

Every human being participates in some kind of physical exercise during the course of his life. This exercise may assume different forms for different individuals. It may be walking, jogging, cycling, working in a factory, participation in games and sports etc. Regular participation in exercise programme markedly influences physical, physiological and mental fitness of the individual. Physical fitness helps an individual to carry out his daily tasks with vigour and alertness without undue fatigue and with ample energy to engage in liesure time pursuits and to meet the above average physical stresses and encounter emergencies. In case of athletes and sportsmen the level of physical fitness must be higher than that of non-athletes and this fitness can be progressively developed by regular training and conditioning. Basically, training
and conditioning cause three basic physiological changes in human beings. These are biochemical, systemic, and other changes. In this study effect of scheduled conditioning and training on selected physiological parameters have been observed on 1st year male students of Bachelor of Physical Education Class of Lakshmibai National College of Physical Education, Gwalior. In order to estimate the qualitative and quantitative validity of the scheduled training and conditioning, pre and post training period Hemoglobin Content, Vital Capacity, Breath holding Time, Resting Blood Pressure, Resting Pulse rate and recovery time after submaximal exercise of the subjects were recorded. Significant changes were observed at 0.05 level of confidence in Resting Pulse Rate, Recovery Time after submaximal exercise, Vital Capacity, Breath Holding Time and Resting Blood Pressure. Pre and Post training Hemoglobin content did not show any significant change.

THERMAL REGULATION AND NEUROMUSCULAR EXCITABILITY IN YOGIS. O. P. Bhatnagar. Maulana Azad Medical College. New Delhi.

Hathayogis, in comparison to untrained persons, are known to be able to adjust better to the variations of cold and heat. Some amongst them, can even consciously vary the temperature of two parts of their body. Yoga training thus appears to improve the conscious control of autonomic thermoregulatory adjustments. Green *et al* (1970) reported a hathayogi, who could, at will, vary the temperature of two parts of his palm by 10°F. Bhatnagar *et al* (1974, 1978) studied thermoregulation in yogis for a period of six months and reported that the core temperature (Tre) decreased significantly and the increase in exercise-induced core temperature (\triangle re) also decreased progressively with yoga training. The exercise-induced increase in the blood flow reduced, whereas oxygen consumption due to exercise progressively increased. This could possibly be due to the body tissues extracting more oxygen per unit blood flow as a result of yoga training.

Yoga teachers often claim that yoga training helps early relaxation of muscles. It increases the threshold for stimulation and yogis, therefore, do not respond to lower grades of normally effective stimuli; but, once they react, their responses are quicker. These claims were scientifically studied by Bhatnagar et al. (1974, 1978). They reported a significant progressive reduction in the half-relaxation time (photomotogram), signifying a quicker relaxation of muscles. They also reported that even at a constant ambient temperature of $27\pm0.5^{\circ}$ C, the rheobase, chronaxie and utilisation time increased consistently and significantly, indicating decreased neuromuscular excitability/increased threshold for excitability. The same workers reported an increased condition velocity in motor nerves, which may possibly explain the quicker reflexes in yogis, once the stimuli have reached the threshold level.

222

YOGA AND CONSCIOUSNESS – AN INTRODUCTION. G. S. Chhina. Dept. Physiology. A.I.I.M.S. New Delhi.

Just as understanding of yoga requires the realisation about several practices so also the state of consciousness is a continuum of several mutually interacting states. The experiential approach is a key to the study of higher states of consciousness outlined in the yogic concepts. Hence, there is a need to study the yogic concepts of consciousness and their experiential correlates in meditative states alongwith psychological coordinates. The role played by the directed flow of prana in the concept of swar-swarodayam is an important instrument to influence the conscious states —a trend which is further strengthened by pranayamic practices. To be able to synthesise the meaning of various states of consciousness manipulated by yogic practices, it becomes necessary to state the current concepts of brain function about the states of consciousness which are revealed in health and disease. Some physiological and biochemical parameters have been monitered during some states of consciousness brought about by yoga which enable us to determine the functional

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basis to some extent. The manipulation of some involuntary coordinates of the body which may indirectly be having a bearing on the induction of the altered states of consciousness by yoga needs to be mentioned.

Hence, some of the investigative information in this area is to be reviewed. There is a proposed interaction between concepts of ayurveda and ancient vedic literature which could clarify the concept of some subtle phenomena mentioned in yogic texts. These are some of the approaches which could help a student of yoga and consciousness to comprehend the current thinking on this topic. Nevertheless, there is a need to outline an interdisciplinary approach to carry out research on unknown manifestations of yoga in relation to the consciousness.

223

PRANAYAMA AND CONSCIOUSNESS. G.S. Chhina and Baldev Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

In yoga controlled breathing is not only meant for changing the primary function of the lungs for ventilation but also for a gradual training of the individual to concentrate on the process of breathing. By providing additional help in physical and mental relaxation, the process of concentration is further strengthened by pranayamic practices. Apart from bringing about control over volitional processes awareness about the visceral signals produced by manipulation of thermo-regulatory mechanisms, blood gases, blood pH and stretch receptors in different locations, is also created. Thus, an individual is presented with signals from the body which he is normally accustomed to receive, leading to the extension of the limits of body consciousness. The functional levels of the neural sub-strates concerned in the regulation of conscious states are modified in the desired direction producing a selective state of consciousness during awake phase. Since, the prolonged practice of pranayama leads to adaptation to slow rhythmic breathing both in awake and sleep state, there is some indication that even the sleep awake cycle is modified. The conceptual model regarding the interaction of pranayama with different states of consciousness shall be presented.

224

A DISCUSSION ON THE NEUROPHYSIOLOGY OF CONSCIOUSNESS. T. Desiraju. Dept. Neurophysiology. National Institute of Mental Health and Neurosciences. Bangalore.

1. Consciousness and Brain:

Consciousness and Brain can be considered (1,2) as inter-related realities, the former being the operational complement of the unique latter material. An opposite view (4) holds that Consciousness and Brain are two independent

but interacting things, the former belonging to the non-matter whereas the latter to the world of matter, the self-conscious reigning supreme over the working of the Brain. We do not know whether it will ever be possible for man to separate Consciousness and study it directly to understand it fully. The search for finding better approaches to study Consciousness is going on. The experimental Brain Science available so far contains *no* Neurophysiology of the non-matter type of Consciousness. What is so far available is about the Brain, either in the absence of the self-consciousness or in the presence of the spell of self.

2. The Daily Cyclicity of Consciousness :

The only experimental approach thus far exploited to study the question of Consciousness is through the study of mechanisms of sleep (1,2). What happens in the Brain in sleep in contrast to wakefulness, which enables conscious experiencing will be briefly discussed in terms of changes of neural impulse codes observed in the highest evolved association areas of cerebral cortex. Further, the substratum that may be concerned in generating the sleep rhythm will also be recapitulated.

3. The Brain Sub-systems subserving contents of conscious experience :

The lateralized functions of the parietal association areas, the interpretive and recall programming mechanisms of temporal association areas, the evidence suggesting integration of operations of limbic cortex and neocortex through the prefrontal association areas offering the neuronal substratum for the personality of the self (3) will be discussed.

4. Development of Consciousness and Brain :

Different methods of Yoga seem to offer possibilities (i) for actualizing the potentialities of the Brain and Consciousness : (ii) for acquiring parapsychological cosmic conscious experiences : and (iii) for emancipating the soul. Neurophysiology on (i) is meagre, on (ii) and (iii) is so far none.

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225

EXPERIENTIAL CORRELATES OF MEDITATIVE STATES. Swami Manuvaryaji. Central Council for Research in Yoga and Naturopathy. New Delhi.

In meditative state an individual sits effortlessly and focuses his mind inwards. There is a highly developed mind body coordination which is required to be achieved before one can undertake the practice of meditation. An individual with experience attains ability to interact in a desired fashion to attain various levels of 'innersense awareness'. Although, an individual starts with the interplay of thoughts but ultimately attains a thoughtless state which has affective attributes of "absolute stillness", "pure awareness", "pure being", "emptiness", "timelessness", "union with the cosmic energies". The narration of some of these states and other panoramic experiences shall be attempted in the context of the description by the ancient sages in the yogic texts.

226

EFFECTS OF YOGIC PRACTICES ON AUTONOMIC BALANCE, THERMOREGULATORY EFFICIENCY AND ORTHOSTATIC TOLERANCE. H. S. Nayar, W. Selvamurthy, R. K. Saxena, N. Krishnamurthy and U. S. Ray. Defence Institute of Physiology and Allied Sciences. Delhi Cantt.

The study was conducted on 30 healthy subjects in the age group of 20-30 years to evaluate the effect of Yogic Training on autonomic balance, thermoregulatory efficiency and orthostatic tolerance. The subjects were divided into two groups of 15 each. Group I was treated as control while in group II Yogic training was administered daily in the morning hours for one hour under the supervision of qualified Yoga instructers from Vishwaytan Yogashram, for a period of six months. The subjects were maintained on controlled dietary and physical activity schedule throughout the period of study. The various Physiological tests were performed before and after every month of Yogic training, in both the groups. The status of autonomic balance was assessed by monitoring following indices : heart rate, blood pressure, oral temperature and respiratory rate in basal conditions, mean skin temperature, cold pressor response, tilt table response and alpha index of EEG. The thermoregulation efficiency was studied by the Tromp's test of rewarming and the orthostatic tolerance was assessed by recording the cardiac vascular response to 70° head-up tilt. In addition the lung function were also recorded periodically. The results indicated a gradual shift of autonomic balance towards parasympathodominance, improvement in thermoregulation efficiency, orthostatic tolerance and lung functions. The mechanism underlying the causation of these changes by Yogic training is discussed.

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227

PSYCHOLOGICAL COORDINATES OF MEDITATIONAL STATES. J. S. Neki. Postgraduate Institute for Medical Education and Research. Chandigarh.

While it is easy to select physical and physiological parameters to assess the body functions during different states of meditation, it is not easy to pin-point psychological coordinates. Since, both conceptually and experientially psychological coordinates constitute an essential element for description of meditational states, a conceptual elaboration of these shall be attempted.

228

YOGIC CONCEPTS OF CONSCIOUSNESS. Baldev Singh and G. S. Chhina. Dept. Physiology. A.I.I.M.S. New Delhi.

The earliest concepts of consciousness were expressed in the form of mythological symbology where an orb was shown in the form of a snake chasing its own tail. In this phase the awareness regarding the discrimination between self and surroundings had not yet appeared. This phase of "creation myth" led to the "heromyth". This was followed by the elaboration of hypothesis of bodiless and embodied consciousness. The latter called citta was related to static while the former also known as prakriti related to kinetic cosmic energy. The kinetic form evolved into form and shape under influence of Maya. The punch mahanbhutas organised into inorganic, organic and biological states with the interaction of Maya and gunas, manifest themselves as consciousness of the objects of the cosmos. This concept of consciousness operates at supramental level dissociated from mind or as citta where it is associated with matter or associated with inorganic gross matter. This consciousness exists in all heirarchy of being. The citta shakti manifest in man as prana and it is related to various nadis and chakras in the body. The consciousness and physical body is linked together by mind (antakarna) which is made up of Budhi (Memory, intellegence), Ahankara (ego) and Manas (Indryas and the perceptivity of sense organs). Mind borrows its consciousness from the citta (primordial) energy. Thus the body consciousness constitutes prana and mind and later functions to bring about physical activities of the body to the level of consciousness. The consciousness is further surrounded by several energy shells from which yoga can deliver freedom to enable it to merge with the bodiless consciousness.

229

BIOCHEMICAL CORRELATES OF MEDITATION AND CONSCIOUSNESS. Sarada Subrahmanyam and K. Porkodi, Dept. Physiology. P.G. Institute of Basic Medical Sciences. University of Madras. Taramani, Madras.

Meditation is an acient scientific discipline by which one can withdraw from extraneous stimuli and maintain a state of equilibrium between mind and body.



During meditation various reactions occur in the body which can be objectively measured but meditation itself is not scientifically standardised and remains a border line discipline. Tranquility of mind depends on the balance between the activities of the sympathetic and parasympathetic nervous systems. There is a close relationship between the endocrine glands and yoga. For optimum health every gland must work efficiently and in harmony with other glands and with the nervous system.

Tension hovers round the heads of millions of people in present day life. In susceptible individuals it may lead to psychosomatic diseases like hypertension, bronchial asthma, thyrotoxicosis etc. Meditation is very useful in them. Though much work is done on yoga and meditation, data on the state of the autonomic nervous system is sparse. The effect of ANS are mediated by neurotransmitters. One of the factors for peace of mind is the delicate balance between the different transmitters, especially the biogenic amines. The present studies were conducted in :

1.	Normal healthy adults	: Yogic meditation
2.	Essential hypertension	:
3.	Bronchial asthma	:
4.	Epilepsy	:
5.	Normal subjects	: Transcendental meditation
6.	Mild aggressive hyperkinetic behaviour	: -do-
7.	Moderate mental retardation	:do
Investigations :		

1. Biochemical : Lumbar CSF, 24-hour sample of urine and blood were collected under regulated conditions.

(a) C.S F.: 3-Methoxy 4-hydroxy-phenyl glycol (MHPG), Homovanilic acid (HVA) and 5-hydroxy-indole-acetic acid (5-HIAA)

(b) Blood : Plasma cortisol and other parameters.

MHPG, HVA, 5-HIAA and 17-ketosteroids. (c) Urine :

2. Electrophysiological : EEG was recorded with split up of the waves, before, during and after meditation.

3. Psychological : The metabolities of catechol and indole amines showed significant changes after meditation in normal subjects and in patients. These along with the accentuation of alpha rhythm were correlated with the general well being in healthy subjects and clinical improvement in diseased states. Thus apart from the spiritual uplift meditation is valuable for physical and mental fitness in normal individuals and in the therapy of not only psychosomatic diseases but also in certain psychiatric disorders.

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DISTURBANCE OF CONSCIOUSNESS IN ORGANIC BRAIN DISEASE. P.N. Tandon. Dept. Neurosurgery. A.I.I.M.S. New Delhi.

Integrated function of the whole nervous system is essential for maintenance of normal consciousness. However, both irritative (epileptic) and destructive lesions of the brain at different sites may produce a variety of disturbances of consciousness. This may manifest as alterations in perception (hallucinations

and illusions), affect (feeling of fear, spontaneous laughter etc.), behaviour (aggression, temper-tantrum etc.) or actual sensorial disturbance *i.e.* loss of consciousness. Some of these manifestations are dependent upon disfunction of specific sites in the nervous system, the others may be non-specific. Lessons learnt while treating patients suffering from neurological diseases which throw some light on this subject will be discussed.

- 1. Lesions affecting the brain stem may result in loss of consciousness without affecting sensory-motor reflex activity.
- 2. Lesions made in the dorso-medial nuclei of the thalamus result in reduction in anxiety, tension, agitation and aggressive behaviour.
- 3. Hypothalamic lesions may result in hostile and aggressive reactions, "Rage" or "Affective Defence reaction" of Hess.
- 4. Limbic system : Stimulation of anterior deep temporal regions produce psychoparetic effects such as confusion, diminished awareness, amnesia and automatic behaviour. Bilateral lesions produce impairment of recent memory. Destruction of amygdaloid nuclei reduces aggressive behaviour.
- 5. Stimulation of temporal cortex produces positive psychical experiences as hallucinations, illusion and recall of past experience.
- 6. Frontal lobe lesions produce loss of foresight, imagination and drive and at times increased lability, lack of appreciation of self and society.
- 7. Diffuse cortical lesions result in global disturbances of consciousness and mentation.

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EFFECTS OF AN ORGANOPHOSPHATE—PESTICIDE—DICHLORVOS ON THE REGIONAL MONOAMINE LEVELS : CORRELATION WITH BEHAVIOURAL STUDIES. S. Fatehyab Ali and Mahdi Hasan. Brain research Centre. Jawaharlal Nehru Medical College. Aligarh Muslim University, Aligarh.

Dichlorvos, an organophosphate, is highly effective contact and systemic pesticide. In the form of resin strip, it is widely used by laymen in public and private areas (Gillett *et al.*, 1972). Use and misuse of dichlorvos has substantially increased resulting in health hazards. It is well known that changes in biochemical mechanisms and amine concentration in different regions of the brain manifest in the form of varying disorders and changes in behoviour including motor activity and a number of psychoactive drugs are known to produce such changes (Taylor and Synder, 1971; Thornburf and Moore, 1972 and Benkert *et al.* 1973). It would, therefore, be of great practical significance to estimate the level of monoamines in different regions of the rat brain after the administration of dichlorvos and correlate these findings with behavioural studies.

Male albino rats weighing 200 ± 20 g divided into four groups were used for all studies. Dichlorvos was administered 3 mg/kg body weight i.p. daily to all the rats of group 1-3. Control rats of the 4th group were sham injected with equal volume of physiological saline i.p. concurrently. Animals of groups 1 and 4 were sacrificed by decapitation on the 3rd, 5th, 7th and 10th day for the estimation of monoaminess (DA, NE and 5—HT) according to the method of Welch and Welch (1969). Rats of groups 2 and 3 were used for behavioural studied—including ambulation, preening, rearing, defecation and motor activity. All the three monoamines estimated in the present study on different days showed similar pattern and correlated well with the behavioural studies.

232

EFFECTS OF THE INSECTICIDE ENDOSULFAN ON THE CARDIOVASCULAR SYSTEM OF THE DOG. M. Anand, R.N. Khanna, Krishan Gopal and G.S.D. Gupta. Industrial Toxicology Research Centre. Lucknow.

Experiments were carried out on anaesthetized dogs, administered Endosulfan (3 mg/kg b. wt. I.V.). A marked fall in blood pressure was recorded immediately after injection due to a direct effect on the heart. After 15 mts. there was a persistent significant rise, which lasted for 90-120 mts. The rise of blood pressure was blocked by α -blocker (Priscol 2 mg/kg). Total peripheral resistance fell down significantly in hind quarter limb perfusion experiments. Catecholamines (E, NE, Do) concentrations in blood showed a significant rise during the experimental period and thus correlated with the cardiovascular alterations.

RETENTION OF PRALIDOXIME CHLORIDE AFTER PRETREATMENT WITH DIFFERENT VITAMINS. S. Dasgupta, A. K. Ghosh and M. V. Moorthy. Department of Environmental Pharmacology add Toxicology-Defence Research and Development Establishment. Gwalior.

Pralidoxime Chloride (2 PAM.Cl) is a well known reactivator of phosphorylated cholinesterase enzyme and as such is used in therapy of organophosphorus insecticide poisoning. As the unchanged oxime is excreted rapidly, it was considered beneficial to use other drugs to increase its retention in the biological system. Vitamin C and two members of vitamin B complex group viz. Thiamine Hydrochloride and Nicotinic Acid were used in the present study. Male and female rats were injected Thiamine HCI (10 mg/kg i.m) followed by 2 PAM. CI (30 mg/kg i.m.) after an interval of 15 min. Oxime concentration in the blood at different time intervals determined by the spectrophotometric method (Creasey and Green, 1959). Similarly Nicotinic Acid (5 mgm/kg i.m.) and vitamin C (250 mgm/kg i.m.) were used and the oxime concentration measured.

Results show that thiamine hydrochloride had an overall effect on the female rate and retentions of 2 PAM. C1 was highly significant at 150 and 180 min. The male rats did not show this effect But in case of Nicotinic Acid pretreatmment, the retention of 2 PAM. C1 was more in male rats. Male rats pretreated with vitamin C retained 2 PAM. C1 till 210 mins compared to 180 min in the control. No such effect was observed in the females. Little is known on influence of the sex of the animal on the retention of oximes. It can be concluded that the rat has an apparent distinction of showing variation between the sexes in its response to oximes pretreated with different vitamins.

234

STUDIES ON ANTIDOTES TO PESTICIDES-ENTRY OF PYRIDINIUM OXIMES INTO RAT BLOOD CELLS AND EFFECT OF THIAMINE HYDROCHLORIDE. A. K. Ghosh, M. V. Moorthy and S. Das Gupta. Defence Research and Development Establishment. Gwalior.

Pralidoxime chloride, Trimedoxime and Obidoxime are effective reactivators of of anticholinesterases. Efficacy of reactivation depends on the blood levels in the body after administration as well as the rate of penetration of the oximes through the cell membrane of the red blood corpuscles. In the present work, rats were divided into four groups which received Pralidoxime chloride, Trimedoxime and Obidoxime (30 mg/kg i.m.) respectively while the animals in the fourth group were pretreated with thiamine hydrochloride (10 mg/kg i.m.) followed by Pralidoxime chloride (30 mg/kg i.m.) as this vitamin was effective in prolonging the biological half life of Pralidoxime chloride (S. Das Gupta, A.K. Ghosh and M.V. Moorthy, Experentia, 1979, 35,249). Oximes level in the blood and plasma determined at the peak level by the spectrophotometric method of Creasey and Green, 1959 ; the haematocrit was determined by microchaematocrit method and the amount of oxime in RBC was calculated.

Results indicate that 50% of the monoquaternary oxime, Pralidoxime chloride enters the RBC while the bisquarternary oximes, Trimedoxime and Obidoixme do not enter as the molecular size is larger than Pralidoxime. Thiamine pretreatment did not alter the entry of Pralidoxime showing that thiamine does no affect the membrane permeability of the RBC.

235

ORGANOPHOSPHATE PESTICIDE DDVP-INDUCED CHANGES IN THE RATE OF LIPID PEROXIDATION IN DIFFERENT REGIONS OF THE RAT BRAIN—A BIOCHEMICAL AND ELECTRON MICROSCOPIC STUDY. Mahdi Hasan and S. Fatehyab Ali. Brain Research Centre. Jawaharlal Nehru Medical College. Aligarh Muslim University. Aligarh.

DDVP (Dichlorvos, 0, 0-dimethyl 2 : 2-dichlorovinyl phosphate, Nuvan 100 EC, 96 3% purity, Ciba Geigy India Ltd.) is an organophosphate which belongs to the organochlorine group of pesticide having low systemic toxicity and hence is widely used. Lipids are essential components of all cellular structures in the brain and they comprise more than fifty percent of the brain weight (Yousufzai and Siddiqui, 1977). Tissue most susceptible to lipid peroxidation appear to be those with low mitctic rates such as the brain (Barber and Wilbur, 1959). The purpose of this study is to evaluate the effect of dichlorvos on the rate of lipid-peroxidation and the consequent ultrastructural changes in different regions of the rat brain.

Male albino rats 150—200 g divided into four groups were used for these studies. Dichlorvos was injected in a dose of 0.6 mg/kg; 1.5 mg/kg ; 3'0 mg/kg weight i.p. daily for 10 days to group 1-3. Control rats of the 4th group were sham injected with equal volumes of physiological saline i.p. concurrently. The animals were sacrificed on the 11th day and their brains were dissected out into cerebral hemisphere, cerebellum and brain stem for the estimation of the rate of lipid peroxidation according to the method of Utley *et al.* (1967). Animals of group 3 were used for electron microscopy. Following perfusionfixation, ultrathin sections of the hypothalamus were examined with a Hitachi HUII Electron microscope at an accelerating voltage of 75 KV.

The rate of lipid-peroxidation significantly increased after the administration of dichlorvos in all regions of the rat brain. A dose dependent increase in the rate of lipid peroxidation was detected. Electron dense bodies were commonly observed in neuronal perikarya of the experimental rats. A few oligodendrocytes of the hypothalamus showed vacuolated dense bodies.

236

EFFECT OF RESERPINE ON SPONTANEOUS MOTILITY AND CEREBRAL GABA LEVEL IN PP' DDT TREATED MICE. F. N. Jaffery and M. A. Matin. Industrial Toxicology Research Centre. Lucknow, U.P.

A group of mice were treated daily with pp' DDT (25 mg/kg., orally) for 30 days. pp' DDT was dissolved in peanut oil. A corresponding group of animals was treated with the oily vehicle. The effect of reservine on the spontaneous

motility in normal and pp' DDT treated mice was determined. Reserpine (2.5 mg/kg, i.p.) reduced the motility in normal mice. In pp' DDT treated mice, reserpine did not change the motility. The motility of the animals was determined in an Photoactinometer cage (Techno). Reserpine reduced the level of cerebral GABA in normal mice. In pp' DDT treated animals, the administration of reserpine further resulted in a significant lowering of the cerebral GABA level as compared to the normal or pp' DDT treated group. Thus pretreatment with pp' DDT seems to modify the reserpine induced effects in animals.

237

HEALTH HAZARDS OF PESTICIDES. M. A. Matin. Industrial Toxicology Research Centre. Lucknow, U.P.

The use of pesticides in agriculture, industry and household has been increasing. The widespread use of these pesticides has presented a potential health hazard to mammalian organisms including man. The organochlorine pesticides (eg DDT) leave residues and metabolites which peesist in the body for long periods. These pesticides, however, usually do not produce acute toxic effects. The organophosphorous pesticides, on the other hand, produce acute effects (tremors, convulsions, lacrimation, etc.) which are due to inhibition of cholinesterase in central nervous system and other parts of body resulting in the accumulation of acetylcholine. These pesticides are however metabolised in the body fairly quickly. The persons with a congenital low level of cholinesterase become particularly susceptible to the toxic effects of organophosphorous pesticides. It is therefore necessary to perform estimations of cholinestesase activity before exposure to organophosphorous pesticides. Another danger by the use of these compounds is the production of delayed neurotoxicity-a syndrome charactersied by insidious onset, progressive course which may ultimately lead to complete disability or paralysis. This condition is not related to inhibition of cholinesterase by organophosphorous pesticides. Lastly there are also reports that the administration of certain pesticides (eg DDT) induces changes in the metabolism of drugs in animals. A number of drugs as well as pesticides have been reported to produce neurochemical changes. It is possible that the exposure to pesticides may result in certain changes in the usual drug responses.

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238

LIPID STATUS IN LIVER AND BLOOD PLASMA IN THE RATS TREATED WITH ACUTE DOSE OF MALATHION. V. K. Rastogi, U. P. S. Chauhan and C. B. Jaggi. Defence Research and Development Establishment. Gwalior.

Malathion is widely used as a pesticide. It is claimed to be non-toxic to mammals. The present investigation describes biochemical changes in lipid constituents and ³²Pi incorporation into phospholipids of liver and blood plasma in rats treated with an acute dose of malathion. LD_{50} for malathicn was determined for female rats and was found to be 741±59 mg/kg body weight.



Treatment of rats with an acute dose of malathion (800 mg/kg body weight) caused an increase in triglycerides and free fatty acids and decrease in cholesterol in blood plasma, while in the case of liver there was a decrease in triglyceride content. ³²Pi incorporation into blood plasma phospholipids indicated a reduced turnover of phosphatidyl choline, phosphatidyl ethanolamine, lysophosphatidyl ethanolamine and sphingomyelin. Similar study with liver phospholipids showed decreased ³²Pi incorporation into lysophosphatidyl choline, lysophosphatidyl ethanolamine and sphingomyelin. However, such ³²Pi incorporation into Phosphatidyl ethanolamine was not affected. The results suggest some relationship between hepatic triglycerides release and phospholipids metabolism.

239

MECHANISM OF LUNG DAMAGE CAUSED BY PARAQUAT : AN EXPERIMENTAL STUDY IN RATS. R. K. Srivastava, A S. Sachan and S. K. Sharma. Defence Research and Development Establishment. Gwalior.

Effect of paraquat on lung surfactant system was evaluated in rats by determining alveolar stability, expansion characteristics of lungs, functional lung compliance, thoracic electrical impedence and histopathalogical parameters. Studies were done 48 hours following paraquat administration at a dose of 30 mg/kg administered intraperitoneally. Inconsistent responses were observed. In some lungs, with no apparant symptoms of pulmonary oedema (with normal lung body weight index : LBI), the alveolar stability and expansion characteristics were found unaltered. However, these lungs tended to trap augmented quantum of air at the end of deflation process. By contrast, some lungs showed signs of frank atelectasis with alveolar transudation (increased LBI). These lungs collapsed at low intrapulmonary pressure. Yet, a few lungs were found leaky even at low inflation pressure. Furthermore, some rats died within the observation period. Histopathological studies of lung tissue showed large scale atelectasis, alveolar transudation and capillary haemorrhage. Of greater interest, were the findings that in all treated animals, the thoracic electrical impedence was increased and functional lung compliance was decreased consistently.

It seems that a shift of the fluid in the lungs is the initial response of paraquat poisioning. Transudation in the alveoli, lifts the surface active lung lining and the surface active forces are altered. As a consequence alveolar inward retractive force is increased resulting in decreased lung compliance. Frank pulmonary oedema, severe atelectasis and haemorrhage are secondary manifestation of paraquat poisioning. There is also the possibility that, in addition, paraquat causes damage to the alveolar septa, thereby rendering the lungs leaky. Augmented trapping of air seen in some lungs seems to be protective mechanism to resist alveolar atelectasis.



COMPARATIVE REVIEW OF THE STATE OF EQUIPMENT IN PHYSIOLOGY DEPARTMENT OF A MEDICAL COLLEGE IN INDIA AND ABROAD. Brahma Dutt Jhansi Medical College. Jhansi.

240

Equipment in Physiology departments in a medical college is often geared to teach basic physiology to undergraduates in medicine, science, dentistry or pharmacy collectively; and to train teachers in investigation procedures. Fundamental or applied research is a by-product. Applied physiology for human hospital use *i.e.* Clinical physiology is an attempt to concentrate hitherto dispersed physiology equipment under one roof for better management. Machine yields results as a joint effort of academicians, technicians, repair cum maintenance personnel, and manufacturer with research and development wings. Today it is no longer possible for one professor to command all the expertise. Thereby nation has but to invest heavily in these apparently non-productive ventures which trains scientific habits and discipline, help in early detection, precise management of therapy and unravel the mysteries of both health and disease mechanisms. Of course, no ideal department capable of doing all exists, but most of the developed countries try to utilise to maximum. The weakest link universally is the availability of trained technicions at the usually low rates of pay. Modern miniaturised wonders cost a lot to maintain.

In the pre 1950 days in India Physiology professors in most of the university medical colleges were better paid than their clinical counterparts and wielded lots of prestige. Their the then gamut was moderate and successfully met with the paraphernalia from Palmer, Baird and Tatlock etc. Animal experimentation in quest of scientific basis of empirical approaches was their almost suicidal obsession which resulted in the current isolation of the physiology community, more so aggravted by the latest trends in ever expanding technology coupled with sudden demand for new medical colleges. Politically motivated restriction on imports helped the capitalists but created a deadly decline in skilled technological standards. Shortsightedness of the bureaucrats made the wonderful Phundoos extinct. It was those lowpaid devoted attendants who lovingly nurtured the machines.

A TECHNOLOGICALLY DEFICIENT generation fed upon M.C.I. certified lists of equipment which were paraded almost as non-functioning full size models depended heavily on diadectic teaching to earn nicknames like Fulton or admirable exponents of this or that standard text. The backbone of scientific spirit the INVESTIGATIVE MANUALS have disappeared. Liddle and Sherrington, or Jackson are now replaced by very amateurish cyclostyled fill in the blank practical sheets. Age old obsolete lists of equipment and consequently fossilized experiments continue to limit of boredom and EXCLUSION OF PHYSIOLOGY from the mainstream of academic life in medical colleges. The clinical counterparts have become bold enough to demand physiology to be a technician to obey their chits. The M.C.I. compounded the felony of denigration of Physiology as no organised body of Physiology opposed the reduction of course from 2 years to 18 months (why 16 week core physiology of Jacobson is surely enough but for whom ?) The latest damage to Physiology equipment is earmarking of only 50 i.e. 16% marks in professional examination. Surely Physiology is on the way out to occupy its place of honour in Universities. The current masoleums of arachaic historically significant museum pieces in various stages of decay continue with apathy of Principal-Director-

Secretary axis and absolutely no employment eavenues besides pitiable teachership in Physiology. The ancient out of time in tune pacemakers are responsible for this.

241

IDENTIFYING THE AGENCIES FOR PROPER MAINTENANCE AND UP-KEEP OF ELECTRO-MEDICAL EQUIPMENT. G. S. Chhina. Dept. Physiology. All India Institute of Medical Sciences. New Delhi.

In view of the varied nature of the equipment available in the medical colleges and also diversity of manufacturers and models obtained from multiple sources located in different countries, organisation of the proper maintenance is an extremely difficult task. While the best agency for up-keep and maintenance of the instruments in a department is its own technical staff trained adequately both in the use and preventive maintanance, help could be sought from various other agencies for the various types of repair. In view of the non-availability of spare replacemeat parts in the general market, the best approach is to enter into contracts with the manufacturers and suppliers themselves or their representatives if it is a foreign firm. There are several organisations which undertake specialised help and assistance to the users that can be identified. These are National Physical Laboratories, Central Scientific Instruments Organisation and some voluntary organisations or even Indian manufacturers who undertake the limited maintenance responsibilities for cultivating a good customer-supplier relationship for the introduction of their own products. The relative advantages and disadventages for identifying different agencies in different locations in the country shall be discussed.

242

MEDICAL EQUIPMENT IN PHYSIOLOGY. Sujoy K. Guha. New Delhi.

Physiological measurement is a field which presents challenges to innovative development of instrumentation. In the past the need to measure and observe physiological parameters with minimal interference with the biological system spurred the formulation of new concepts in instrumentation. Thus some of the commonly used systems in technological fields owe their origin to physiological research. Lately however such activity has slowed down because the needs of industry involve far greater monitory sums than of the medical institutions. Nevertheless the potential of creating new instrumental concepts within the physiological laboratories still exists.

Advances in technology are extremely rapid and it is no longer possible for a physiologist to keep abreast with all the techniques which may fruitfully be utilized. At the same time physical scientists and engineers cannot readily perceive the significance of the constraints imposed by the biological systems. A team work is therefore essential.

Progress in the past few years and future predictions indicate that there is a possibility of innovating measurement techniques which may be far less traumatic than everbefore. Completely noninvasive method which can focus onto specific functions and specific regions are likely to emerge. The presentation details priority areas both in terms of current needs and future projections. Also the approach to setting up a mechanism to achieve the targets have been discussed at length.

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243

ACTIVITY OF CSIO IN RELATION TO THE NEED OF MEDICAL ELECTRONIC EQUIPMENT IN THE COUNTRY. R. S. Khandpur Medical Electronic Instruments Division. Central Scientific Instrument Organisation. Chandigarh.

During the last two decades medical science and simultaneously research on and the development of medical instruments have shown a tremendous increase on a world scales. In India, CSIO started research, design and development activity in Medical Instruments in 1965 with the sole object of working for import substitution of the commonly used electronic items in the medical profession. The activity has now substantially grown so much that work on the development of some of the latest diagnostic techniques is being actively pursued.

The selection of projects in the CSIO in the area of medical instruments has been made keeping in view :

- (a) National needs—aiming at development of instruments required in the country, culminating in their indigenous production and there by substituting import, thus ensuring better servicing and operation facilities.
- (b) Trying new techniques and methods in medical instrumentation for specific applications suggested by medical profession.
- (c) Recently, work has been started for the development of simplified medical instrumentation and appropriate technologies useful for primary health centres.

The instruments designed in CSIO are given careful industrial design so that the know-how is such that it can be commercialised straightaway. These designs are based on the considerations of manufacture, easier maintenance, ergonomic convenience and aesthetics. CSIO also renders consultancy services to industrial organisations with a view to accelerate the development and production of specific items required in the country and this helps to achieve higher standards and increased efficiency in the realm of medical instrumentation.

An important on-going programme of far-reaching importance is the setting up of testing, evaluation and standardisation facilities for medical itstruments of various types. These facilities are of utmost importance for the indigenous development and production of accurate, reliable and safe equipment. The instruments developed in CSIO are given thorough clinical trials at the Medical Institutes before releasing the know-how for their commercial production. CSIO in the last few years has developed quite a few important medical instruments. The paper will highlight some of these in detail. Besides the RD and D activity on medical instruments, CSIO has established nine service and maintanance centres in the country. These centres undertake service and repair of all types of medical equipment received from hospitals and medical institutes. The centres are fulfilling the often-felt and expressed need for such services in the country and have repaired thousands of instruments, most of which are imported. They have thus notionally saved the re-investment of valuable foreign exchange.

244

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PROCEDURE FOR ACQUIRING EQUIPMENT FOR TEACHING/ RESEARCH NEEDS OF A PHYSIOLOGY DEPARTMENT IN A MEDICAL COLLEGE. K. N. Sharma. Dept. Physiology. University college of Medical sciences. New Delhi.

The requirements of a physiology department, of necessity, vary from place to place and are linked to the interest and expertise of the faculty, available resources of funds, space and equipment, characteristic local and regional priorities of medical and health problems vis-a-vis national and global overtones, M.C.I. guide lines, and above all the philosophy and directions pursued by the management. Given these constraints of priorities, competitions and compromises, a department can still optimise its needs and dovetail the resources to achieve the objective. Once the needs are defined, faculty identified and resources gauged, the next stage is to develop the laboratories and tackle the bottlenecks in procedural details for procuring local and/or foreign manufactured equipment. In this endeavour, the multitier administrative system of the institution, State Government and Central Government agencies is required to be formalised for obtaining specifications, quotations, open tenders, CDE and NMI certificates and use of the presently available OGL Scheme. Procedures for bank drafts/letters of credit, terms and conditions of supply and shipment, insurance, customs clearance, are some of the important links that must be handled carefully. Accessories, spares, and consumable items to go with the equipment form another class of problem. Streamlining of these procedures and how to achieve them will be highlighted.

245

MANPOWER FOR MEDICAL ISTRUMENTATION—MANUFACTURE AND MAINTENANCE. S. K. Suri. N.P.L. New Delhi.

India now produces a large number of instruments, with total or partial indigenous content, used in medical practice for predictive, diagnostic and therapeutic purposes as substitudes for or to supplement the imported medical apparatus. While the manufacture of instruments, ipso-facto, is indicative of the fact that suitable technical personnel is available for manufacture, the maintenance aspact, especially at the breakdown stage is still not satisfactory. Out-of-order equipment continues to pile up. It is a mixed problem of attitudes, manpower and budgeting for maintenance and lack of methodology for the physical removal of dead apparatus which accounts for this state of affairs. This paper attempts to present an integrated picture of this problem.



BIOPHYSICAL EFFECTS OF MICROWAVE FIELDS. J. Behari. School of Environmental Sciences. Jawaharlal Nehru University. New Delhi.

As compared to ionizing radiations, the biological and biomedical applications of non-ionizing radiations (particularly the microwaves) are rather few, probably because of their low energy quantas. However, in recent years there has been a spurt of knowledge in this area and their use in hospital environment has become a distinct possibility. There have already been reports of the use of pulsed microwaves impinging on the head of animals and man producing auditory sensations and in diagnosis of pulmonary edema. Functional alterations in neuroendocrine system of both animals and humans exposed to microwaves or radiofrequency energies have been reported. The characterisation of electromagnetic wave interaction with biological system assumes significance in this context. The literature is abundant with reports on the effect of electromagnetic fields on the central nervous system and on the peripheral nervous system of both man and animals, though these findings are only of qualitative nature. Additional controversy centres round the fact whether these phenomena are thermal or athermal in nature. In this connection, it may be pointed out that the knowledge of dielectric constants is of central importance in quantifying these data. Some of the data for physiological liquids and biological solids are presented and results discussed.

247

MODIFIERS OF RESISTANCE TO STRESSORS. B. Bhatia. School of Environmental Sciences. Jawaharlal Nehru University. New Delhi.

Under normal conditions of life, exposure is seldom to a single physical or chemical stressor on healthy individuals, and the most vulnerable in a population are likely to be those with diseased states or with sub-optimal states of health. The existing practice of establishing maximum allowable magnitude of a given physical or chemical agent or factor through information obtained by experiments on healthy, well nourished young animals or humans under ideal conditions of controlled experiments can not therefore be valid.

With our existing state of knowledge, the resistance of an organism with a pathological state to a given stressor can not be predicted from a knowledge of the physiological responses of the healthy organisms to the stressor and of the altered physiological functions brought about by the pathological state. Likewise, the resistance of a healthy organism to a stressor when other stressors are acting simultaneously or successively can not be predicted from a knowledge of the altered physiological functions or resistance of the organisms when exposed only to the given stressor. Such information can only be based on empirical observations.

Studies on modifiers of resistance can also yield very useful information on whether an observed change in a parameter under the action of a stressor is a manifestation of a damage or of a compensatory mechanism. Thus, with a modifier which increases or decreases the resistance to a stressor, a rise or a fall respectively, under the influence of the modifier, of the magnitude of a

change in a parameter is likely to be a manifestation of a compensatory mechanism in the organism.

The results of some of the recent studies in our laboratory on interaction between stressor and on interactions between stresses and pathological states are as below :

Hypoglycemia, diabetes, high ambient temperature and carbon tetrachlorideinduced liver toxicity decrease and hyperglycemia, isoproterenol-induced cardiac necrosis and low ambient temperature reduce the resistance to hypoxia. Exposure to low ambient temperatures for a few weeks also lowers the resistance to hypoxia. Diabetes and hypoglycemia decrease and hyperglycemia and liver toxicity increase the resistance to cold. Diabetes, hypoglycemia, hyperglycemia and liver toxicity decrease resistance to heat. In hypoxic animals the body temperature falls at low ambient temperatures and rises at high ambient temperatures as compared to the values in normoxic animals. Glucose administration tends to eliminate the reduction in resistance to hypoxia by carbon tetrachloride induced liver toxicity. Hypoxia probably prevents the reduction in pore area of egg shells of birds in order to compensate any increased diffusion coefficient for water vapour at low ambient pressures, but does not do so in the birds adapted to high altitude.

248

NEUROPHYSIOLOGICAL MANIFESTATIONS OF HYPOTHERMIA. Neena Bhattacharya, G. S. Chhina and Baldev Singh. Dept. Physiology. All India Institute of Medical Sciences. New Delhi.

Functions of many cells in central nervous system change with change in temperature, but certain neurones show high temperature sensitivity and participate in temperature regulation. The location of thermo-sensitive neuronal elements has been shown to be in the skin, the deep viscera, the spinal cord, the mesencephalic reticular formation and hypothalamus. Electrical activity recorded from cutaneous nerves has shown the presence of cold fibres which show typical increased discharge within the temperature range of 20 to 30°C.

Thermoregulatory responses in terms of shivering with increased metabolism and vasoconstriction have been shown to result on local cooling of some segments of spinal cord. A good number of studies done on animals (particularly cats) have revealed temperature sensitivity of spinal motoneurones as well as monosynaptic and polysynaptic reflexes. A hyperresponsiveness of these reflex responses at lower temperatures from 34°C down to 30-27°C has been quite a consistent finding. Hence participation of spinal neuronal pool in thermoregulation at lower temperature has been proposed. However, it has been reported from clinical studies on patients with spinal cord transection that effective thermoregulatory responses to cooling can not be obtained like those reported in dogs. In addition lowering of body temperature only gradually depress the spinal reflexes and no cooling has been quite successfully employed for relief of exaggerated reflexes.

Effect of lowering the temperature on peripheral nerves varies from species to species and in the same species on the type of nerve fibres under study. Most studies in the past have indicated a gradual slowing of conduction of impulses



with a final block at very low temperatures. A few studies done recently have shown an increase in amplitude and prolongation of evoked potentials in peripheral nerves within mild hypothermic temperature ranges. A number of studies have revealed EEG slowing with lowering of body temperature, with a considerable change below 29°C. The critical temperature where EEG silence and irreversible changes in CNS occur varies in different species and is also affected by the anaesthetic employed. The effects of cold on mammalian central nervous system is also related to metabolic and neurochemical alterations.

249

EFFECTS OF SOCIAL ENVIRONMENT ON BODY FUNCTIONS. A. S. Chakrabarty and K. Chakrabarty. Dept. Physiology. Maulana Azad Medical College. New Delhi.

Review indicates that animals, when housed in individual cages only for 4-6 weeks, show marked changes in various behavioural and physiological processes. The aim of the presentation is to emphasise that the effects of social isolation on various body functions should be considered when we carry out experiments keeping animals in isolated cages.

As described by Harlow and Harlow (1) there are various affectional systems (infant mother affectional system, maternal affectional system, peer affectional system, heterosexual affectional system and paternal affectional system) which "bind together various individuals within species in co-ordinated and

constructive social relations". They have described how isolation affects the affectionate system and thus it alters social, maternal and sexual behaviour (2). The normal threat response, play and heterosexual response are almost abolished by 6 months of total social isolation (1). It is known that the influence of social contact affects the feeding behaviour of both vertebrates and invertebrates. Rhesus monkeys, when isolated during the first years of life, show hyperphagia and polydipsia (2) and rats reared from weaning in social isolation show higher level of food motivation with less depression of food intake (3). The decreased body weight (4) inspite of increased food intake has been reported in socially isolated animals. However the permanent separation of infant from the mother after six months produces a syndrome called Anactitic depression characterised by loss of appetite, loss of body weight and marked susceptibility to infection (5).

Social isolation also affects learning process. Isolated rats are slow to learn a two-level alternation schedule (3), whereas they are facilitated in both the acquisition and extinction of a shuttle—box avoidance response (6). Aggressive behaviour has been reported in all types of socially isolated animals. A relationship between the effect of social isolation and the effect of disinhibitory brain lesion has been suggested (3). Development of the nervous system is also affected by social isolation (7).

Social isolation produces enlarged adrenal gland (8) with high level of plasma corticosterone, increased ethanol consumption and produces higher incidence of gastric lesions. The effect of social isolation is described as isolation syndrome (4) characterised by increased haemoglobin level and packed cell

volume, lymphopenia, diminished lysis of lymphocytes after ACTH, decreased spleen and thymus. Thus social isolation is an example of long-term stress, with increased adrenocortical activity.

with increased adrenocortical activity.
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250

HEAT ACCLIMATION. B. N. Chaudhuri and S. K. Mukherjee. Experimental Medicine Division. Institute of Nuclear Medicine and Allied Sciences. Delhi.

The thermoneutral zone is very narrow in case of laboratory rats and guineapigs. Since, these rodents have a very little capacity for heat loss by evaporative process and cannot dissipate heat at high temperature, they become hyperthermic relatively quicker than other homeotherms having sweating or panting ability. It has been demonstrated that laboratory rats die if they are maintained at 39.0° C or above. An environmental condition having air temperature $19.4^{\circ}-25.0^{\circ}$ C with mean temperature of $22.2^{\circ}\pm2.8^{\circ}$ C and 45.50% relative humidity has benn considered most suitable for breeding and maintenance of laboratory rats. Ambient temperature either high or low can induce changes in warm blooded animals. But, the information on the effect of heat on these animals are very poor as compared to the level of understanding on the effect of hypothermia on homeotherms. Only a limited number of published materials have revealed the increased cardiac output with simultaneous increase in peripheral blood flow, hepatocellular damage and inhibition in growth and development are affected by high environmental temperature.

Certain metabolic and endocrinal aspects of heat acclimation in laboratory rats have been studied by us in the recent past. Using a specially designed chamber adult Sprague—Dawley rats were continuously exposed to $37.5^{\circ}\pm$ 0.5° C for 45 days, while their control mates were maintained at $23.0^{\circ}\pm0.5^{\circ}$ C. Relative humidity in rat chambers was in the recommended range. Rise in ambient temperature caused increase in rat's rectal temperature, decrease food intake, progressive loss of body weight along with weight loss of visceral organs. Suppression of thyroid function evidenced by reduction in transthyroidal availability of iodide, decreased thyroid hormonogenesis and reduced peripheral utilization of thyroid hormones in rat after 6-8 hrs., heat exposure revealed the endocrinal response for adjustment of calorigenesis at high temperature. Myocardial glycogen content was increased at 6-8 hrs., after continuous heat exposure and the glycogen content of experimental rat heart remained high till the 45th day of heat exposure. Reduced

incorporation of 14e glucose in heart glycogen indicated that net increase in myocardial glycogen at high temperature was probably effected by decreased glycogenolysis and not by enhanced glycogen synthesis. Hepatic and skeletal muscle glycogen content of experimental rats was not altered significantly. Neither the total protein content of heart, liver, skeletal muscle and blood, nor the incorporation of 14e leucine in tested tissue protein was altered in experimental group of rats. Total lipid and fractional lipids in gastrocnemius and heart muscle were not altered in rats at any stage of heat exposure. In contrast, total lipid and total cholesterol contents in liver were significantly increased in rats after 30 days of heat exposure. Serum concentration of FFA, phospholipids and total cholesterol were lower in experimental rats. Mobilization of subcutaneous fat observed in experimental rats resulted in a decrease in their body insulating material. This has been considered as the process of adaptation to facilitate dissipation of body heat of non sweating and non-panting rodents at high environmental temperature. Results of our experiment suggested proportional adjustment of endocrinal and metabolic events according to the functional requirements of rat body at high ambient temperature.

251

EXTENDED TOLERANCES TO ENVIRONMENTAL STRESS. G. S. Chhina and Baldev Singh. Dept. Physiology, A. I. I. M. S. New Delhi.

Hypo and hypermetabolic states can be produced by prolonged exposures to hot, cold and hypoxic environments. These states can also be created by certain types of training. The thermal and hypoxic tolerance in individuals with such responses is considerably enhanced. This may involve several factors like relative insensitivity or hypersensitivity of neuronal elements which sense such changes or changes in effector components of regulatory processes. The responses are generally reversible but the time course of their recovery varies considerably for different situations. The role of chronic deprivations of an optimum level of a substrate for body needs may precipitate similar adjustments but those produced by acute deprivations interact with homeostatic states much more effectively. The responses of diving animals and even in man during asphyxia have helped in pointing out some of the concerned mechanisms. Chronic elevations in CO_2 tension, relative failure of thermoregulatory mechanisms in meditative states have thrown additional light on the widening of ranges of tolerance to environmental stresses thus suggesting shifts to new levels of basal activity to suit the needs of an organism economically.

252

CADMIUM TOXICITY. K. Datta. School of Environmental Sciences. Jawaharlal Nehru University. New Delhi.

Cadmium is reported to be one of the toxic heavy metal in the environment. The toxicological manifestations of cadmium depends on the form, level of exposure and mode of entry. The most common toxic effects of chronic cadmium

poisoning in man and experimental animals are renal tubular dysfunction, necrosis of livers and testes, anemia and bone demineralization. In humans, hypertension incidence has been related to elevated cadmium concentration in kidneys. Experimentaly induced sarcomas by the salt of cadmium are located at the site of injection. Teratogenic effects of cadmium is observed when its salts are administered in the animals during the period of gestation. Chromosomal abberations are apparent in cultured normal human leucocytes, treated with cadmium sulfide and in leucocytes obtained from Itai Itai disease patients. Biochemical alterations resulting from cadmium exposure include changes in mitochondrial respiration, and cytochrome concentrations, RNA metabolism, heme synthesis and different enzyme's activities. The biosynthesis of cadmium binding protein, metallothionein, is reported in liver and kidney of cadmium treated animals. Some of the biochemical properties of metallothionein and its potential role in the pathology and toxicology of cadmium will also be discussed.

253

EFFECT OF NUTRITIONAL AND ENVIRONMENTAL STRESS ON REPRODUCTION. S. R. Gupta. Dept. Physiology. A.I.I.M.S. New Delhi.

The process of reproduction depends (1) on the physiological events that take place in the body to develop the capacity to reproduce and (2) the active process that begins with fertilisation, covering the entire gamut to the birth of the new born. Indeed the defects that appear in earlier childhood might well have their cause during gestation. Changes in environment influence both these phases. The most susceptible phase is during pregnancy when implantation and placentation have not taken place, or the embryo is in the phase of organo genesis. The uterine environment at the time of implantation is critical and hormone dependant. These in turn depend on neuroendocrine mechanisms that regulate hormone release. Changes in external environment such as light darkness pattern, may disrupt the neuroendocrine balance or bring about a delay in the passage of ova, resulting in disharmony of the maturation phase of ova and uterus and failure of implantation.

After placentation, the nutrition and oxygen requirement of the fetus are aptly met with even if the external environment is hypoxic. Glycogen stored in the placenta and nutritional reserves of the mothers are utilised to fulfil the needs of the fetus.

In experimental animals, such as rat and rabbits, changes in ambient temperature result in failure of implantation and increased prenatal loss, while a more specific nutritional stress at a critical period results in congenital malformation.

In human reproduction, there is a long gestation period after organogenesis, resulting in less likelihood of congenital malformation but the baby could be small for dates and show other signs of intrauterine growth retardation as a result of environmental stress.

ENVIRONMENTAL INFLUENCES ON SLEEP. S. Kesar, G. S. Chhina and Baldev Singh. Dept. Physiology. A.I.I.M.S. New Delhi and Dept. Zoology. University of Delhi. Delhi.

The evolution of the basic rest activity cycle (BRAC) into awake sleep cycle, in the higher forms of life has occured pari-passu with the evolution and development of the brain functions. The appearance of REM phase of sleep and the non-REM and REM sleep cycles, however, occurred with the development of adrenergic neural circuits in the brain on one hand and the thermoregulatory mechanisms accompanied by efficient aerobic metabolic activity, on the other. The longer sleep and shorter awake phases during infancy and the appearance of adult pattern of REM sleep with the maturation of thermo-regulatory mechanisms and the adrenergic neuronal networks emphasise the role of sleep in the growth and development.

The environmental influences seem to effect sleep mechanisms by interfering either with the thermo-regulatory mechanisms through thermal stress or with metabolic changes through the availability of oxygen for neuronal metabolism related to adrenergic circuits. The effects of extreme conditions of cold and hypoxia are exhibited by the sleep patterns studied in human subjects at south Polar regions. The marked increase in stage I, almost a complete loss of stages III and IV and a tremendous decrease in the REM phase are attributed to the extreme cold and low tension of oxygen in the blood.

Another way in which sleep mechanisms are effected are through emotion or social stresses precipitated by environmental changes. Although the basic awake-sleep cycle dependent upon the cues from the day and night cylce, is relatively vulnerable to the environmental changes but the circadian awake-sleep rhythm is much more stable in the adult individual. Investigations carried out on experimental animals indicate that the relationship between sleep and the 24 hour clock is independent of atmospheric, climatic and internal disturbances. The stability seems to emerge from the brain stem diencephalic neuronal substrates which can sustain the biological clock even in the absence of environmental modulation.

255

REACTIVITY OF PULMONARY CIRCULATION. Kamla Khetarpal. Dept. Physiology. A.I.I.M.S. New Delhi.

It has been appreciated by now that pulmonary circulation does not passively reflect the systemic haemodynamic state but selectively reacts to situations by active vasomotor changes.

It releases certain vasoactive substances into the blood stream such as histamine and sequesters others like 5 hydroxy tryptamine.

Our interest in pulmonary circulation dates back to the early fifties when senior scientists like Vishwanathan and Padmavati were engaged in investigating the problems of chronic bronchitis, emphysema and corpulmonale.

Next decade saw a lot of investigative work put in by Roy and his co-workers at the A.I.I.M.S., Viswanathan and his team at the Patel Chest Institute and Inder Singh et al in the defence laboratories of India.

Response of pulmonary vessels to hypoxia and their role in high altitude pulmonary edema was the major problem because it concerned the welfare of Indian Troops in the Himalayan regions.

West and Stanb contributed to additional understanding of the reactivity of pulmonary vessels to hypoxia, acute as well as chronic.

Several pharmacological studies have been conducted to demonstrate the reactivity of pulmonary vessels to catecholamines, histamine, 5HT, angiotensin, other peptides and prostaglandins.

Pulmonary circulation responds to substances in diet like pyrazolidine alkaloids and aminorex.

That adult human female suffers more from primary pulmonary hypertension has been demonstrated by pathological studies quoted by Wagenroots whether the cause is hormonal or veno occlusive disease, a large number of cases remain unexplained. Autoimmunity has been suggested to be another cause.

Based on Padmavati's hypothesis, we have demonstrated experimentally that several of the cases of primary pulmonary hypertension may well be those suffering from effects of chronic environmental pollution.

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256

PHYSICAL PROCESSES IN ENVIRONMENTAL STRESSES. N. C. Majumdar. Defence Science Laboratory. Delhi.

A brief review of upto-date knowledge of the physical factors of the environment in relation to their effects on the human body has been presented, with particular reference to work carried out in India. The chief factors considered are : (i) Cold-dry and wet (ii) high-altitudes, (iii) heat-dry and humid. Additional factors of limited application are : (i) high pressures as in diving, (ii) high and low gravitational forces, as in air craft and space vehicles, (iii) noise-sonic, ultra-sonic and infra-sonic, (iv) light and glare, including ultraviolet, (v) ionising radiations from nuclear phenomena. Problems considered in some detail are :-



(a) Solar heat load : its assessment and integration with other environmental parameters.

(b) Load carriage at high-altitudes in relation to speed and steepness of climb.(c) Heat tolerance in relation to ambient dry and wet bulb temperatures. Effect of acclimatisation.

(d) Wind-chill-factor in relation to altitude.

(e) Classification of bio-climates and sub-classification of arid-zones on a linear scale.

(f) Instrumentation.

Finally, important unsolved problems in the above fields have been briefly enumerated, with special emphasis on range of adaptability, irreversible changes and their cumulative effect on the human body.

257

EFFECT OF THERMAL STRESS ON RENAL FUNCTIONS. Shashi L. Malik. Dept. Physiology. All India Institute of Medical Sciences. New Delhi.

Thermal regulation is an excellent example of an intergrative homeostatic mechanism in which practically every aspect of physiological control is involved. Hypothalamus plays an important role to maintain the thermal homeostasis at 37°C by regulating heat gain and heat loss. Any factor that tends to increase body temperature initiates heat loss mechanism which has an essential feature of loss of water and electrolyte from the body during evaporative cooling.

Though the kidneys are not primarily involved in the heat loss mechanism, but they play secondarily a very important role in the conservation of water and electrolytes. Various kidney functions are found to be altered along with other thermo-regulatory responses in men and animals when exposed to high ambient temperature. The first change observed is a decrease in urine volume and suppression of water diuretic response, even when extra diuretic dose of water is given. The decrease in urine volume is observed even before a significant increase in blood ADH level occurs. This observation indicates that there are some other physiological mechanisms which are brought into action to produce water retention. A concomitant decrease in renal plasma flow and glomerular filteration rate observed in individuals exposed to heat, pointed that these changes in renal haemodynamics could be one of the contributing factors for decrease in urine volume by decreasing renal tubular load. Besides these changes, the renal tubular function is also altered. During heat exposures the urinary excretion of Na⁺ Cl⁻, urea, uric acid, phosphate and tubular maximum for glucose reabsorption falls while K^+ and $HC0^-_3$ excretion rises. Greater the exposure to heat more marked are changes in urine volume, renal haemodynamics and tubular excretion.

If the thermoregulatory responses are unable to match the rate of heat loss with heat gain, then the body temperature starts rising. If the core temperature increases beyond 39°C then it affects the renal parenchyma directly. Histopathology of hyperthermic kidneys reveal marked cloudy swelling and

necrosis of glomerular endothelium and tubular cells, thus suggesting that during hyperthermia, besides involvement of kidney in generalized thermoregulatory responses, there occurs increases in intrarenal and intra glomerular resistance due to direct effect of heat on the kidneys.

258

PULMONARY HEMODYNAMIC CHANGES IN HYPOXIA. V. Mohan Kumar, G. S. Chhina and Baldev Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

Increased pulmonary arterial pressure due to hypoxic breathing, and redistribution of blood supply in the lung because of localised hypoxia are well recognised phenomenon, brought about, mainly, by the altered pulmonary vascular resistance. Vasoconstriction at pre and post capillary level in the lung is the most important single factor contributing to the elevated vascular resistance in hypoxia. Pulmonary vasoconstriction is brought about through direct effect of hypoxia, and to some extent, reflex stimulation of sympathetic system. Hypoxia has also been shown to produce depolarisation of smooth muscle in pulmonary vasculature. Thus, the alveolar hypoxia is responsible for the local effect of increased resistance, and hypoxemia responsible for reflex increase in vascular resistance through chemoreceptor stimulation. The role of various humoral agents, in this context, is still controversial. The concomitant increase in perivascular mast cells, along with vascular morphological changes can be taken as indicative of its role is altered pulmonary hemodynamics to hypoxia.

Shift of blood from systemic to pulmonary circuit has been suggested, but it may not play an important role in acute hypoxia and its role in chronic hypoxia is also limited. Similarly increased hematocrit may add to the viscosity leading to increased vascular resistance in chronic hypoxia. Hypoxic responses of pulmonary vasculature are temperature dependent. Decreased atmospheric temperature may either add to the pulmonary vascular changes, or act in such a way as to stabilise the alteration brought about by hypoxia. It seems likely that multiple neurohumoral and physical factors are involved in mediating the hypoxic stimulus resulting in altered pulmonary vascular changes.

259

BIOPHYSICS OF RADIATION CARCINOGENESIS. Anjali Mookerjee. School of Environmental Sciences. Jawaharlal Nehru University. New Delhi.

The living world is exposed to radiation of many types. A number of different types of radiations give rise to similar changes in all living systems. These can be conveniently grouped into two broad categories ; (a) non-ionising radiation and (b) ionising radiation. Under appropriate conditions both categories can produce similar biological effects such as gene mutation and the production of tumours. The initial mechanism whereby these radiations produce tissue damage is the direct disruption of chemical bonds. This is

followed by complex and diverse chemical steps, which for a sufficient quantity of radiation, ultimately interfere with the functioning of the whole tissue or organ. Large doses of radiation are known to increase the chance of developing leukaemia. All the early X-rays were relatively 'soft' and so delivered the greatest dose at or near the surface of the body. Consequently all of the early malignancies apparently originated in the skin. Since radiation induced neoplasms are non-specific and indistinguishable from spontaneous neoplasms it is possible that the two may develop at least partly through common mechanisms. Cancer may also be induced by chemical carcinogens in the environment, and cancer may be cured by chemotherapy by anti-cancer drugs. The biological effectiveness of all these agents depends on their ability to associate or interact with the genetic materials DNA, RNA or nucleoprotein. Effect of ionising radiations modify these interaction patterns.

260

CARBONDIOXIDE SENSTIVITY OF CENTRAL CHEMOSENSITIVE MECHANISMS UNDER HYPOBARIC CONDITIONS. U. Nayar. Dept. Physiology, A.I.I.M.S. New Delhi.

Carbondioxide sensitive neurones detecting small errors in CSF PCO₂ and pH, have been localised on the ventral surface of the brainstem of the cat. These neurones on excitation bring about changes in ventilation leading to correction of error and maintenance of CSF and brain extracellular fluid (ECF) homeostasis. During rest ventilation seems to be directed to maintain the extracellular pH of the brain rather than to secure the oxygen supply. Local of pH of the CSF and ECF depends upon CO2 production which in turn depends on O₂ consumption. Under normal atmospheric conditions there is no threat to oxygen supply and such a mechanism appears adequate. In hypobaric conditions, however, the body is threatened by deficiency of oxygen, and therefore the role of PO₂ sensitive peripheral chemoreceptors becomes vital. Under these constantly hypoxic conditions an appropriate compromise between the brain extracellular fluid homeostasis and needs of the tissues for oxygen has to be met. Once adequate adjustments are made acclimatization is said to occur. In what way the sensitivity of the central chemosensitive neurones changes and what role the peripheral chemoreceptors play in constantly hypobaric hypoxic conditions has revealed interesting adaptive mechanisms. Major directions of suggestions are : an increased sensitivity of the central chemoreceptor mechanism to CO_2 ; a reduction in the brain extracellular fluid HCO-3 leading to greater changes in H⁺ ions for a given PCO₂ and thus greater excitation of neurones, a decreased response from the peripheral chemoreceptors or their poor development as happens in high altitude natives ; the CO₂ sensitive neurones become unstable under changed metabolic conditions and thus produce enhanced responses to PCO₂; changes in brain blood flow etc. All these factors which have been implicated would be discussed in the light of recent observations.

ROLE OF HYPOTHALAMIC CHEMICAL ENVIRONMENT IN THERMOREGULATION. S. Nayyar, A. S. Chakrabarty and S. K. Lal. Dept. Physiology. Maulana Azad Medical College. New Delhi.

261

In homeotherms, the regulation of a relatively constant body temperature, against the varying environmental conditions, involves a complex interaction between the various heat loss and heat gain mechanisms. The extents, to which these mechanisms are active at any given time of thermal state, are controlled by the so-called. 'Temperature Regulating Centre'-The Hypothalamus' This role of thermo-regulation has been attributed to the hypothalamus on the basis of the effects of local warming/cooling & electrical stimulation and from the effect of neurosurgical lesions in this area. It is a known fact that there are two linked hypothalamic centres for thermoregulationanterior for heat loss and posterior for heat production mechanisms. And, the 'Hypothalamic Set Point' theory for the optimal activity of these mechanisms has also been postulated.

Myers & Feldberg (1, 2, 3) carried out a series of experiments to explore the possible role of neurotransmitters in hypothalamic regulation of body temperature, as earlier suggested by other workers. They got dramatic findings & thus originated the 'Monoamine Theory of Thermoregulation'. This theory was widely supported though opposite results with the same drug were reported in different species and even in same species when administered through different routes. A few explanations have been put forward to explain this. Later, this Monoamine theory was modified to include the role of cholinergic neurotransmitters i.e. Ach in thermoregulation. While making this modification, Myers emphasised that there is no heat loss regulating system in hypothalamus. The cholinergic inclusion in the theory was supported by a number of workers, including D.D. Avery (4, 5) who at the same time stressed that a heat loss mechanism does exist in the hypothalamus. The modified theory was proved further by Myers & Waller (6) while studying the 5HT & N.A. induced release of Ach from the hypothalamus. The role of these neurotransmitters, at the hypothalamic level, was found to be more complex when it was seen that the mechanisms through which these influence the body temperatures differ at different ambient temperatures. (7, 8). To add to the complexity of the mechanism of action of these neurotransmitters, it has been found that their action also varies depending on the ionic environment of hypothalamus i.e. the concentration of ions like Calcium, Potassium, Sodium etc. Not only this, the administration of these ionic solutions in different concentrations in the hypothalamus produces changes in body temperature.

The interaction, between various chemical environments of the hypothalamus, involved in thermoregulation, will be discussed.

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526

EFFECTS OF THERMAL STRESS ON AUTONOMICBALANCE. L. Rai, G. S. Chhina and Baldev Singh. Dept. Physiology. All India Institute of Medical Sciences. New Delhi.

In homeotherms tolerance to hot and cold environment depends upon the responses of the body mediated by the autonomic nervous system. The response-complex at any given time determines the adaptability of an individual to thermal stress. The basal patterns of activity of autonomic nervous system seem to constitute the substrate for this tolerance to heat or cold. The sensitivity of each participating system of the body for thermoregulation has been earlier used to determine the index of tolerance to acute and chronic thermal stress. This approach, however, ignores the simultaneous participation of several supporting reactions of the body which depend upon the sympathetic or parasympathetic innervation. To account for this multiresponse involvement an approach has been made to take into account the autonomic balance of an individual at rest and during thermal stress. The determination of the autonomic balance involves the analysis of several parameters reflecting the activity of autonomic nervous system in the body and finding out the intercorrelation expressed in the form of a mathematical figure. Using this approach it has been seen that the tolerance of heat is related to the autonomic status of the individuals which expresses itself by dominant sympathetic activity. A similar though less marked trend is noticed in responses to the ambient cold.

263

ONTOGENY OF THERMOREGULATION. Usha Sachdeva, G. S. Chhina and Baldev Singh. Dept. Physiology. A.I.I.M.S. New Delhi.

Homeotherms maintain a steady core temperature in a wide range of thermal environment. The regulatory mechanism in the adult individuals involve cutaneous, muscular, metabolic, cardiorespiratory and neuro-humoral responses. The homeothermic capacity of new born mammals however, are not well developed. Mammals like rats, mice, dogs, cats and rabbits fail to respond to cooling by a rise in metabolic rate. Whereas other mammals which are born in a much more mature thermoregulatory state such as guineapigs, calf, pig, monkeys and human infants show an increase in metabolic activity when exposed to ambient cold. In some species nor-adrenaline increases non-shivering thermogenesis in new born due to the presence of brown fat.

A progressive increase in the metabolic rate occurs during the post natal period which is associated with increase in body weight even under thermoneutral conditions. In undernourished rats, dogs and human infants the capacity for homeothermy is either lost or is very poor. The other mechanism for homeothermy is the heat conservation and heat loss by changing the dermal conductivity evaporative cooling through sweating or panting. Rats, dogs, rabbits and human are born with lack of sub-cutaneous fat, absence of hair coat and lack of sweat glands. Therefore, in these

mammals cutaneous heat loss or conservation by vascular changes are not effective. In most of these by 1st weak of life the outer coat develops and then they have a substantial advantage over the initial thin and bare skin. The most important mechanism for homeothermy is the development of nervous system. Anterior hypothalamus is the locus for thermo-regulation and is shown in rats, mice and guineapigs to develop last in ontogenic scale. The other system which is the main biochemical basis for thermoregulation is aminergic system of brain. Aminergic system developes in rats, rabbits and guineapigs alongwith development of hypothalamus. Thus these two attain their maturity after the development of sensory and motor neuronal connections which coincides with the adult pattern of thermoregulation in homeotherms.

264

ORGANOCHLORINE COMPOUNDS IN THE ENVIRONMENT. J. D. Sharma. School of Environmental Sciences. Jawaharlal Nehru University. New Delhi.

Hundreds of organochlorine compounds have entered the environment long before they were detected by sophisticated methods of modern chemical analysis. They have taken up a ubiquitous place in many a known ecosystem. The two main groups of organochlorine compounds are the polychlorinated biphenyls, largely used in industries, and the organochlorine pesticides used in increasing quantities in agriculture. The chlorinated ethane derivatives like DDT, are an epoch making group in revolutionalising pest control, but have, because of their stability and persistance, become recognised as presenting an element of risk to one or more forms of life. They accumulate by a process of biologic concentration in food webs, as they pass from prey to predator, and also within one or more compartment of an animals physiological processes.

Residues are known to accumulate in acquatic species, terrestrial species, birds and mammals. Factors that affect toxicity to organochlorine compounds are those affecting intake, especially routes of exposure ; those affecting distribution and final sites of storage ; enzymic systems which metabolise foreign compounds ; immunological responses to constant exposures ; and factors affecting excretion of these compounds. It is desirable to identify the species that are likely to be efficient accumulators, and vectors which are unaffected by these organochlorine compounds. It is also desirable to know which species or groups are deficient in important enzymes and furthermore which chemical structures are difficult to metabolise and their rate of metabolism.

Most organic solvents are highly volatile and enter the living system quite easily, leaving behind their toxic and non-toxic effects. Monitoring and surviellance of the environment over regular periods of time and the development of model bioassay systems are important pre-requisities to study the side effects of these compounds.

EFFECT OF ENVIRONMENT ON ENERGY BALANCE. K. N. Sharma. Dept. Physiology, University College of Medical Sciences, New Delhi.

Inflow and outflow of energy, and body mass as potential energy have been conventionally considered and studied separately with food intake taken as the major efferent element for regulating input. It is only during recent years that concepts about body energy balance have been discussed under the rubric of overall regulation of body exchanges in which output variables have been found to influence not only body energy content but modulate energy input. The organism establishes priorities, competitions are manifest, and compromises reached among various regulatory systems directly related to survival value. It is a multistage organisation in which biologic determinants like genetic, anatomic and biochemical features form the base and interact with environmental factors to maintain the equilibrium. Land and water environment governing in part the food production, purchasing power and means of exchange, and traditions and traits result in what man finds on his plate. This in turn is reflected in the ontogeny of food optimisation, food preferences and food habits. Persons with similar attributes and work pattern have been reported to food intake variations by twice as much. Conversely, energy expenditures of a reasonably homogenous group have been found to range from 2000 to 5500 cal/day. These types of evidences necessitate a reappraisal of questions bearing on input-output relationships without suppressing or considering one or the other factor as constant but rather to account precisely for an intrinsically dynamic situation-both internal and external. That fixed ambient temperature and environment is a myth, that studies on short term effects of temperature change on energy input or feeding reveal interesting trends, and that in free-moving, fasting and fed animals the continuous outflow of energy is widely fluctuating over time with the sleep-wakefulness and feeding patterns, places the model of energy exchange requiring multifactorial analysis.

266

RENAL FUNCTIONS UNDER ACUTE HYPOXIA. H. H. Siddiqui and R. Subramanian. Dept. Pharmacology. All India Institute of Medical Sciences. New Delhi. and School of Environmental Sciences. Jawahar lal Nehru University. New Delhi.

Little is known about the relationship of the body fluid shifts to the urine output and electrolyte excretion under the hypoxic conditions. Also there is a gap existing in the literature on the relationship of these effects to the pulmonary oedema and mountain sickness. This has great relevance to the prevention and treatment of hypoxia not only encountered at high-altitude but also associated with many clinical disorders. Although many speculations have been made on the factors responsible for the changes in urine output and electrolyte excretion, no conclusion can be drawn on the precise mechanism underlying these changes under hypoxia. This is due to (a) different and sometimes conflicting results obtained by various workers due

529

to the lack of control of certain variables influencing the urine output and electrolyte excretion, (b) failure of workers to study in one species the complete pattern of urine output and electrolyte excretion over a wide range of atmospheric pressures, (c) failure to determine the blood ADH and reninangiotensin-aldosterone system.

Using rat as experimental model, experiments were carried out to study the the influence of air temperature, humidity, rate of air flow in decompression chamber and water intake on urine output and electrolyte excretion. The effect of exposure of rats to different simulated altitudes, with constant duration of exposure on urine output, blood ADH, renin activity, urine output, blood osmolarity and urine, blood electrolytes was determined. In addition, the factors controlling the release of ADH under hypoxia has been studied.

267

ELECTROENCEPHALOGRAPHIC (EEG) AND MAGNETOENCEPHALOGRAPHIC (MEG) CHANGES PRODUCED BY EXPOSURE OF BRAIN TO MICROWAVE RADIATION AND ELECTROMAGNETIC FIELD. *Baldev Singh* and *G. S. Chhina*. Dept. Physiology. A.I.I.M.S. New Delhi.

The effects of microwaves and electromagnetic radiation on the electrical and magnetic field variations in the brain have been studied in reptiles, mammals and primates. The low level, low frequency electric fields produced a relatively higher peak in power for the hippocampus but smaller magnitude on amygdala and thalamic nuclei. The very high frequency fields produced increase in the rate of spontaneous rhythm of the brain in the cat when modulated at frequencies close to the biologically dominant frequency of the selected EEG rhythmic episodes. The magnetic fields produced also modified the brain activity in the frog and also in man. In the rabbit desynchronization follows a well deserved driving reaction. The effects are considered to be mediated through the changes in the membrane composition of the neurone and can manifest in the form of various types of abnormal behaviour and epileptic fits.

268

STRESS AND CATECHOLAMINES. Sarada Subrahmanyam. Dept. Physiology. P. G. Institute of Basic Medical Sciences. University of Madras. Taramani, Madras.

The concept of stress has been widened considerably in the light of recent research. The spectrum of stress hormones has broadened to include growth hormone, prolactin, glucagon and insulin in addition to the adrenocortical activation discovered by Selye, and activation of adrenal medulla and

sympathetic system detected by Cannon. Modern evidences suggest that brain catechol amines play a key role in stress reaction.

Study of catechol amines under stress has been facilitated by the sophisticated sensitive radio-enzymatic assay method. By the technique of chronic catheterisation of the tail artery in rats, the stimulant action of decapitation on sympatho-adrenal system has been demonstrated. This helps in the study of behavioural and psychological stressors. The method of isolating brain nuclei and flourescent microscopy has helped in localising noradrenaline, adrenaline, dopamine and enzymes in hypothalamic and brain stem nuclei. Distribution of NA and DA in individual nuclei by micro-dissection and radio enzymatic micro-method of assay have lately come into vogue. Secretion of CA and DBH by exocytosis has been demonstrated.

Involvement of brain CA in the regulation of neuroendocrine reaction has advanced rapidly during the last few years. About 50 different types of stressors have been employed. Brain NA and DA have an inhibitory effect on CRF and vasopressin release and a stimulant effect on growth hormone secretion. DA has an inhibitory effect on prolactin. During stress, catecholamines stimulate glucagon secretion and inhibit insulin.

Research on CA degradation and of adrenergic receptors and DA sulphate is sparse. The activation of peripheral sympathetic system under stress is poorly understood. The detection of opioids and their receptors along with their elevated levels in plasma in stress reveals a new approach to study the mechanism of CA triggering. Cosmos biosatellite carrying rats with the aim to investigate the stressogenic effect of weightlessness, effect of acclimatisation at altitudes of 1400 meters, etc. are being worked out.

Though much work has been done on CA and enzymes in blood, urine and brain of animals, little has been reported on human subjects.

Stress plays a vital role in mental and physical illnesses. Psychological trauma can lead to overtly maladaptive physiological and psychological responses. Psychological stimuli resulting from interaction of a susceptible individual with the environment triggers a chain of events that may eventually lead to behavioural disorders like depression, schizophrenia, epilepsy, aggression, torsion dystonia etc.

The cases selected for the present study were :

(a) Aggressive hyperkinetic behaviour, (b) Schizophrenia, (c) Epilepsy and (d) Depression. Psychic stress was the precipitating factor in all.

Medical treatment for more than a year was tried and those who were refractory were subjected to non-volitional biofeed back therapy for 20 minutes daily for 1 month, bi-weekly for 3 months, weekly for 6 months and later once a month for a year. The alpha waves of the EEG from the temporo-occipital region were fed back into the patient in the form of a visual stimulus. The investigations done were-clinical, psychological, neurophysiological and biochemical.

In C.S.F. : MHPG, HVA and 5-HIAA,

in Blood : Plasma cortisol, and

in Urine : MHPG, HVA, 5-HIAA, VMA and 17-ketosteroids, were assayed. EEG recording and other investigations were done before and after treatment. There is a definite correlation between the biogenic amine levels and the clinical improvement in the patients.
PULMONARY OEDEMA OF HIGH ALTITUDE. R. Viswanathan. Delhi.

269

196 Indian soldiers who had seen active service at High Altitude and of whom 101 had developed pulmonary oedema a year or two before investigations, were included in our studies which consisted of haemodynamic estimations, pulmonary function tests and blood chemistry under acute hypoxic stress. Animals of different species were exposed to simulated altitude of 3500 meters for 6 hours and the lungs examined for pulmonary oedema of high altitude (POHA) on the basis of changes in lung body weight ratio and histology. Effect of prolonged hypoxia on the pulmonary vasculature in animals were also studied.

The analysis of data collected will be presented and the pathogenesis of pulmonary oedema will be discussed in the light of observations made, and on a laboratory model simulating pulmonary circulation.

532

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A NOVAL APPROACH TO MALE CONTRACEPTION USING NON-OCCLUSIVE REVERSIBLE INTRA-VASAL DEVICES. K. R. Laumas, K. Seth, Roomana Khatoon, M.M. Kapur and A. Farooq. Dept. Reproductive Biology and Surgery. A.I.I.M.S. New Delhi.

Vasectomy is very useful method for control of fertility in the male. However, the method is permanent and presents problems to achieve reversibility. Thus there is a need to develop methods for control of male fertility which are longacting and reversible. To achieve this objective a noval approach using a nonocclusive intra-vasal device has been developed. The device made of pure copper is 100 per cent effective in the rat in controlling fertility. On removal of the device the fertility is restored. The sprems on passing over the devices, are decapitated and the device causes the reduction in the motility of the sperm. Second generation devices made of copper and other metals have been tested to extend the life span of the device and also determine minimal amount of copper necessary to produce a contraceptive effect in the animals. This method of long-term control of fertility in the male has potential of development of a useful reversible technique of contraception which could ultimately be used for the human.

271

SPERM MOTILITY AND METABOLISM. A. R. Sheth, G. V. Shah and A. N. Gunjikar. Institute for Research in Reproduction (ICMR). Parel, Bombay.

Spermatozoa are highly specialized cells that are well designed to accomplish a single objective *i.e.* fertilization of an ovum. Its biosynthetic capabilities are directed primarily towards maintenance of ATP stores adequate to supply its mechanical requirements for finite period of time beyond which irreversible senescence sets on.

Ejaculated spermatozoa need to undergo an additional ripening process in the female genital tract before they can pass through the layers surrounding the ovum. The functional dependance of spermatozoa upon the female reproductive tract prior to fertilization is termed as capacitation and it has been shown to occur in all mammalian species studied so far.

The presence of protein hormones in human and animal semen has been demonstrated by us for the first time. Subsequent studies carried out have revealed that these hormones could significantly alter the sperm fertilizing potential. The knowledge of factors controlling levels of protein hormones in male and female genital tract secretions may offer a new approach for controlling fertility in men and animals.

From human epididymis, we have isolated a water-soluble factor capable of sustaining the motility of ejaculated spermatozoa. In presence of the epididymal factor, the forward progressive motility of the ejaculated spermatozoa is better maintained during storage at 37° C upto 6 hours. The factor is heat labile and susceptible to trypsin digestion indicating its proteinaceous nature. The factor could be precipitated between 40—60 percent concentration of ammonium sulfate. Further our preliminary studies indicate that the prolongation of the spermatozoal motility is brought about by the alteration of sperm metabolic rate *i.e.* fructose utilization and cyclic AMP accumulation.

533

ROLE OF NEUROTRANSMITTERS IN EPILEPSIES. M. C. Maheshwari. Dept. Neurology. A.I.I.M.S. New Delhi.

The concept of abnormal excessive discharge of a group of neurones in epilepsies is widely accepted. This concept was formulated from clinical observation by Jackson in 1870 and to date holds true by extensive investigations of the electrical activity of the brain. What starts the abnormal discharge is easier to understand than to what ceases this abnormal discharge. Experimental studies lend some support to excitatory and inhibitory systems of neurones. The role of inhibitory neurone in limiting and suppressing the spread of discharge has been solicited by neurophysiologists and epileptologists. The genetic abnormality of the central subcortical neurones acting as a generator or pacemaker determine the susceptibility to epilepsy while local cerebral lesions, constitutional or acquired, may influence the pattern of attacks. A number of precipitating factors, neurogenic, vascular or biochemical may fire the pacemaker.

Among the biochemical causes neurotransmitters occupy a special position. Abnormalities in the concentration of many chemicals including water, electrolytes, blood gases, vitamins and hormones, are known to influence seizure susceptibility. Neurotransmitters appear to form a better bridge between the biochemistry and the physiology of the C.N.S.

The existence of inhibitory transmitter substances like gamma aminobutyric acid (GABA) has been given the most clinical consideration. Some support for the role of GABA in epilepsy comes from its action at inhibitory synapses. Other support comes from the fact that many known analeptic drugs,

thiosemicarbazide, INH and pyridoxine deficiency which causes convulsions in infants, block enzymes essential to GABA level from the cerebral hemispheres of mice after administration of several anticonvulsants like phenosarbital, prominal, primidone, diphenylhydantoins, mesantoin. These anticonvulsants also antagonised the GABA decrease induced by INH.

Other current discussion about neurotransmitters in relation to epilepsies is centred around monoamines like dopamine (DA), noradrenaline (NA) and 5-Hydroxy-tryptamine (5-HT). The monoamine depleting drugs like reserpine and tetrabanazine cause a striking increase in seizure susceptibility. If amine depletion is prevented by a monoamine oxidase inhibitor (MAO) the effect on seizure susceptibility is also prevented. Moreover 5-HT and Dopa (DA) exert a protective action against seizures. These observations provide strong evidence that the brain monoamines are capable of reducing seizure susceptibility. Acetylcholine facilitates the initiation or spread of experimental seizures. There are reports to indicate the usefulness of cholinesterase inhibitors for the treatment of certain types of epilepsies. Atropine and scopolamine have been useful on certain occasions in the treatment of epilepsies.

The probability that some neurotransmitters do affect the seizure susceptibility, should stimulate scientists to explore these chemical compounds, which are very different from usual anticonvulsants, for the treatment of convulsions. Choline acetylase inhibitors may be useful but more attractive proposition however appears to be in the realm of glutamate blocking agents or substance that inhibit the reuptake of GABA. Treatment with orally administered GABA in patients with petitmal or grandmal epilepsy did not live up to its promise. A new anticonvulsant sodium valproate (Epilim) has got its action by increasing the GABA by inhibiting the GABAase.

534

CHANGES IN CURRICULUM IN PHYSIOLOGY FOR COMMUNITY NEEDS. C. M. Francis. St. John's Medical College. Bangalore.

One of the important requirements is to give emphasis to Environmental Physiology. The relationship between weather, climate and men should be understood. It is necessary to learn the responses of the human body to hot or cold, and dry or humid environments. The adaptive variations induced by physical factors in the environment, including radiant energy and noise must be studied.

In view of mass undernutrition, the student should be aware of adaptation to food restriction and food deprivation. A better understanding of nutrition, growth and development is necessary.

Greater emphasis should be given to basic clinical physiology, especially haematology and respiratory physiology.

A certain amount of understanding of chronobiology and biological rhythms will be useful.

Changes in experimental physiology to have measurements of parameters useful in community, replacing some of the amphibian physiology must be brought about.

274

HEALTH NEEDS OF THE COMMUNITY AND NEED FOR CHANGE IN CURRICULUM. S. K. Ganeriwal. Dept. Physiology. Dr. V.M. Medical College Solapur.

Community is a large group of people living in a particular geographic area. It is composed of various subgroups of the population which may be having different interests, goals, behaviour, and way of life as well. The subgroups may comprise of expectant mothers, infants, children, patients, working groups etc.

The "Health care" is delivered to the community by a health team which is called in the modern terminology, "Health manpower".

There are certain shortcomings in our health care system. There is a great disproportion between the health manpower and medical resources on one side; and the population on the other. This is evident from the fact that three quarters of our population is rural whereas three quarters of our resources are spent in urban areas where three quarters of our doctors live. Also, our medical budgets are diverted more in curative services rather than on prevention of disorders.

A proper solution to this problem would be to emphasise these points in the teaching programme itself. This entails a reorientation of the teaching programme from the present stereotyped to the one which in needbased.

REORIENTATION OF TEACHING OF PHYSIOLOGY. K. Madhavankutty. Medical College. Trivandrum.

1. Medical Education in India is today at the cross roads. On the one hand there is an awakening among the masses throughout the length and the breadth of our country about health needs and about the privileges in health care which is their rightful due. On the other hand, there has been no change or innovation in medical education which would make the product coming out of our medical colleges readily acceptable to the rural masses, and also which would make them capable of acquitting themselves creditably under such circumstances.

2.1 To this end the entire medical curriculum will have to be restructured. While the exact logistics of this operation require a detailed study in depth and can be arrived at only after examining the pros and cons of all the diverse facts of such a change some general direction regarding this change can be listed. They are :

- 2.2 (A) The present hospital-based, city oriented academic course will have to be modified to make it health-based, rural and more practical.
 - (B) Practical training and clinical work must start from the very beginning of the course.
 - (C) There must be more emphasis on working with the people and understanding their problems, rather than concentrating on the theoretical aspects of the subject.
 - (D) The course could be shortened if possible by (i) delegating some basic theoretical studies to the pre-professional period (ii) by emphasizing more on clinical physiology and helping the students to study by doing actual practical work in situ rather than on artificially contrived experiments. (iii) by making them less dependent on highly sophisticated gadgets.

3. All basic subjects have hitherto been taught as an end in itself. While conceding that this would be the best method in an ideal situation, it is doubtful whether this can be continued in our present set-up where the demand is for more doctors with a rural bias. Therefore a dichotomy may have to be affected in which while a small percentage pursues basic study and research for its own sake, the large majority would have to be satisfied with pursuing the study of physiology for the understanding of the practice of the art and science of medicine. In other words, in most cases, the training in physiology will have to be undertaken as a means to an end rather than as an end in itself.

4. The teaching of all subjects in the medical curriculum including Physiology will have to be done in an Indian background, with greater emphasis on local problems and to produce doctors who would be able to work optimally to improve the health condition in the villages and localities from where they come from. It may sound blashphemous to say that we should not attempt to climb the pinnacles of medicine. But there is lot of truth in the statement that "the more a person studies, the more impractical he becomes and that a vast amount of manpower and materials have been diverted from mass work and are expended in carrying out research on the high level, complex and difficult diseases. As for the frequently occuring illnesses, the wide-spread

536

sicknesses, the commonly existing diseases, we pay no heed or slight heed to their prevention or to finding improved methods of treatment. It is not that we should ignore the pinnacles. It is only that we should devote less man and materials in that direction and devote a greater amount of men and materials for solving the urgent problem of the masses.

In order to do this our curriculum in Physiology must be redesigned to meet the above objectives. Students should have more interface with socioeconomic problems, must have more understanding of the problems of the poor rural people, must have more knowledge of the indigenous system of medicineand in general should be able to merge with the aspirations and ambitions of the common people than develop as a seperatist intellectual elite group divorced from the realities of day-to-day existence.



INFLUENCE OF CLIMATIC FACTORS ON PHYSIOLOGICAL REACTIONS AND PRODUCTION IN CATTLE. N. K. Bhattacharyya and S. K. Saxena. Division of Physiology and Climatology. Indian Veterinary Research Institute. Izatnagar, U.P.

The cattle ecology has so far been studied in a limited way. Without exception, however, they respond to the alterations of ambient environmental conditions and functionally adjust themselves to be fit in changed circumstances. In broader sense, environment includes all the combinations under which the animals live except for those imposed by heredity. The scientists engaged in cattle production often find that the climatic component of environment holds a key to those physiological reactions which lead to higher production. Thus the role of major climatic elements viz. temperature, vapour pressure, solar radiation, wind velocity and oxygen tension have been judicially studied in relation to cattle physiology and production. The macro and microclimatic elements operate significantly on the thermoregulatory, endocrine, energy metabolism and reproduction systems. The physiologicol responses in cattle to surplus body heat and heat gain through radiation in tropical climate are comprised of sensing the increased temperature through skin receptors, vasodilatation of skin through spinal response and hypothalamic control on the thermoregulatory centre and anterior pituitary. The prolonged exposure leads to the adjustment in the functioning of endocrine glands. There is good evidence of local cooling system in the scrotal sac and in udder. Improved water distribution and conservation systems in heat adapted animals have been reported. Endocrine adaptations in cattle in relation to energy metabolism and utilization of depot fat in tropics deserve additional consideration. Physiological reactions in cattle to low ambient temperature are essentially those which retard the heat loss and enhance the heat production in the body as a result of nervous and hormonal coordination. As cold conditions prolong, hypothalamic-hypophyseal out flow leans more on thyroxin, somatotropic-hormone and corticosteroids for enhanced heat production in liver and other tissues. Low temperature coupled with hypoxia is major hurdle for cattle to flourish at high altitude. The physiological reactions in natural acclimatization at high altitude operate along the total Po2 gradient introducing a marked economy in the drop of this gradient and at tissue level including enlargement of capillary vascular bed and modifications in the chemical and enzymatic processes of internal respirations. Along with the alterations in these physiological reactions due to climatic factors, the growth, lactation and reproduction performances in cattle are altered with significant economic loss to the producer.

277

HEAT DETECTION AND OESTRUS SYNCHRONIZATION AS RELATED TO REPRODUCTION AND PRODUCTION IN INDIAN BUFFALOES. K. Janakirnman. Reproductive Bology Research Unit. Gujarat Agricultural University. Anand, Gujarat.

Production efficiency and its sustaining nature to a large extent depends upon the reproductive efficiency of a species. The production perfermance of a species in a particular ecological niche depends on the optimum

538

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reproductive performance of that species. Today buffalo is looked upon as a triple purpose animal (milk, meat and power). In our country buffaloes are largely dairy animals, next comes power and meat.

Heat detection at the right time and breeding the animal at the right time in heat are the foremost requirements. This is true for all animals at any stage in the reproductive cycle. The method used should be useful for tracking puberal animals, matured heifers, lactating as well as dry animals. At the same time it should be specific enough to occur only at the right heat and should be useful to differentiate proestrus gestational heat and the likes.

Our experience repeatedly assured us that frequent urination is the most specific characteristic heat symptom for the buffaloes. It is easy to detect, easy to be told to the farmers and does not occur at proestrus. An animal in heat throws out obout 7 to 10 ml of urine in drops at every five to six minutes. When observed for 15 to 20 minutes frequent urination occurs 3 to 4 times. It occurs at all seasons even when the conventional symptoms like bellowing, discharge and activity...etc...are not to be seen.

Estrus synchronization has been successfully tried in buffalo in our laboratory as well as in other places both in our country and in others. It is possible to synchronize estrus in buffaloes with success. The data on this will be looked into in this paper. It has now been fairly established that this technique can be profitably used to improve buffalo productivity.

*Data reported here were collected through the scheme studies on buffalo reproduction and its experimental control financed by the ICAR (1973-76) and also through AICRP-Buffalo Project. Endocrinology Unit, Anand Centre.

278

FACTORS AFFECTING THE VOLUNTARY FEED INTAKE IN CATTLE. Kiran Singh. Indian Council of Agricultural Research. Krishi Bhavan. New Delhi.

The mechanisms regulating feed intake appear to be the same mechanisms that control energy exchange. Broadly these are related to the physiological state of animals, the type of feed and the environment. The physiological mechanisms brought into play are numerous and involve chemo-sensitive areas, reflex responses and integrative function of the central nervous system. The central nervous system has a similar function in the control of feed intake in both ruminants and monogastric animals inspite of the fact that there are probably differences in the feedbacks. These are again influenced by the physiological state of the animal e.g. young, growing, fat, pregnant, lactating and working etc., which affect the amount of energy it can utilise and this in turn will affect the voluntary intake. Thus, the stimuli for changes in food intake arise from animal functions and environmental conditions. In the ruminant the rate of energy expenditure, environmental temperature, qualitative characteristics of the diet availability of digestible energy in the ration and the physical effects of food are significant factors influencing the amount of feed and day to day changes in food consumption. Additionally environmental factors like high temperature for rainfall, short day length reduce intake while low temperature increase intake. A resume of the work done on the mechanisms involved in the regulation of voluntary feed intake would be presented.

INFLUENCE OF THYROID STATUS ON PRODUCTION TRAITS IN POULTRY. P. N. Varman and Onkar Parsad. Dept. Vety. Physiology. Punjab Agricultural University. Ludhiana. Punjab.

No information about the status of thyroid gland in relation to growth and development of reproductive system in Poultry was available in literature. Our group has therefore been conducting studies to elucidate this aspect as well as the influence of changed thyroid status on production traits in poultry with special reference to the female birds. Trials were also conduced to compare the results obtained by the use of common thyroid function tests. The thyroid status was changed experimentally towards mild hypothyroidism by administering methimazole, one of the known goitrogens, for different durations, at different dose levels and at different stages of growth as well as different seasons.

The results have indicated that the egg laying breeds raised in our country have higher thyroid activity throughout as compared to thyroid status in birds of similar breeds raised in other advanced countries. Continuous feeding of methimazole at the level of 0.00075% to White Leghorn birds with higher thyroid status than expected, for 63 days i.e. starting from 16 days upto 79 days of age during winter and for 52 days i.e. starting from 15 days upto 67 days of age during summer, advanced the age of sexual maturity by 20 and 9 days respectively. The percent egg production was also found to be higher by 10 and 6% respectively in such birds. The results have indicated that experimentally induced mild hypothyrodism with the help of methimazole in our birds, favourably enhances the development of the reproductive system and in turn advances the age of sexual maturity and increases the agg production without affecting the growth of the birds adversely. The indications are available that the status of thyroid activity can possibly be used as an index for predicting as to how far the production traits in the form of meat or egg production in various breeds of poultry have progressed. A possibility for the use of this approach in breeding programme, therefore, seems to exist. Some possibility also exists that the thyroid hormones present in the egg yolk help the embryogenesis and the status of thyroid hormones during this period may be an important factor in the hatchability.

540