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ABSTRACTS

THE STABILITY OF MEASUREMENT OF AUTONOMIC BALANCE IN TWO SUCCESSIVE SEASONS.

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Physiological measurements of autonomic parameters were made during the Summer on fifty-eight adult human male subjects at a control T_a of 27°C to investigate the autonomic balance. A regression model composed of a battery of seven weighted tests for use in obtaining quantitative estimates of autonomic activity was derived using "Principal Components method" of factor analysis (Hotelling, 1957). The measures in order of their beta weights were : Salivary output, Volar skin resistance, Palmar conductance, Diastolic blood pressure, Respiration rate, Heart rate and Pupillary diameter. The computed regression scores regarded as the estimates of autonomic balance for fifty-eight of these cases were found to be normally distributed about a central tendency. The theoretical means score for autonomic balance (A) for the sample was found to be 83.59 with a sigma of 7.47.

In the succeding Summer season the full test battery of autonomic parameters was given to eighteen out of fifty-eight cases at the same ambient temperature of 27°C. The test -retest reliability coefficients between the data of two consecutive seasons observed on the same individuals were found to be fairly high. The reliability coefficient between the estimates of autonomic balance in two successive years was 0.75. The comparison of autonomic scores for most of the individuals as demonstrated by the correspondence between results from two separate analyses which approximate so closely indicate that the estimates of autonomic balance for a given individual tend to remain constant from season to season. Thus, the test battery appears to measure a composite function which differs in individuals, but tends to remain constant in a given individual in a given season.

ONTOGENY OF GLUCOSE SENSITIVITY IN HYPOTHALAMIC FEEDING CENTRES OF RATS.

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It is common knowledge that the feeding pattern of mammals undergoes dramatic transformation during ontogeny. The hypothalamic centres get organised for appetite

regulation at some critical time during development and this varies with the species. The critical period in the development of rat is during the suckling period and during that phase the mechanism of regulation of feeding is integrated. The sequence of events which finally leads to the development of sensitivity of hypothalamic neurones to neural and chemical influences has not been worked out. It has, however, been shown that deprivation at any age during the suckling period stimulates feeding while gastrointestinal filling suppresses it (1). The present study was thus taken up to study the genesis of glucosensitive mechanism in the hypothalamic feeding centres. Bipolar electrodes were guided to the ventromedial (VMH) and lateral hypothalamic (LH) areas in Urethane anaesthetised rats varying in age from 10 to 40 days. EEG activity at different age periods evolved in a definite sequential manner. Having determined the evolution of EEG pattern of hypothalamic feeding centres controlled conditions, the effect of intraperitoneal glucose injections was observed. It was found that immediately after weaning, the hypothalamic feeding centres showed reciprocal sensitivity to glucose. The activity of VMH was very much increased occasionally giving rise to high voltage synchronous discharges, almost resembling epileptic discharges lasting for variable periods. The activity of other regions like hippocampus and amygdala, recorded simultaneously did not show any change and served as controls. Before weaning, after 15 days, the activity of VMH and LH showed only very slight changes in response. The significance of these observations will be discussed.

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MATURATION OF CLIMBING FIBRE RESPONSE IN THE DEVELOPING RAT CEREBELLUM. **K. P. Puthuraya, Usha Nayar and M. G. Deo.** *Department of Physiology, All-India Institute of Medical Sciences, New Delhi—110016.*

Climbing fibres (CF) originating mainly from the Inferior Olive (IO)have a powerful excitatory action on the Purkinje cells (PC) of the cerebellum. The PC response to an IO stimulation is a brief all-or-none burst of several spike potentials also termed as complex of spikes to distinguish it from the single spike activity due to mossy fibre input. Maturation of this climbing fibre response (CFR) was studied in rats from the day of birth to 21 days of postnatal life. Evoked CFR obtained by stimulating the IO could be recorded from the P cells of the contralateral side by 3rd day of postnatal life and at all ages thereafter. During maturation the latent period of CFR is reduced from 32.5 msec at day 3 to 6.25 msec at 21 day of age, while the number of spikes in each burst increases from 2-3 to 4-5 spikes. Thus the maturation of CFR is found to take place during the first 3 weeks of postnatal life in case of the rat in a characteristic manner with progressive changes such as shortening of the latent period and dur-

ation, and an increase in the number of spikes and mean frequency discharge in each burst. Studies on the maturation of this electrophysiological parameter is of great importance in the cerebellar development in that it provides a functional basis for the structural, biochemical and behavioral changes observed during ontogeny.

THE EFFECTS OF EXCESS CALCIUM ON THE ACETYLCHOLINE TURNOVER FROM THE MINCED AND INCUBATED RAT'S BRAIN. **Y. Venkata Reddi, P. Brahmayya Sastry and G. Ramadas.** *Department of Physiology, Andhra Medical College, Visakhapatnam.*

Experiments undertaken reveal another important action of Calcium ions on the Acetylcholine (Ach) kinetics in the brain. The right and left cerebral hemispheres of field rats were incubated separately and alternately after mincing them in Eserinised Ringer Locke's (ERL) medium as per the experimental lay out. The incubation of brain mince in ERL with excess Calcium was done separately for periods ranging from 30 minutes to 3 hr. The free (release) and bound (synthesis) values of Ach were determined during the successive 30 minute periods. The Zero and 5 minute values were also determined for each incubation experiment before any substantial increase in enzymatic activity. Rat's blood pressure after evisceration and eserinisation was selected as an ideal test object for bioassay of Ach for its high sensitivity and maintenance of steady blood pressure. The values of unknowns were determined by comparing their fall of blood pressure with those of standard Ach $5x10^{-8}$ *g/ml*.

In the normal ERL incubations at 30 minute intervals the Ach release and synthesis were progressively increased along the time course. It reached the highest values at 180 minutes due to a greater release of free fraction from the total amount. In all the periods the release is greater than the synthesis. With excess Calcium (0.105M) in ERL there was slight but gradual increase in the free and bound Ach upto 180 minutes. In the first 30 minutes of incubation the synthesis is more than the release and in the later periods reverse is the case. But they were very low when compared to normal at 180 minutes (free 41% and bound 75%). These results were compared with the results of other workers who investigated similar effects on brain slices, dried powdered brain, placenta, superior cervical ganglion, myoneural junction and neuronal synaptic junctions. The effects of Calcium excess in the ERL controlling the membrane permeability and enzymatic system of the nerve cell will be discussed, which explain satisfactorily the possible actions of Calcium ions in the Ach turnover by minced and incubated rat's brain.

THE EFFECT OF VISCERAL FILLING ON ABDOMINAL REFLEXES. **M. Subramanyam and Annapoorni Balan.** *Thanjavur Medical College, Thanjavur.*

A statistical method was employed to find out if stroking the abdominal skin in a particular direction was more productive of positive responses, in contract to the opposite

direction in eliciting superficial abdominal reflexes. In about 100 men and 100 women neurologically normal and around 19 years of age, the skin was stroked in two directions from without inwards and in the reverse way in each corner of the anterior abdominal wall. The success and failure of response in respect of each direction of stroking and each reflex were tabulated and the Chi Square test was applied. The Values of Chi Square obtained showed that when the viscus (stomach in the case of the upper reflexes and the urinary bladder for lower reflexes) was empty the direction of stroking did not matter in obtaining a response. But when the organ was full, stroking inwards diagonally was comparatively more effective. This study raises the question if the greater area of contact between the filled organ and the overlying peritoneum facilitated stroking in the inward direction or alternatively, if a mechansim like convergence-facilitation evoked from the wall of the filled organ could impose a directional preference.

MODIFICATION OF DDT INDUCED CONVULSIONS AND NEUROCHEMICAL CHANGES BY BARBITURATES IN RATS. **M. A. Matin and P. P. Kar.** *Industrial Toxicology Reserch Centre, Lucknow, (U.P.)*

The pharmacological effects of DDT-hyperexcitability, tremors and convulsions-are due to the effect of the compound on the central nervous system but the neurochemical basis of these effects is not clear. DDT increases the level of cerebral free ammonia and reduces the concentration of brain acetylcholine. The effect of certain barbiturates on DDT induced convulsions and neurochemical changes in rats was studied. The barbiturates used were phenobarbitone, prominal and primidone. Phenobarbitone completely abolished the DDT induced convulsions in rats; the concentration of brain acetylcholine was normal but the level of cerebral free ammonia was raised. Prominal reduced the severity of convulsions in DDT treated animals; the concentration of brain acetylcholine was slightly reduced and the level of ammonia was raised. Primidone did not modify the convulsions induced by DDT; the concentration of brain acetylcholine was lowest and the level of cerebral ammonia was high. The results indicate that phenobarbitone provide maximum protection against the toxic effects of DDT. Prominal was less effective and primidone the least against these effects.

CHANGES IN EEG PATTERN DURING ACCLIMATIZATION TO HIGH ALTITUDE IN MAN. **W. Selvamurthy, M.S. Malhotra, R. K. Saxena and N. K. Murthy.** *Defence Institute of Physiology and Allied Sciences, Delhi Cantt. –110010.*

A study has been conducted on 40 healthy soldiers - 15 lowlanders (LL), 15 lowlanders acclimatized to high altitude (HA) for one year (ALL) and 10 high altitude natives (HAN), between the ages of 20-30 years. The EEG was recorded during rest, hyperventilation and photic stimulation. In the LL the basal EEG recording was made at Delhi (260 m. alt.) and thereafter they were airlifted to an altitude of 3500 meters in Western Himalayas where

they stayed for 4 weeks. During this stay their EEG was recorded on Days-2, 7, 14, 21 & 28. In HAN and ALL the EEG was done once at the same altitude. The mean alpha index (AI) in LL at sea level (SL) was 30% and it changed to 43%, 23%, 28%, 31% and 41% respectively on Days-2,7,14, 21 & 28 of stay at HA. In ALL the AI was 48% and in HAN 57%. The avarage amplitude showed about 90%, increase from its initial SL value of 16.71 μv, immediately on arrival at HA, which changed to 14.50 μv, 18.00 μv,21.94 μv and 29.11 μv respectively on days-2, 7,14,21 & 28. During hyperventilation the magnitude of build-up and percentage slow wave activity, and response to photic stimulation showed similar trend. In ALL and HAN the average amplitude and slow wave activity were higher compared to that of LL at HA. These results indicate that there is cerebral depression in the initial phase of induction to HA primarily due to hypocapnia as a result of hyperventilation. After the third day there is a cortical excitation probably due to sympathetic hyperactivity and adaptation of central neurones to a lower P_aCO_2. In HAN the EEG changes are due to parasympathetic predominance and relaxation of sympathetic tone. The responses of ALL are intermediate between the LL and HAN.

HYPOTHALAMIC ELECTRICAL RESPONSES TO GUSTATION. **B. S. Rao and K. N. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore--560034.*

Electrical activity in Ventro medial (VMH) and lateral (LH) hypothalamic areas in response to gustatory stimuli (glucose and saccharin solutions) was investigated in chronically prepared adult unrestrained rats kept on *ad lib* (gr.I) and 3-hour food schedule (gr. II). The activity was recorded for 1-2 miunutes at regular intervals, before (O time) and 5, 15, 30 and 60 minutes after presentation of the test solution.

The basal activity in group I rats showed wide variation from the mean values as compared to group II rats' activity. In group I rats, though the profile of VMH activity (low 141.5 $\pm$19.3/min, medium 107.8$\pm$17.6/min, high 9.0$\pm$0.4/min, very high 0.0/min. indicated a higher activity than that of LH (low 100.5$\pm$14.9/min, medium 110.6$\pm$16.4/min, high 5.3$\pm$2.7/min, very high 0.0/min) area of the same groups, the differences were not significant ($P > 0.05$). On glucose ingestion the electrical activities of VMH and LH areas of group I rats showed a tendency to fluctuate around the basal activity but showed some decrease on saccharin ingestion. In group II rats, after glucose ingestion, the VMH showed enhanced activity whereas LH showed no change and was comparable to control period. Saccharin ingestion also showed some increase in hypothalamic activity of group II rats, the increaments being not significant ($P > 0.05$).

GUSTATORY NEURAL FEED-BACK CONTROL IN THE PERIPHERAL MECHANISM OF SATIATION OF HUNGER AND THIRST. **V. Gopal and G. Hellekant.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Auto-*

nomous P. G. Centre, Coimbatore, and Department of Physiology, Kungl Veterinarh, ogskolan Uppsala, Sweden.

Investigation undertaken during the last three decades suggest that regulation of food intake is a central phenomenon in which hypothalamus plays a major and decisive role. By contrast, peripheral factors were considered to play a minor role. Our previous series of studies (Sharma *et al*. '72: Gopal '72) have shown the importance of peripheral factors in information transfer in the regulation of food intake. The present study is an attempt to investigate the mechanism by which efferent control of food intake regulation is effected at the oral phase, which is, one of the first and important steps in food ingestion.

Gustatory neural activity obtained from the gustatory nerve (IX nerve of the frog and Chorda tympani nerve of the rat) of well fed and chronically starved animals showed significantly higher response as compared to well fed animals, suggesting that the gustatory sensory neural cues can be influenced by hunger and satiety. These cues were either inhibited (well fed animals) or facilitated (starved animals) by the satiety signals such as distension of stomach, either with air or various nutrient solution, thereby suggesting the efferent control of gustatory neural input.

These results indicate that signals arise at various levels of gastro-intestinal tract and extend well beyond the sense of taste and olfaction and form an important linkage in the multifactoral control theory of food intake thereby throwing light on which way the signals would switch the controls from a stage of hunger to one of satiety and vice versa. This is discussed in the background of electrophysiological efferent activity obtained from the central end.

QUANTITATIVE CHANGES OCCURRING IN THE RABBIT BRAIN RNA AND DNA ASSOCIATED WITH HYPOGLYCEMIA INDUCED BY STARVATION AND INSULIN ADMINISTRATION. **Rajni Gupta, M. C. Pant and V. K. Negi.** *Department of Biochemistry, L.L.R.M. Medical College, Meerut.*

Quantitative changes on wet weight basis occurring in RNA and DNA levels in cerebrum, cerebellum, mid brain and medulla oblongata of adult albino rabbits as a result of varying degrees of hypoglycemia induced by starvation of varying periods (48, 96, 144 hrs) and administration of different doses of insulin (5,10,12 units daily for 3 days subcutaneously) have studied. The different regions of the brain were excised immediately after sacrificing, weighed, homogenised and defatted thrice at chilled temperature. RNA and DNA were separated according to Ogur and Rosen (1). RNA was estimated according to Mejbaum (2) and DNA according to Burton (3).

The RNA content in all the four regions of brain exhibited slight lowering even upon 48 hrs starvation, and administration of 5 units of insulin. It lowered further with increasing time of starvation or by increasing the dose of insulin. After starvation over a period 144 hours blood sugar was reduced to one-sixth and the percentage fall of RNA content in different regions was observed as follows : cerebrum-51.5, cerebellum-39.8, mid-brain-23.2 and medulla-44.9. With the highest dose of insulin used (blood sugar reduced to one-sixth), the RNA content was lowered as follows: cerebrum-38.9, cerebellum-42.8, mid brain-19.5 and medulla-18.4 per cent.

The DNA content, likewise, exhibited lowering patterns during both types of hypoglycemia. After starvation over a period of 144 hours the DNA content decreased as follows : cerebrum-38.2, cerebellum-36.2, mid brain 56.5 and medula-63.2 per cent. With the highest dose of insulin used, percentage lowering in DNA level was found to be : cerebrum-39.0, cerebellum-24.1, mid brain-52.1 and medulla oblongata-72.1

Thus, both types of hypoglycemia result in lowering of RNA and DNA levels in the brain. Regional differences are observed in the lowering of RNA as well as DNA. When the blood sugar level was reduced to one sixth the percentage lowering brought about in the RNA and DNA levels in these regions was found to differ in magnitude during starvation hypoglycemia on one hand and insulin hypoglycemia on the other.

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FURTHER EVIDENCE POINTING TO PINEAL GLAND INVOLVEMENT IN MEDIATING LITHIUM ACTION. **S. Parvathi Devi, N. Hariharasubramanian and A. Venkoba Rao.** *Department of Physiology, Madurai Medical College, Madurai.*

Lithium has come to stay as an effective psychoactive agent particularly in the therapy of manic-depressive episodes. Its effects on the pineal adrenocortical axis have been studied by us and this paper brings out further evidences of lithium on the pineal gland.

Melatonin, the specific pineal indole is derived from its precursor serotonin by the action of HIOMT (hydroxy-indole-O-Methyl transferase) the enzyme peculiar to the pineal gland. Exposure to constant illumination inactivates HIOMT and pineal regression sets in. Constant darkness stimulates this enzyme and the pinealocyte. Lithium administration invokes pineal hyperactivity. Rats which were housed under constant lighting and given lithium in the usual daily 1M dose of 20 *mg/kg* body wt. did not show pineal regression.

It has been an interesting observation that lithium prevents the pineal inactivation induced by constant lighting. The significance of this observation was discussed.

Further, with histochemical fluorescence techniques, lithium was noted to invoke increased cellular and nerve-terminal serotoninergic flourescence as well as nerve-terminal nor-adrenergic fluorescence within the pineal gland.

EFFECTS OF HYPOXIA AND HYPEROSMOLAR BICARBONATE RAPID AND SLOW INFUSION IN EXPERIMENTAL ANIMAL. **B. S. Gajalakshmi, B. Vijayalakshmi and Sarasa Barathi.** *Department of Physiology, Stanley Medical College Madras*

Rapid intravenous hypertonic solution creates potenial hazards in cases of intracranial hemorrhages leading to shift of water from central nervous system followed by a fall in C.S. F. pressure. Routine bicarbonate therapy is widely used in correcting the acidosis especially in neonates and children. Though the acidosis is corrected, the controversy still exists as to the nature of the changes which occur in the brain and whether such changes are related to tissue hypoxia or hypernatremia and whether these changes are irreversible. In the present study, 7.5% sodium bicarbonate solution was given as an infusion, slowly or repidly, in normal and hypoxia induced dogs. Serum Na concentrations were estimated and the animals were sacrificed at the end of 6 hours. The brains were exposed and examined for evidences of C.N.S. hemorrhages. Macroscopic and histopathological studies of the brain were done.

It is observed that tissue hypoxia is a major contributing factor in producing C.N.S, hemorrhages and rapid infusions of HCOs for short duration under such condition does not worsen the hemorrhagic effect. This study was supported by a grant from Tamil Nadu State Research Committee.

NEUROPHYSIOLOGICAL APPROACH TO CEREBRAL PALSY. **T. S. Kanaka and V. Balasubramaniyam.** *Institute of Venerology, Madras Medical College, Madras-600003.*

This paper explains the neurophysiological basis of the various operations currently employed in cerebral palsy. The operations are being done by open technique Rhizotomy, etc. and/or by stereotaxic procedures. In most cases the operations have been performed on the basis of results achieved by others or on our present understanding of the neurophysiology of posture and locomotion.

The patients have been operated between the years 1967-1976. A total of 204 patients have been operated. Cerebral palsy is defined as a non-progressive predominantly motor disorder due to damage of the brain sustained in the early years of life before the

maturation of the brain is complete. The cerebral palsy child may present with altered tone and/or abnormal movements.

The altered tone may be spasticity or rigidity. The analysis of this hypertonus is by surface EMG. The technique and details of classification by surface EMG are given. Based on the EMG analysis the appropriate surgical procedure is chosen.

The involuntary movements may be one of many kinds. They may be made worse by sensory stimuli. The various types are given. The targets for the amelioration of the movement and the neurophysiological reasons are also elaborated.

Criteria for selection of cases for surgical treatment, details of operative procedures including the choice of the targets, made of assessment of the results and the results were presented.

AGGRESSIVE RESPONSES ELICITED FROM PREOPTIC AND ANTERIOR HYPOTHALAMIC REGIONS BY ELECTRICAL AND CHEMICAL STIMULATION. **S. C. Bhatia, I. S. Aneja, B. K. Kapoor and S. K. Manchanda.** *Department of Physiology, All-India Institute of Medical Sciences, New Delhi*-110016.

We have already reported the role of cholinergic mechanisms in the affective display accompanying aggressive responses elicited by hypothalamic stimulation (Bhatia *et al.* Proceed. XXVII Interenat. Cong. Physiol., Paris, 1977, abst. no. 205). The present series of experiments demonstrates that stimulation at the lowest strength (mean = 3.7± 0.5V, 0.5 msec 60 hz) of 11 loci in anterior hypothalamus and preoptic area of the cat elicits defence response. Raising the stimulation strength (6.0 ± 0.5V, 0.5 msec 60 hz) recruits more somatic and autonomic components to give it the shape of a flight or an attack response. Further increase in the stimulation strength (7.5 V ± 0.5V, 0.5 msec 60 hz) in animals exhibiting flight response in addition produces a wild running in the cage culminating in vigorous leaping to foot (violent flight). These observations suggest that the aggressive behaviour can be broken down into simpler components which can be recruited depending on the stimulation strength to elicit these graded responses.

Application of carbachol at the site of electrical stimulation in graded doses of 2.5, 10, 15 μg to produced similarly graded responses. The components to appear earliest are pupillary dilatation, alertness and growling. With successively increasing doses other components like hissing, respiratory excitation, piloerection, tail lashing, looking at the escape route, running and leaping to foot are added to the response. Occasionally there is also urination and defaecation, and in some animals (20%) there was also a goal directed attack. Prior application of atropine sulphate (10 μg) always blocked the response obtained with carbachol application. Similarly, the goal directed attack (dynamic somatic components) elicited by electrical stimulation was completely blocked and the accompanying affective

display was significantly attenuated by prior application of atropine (10 μg). However, the violent flight or flight produced by electrical stimulation was never blocked by atropine.

DEFENCE AND FLIGHT ELICITED BY ELECTRICAL STIMULATION OF THE PREOPTIC AREA IN RABBITS. **I. S. Aneja, M. Dodeja, N. Desai and S.K. Manchanda.** *Department of Physiology, All-India Institute of Medical Sciences, New Delhi—110016.*

Stimulation of the preoptic area in the cat produces defence, attack and flight responses (Inselman, B. R. and Flyann, J. P., *Brain Res.*, 42: 73-87, 1972) Studies on such behavioural responses elicitable on hypothalmic stimulation in the rabbit do not seem to be reported.

In the present study, preoptic area was stimulated with permanently implanted monopolar electrodes in 8 rabbits moving freely in a behaviour cage (1 m^3). At lower strengths of stimulation (2-3, 5V, 0.2 msec, 60 Hz for 30 secs) each rabbit thus tested exhibited alerting accompanied by pupillary dilatation, sniffing and ear movements. Increasing the stimulation strength by 1.5 times produced in addition a defensive posture (arching of back and withdrawal to a corner in the cage), and increasing it by about 2 times produced a clearcut flight response accompanied at the end by vigorous thumping of floor with hind limbs. Attack responses of the type found on pre-optic stimulation in the cat i.e. unsheathing of claws, baring of teeth, striking with paws and biting were never obtained even on further increasing the strength of stimulation. These responses were also checked by manipulating the environment with the introduction of another rabbit in the cage. However, in no instance was an attack or fight behaviour elicted. This study defines the possible neural basis for the observation that rabbits during their normal fee behaviour rarely indulge in attack (Southern, H.N. *Ann. Appl. Biol.*, 27 : 509-526, 1940).

EFFECT OF BILATERAL SUB DIAPHRAGMATIC VAGOTOMY AND BLOOD SUGAR LEVEL ON THE FOOD MOTIVATED BEHAVIOUR IN ALBINO RATS. **Susheela Veliath, A. K. Ganguly, S.S. Sathiamoorthy and O. P. Bhatnagar.** *Department of Physiology, Government Medical College, Surat and J.I.P.M.E.R., Pondicherry-605006.*

The gastro intestinal stimuli and the blood sugar level constitute two of the major peripheral mechanisms influencing food intake in animals.

At present no published data exists correlating the influence of these peripheral mechanisms controlling food intake with their role in modifying food motivated behaviour which can be quantitatively assessed by the conditioned reward system using the Skinner Box.

This study was undertaken to elucidate the relative role of the vagus and blood sugar level on food motivated behaviour in albino rats and to study their probable role in the hyperphagia of alloxan induced diabetes mellitus.

Vagotomy performed alone was associated with an increase in the food motivated behaviour which could be explained on the finding that vagotomy abolished the effect of gastirc distension on appetite and food intake.

When a diabetic state was produced with alloxan, it was found to be associated with increased food motivated behaviour which is probably due to the hyperphagia known to be associated with diabetes.

When a vagotomised rat was made diabetic with alloxan, the increased food motivated behaviour associated with vagotomy was found to be significantly reduced after induction of alloxan diabetes which suggests that the vagus in some way modifies the food motivated behaviour induced by alloxan diabetes or *vice versa*. Further work has to be carried out to establish the definite role of the vagus in this respect.

POSSIBLE SITE OF CO_2 INDUCED DEPRESSION OF MONOSYNAPTIC REFLEXES. **Subhra Basu.** *Department of Physiology, University College of Medical Sciences, New Delhi-110016.*

Monosynaptic reflexes (MSR) were recorded from L_7 or S_1 ventral root after stimulation of the posterior biceps and semitendinosus nerve (PBST) in anaesthetised cats. Sixty ml of 100% Co_2 introduced through the tracheal cannula at the end-expiratory phase produced depression of the monosynaptic reflex but did not show any change in the threshold of the stimulation of PBST nerve. The depression of MSR persisted after bilateral vagotomy thereby showing its non-vagal afferent nature and disproving it to be a component of J-reflex.

Equivolume of 100% N_2 or air did not show any change in MSR. The Co_2 induced depression of monosynaptic reflexes was present in paralysed cats under cotrolled ventillation, showing the genuinity of the response and not just movement artifact due to Co_2 induced tachypnoea. The depression after Co_2 introduction was abolished following spinal cord section. By contrast, in decerebrate vagotomised animals Co_2 produced depression of the monosynaptic reflexes. It apprears that single breath of 60 ml of 100% Co_2 (producing arterial pCO_2 of 90—172 mm of Hg for 7 secs and pO_2 of 85-96 mm of Hg) depresses the MSR at supraspinal level (below superior collicular level of the midbrain).

EVIDENCE FOR THE ROLE OF A NORADRENERGIC MECHANISM IN THE HATCHING BEHAVIOUR OF THE CHICK. **T. Ramakrishna, Rsndall Pittman and R.W. Oppenheim.** *Section of Developmental Neurobiology, Division of Research, N. C. State Department of Mental Health, Raleigh: N.C. 27611, U.S.A. and National Institute of Mental Health & Neuro Sciences, Bangalore.*

Clonidine, an agoinst of norepinephrine, induces a depression in certain aspects of embryonic behaviour (Type 1 and 2), but also selectively enhances a coordinated motor pattern (Type 3) involved in prehatching behaviour (tucking). Clonidine first evokes this behaviour pattern 1-2 days prior to its spontaneous appearance on day 16. After pipping on day 19 or 20 clonidine no longer activates type 3 behaviour, even if injected during the actual hatching process (climax). Since the alpha-adrenergic blocking agent phenoxybenzamine blocks the effect of clonidine on Type 3 tucking behaviour, the beta-adrenergic blocker propranolol does not. It is presumed that tucking and the attainment of the hatching position are mediated by an alpha-adrenergic mechanism in the brain and/or spinal cord).

PINEAL GLAND RESPONSES TO PSYCHOACTIVE DRUGS. **N. Hariharasubramanian S. Parvathi Devi and A. Venkoba Rao.** *Department of Physiology, Madurai Medical College, Madurai-625020.*

The hormones of the pineal gland influence many aspects of central nervous system functioning-like electrical activity, sleep-wakefulness rhythm and biogenic amines turnover. It has been of interest to study changes in pineal amine content induced by systemic administration of drugs which affect central nervous system and behaviour.

Adult male albino rats received intraperitoneal injection of the following drugs daily for one week; Lithium chloride (20 *mg/kg*/day), Chlorpromazine (10 *mg/kg*/day), Diazepam (5 mg/kg/day) and Haloperidol (5 *mg/kg*/day). Saline injected rats were used as controls. Histochemical fluorescence technique for biogenic amines was employed.

The observations were :

Drug	*Cellular serotonin (Yellow)*	*Nerve-terminal serotonin (Yellow)*	*Nerve-terminal Noradrenaline (Blue-Green)*
Lithium	Increase	Increase	Increase
Chlorpromazine	Mild decrease	Marked increase	Marked increase
Diazepam	decrease	decrease	decrease
Haloperidol	decrease	decrease	decrease

The findings were discussed and it is suggested that the pineal gland may mediate or influence the systemic effects of these psychoactive drugs.

BEHAVIOUR OF DIVALENT CATIONS DURING LITHIUM TREATMENT OF AFFECTIVE DISORDERS. **V. Srinivasan, A. Venkoba Rao and S. Parvathi Devi.** *Department of Physiology, Madurai Medical College, Madurai-625020.*

Affective disorders are associated with functional changes in biogenic amine levels particularly norepinephrine and serotonin. Alterations in sodium, potassium, calcium and

magnesium levels have been confirmed in these disturbed behavioural states. The electrolyte variations may be due to genetic defects in the enzymatic capacity of the "adenosine triphosphatase (ATPase) activated pump mechanism". It is of significance to note that an increase in serum magnesium and calcium occurs when lithium is administered either to animals or to man, in acute or chronic experiments (Mellerup *et al.*, 1973; 1976, Andreoli *et al.*, 1972).

In the present study, serum magnesium and calcium levels have been measured in ten maniacs and seven depressives before and during lithium therapy.

(a) A significant in increase in the mean serum total magnesium concentration has been observed after 60 days of lithium treatment (P .001).
(b) Mean total serum calcium concentration did not change significantly with lithium.

A deficiency of magnesium at the cellular level in the central nervous system has been thought of as the probable underlying defect in manics and depressive states Modes of action of lithium in affecting serum magnesium were discussed.

BIOGENIC AMINES AND DEPRESSIVE PSYCHOSIS. **Amanulla Baig and Sarada Subrahmanyam.** *Post-graduate Institute of Basic Medical Sciences and Madras Medical College, Madras.*

Biochemical studies in depressive psychosis have been reported in literature but no conclusive evidence regarding the nature and extent of their involvement is available. The error may be in the synthesis, release, metabolism or utilisation.

The important biogenic amines are the indole and catecholamines. They are not found as such in the CSF; but the metabolite of noradrenaline - MHPG, of dopamine - RVA, and of serotonin - 5-hydroxy indole acetic acid are present in measurable quantities.

The investigations were carried out in 40 cases of endogenous depression and 10 cases of exogenous or reactive depression, from the Govt. Mental Hospital and The Institute of Neurology, Madras. MHPG, HTA and 5-HIAA were assayed in the CSF and in urine VMA also was estimated. In a few cases plasma cortisol was also determined. In 10 subjects, analysis was done after administration of probenecid which blocks exit of acid metabolites from CSF.

Studies were conducted before and after medical and surgical therepy. The results indicate that there is a diminution of the amines in CSF and urine in both types of depression. Cortisol level was increased in exogenous depression. After probenecid, there was no significant difference in 5-HIAA level. The treatment whether medical or surgical, brought

about, a rise in the amine levels; but they were not restored to normal by either therapy though the patients were apparently normal clinically. A few patients were followed up for a period of 3 to 18 months.

EFFECT OF CYPROTERONE ACETATE ON MATING BEHAVIOUR IN MALE ALBINO RATS.* **Charanjit Kaur and H. K. Mangat.** *Department of Biology, Guru Nanak Dev University, Amritsar.*

The effect of high dose of cyproterone acetate (CA) is reported on different components of sex behaviour in male rats. Twenty male rats each after two matings with receptive females were given CA i.m. 10 *mg*/day dissolved in a mixture of benzyl benzoate and castor oil (1:1) for 28 days. Another group of 10 rats were given equal volume of the vehicle. Each animal (CA-treated animal as well as sham-treated rat) was given weekly mating tests after 7, 14, 21 and 28 days respectively. The observations were recorded on a polyrite (Inco, India). The licking frequency (LF), mount latency (ML), mount frequncy (MF), Interomission latency (IL), Interomission frequency (IF), Ejaculation latency (EL), erection frequency (EF) and post ejaculatiory period (PEP) were calculated. A significant decrease in LF, ML, IL, and EF and an increase in MF, EF and number of ejaculations per test was observed in both groups. There was no indication of any behavioural inhibition by CA over 28 days of treatment and the observed facilitation might be due to experience gained by repeated exposure to mating. None of females was impregnated when paired with treated males overnight. On autopsy, the epididymis, seminal vesicle and prostates were found to be considerably regressed in size and showed a decrease in wet weight. These organs also showed atrophical changes on histological examination. This shows that the synthetic steroid CA even in high doses exerts strong antiandrogenic properties with respect to accessory sex organs, but not with respect to androgen-dependent mating behaviour.

EFFECT OF CANNABINOL ON HUMAN BEHAVIOR. **N. Singh.** *Division of Pharmacology & Toxicology, Indian Veterinary Research Institute, Izatnagar (U.P.).*

Cannabinol was isolated according to the method of Mukhopadya *et al.* (1943). 5 *mgms* taken orally relieved headache after 30 min and after 13 hr judgement of itme could not be made. Partial forgetfullness, depraved appetite, dryness of mouth and partial loss of sensation by touch, sex depression and blurred vision were experienced after 13.30 hr., while auditory tone increased. It makes a person get absorbed in thoughts and continuous reading for a long period did not cause exertion or reduce the knowledge of the subject but indicated that very little reading was done. Continuous walking exercise for about 3 miles and over-eating were not conspicuous. Movements on the stairs were normal but a feeling of weightlessness was observed. Normal activities like plugging a heater in light or

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darkness and shaving were not much different excepting for more awareness and less pain under the influence of the drug.

In the female lactating volunteers, smoking of Cannabinol caused let down of milk and had no sedative effect on suckling babies.

One likes to take it after tiredness, nervousness and mental tension. Memory is not lost. One becomes purely non-possessive. Self-control is over-emphasized with a loss of jealousy and self-respect. One used to laugh away everything without considering things seriously. Concentration of mind is there but it is transient. Loneliness and calmness are more acceptable. "CANNABIS AND CALMNESS GO TOGETHER".

EFFECT OF PROSTAGLANDIN SYNTHETASE INHIBITOR ON PERMEABILITY OF BLOOD-BRAIN AND BLOOD-CSF BARRIER. **P. K. Dey and H. S. Sharma.** *Neurophysiology Research Unit, Department of Physiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi -221005.*

Many biologically active substance as well as few therapeutic agents are not effective for correction and treatment of certain neurological ailments, because of existence of physiological blood-brain and blood-csf barrier. Recently, several investigators have been successful in reversing the opening of such barriers following intracarotid injection of hypertonic electrolytes. The evaluation of opening of the barriers was made by observing the ability of a dye, Evans Blue (normally impermeable to brain) to penetrate the brain tissue and CSF after injection of hypertonic electrolytes.

In our laboratory we observed that prostaglandin synthetase inhibitor was also very effective in reversible opening of blood-brain; and blood-CSF barrier. Thus right intracarotid injection (external carotid branch tied) of Indomethacin (8-16 *mg/kg*) in urethane-anaesthetised rats makes the entry of bromophenol blue dye (normally impermeable) ipsilaterally into the cerebral cortical tissue, ventral hypothalamic area, dorsal surface of hippocampus and collicular region. The maximum permeability of the dye was observed within 6 to 15 minutes after indomethacin injection, and then there was a decline. It was further observed that the effect of indomethacin on permeabilty was relatively more pronounced on pial blood vessels than on choroid plexus. Similar finding was also observed in rabbits (1.2 to 1.5 *kg*.).

Intraperitoneal injection of indomethacin (10-20 *mg/kg*) was also effective in opening the barriers towards the dye which generally occurs after 30 minutes following the drug injection. It was observed that intraperitoneal injection of indomethacin was more effective in opening the barrier in older rats (200-400 g) than in younger rats (90-180 g) in which a higher dose of indomethacin (40 *mg/kg*) was required to increase the permeability of blood-brain barrier.

EFFECT OF HIPPOCAMPAL STIMULATION ON THE ESTRUS CYCLE IN RATS. **D. P. Thombre, V. Srinivasan and O. P. Bhatnagar.** *Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry—605006.*

Irregularity in estrus cycle followed by predominance of estrus phase was observed after bilateral hippocampal lesions in female rats, as reported in our previous studies. In the present work bilateral stimulation of the hippocampal area was carried out in adult female rats exhibiting 4-5 days estrus cycle, as studied by vaginal smears.

Stainless steel unipolar electrodes were implanted in the hippocampus bilterally under Nembutal anaesthesia (35 *mg/kg* ip). The electrodes were secured to the skull with dental acrylate and stimulation was effected by using rectangular uniphasic/biphasic pulses (frequency-100/sec. 0.5 m. sec. duration 50-3000uA 15 sec/on/off) for a period of 7-8 days The current strength was adjusted by observing animal behaviour and was reduced slightly, if animal showed signs of alerting response. Stimulation of this limbic area showed that the animal remains in diestrus during and immediately after stimulation period. The vaginal smear did not exhibit any estrus phase during these periods of stimulation.

PINEALECTOMY AND REST-ACTIVITY RHYTHM IN THE RAT. **V. Krishnan, S. Parvathi Devi and Chandrasekharan.** *Madurai Medical College, Madurai.*

These studies relate to the possible involvement of pineal control over the circadian rhythm in locomotor activity. Reiss *et al.* (1963) demonstrated that pinealectomy alters running activity in rats. Quay (1969) has suggested pineal control of phase-shift rate in circadian locomotor rhythms following exposure to varying photoperiods.

The present paper is concerned with wheel running activity of sham-pinealectomized and pinealectomized rats recorded in static 14L:10D conditions. With entrainment, both

The observations are :

Physical state	*Pineal gland*	*Raphe neurons*	*FSH & LH gonadotrophes*
Constant Illumination	Decreased serotoninergic fluorescence	Decreased serotoninergic fluorescence	Degranulated-increased release
Constant Darkness	Increased sertoninergic fluorescence	Increased sertoninergic fluorescence	Increased granularity-diminished release

groups of rats exhibited spontaneous circadian locomotor rhythms. The endpoint of activity was noted to be prolonged in daily records of pinealectomized rats as compared with the sham-pinealectomized ones. Such extended activity in pinealectomized rats is suggestive

of a delay in the onset of rest. Possible pineal involvement in control of rest-activity rhythm is being discussed.

THE INTERACTION BETWEEN THE PINEAL AND THE MIDBRAIN RAPHE NEURONS IN THE CONTROL OF ADENOHYPOPHYSEAL GONADOTROPHIC ACTIVITY. **N. M. Muthayya, S. Parvathi Devi, N. Hariharasubramanian and V. Krishnan.** *Madurai Medical College, Madurai.*

This paper attempts to bring out the role of the mid-brain raphe neurons in the control of adenohypophyseal gonadotrophic activity with the pineal gland intervening between these two sectors. Pineal inhibition with constant illumination and pineal hyperactivity in constant darkness have been proved. Under these two physical states of lighting and darkness, observations were made on the serotoninergic intensities within the pineal and the raphe neurons while parallel changes in adenohypophyseal gonadotrophes were noted. Fluorescence histochemical techniques were employed for this study.

Further, three experimentally induced changes were observed,

(a) Administration of DL Parachloropheny lalanine (PCPA), a serotonin antagonist, markedly reduced pineal and mid-brain raphe neuronal serotoninergic fluorescence.

(b) Melatonin, the specific pineal indole, on administration, did not alter pineal serotonin fluorescence while raphe neuronal 5-HT fluorescence was increased ;

(c) PCPA in combination with melatonin was administered and the findings on raphe nuclei are suggestive of "melatonin blocking the serotonin knock-out effect of PCPA".

The effects of these circumstances on adenohypophyseal gonadotrophin release were discussed.

EFFECT OF PROSTAGLANDIN SYNTHETASE INHIBITOR ON THE PERMEABILITY ON BLOOD-BRAIN AND BLOOD-CSF BARRIER. **P. K. Dey and H. S. Sharma.** *Neurophysiology Research Unit, Department of Physiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi-221005.*

Many biologically active substances and few tharapeutic agents cannot enter the brain because of existence of physiological blood-brain and blood-csf barrier. Recently, several investigators have been successful in opening such barriers reversibly following intracarotid injection of hypertonic electrolytes. The evaluation of opening of barrier was ascertained by observing the ability of Evans Blue (normally impermeable to barin) to penetrate the brain tissue and csf after injection of hypertonic electrolytes.

We investigated the role of prostaglandin of E series on permeability of blood-brain and blood-csf barrier in different species following intracarotid injection of PG synthetase

inhibitor drug, Indomethacin. The permeability of barrier was evaluated by observing penetration of bromophenol blue dye into the brain (which is normally impermeable to brain).

All the experiments were carried out under urethane anaesthesia and indomethacin and dye were injected slowly into right carotid artery. In rats, indomethacin (520 *mg/kg*) increased permeability of both blood-brain and blood-csf barrier towards dye within 6-10 minutes of drug injection, and by the end of 30 minutes, such increased permeability disappears. Similar results were obtained in rabbits also. The penetration of dye occurred in right cerebral cortical tissue, ventral hypothalamic zone, dorsal hippocampal area, and collicular regions. In guineapigs, indomethacin (10-20 *mg/kg*) produced dilatation of cerebral blood vessels along with penetration of dye in to the brain tissue. In pigeon, 10 *mg/kg* was ineffective but 20 *mg/kg* of indomethacin makes barrier permeable within 8-10 minutes and after 30 mins such permeability disappear. In frogs, a smaller dose, 5 *mg/kg* was very effective in opening the blood-brain barrier within 8 minutes with less effect on blood-csf barrier.

In lizards (Caletes versicolor), it was surprisingly observed that blood-brain and blood csf barrier was normally permeable to dye unlike other species. 30 *mg/kg* indomethacin produces closure of such permeability for about 5-8 mins. It can be suggested that PGE may play some important role in physiological mechanisms in blood brain and blood-csf barrier and the nature of function of PGE may be different in various species.

GLUCOSE AND SACCHARIN INTAKE IN ESTRUS CYCLE. **Farida Montero and M. G. Gogate.** *Department of Physiology, Goa Medical College, Goa.*

The intake of glucose and saccharin was determined in female albino rats and their relation to the various phases of the cycle studied. It was observed that the rats showed an increase in the glucose intake at estrus and an increase in the saccharin intake during diestrus. Ovariectomised animals show a general decrease in glucose intake and slight increase in saccharin intake. The glucose intake improved markedly when injections of Oestrogens and Progesterone were administered in ovarectomized animals. The significance of glucose and saccharin was discussed.

EFFECT OF A FLUORINATED ANDROSTANE DERIVATIVE ON OVUM IMPLANTATION IN THE MOUSE.* **S. K. Roy, Jayasree Sen Gupta and S. K. Manchanda.** *Department of Physiology, A.I.I.M.S., New Delhi—110016.*

Random bred Swiss female mice were mated overnight with the males and the finding of the sperm plug was designated as Day 1 of pregnancy. On the afternoon of Day 3 the ovaries were removed care being taken to preserve the oviducts and the animals were maintained on Progesterone 1 *mg* daily till the end of the experiment. In such ovariectomized mice the embroys enter into the nonsensitized uterus where they remain as dormant blastocysts till oestrogen is administered exogenously, when implantation is induced within a

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few hours. The present study was undertaken to assess the effect of an androgenic steroid, 9α fluoro, 17α methyl, 11β, 17-dihydroxy-4-androstane-3-one (FMA, Upjohn Company) on delayed blastocysts and on uterine stromal cell decidualization in ovariectomized progesterone-treated mice. In the first experiment FMA in doses of 500 μg in 0.1 *ml* propylene glycol was administered subcutaneously from Day 4 till Day 9 while the control group received the same volume of solvent vehicle only. In both groups 0.5 μg oestrogen was administered on Day 8 to induce implantation. The animals were autopsied on Day 11 and implant sites recorded and examined histologically. The animals receiving FMA prior to oestrogen showed large Day 11-like implants indicating that the androgenic steroid most likely prevented the blastocyst from entering into the inactive diapausing condition and caused its implantation. In the control group, however, oestrogen initiated implantation resulting in Day 2-like implants in all animals. In the second experiment the animals were given on Day 8 a single injection of FMA at two dose levels of 50 μg and 500 μg in 0.1 *ml* vehicle and the animals autopsied on Day 11. Implantation and decidual cell response could be elicited with only the higher concentration of the drug. Histological examination of the implant sites obtained from animals receiving FMA revealed abnormalities in embryo growth and development indicating that the androgenic steroid though capable of blastocystic activation and its subsequent implantation was unable to maintain pregnancy and resorption soon ensues. The biological significance of androgenic steroid action on diapausing mouse blastocysts and stromal cell decidualization was discussed.

EFFECT OF TAURINE ON BLOOD SUGAR IN RABBITS. **N. Gopalankutty, T. K. Padmakumari, M. Basinath and M. N. Guruswami**. *Department of Pharmacology, Kasturba Medical College, Manipal, Karnataka.*

Zhikhareva, A.I. *et al.* have reported (Deposited Doc. 1974, VINITI 731-74, 9 pp) that taurine in irradiated rats stimulated glycogen formation in the liver and decrease blood sugar levels by 50%. Present study was undertaken to study the influence of taurine on blood sugar in normal (non-irradiated) and in alloxinised (non-irradiated) rabbits. It was found that taurine could reduce blood sugar in both normal and in alloxinised animals. Significance of the finding was discussed.

PROBABLE INFLUENCE OF HORMONES ON TASTE PERCEPTION IN DIFFERENT STAGES OF GESTATION IN WOMEN. **V. Gopal and Savithri Natarajan.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P. G. Centre, Coimbatore.*

Voluminous literature is available on the diversified feed-back mechanisms of hormones in reproductive biology, but practically not much of work has been done on the

influence of hormones on taste perception, though abnormal taste function have been observed in patients with endocrine disorders such as adrenal and pituitary insufficiency.

Our earlier electrophysiological work in acute animal preparations has shown that hormones influence gustatory neural transmission. The present study was initiated to investigate taste response in women who are in different states of gestation. This included different stages of pregnancy, lactation and menopause.

The gustatory correlates of psychophysical scoring of human behaviour was obtained after stimulating the tongue with various substances such as glucose (0.5 M), Sodium chloride (0.1 M), acetic acid (0.015 N) representing sweet, salt and sour taste respectively. Specially devised questionaire helped to evaluate the stages of pregnancy and taste perceptive reaction.

Preliminary data obtained indicate that women in different stages of pregnancy show difference in gustatory perception as compared to women in normal stages (non-gestation). It seems that gustatory reception can be modulated by states of pregnancy, lactation and menopause. This was discussed in the background of hormonal feed-back.

ANTAGONISM OF RESPONSES TO PROSTAGLANDIN (PGE_1) BY SOME PHENOTHIAZINES. **Smita M. Patel, M. H. Panjwani and K. S. Sachdev.** *M. P. Shah Medical College, Jamnagar.*

Search for specific antagonists of prostaglandins has so far not been fruitful. Fried *et al.* (2), synthesised several compounds structurally related to prostaglandins, and reported various degrees of antagonistic activity against PGE_1 on the guinea-pig ileum and jird colon. Eakins, Karim and Miller (1), found that polyphloretin phosphate (PPP, antagonised PGE_2 and PGB_2 alfa induced contractile responses on Jird colon and rat uterus. This could not be confirmed in our laboratory. We have investigated the effect of broad spectrum antagonists, i.e. phenothaizines on the contractile responses to PGE_1 on rat fundal strip, guinea-pig ileum and rat uterus. It was found that all the three phenothiazines, i.e. chlorpromazine, promethazine and prochlorperazine, effectively blocked the contractile responses to PGF_1 in extremely small concentrations (varying from 10^{-8} to 10^{-5} *gm/ml*). Their antagonism was not specific, since the effects of other agonists were also blocked. The blockade was not however, due to local anaesthetic action, which required much higher concentrations.

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IMMUNO REACTIVE INSULIN RESPONSE IN MATURITY—ONSET—DIABETICS. **M. Viswanathan, C. Snehalatha, A. Ramachandran and Mohan Viswanathan.** *Diabetes Research Centre, Madras.*

Immuno reactive insulin (IRI) response to glucose stimulus was measured in 100 maturity-onset-diabetics. The results were analysed with respect to two parameters, viz. the severity of diabetes and the body weight of the patients.

Diabetics showed a delayed IRI response to glucose stimulus. A gradual transition from exaggerated IRI response to flat response was observed in diabetics with increasing severity of hyperglycemia. The overall output of insulin in mild diabetics was higher than in normal controls. Insulin output became gradually less in the moderate diabetics and the severe diabetics showed markedly reduced insulin response.

Although, intragroup variations were noticed among the three groups, it was clearly seen that the insulin response became weaker with increasing degree of glucose intolerance.

Obesity was found to be an important factor in determining the magnitude of the plasma insulin output. The mean insulin levels were much higher in the obese diabetics than in those with ideal body weight. The lean diabetics showed flat insulin responses.

DIURNAL VARIATIONS IN THE URINARY EXCRETION OF BIOGENIC AMINES. **S. Sivakumar and Sarada Subrahmanyam.** *P. G. Institute of Basic Medical Science, Madras and* **M. Vaithyalingam.** *Mental Hospital, Madras.*

The diurnal variations in the excretion of catecholamines and their metabolites, namely VMA and MHPG were studied in 24 adults and 12 children of both sexes. 5-HIAA, one of the metabolites of serotonin was estimated in 12 normal subjects and in cases of epilepsy. Three samples of urine were collected with all the necessary precautions at 8 hour intervals; the first sample from 6 AM to 2 PM, the second from 2 PM to 10 PM and the third from 10 PM to 6 AM.

These studies revealed that the maximum excretion of noradranaline, adrenaline, VMA, MHPG and 5-HIAA was in the first 8 hour sample in both men and women and least in the third sample collected from 10 PM till 6 AM. The same pattern is seen in children also. The results tend to indicate that the maximum excretion of amines occur during the period of highest activity and least during rest.

PLETHYSMOGRAPHIC AND ELECTRICAL RECORDING OF OVIDUCTAL ACTIVITY IN CONSCIOUS RABBITS AND THE EFFECT OF HCG. **Ratna Roy Chowdhary, S. K. Guha, Jayasree Sen Gupta and S. K. Manchanda.** *Department of Physiology, All-India Institute of Medical Sciences, New Delhi—110016.*

Oviductal motility at the level of isthmus was recorded in conscious rabbits by plethysmographic technique. The plethysmographic probes were so constructed so as to accomodate platinum electrodes for simultaneous recording of the isthmic electrical activity. The baseline activity of the oviduct during esturs was recorded intermittently over a period of 48 hrs. and showed plathysmographic waves with an average amplitude of 15-16 ohms, at a frequency of 9-10 waves per min., area of 700-800 mm^2/30 sec. and the frequency of electrical pulses was 4-5 pulses per min.

Administration of HCG (50 *I.U./kg* of body wt), for the induction of ovulation, produced marked changes in the plethysmographic as well as electrical activity of the isthmus. At 4-10 hrs after HCG injection there was a distinct decrease of the average wave amplitude and area covered by waves but an increase in the wave frequency as well as the number of electrical pulses per unit time. Thereafter both the amplitude and the area started increasing reaching a maximum at 36-48 hrs. (area 2300-2400 mm^2/30 sec. amplitude-60-65 ohms). The wave frequency on the other hand showed a decrease (6-7 waves per min) but the frequency of electrical pulses showed an increase (20-30 pulses per min). After 48 hrs. these changes started getting reversed till the baseline levels were reached after 70-72 hrs. These results fit in well with the existing data on ovum transport in the oviduct after HCG administration. Such an experimental model may be of use in screening drugs and hormones for their expected effect on oviductal motility.

A STUDY OF AMNIOTIC FLUID PROTEIN AND CREATININE AS AN INDEX OF FOETAL MATURITY. **O. P. Bagga, Y. Pinto-do-Rosario and R. Varghese.** *Lady Hardinge Medical College, New Delhi—110001.*

Obstetricians are frequently faced with the problem of accurate antepartum estimation of foetal maturity for the management of obstetrical problems like maternal diabetes toxemia, dysmaturity, erythroblastosis, placental insufficiency, elective repeat coesarean etc. With this object in mind the present study was conducted. Amniotic fluid obtained by transabdominal or by transveginal route from 70 normal gravid females admitted in Lady Hardinge Hospital for women, was investigated for creatinine, protein content and for percentage of orange stained Fat cells. Infants birth weight and gestational age was calculated by Naegele's rule.

Amniotic fluid creatinine had a linear relationship with the weight of the foetus. It increased, with increase in weight of foetus and a spread of 1,12 *mg* to 2,18 *mg*% was recorded. Amniotic creatinine value of 1.5 *mg*% was associated with an average birth weight of 2,250 G and gestational period of 37 weeks and above.

Further Amniotic fluid protein content had an inverse relationship to the foetal birth weight. It decreased from 397.78 *mg* percent ot 243.7 *mg* percent, when the weight of the foetus was more than 2500 grams.

Orange cells made their first appearance in one case at 35th week of pregnancy and the count was only 2 percent, but its count increased to 50 percent around 40th week. An orange cell count of more than 20% and amniotic fluid creatinine of 1.5 *mg*% and above, indicated, a birth weight of 2500 grams or more and gestation of 37 weeks and above.

RECOVERY OF AMINOPTERIN INDUCED OVARIAN CHANGES BY FOLIC ACID. **Rakesh Sharma, Usha Mathur and B.B.L. Mathur.** *Department of Physiology, G.R. Medical College, Gwalior.*

Administration of folic acid antagonist to the nonpregnent female albino rats causes cyst formation in the ovaries, congestion of ovaries & uterus, nuclear degenerative changes, increased number of atretic follicles and increased size of corpora lutrea. Folic acid administration (1 *mg*/100 *gm*. body wt.) daily for a period of 15-45 days to rats having been previously treated with Aminopterin (.001 *mg*/100 *gm* body wt) daily for 7-15 days, resulted in reduction in the number of atretic follicles, slight increase in the number of mature graffian follicles and gradual complete recovery of nuclear changes to normal. Aminopterin treated animals which were not given folic acid showed only slight recovery even after 90 days. Bone marrow which showed megaloblastic changes following administration of aminopterin recovered completely to normoblastic type after the administration of folic acid.

SERUM PHOSPHOHEXOSE ISOMERASE (PHI) AS A DIFFERENTIAL DIAGNOSTIC TOOL IN WOMEN TAKING OVULEN (1.0 mg). **Usha Gupta and K. P. Khuteta.** *Upgraded Department of Physiology, S.M.S. Medical College, Jaipur (Rajasthan).*

Serum Phosphohexose Isomerase (Glu. 6 PO_4 PHI Fruc 6. PO_4 was estimated (by modified method of Bodansky, 1954-as per Sigma Technical Bulletin No. 650-1974) in NORMAL healthy women (not suffering from malignancy, hepatitis and leukaemia etc) in reproductive age group, before and after taking 'OVULEN' (1.0 *mgm*— an 'oestrogenic progestin') for THREE menstrual cycles (i.e. 3rd, 6th, and 9th). A highly significant 'progressive' rise of PHI was observed ($P<0.001$). Thus, the rise of PHI values in serum after oral contraceptives (especially 'oestrogenic progestin' type) will be of considerable significance and must always be kept in mind for differential diagnosis with other conditions in which the values of this important enzyme rises.

PLASMA TESTOSTERONE LEVELS IN VESECTOMISED MEN. **G.C. Agarwala, V. Mishra and V. Bapat.** *Department of Physiology, M.L. N. Medical College, Allahabad-*211001.

The study was conducted in the year 1971 on sixty healthy office workers, all residents of Allahabad. They were divided in two groups—Group 'A' with n=24 (subjects

between the ages of 36 and 40 years) and Group 'B' with n =36 (subjects between the ages of 41 and 45 years).

In both the groups plasma testosterone level was measureed a month before and upto five years after elective vasectomy.

During the seven days after vasectomy there was a gradual fall in plasma tes osterone level irrespective of age. The maximum fall in plasma testosterone level from 0.81±0.10 to 0.58± 0.08 *µg*/100 *ml* (P< 0.05) in group 'A' and from 0.78± 0.08 to 0.60± 0.12 *µg*/ 100 *ml* (P>0.05) in group 'B' was observed on the seventh day after vasectomy. This fall in plasma testosterone level did not return to prevasectomy level even after five years, following vasectomy.

CHROMOSOMAL CHANGES AFTER THE ADMINISTRATION OF FOLIC ACID ANTAGONIST IN THE TESTIS OF ALBINO RATS. **B.B.L. Mathur, J. K. Goswami and Usha Mathur.** *Department of Physiolcgy, G.R. Medical College, Gwalior.*

Aminopterin, a folic acid antagonist, produces arrest of cell division in metaphase, and causes nuclear degenerative changes. Chromosomal changes in the meiotically and mitotically dividing cells of seminiferous tubules were studied in the rats treated with aminopterin .001 *mg* per 100 *gm* for 7-28 days. Squash preparations were made as described by Darlington *et al*. (1969).

Seven days after treatment with aminopterin, of the incidence in metaphase in Meiosis I, was reduced to almost 50%, while in meiosis II, there was no significant change. Chromosomal abnormalities, like sticky chromosomes in metaphase, lagging of Chromosome and anaphase bridges were observed in both meiosis I and meiosis II, the incidence being higher in the former than in the latter. On further treatment, the incidence of metaphase was further reduced both in meiosis I and meiosis II, and the frequency of chromosomal abnormalities progressively increased.

STUDY OF SYMPTOMS ASSOCIATED WITH MENSTRUAL CYCLE IN WORKING WOMEN OF ROHTAK (HARYANA). **K.K.Mahajan and B. K.Maini.** *Department of Physiology, Medical College, M.D. University, Rohtak.*

A study was carried out to find out the symptoms associated with menstrual cycle in working women of Roktak city. A total of two hundred women, 130 unmarried and 70 married, were studied subjectively, with a well documented questionaire. Female medical and nursing students, staff members of medical college and hospital and lady teachers of Women's college were included in this study. A high incidence of associated symptoms (96%) was

found both in married (98.5%) and unmarried women (94.5%). As many as 68% had to restrict their activity, though only 7% missed their work on the first day of the menstrual cycle. Passage of clots in the menstrual fluid was quite common (68%). Married women had statistically significant higher incidence of oedema (63%) including tenderness of the brests (34.3%). Psychological changes, irritability and nervousness were also more common in married (47%) than unmarried women (32%). Dermal changes like greasiness of hairs (40%) were more common in unmarried women.

EFFECT OF HIPPOCAMPAL LESION ON SPERMATOGENESIS IN RATS. **V. Srinivasan, D. P. Thombre, G. Anuradha and O. P. Bhatnagar.** *Department of Physiology, J.I.P.M.E.R., Pondicherry-605006.*

The limbic region of the brain influences the sexual behaviour and it is possible that this may be associated with endocrine effects. It was therefore planned to study the effect of hippocampal lesions on Spermatogenesis in rats.

Bilateral hippocampal lesions were produced by suction in mature male albino rats. The control group of rats were subjected to the same surgical procedure excepting the removal of hippocampus. Testicular histology of the control and experimental group was studied after two to four weeks of ablation, in sections of 5 μ thickness, stained with PAS- Iron Haematoxyline. The results show that the hippocampus may influence the testicular function as in our experimental group the spermatogenesis is decreased.

STUDY OF MENSTRUATION PATTERN OF SCHOOL-GIRLS IN POONA. **P.S. Gokhale and V. G. Ranade.** *Department of Physiology, B.J. Medical College, Pune.*

About 1200 girls from various schools in POONA were interviewed to find out the average age at the onset of menarche, average height in cms, and average weight in kg at the onset of menarche. Their menstrual pattern was also studied to assess the quantity of blood lost, to judge the duration of menstrual cycle, intermenstrual interval, and the frequency of pain and associated symptoms during the periods.

Information was also collected to find out the type of personal hygeine used by them during the period.

INFLUENCE OF STRESS ON CERTAIN PHYSIOLOGICAL FUNCTIONS IN PARABIOTIC ALBINO RATS. **N. V. Adinarayana Murthy and O. P. Bhatnagar.** *Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry—605006.*

Stress may be any influence, whether it arises from the internal environment or external environment which interferes with the basic needs. Stress can initiate a comprehensive pathophysiologic adaptation pattern which comprises a chain of complex interactions

involving the nervous system and endocrine glands and can alter the functional status in the organism. Though pregnancy in a biologically normal phenomenon, yet is an exceptional condition which tests the physiological and psychological reserves of women. It is also known psychic factors play a role in all forms of menstrual disorders. Hence it can be expected that stress can influence the course of pregnancy and may bring about some changes in the offspring.

Keeping this in view, an attempt was made to study the influence of stress on pregnancy, as well as on the foetus. Simultaneously, a study of influence of stress on other physiological functions, like body temperature, oxygen consumption, oestrous cycle, haemogram, gastric ulceration, etc. is carried out. This study was done in parabiotic albino rats in order to find out the effect of parabiosis itself on these parameters. Stress was induced by immobilization of the animals.

REGENERATION OF SPERMATOGENESIS WITH FOLIC ACID FOLLOWING ITS SUPPRESSION BY FOLIC ACID ANTAGONIST IN ALBINO RATS. **Usha Mathur and B.B. L. Mathur.** *Department of Physiology, G.R. Medical College, Gwalior.*

Farilier it was reported that aminopterin even in low nontoxic doses suppresses spermatogenesis. It causes reduction in cell counts of spermatogenic cells, chiefly the spermatogonia A_1, pachytene cells and spermatids. Besides it produces nuclear degenerative changes, like vacuolation and pyknosis. Following administration of aminopterin for 7 to 15 days (.001 *mg*/100 *mg* body wt), folic acid was administered in large doses (0.75 *mg*/100 *gm*) body wt.) daily for 7-48 days. After 7 days of folic acid administration, spermatogonia A_1 showed complete recovery. The counts of other sparmatogenic cells recovered gradually starting from 15 days, and returned to normal after 48 days. The nuclear degenerative changes were also reversed by folic acid commencing after 15 days. Control animals, which were not given folic acid after treatment with aminopterin did not show any recovery; on the contrary the degenerative changes progressed.

SOME OBSERVATIONS ON HUMAN SEMEN ANALYSIS. **S. Bhushan, R. C. Pande, S. P. Singh, P. Seth and D. N. Pande.** *Department of Physiology and Biochemistry, B.R.D. Medical College, Gorakhpur (U.P.).*

Data on semen examination in healthy Indian subjects has been scanty. There is at present no standard criterion of normal values of semen in Indians. The present study was undertaken with a view to establish normal values for semen analysis in healthy Indian subjects.

Unmarried students of the Medical College, Gorakhpur, U.P., volunteered for this study. After routine clinical and laboratory examination only healthy subjects were selected. Semen samples were collected in the day time after three days of abstinance from ejaculation.

A higher liquefaction time, pH, motility lower sperm count and abnormal forms were observed. Significant differences in liquefaction time, pH and sperm count in non-vegetarians and vegetarians were also found. Studies to confirm the validity of above observations are further advocated.

THE EFFECTS OF ORAL CONTRACEPTIVE ON ANTI-PROTEASES ACTIVITY. **R. B. Singhal, Nawal Kishore, V. Rizvi, R. V. Sharma and B.B. Sharma.** *Department of Physiology, S.N. Medical College, Agra.*

Alpha-1-antitrypsin enzyme, alpha-2-macroglobulin and STIC were estimated in 50 healthy females. They were put on oral contraceptive therapy. Enzyme activity was measured in each subject at intervals of three sucessive months. The enzyme activity was significantly raised ($P < .001$) after the use of oral contraceptive. The enzyme levels in one deficient subject (heterozygous) became normal after therapy. The significance of these observations was discussed.

A STUDY OF CONTRACEPTIVE STEROID—EFFECT ON SERUM ELECTROLYTES AND ABSOLUTE EOSINOPHIL COUNT IN WOMEN. **V. S. Rathore, Som Nath and K. P. Khuteta.** *Upgraded Department of Physiology, S.M.S. Medical College, Jaipur-302004.*

The effect of oral contraceptives (combination type) on serum electrolytes and absolute eosinophil count was studied in 140 normal women after the third, sixth and nineth consecutive menstrual cycle. A significant fall of potassium and eosinophil count, with a slight rise of sodium (within normal limits) was observed. This is possibly due to the direct action of sex hormones on the adrenal cortex and increased activity of renin-angiotensin aldosterone mechanism.

A STUDY OF CERTAIN HAEMATOLOGICAL AND METABOLIC CHANGES DURING PRE-OVULATORY PERIOD. **H. N. Mehrotra, M. C. Pant, G. K. Tandon and V. K. Negi.** *Departments of Physiology and Biochemistry, L.L.R.M. Medical College, Meerut (U.P.)*

Changes in the levels of serum cholesterol, blood ascorbic acid, the absolute eosinophil count and the platelet count have been studied during preovulatory period in the same woman, with a view to find out whether there is any correlation with blood hormone levels and the period during which preovulatory oestrogen peak and LH urge is expected.

Day of ovulation was ascertained by BBT method. Blood samples were collected on 1st, 8th, 11th, 14th and 15th day after the onset of menstrual flow. Values obtained from the samples of the 1st day served as control. Ascorbic acid manifested a rising pattern on successive days having attained a peak value in the preovulatory period on the day preceding the ovulation. There was a fall in blood cholesterol throughout the pre-ovulatory period with maximum decrease on the day of ovulation. Absolute eosinophil count was observed to attain a peak value in the preovulatory period without an appreciable change in count.

GUSTATORY RESPONSES DURING ESTRUS CYCLE IN RATS. **R. Kanaka, S. Dua-Sharma and K. N. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore-560034.*

Gustatory responses were assessed in rats during estrus cycle by giving a two-bottle choice test for one hour daily. Glucose (13.5%), Sodium saccharin (0.2%) sodium chloride (0.9%), citric acid (0.004%) and quinine sulphate (0.002%) was each paired with water and the particular solution was presented every day for one week. Two days gap was given between two different solutions when only water was made available in both the bottles in the one hour test. The percentage preference was calculated by taking the total fluid intake. In addition body weight, food and water intake were measured daily. A preference for 13.5% glucose and 0.2% sodium saccharin was seen during proestrus phases; 0.9% sodium chloride showed a gradual decrease with a 50% preference at metestrus. The preference for citric acid increased during proestrus and was minimal during metestrus. By contrast, the preference for quinine showed a 2-fold increase from diestrus through proestrus and estrus reaching a maximum of 70% during metestrus. Body weight showed a decrease during proestrus and estrus phases. Periods of lowest food and water intake was observed during estrus phase.

INVOLVEMENT OF BIOGENIC AMINES IN SEXUAL DISORDERS, PREGNANCY AND HYPERTENSION. **N. Suthanthirarajan.** *Department of Physiology, P.G. Institute of Basia Medical Sciences, University of Madras, Taramani, Madras.*

The role of Biogenic amines and their metabolites in certain conditions of reproductive behaviour have been investigated. It is well established that altered amine metabolism will lead to changes of sexual behaviour patterns in animals (Shillito, 1969; Redmond, et al, 1971). However, there is still a controversy on the exact involvement of biogenic amines in sexual behaviour. Not much information is available on human subjects. Therefore, in the present studies, Vanilymandelic acid and 5-hydroxyindoleacetic acid in 24 hours urine samples were estimated in human subjects with the following

disorders : (a) Primary amenorrhoea ; (b) Secondary amenorrhoea ; (c) Male infertility (d) Hypertension; and few cases of normal pregnancy.

It is seen from the results that the levels of VMA and 5-HIAA were considerably lower in primary amenorrhoea and pregnancy, they remained unchanged in secondary amenorrhoea and male infertility. Elevated values were noted in hypertension especially in females. The results have been analysed in the light of available information.

IMPROVED TECHNIQUE FOR ELECTROEJACULATION IN ABINO RATS. **Runbir Singh Hundal, Charanjit Kaur and H.K. Mangat.** *Department of Biology, Guru Nanak Dev University, Amritsar.*

Sixteen albino rats were successfully electroejaculated repeatedly after an interval of one week. Liquid and coagulated ejaculates were collected separately by the electrical stimulus of same strength. The equipment used was made of a bipolar rectal probe electrode which was made of stainless steel rod 1/16 inch diameter fitted in a probe and insulated from each other by a sieve. The probe was 3/16 inch in diameter and 2/5 inch in length. The electrodes were 1.1 inch apart. The source of electrical stimulus was 1 Kilo cycles per second AC and the voltage was raised from zero to a maximum of 10 volts with a unit of stimulation of 1.5 volts, in a train of pulses, each with 4 msec duration and with 4.5 msec delay between them for a period of 5 seconds with an interval of 10 seconds of no stimulus. All the animals ejaculated successfully at a maximum of 10 volts and produced consistent amounts of coagulum and liquid ejaculate with constant sperm count. The technique is of immense experimental value due to the fact that surgery need not to be involved and mortality is negligible.

PERCENTAGE DISTRIBUTION OF ABO BLOOD GROUPS IN A RANDOM SAMPLE OF 1000 PERSONS AND ITS RELATION WITH SEX & RELIGION. **Nandini B. Kotmire and C. S. Narayana Setty.** *Department of Physiology, J.N. Medical College, Belgaum.*

In 1910 Hirszfeld and Von Durngern discovered that blood groups were inherited as mendelian characters and there were racial differences in the distribution of blood groups. After Hirszfeld's observation, many workers found out the frequency distribution of blood groups in their respective studies.

The present study was carried out :—

(1) To establish frequency of dstribution of ABO blood groups in Hubli and surrounding areas of Dharwar District (Karnataka).

(2) To find out the effect if sex and religion on this distribution.

The study comprises of 1000 persons consisting of 600 males & 400 females of Hindu and Muslim origin. Plane glass slide method was used for determining ABO blood groups.

It was observed that frequency distribution of blood group 'O' was 33.77% and 'AB' was 8.4%. Further it was observed that there was no statistically significant difference in the distribution of blood groups between males and females. But there was statistically significant difference of 1% in the frequency distribution of blood group 'AB', in Muslims of either sex and also in Hindus of either sex. Detailed survey is required to explain the high frequency distribution of blood group 'O' in South India as compared with high frequency of blood group 'B' in other parts of India.

ABO BLOOD GROUP SECRETOR AND NON-SECRETOR STATUS OF 815 SUBJECTS. **Mandakini Sudhakar Pansare, Ameeta N. Adhiya, S. D. Lokhare and V. G. Ranade.** *B.J. Medical College, Poona.*

The secretor and non-secretor status of 815 subjects belonging to blood groups A, B, AB and O was determined by using the saliva sample of the subject. Anti-A and Anti-B sera were used for blood groups A,B and AB subjects and an extract of Ulex Europeas was used for blood group O subjects. The combined and groupwise value of secretor and non-secretor status was compared with the values of other workers. The gene frequency was calculated and compared. The results were discussed.

EFFECT OF ENVIRONMENTAL TEMPERATURE ON BLOOD VOLUME. **Ajit Bhattacharya.** *Department of Physiology, Christian Medical College, Ludhiana.*

There is ample evidence that the circulating blood volume of an individual may vary to some extent on exposure to warm or cold environment. One of the factors which determines the extent of variation is the duration of exposure. In Punjab the environmental temperature varies considerably, the maximum being 45°C or more in the months of May & June & the minimum being 5°C or less in the months of December & January. Blood Volume (from plasma volume by dye dilution and P.C.V. and expressed as *ml/kg* body weight) was estimated in (about 100) medical students and nurses. In one group, studied in the early summer & winter (to ascertain the effect of short exposure), showed mean blood volumes of 91.0 *ml* in summer & 82.0 *ml* in winter, in 24 males and 77.3 *ml* in summer and 66.3 *ml* in winter in 18 females. The changes in both sexes were highly significant $P < .01$. The second group studied in late summer & winter (to show the effects of prolonged exposure) showed mean volumes of 83.2 *ml* in summer and 83.5 *ml* in winter in 28 males & 76.3 *ml* in summer & 71.5 *ml* in winter in 26 females. The changes were not statistically significant. Present studies indicate that blood volume is increased on intitial

exposure to heat as compared to cold. The magnitude of change decreases with prolonged exposure. Females show more marked & consistent change.

EFFECT OF SUPPLEMENTARY VITAMIN 'C' ON BLOOD COMPONENT VALUES. **P. K. Jain, K. Keshavaram, V. R. Athwale and Bhaskar Rao.** *M. R. Medical College, Gulbarga (Karnataka).*

Effect of Ascorbic acid on blood glucose, cholesterol etc. have been studied amply but few attempts have been made to study its effect on haematological values like Hb., W.B.C., E.S.R. etc. 30 medical students, divided into 3 groups A.B.C. of 10 each, were subjected to clinical trial. Vitamin C in doses of 100, 500 and 1000 *mg* a day was given to A, B and C group respectively after taking blood sample for E.S.R., Hb, total and differential W.B.C. Investigations were repeated after 1, 2 and 3 weeks in each group.

No change was observed in 'A' group except that the neutrophils showed a decrease of 20.37% after 2nd week. 'B' group (500 *mg*/day) Hb. E.S.R. and total W.B.C. showed no signiflcant change but neutrophils decreased by 24.49% and lymphocytes increased by 22.7% at the end of 2 weeks which was statistically significant. 'B' group (1000 *mg*/day). Hb did not change even after 3 weeks. E.S.R. showed increase of 78.07% after 2 weeks, total W.B.C. increased by 43.02% at the end of 2nd week coming back to normal after 3rd week. Neutrophils decreased by 27.27% and 32.71% at the end of 1st week and 2nd week respectively coming back to normal after 3rd week. Lymphocytes showed an increase of 35.37% and 51.22% after 1st and 2nd week respectively coming back to normal after 3rd week. Values were statistically sginificant in most of the cases.

DISTRIBUTION OF ABO GENE FREQUENCY IN SOUTHERN MAHARASHTRA. **B. V. Reddy, S. K. Ganeriwal, V. D. Degaonkar and R. S. Kulkarni.** *Dr. V.M. Medical College, Solapur (Maharashtra).*

The study was carried out on 5721 individuals of Southern part of Maharashtra to determine the distribution of ABO blood groups and their gene frequencies. The study revealed that the percentage distribution for A,B,O, and AB were 27.44%,29.42%, 36.48% and 6.66% respectively. The gene frequencies were 18.89% for gene A; 20.13% for gene B; and 60.96% for gene 0.

The present study showed the highest incidence of 'O' group (36.48%), resemble closely those of southern states of India, while North Indians have higher frequency of gene B.

HAEMETOLOGICAL CHANGES DURING EXERCISE. **N. D. Kuchabal and C.S. Narayana Setty.** *Department of Physiology, Karanataka Medical College, Hubli.*

The effect of exercise during bicycle ergometer was studied in 70 boys who were apparently in good health. The following parameters were studied.

(1) Hb%, (2) R.B.C. count, (3) Total leucocyte count, (4) Polymorphonuclear leucocyte%, (5) Lymphocyte%, (6) Monocyte%, (7) Eosinophil%, (8) Eosinophil count, (9) Lymphocyte Count, (10) Polymorphonuclear leucocyte count, (11) Monocyte count were studied and results are tabulated.

Parameters	*Change in %*	*Significance*
Hb% in G	+ 6.6	S
R.B.C. count	+15.2	S
Total Leucocyte	+12.5	S
Polymorphs %	—14.3	S
Lymphocyte %	+22.7	S
Monocyte %	+35.0	S
Eosinophil %	—61.2	S
Polymorph count	—0.74	N.S.
Lymphocyte count	+33.8	S
Monocyte count	+42.3	S
Eosinophil count	—36.8	S

'S' means Significant
'N.S.' means Not Significant

The results of the similar study on girls were presented.

EVALUATION OF NORMAL SERUM CHOLESTEROL LEVELS IN INDIAN PEOPLE OF DIFFERENT AGE GROUPS. **Surekha Devi, Kalpana Das, A. K. Kar and A. K. Acharya.** *Department of Physiology, S.C.B. Medical College, Cuttack.*

Despite a host of biochemical parameters like serum T.G., F.F.A. and different fractions of lipoproteins studied in recent years, cholesterol estimation is most useful in cardiovascular disease. The normal values in different age groups of Indians as reported by various workers, show a wide range of variability. Most of the workers have estimated cholesterol according to the Scakette's method. A comparatively simpler and more accurate method has been used by Kim & Goldberg (1969) for estimation of cholesterol, avoiding the cumbersome and time consuming procedure of protein precipitation.

The present work comprises the sutdy of serum cholesterol according to method of Kim & Goldberg on 300 subjects of varying age groups with different nutritional status.

The values have been statistically analysed and compared with the reports of other workers. An attempt has been made to find out the normal range in accordance with different age groups.

CIRCADIAN RHYTHM OF CIRCULATING EOSINOPHILS. **K. C. Barthwal, L. Paramasivam, M. S. Patel and R. C. Agarwal.** *M.L.B. Medical College, Jhansi (U.P.).*

Cortisol administration produces a rapid fall in circulating eosinophils (Nelson 1953). Hudson (1964) found that adrenocorticoids interfere with the discharge of eosinophils from the marrow reserve into the circulation. As cortisol concentration in blood shows circadian rhythm, it is suggested that this rhythm may reflect on the total number of circulating eosiophils. Mills (1970) has reported cyclic diurnal variation of eosinophils with a decrease in the morning while Acland (1956) has stressed that there is no pattern common to all subjects and that day to day differences were found in the same subject.

The present study was conducted in a group of medical students. Total eosinolphil count was done every four hour upto twentyfour hours. A definite pattern of circadian rhythm was found. The investigation was discussed in detail.

CORELATION BETWEEN 'ABO' BLOOD GROUP & FINGER PRINTS. **L. Paramasivam, M.S. Patel, R. C. Agarwal and K.C. Barthwal.** *M. L. B. Medical College, Jhansi (U.P.).*

Blood Groups are genetically determined. Finger prints develop during thirteen to fifteenth week of Intrauterine life and pattern of these prints is determined genetically (Roberts : 1959) The association between blood group and finger prints have been reported by various authors. Neel (1964) reported an increase in whorls and decrease of loops in blood group 'O' while Otto (1968) founds no relationship between digital pattern and Rh factor.

In the present study fiinger prints pattern was studied in a group of medical students and professional blood donors. The study was discussed in detail.

EFFECT OF 50% INTRAVENOUS GLUCOSE ON FIBRINOLYTIC ACTIVITY OF BLOOD (AN EXPERIMENTAL STUDY). **S. B. Gupta, B.B. Sharma, S. Sharma, V. Agarwal and D. N. Pandey.** *Department of Physiology, S.N. Medical College, Agra.*

Present study was conducted in 20 rabbits of either sex weighing between 1.5 to 2 kgs to observe the effect of 50% I.V. glucose (1 cc/kg of body weight) on euglobulin lysis time (ELT) at various intervals (30,60,90, 120 and 180 minutes) by Von Kaulla modified technique (Menon *et al.*, 1969). The administration of 50% I.V. glucose caused a progressive increase in ELT which reached a peak after 60 minutes. This was followed by

gradual decline and returned to normal after 180 minutes of injection. The clinical significance of increased ELT after I/V administration of 50% glucose was described.

OBSERVATIONS ON PERIPHERAL BLOOD-SMEAR EXAMINATIONS IN THE TRIBAL POPULATIONS OF SANTHAL PARGANAS IN BIHAR. **K. P. Sinha.** *Department of Physiology, Govt. Medical College, Bhagalpur (Bihar).*

Six hundred subjects from Santhal Paharia tribals of Bihar were studied for abnormal findings in the peripheral-blood smear. It was interesting to note that in 80% of the cases, target cells were found and also in more than 50% of the cases three lobes in the nucleus were deserved in the Amith Cooke Count. The probable causes for the shift to the right in the Ameth Cooke-Count as well as for the preponderance of target cells were discussed.

HAEMOTOLOGICAL CHANGES AS A CONSEQUENCE OF RODENTICIDE TREATMENT IN A RAT AND GERBIL. **K. Srihari and Shakunthala Sridhara.** *Department of Vertebrate Biology, University of Agricultural Sciences, G.K.V.K. Campus, Bangalore.*

Toxicological studies of rodenticides are limited to the determination of LD_{50} for a few rodent species. In this study two acute posions viz. phosphide and 'vacor' were administered in sublethal quantities to both the sexes of Bandicota bengalenis and Tatera Indica and the haemotology studied to assess the relative suceptibilities. Percent weight loss was sex dependent in gerbils and poison dependent in bandicoots. RBC count increased in both the sexes and WBC counts decreased in males of gerbils, while in bandicoots only Zinc phosphide resulted in changed RBC count. Differential count of only female bandicoots and male gerbils was altered. In bandicoots 'vacor' increased platelet counts and zinc phosphide decreased the same. However, in gerbils only 'vacor' poisoned males exhibited changes in platelets. Clotting time was dependent on sex, poison and species. The results indicate differential susceptibilities of the two species and the two sexes to the posions suggesting the necessity of a pre-control analysis of rodent populations to select the most suitable rodenticide.

CARDIO-RESPIRATORY PROFILE IN DOGS. EFFECT OF ANAESTHESIA, BUFFER NERVES AND SPINAL INFLUENCES. **T. P. Suresh and K. N. Sharma.** *Department of Physiology, Veterinary College, University of Agricultural Sciences, Hebbal, Bangalore.*

Analysis of basal values of 23 paraldehyde (PLD) anaesthetised dogs (in four subgroups) and 24 chloraloseurethane (C&U) anaesthetised dogs (in four subgroups) and the study of quantitative effect of vagotomy and/or CS denervation and spinal transection in six different groups of dogs (total 78 dogs) has shown that grouping error could cause intergroup differences in basal values of cardiovascular and respiratory parameters in dogs under same anaesthesias. Type of anaesthesia could greatly change the basal heart rate, respiration and amplitude of ECG waves. Paraldehyde anaesthesia results in tachycardia and ECG amplitude change while C&U anaesthesia has no such effects.

The heart rate, respiration and ECG changes resulting from vagotomy are greatly influenced by the type of narcosis. PLD anaesthesia masked the effect of vagotomy on heart and respiratory system but not C&U anaesthesia. Abolition of vagal and CS afferent impulses increase the sympathetic activity leading to tachycardia and peripheral vasoconstriction and increased amplitude of ECG wave which are quantatively similar when these denervations are performed either alone or together. Spinal transection with or without vagotomy resulted in an acute fall in blood pressure and amplitude of Q R S but the fall in peripheral blood flow was variable, especially in the earlier group.

HEART RATE REGRESSION PATTERN DURING INFUSION OF FLUIDS IN INTACT, BUFFER NERVE DENERVATED AND SPINAL DOGS. **T. P. Suresh and K. N. Sharma.**
Department of Physiology, Veterinary College, University of Agricultural Sciences, Hebbal, Bangalore.

The heart rate (HR) regression pattern was studied during infusion schedule (0.5 to 0.9 *ml/kg/min* given to a dose of 100 *ml/kg* body weight or more) of normal saline, Ringer-Locke and tender coconut water (TCW) in three intact groups each of Paraldehyde and Chloralose-Urethane anaesthetised dogs. RL infusion schedules were repeated in six separate groups of vagotomised and/or carotid sinus denervated and spinal dogs with or without intact vagi. Generally, the infusion schedules in intact dogs caused initial tachycardia followed by a bradycardia reaching basal or even below basal HR. The HR changes in intact dogs were found to be independent of the initial HR but were profoundly influenced by type of narcosis, composition of infusion fluid. The mean % HR changes during infusion could be predicted accurately as indicated by high R values. The tachycardia seen during initial stages of infusion appeared to be due to an increased right atrial pressure but the bradycardia seen during later infusion stages was the result of increased vagal tone. TCW infused to an extent of 100 *ml/kg* body weight has no deleterious effect in chloraloseurethane anaesthetised dogs, but it caused tachycardia by changing serum Na^+, Ca^+ and K^+ composition. Vagotomy and CS denervation performed separately decreased the amplitude of infusion induced initial tachycardia but only the vagotomy abolished infusion induced bradycardia seen in later infusion stages: the combined surgery abolished both tachycardia and bradycardia. In spinal dogs, infusion *per se* increased HR which was abolished by simultaneous vegotomy.

BLOOD PRESSURE REGRESSION PATTERN DURING INFUSION OF FLUIDS IN INTACT, BUFFER NERVE DENERVATED AND SPINAL DOGS. **T. P. Suresh and K. N. Sharma.**
Department of Physiology, Veterinary College, University of Agricultural Sciences, Hebbal, Bangalore.

The sequential blood pressure (BP) changes were recorded during infusion of normal saline (NS), Ringer-Locke (RL) and tender coconut water (TCW) given at a clinically feasible rate of 0.5 to 0.9 *ml/kg/min* upto a dose of 100 *ml/kg* body weight or more. The

fluids were infused to three groups each of Paraldehyde (PLD) and Chloralose-Urethane (C & U) anaesthetised dogs. NS had no significant effect on BP under both anaesthesias. RL increased BP in PLD group but had no effect in C&U group. The regression lines fitted to % BP changes during various infusion stages had high R value. The infusion schedules increased BP invariably during initial stages but BP decreased towards basal or even below basal level in later stages. TCW infusion upto 100 *ml/kg* body weight was safe in C&U group where it did not change BP significantly. RL infusion vagotomised dogs increased BP in PLD group but not in vagotomised C&U group indicating that vagotomy prevented infusion induced hypertension of C&U group. Carotid sinus denervation also prevented such RL infusion induced hypertension. The combined vagotomy and carotid sinus denervation, however, changed the BP response pattern; where infusion caused initial BP fall but produced an increase during later infusion stages. RL infusion in spinal dogs increased BP linearly upto 50 *ml* stage and then BP decreased with the increasing infusion stage. This fall in BP in later half of the infusion schedule could be prevented by simultaneous vagotomy.

EFFECT OF RESPIRATION ON MEAN FRONTAL P, Q R S & T WAVE AXIS IN NORMAL YOUNG ADULTS. **S.I.B. Rizvi, M.M. Singh, C.B. Bagga, S. B. Mishra and P. Seth.** *Departments of Physiology and Medicine, B.R.D. Medical College, Gorakhpur (U.P.).*

Influence of respiration on electrocardiographic changes has received little attention in literature. Fiftyone medical students had volunteered for this study.

Deep inspiration shifted the mean frontal plane axis of all the P, Q R S and T waves to the right and deep expiration to the left. The change in axis varied from one degree to 64 degree. Greater degree of change in axis was observed in cases where the axis was between 0° to 30° and on the other hand minimum degree of change was observed where the axis was more close to 90 degrees.

In none of the cases QRS axis changed from normal to abnormal with deep inspiration.

THE ANTIARRHYTHMIC PROPENSITIES OF ALPHA CEPTOR ANTAGONISTS ON CORONARY LIGATED AND CATECHOLAMINE TREATED DOG'S HEART. **T. Bharghava, R. D. Srivastava and V. M. Bhatnagar.** *Department of Physiology, G.S.V.M. Medical College, Kanpur (U.P.)*

Ligation of anterior descending branch of left coronary artery in 15 dogs under nembutal resulted in the appearance of solitary or multiple ventricular ectopic beats in 4 dogs (26.6%) within half an hour. These spontaneous arrhythmias could be successfully reverted to sinus rhythm by phenoxybenzamine (7.5 *mg/kg.* I.V.) in one dog. Phentolamine (1.8 *mg/kg.* I.V) also attenuated the arrhythmias significantly in one dog, but failed to do so in another dog even with a dose of 5 *mg/kg.* In the fourth dog arrhythmias were short

lived and disappeared spontaneously prior to treatment with antagonistic drugs. Administration of antagonists was always followed by hypotension.

In animals without spontaneous arrhythmias, repeated bolus injections of NE or E 10 *μg/kg*. I.V. each, at 15 min. interval produced supraventricular ectopics, ventricular bigeminy, multiple ventricular ectopics or ventricular tachycardia, singly or in combinations. These animals were than treated with bolus injections of antagonists and 15 min. later subjected to aforesaid catecholamine treatment. The severity of pre and post antagonist arrhythmias was compared.

Animals were divided in two groups: Group I, comprised of 8 dogs including one with spontaneous arrhythmias. Phenoxybenzamine (5-15 *mg/kg*) significantly blocked NE induced arrhythmias in 6 dogs (75%) and completely abolished in other two (25%). Group II, comprised of 7 dogs including three with spontaneous arrhythmias. Phentolamine (1.25 *mg/kg*) signifacantly attenuated arrhythmias in three out of five (60%) NE treated animals while it offered complete protection in the remaining two (100%) E treated animals.

HISTAMINE RECEPTORS IN RABBIT ATIRA. **R. D. Srivastava.** *Department of Physiology, G.S.V.M. Medical College, Kanpur (U.P.)*

Spontaneously beating isolated atria of rabbits responded to histamine with positive chrono and inotropism. However, the inotropic response was decidedly greater than chronotropic action. The dose response curves of histamine for both chrono and inotropic effects were markedly shifted to right in presence of 0.5 *μg/ml* metiamide (H_2-receptor antagonist), which *per se* augmented the control amplitude in all the expermients. Similarly, a shift to right was observed with promethazine (0.6 *μg/ml*) for both the responses, though the right shift of inotropic response curve in case of promethazine (H_1-receptor antagonist) excelled over that with metiamide, suggestesting a greater share of H_1 than H_2 receptors, in mediation of positive inotropic response. Unlike metiamide, promethazine did not alter the control of amplitude. The present study, thus lends evidence for dual histamine receptors in rabbit atrium.

DUAL ADRENOCEPTOR AFFINITY OF PHENYLEPHRINE IN RABBIT ATRIA. **R. D. Srivastava, M. Balitha, P. Varma, R. C. Pandey and V. M. Bhatnagar.** *Department of Physiology, G.S.V.M. College, Kanpur (U.P.)*

Phenylephrine exerted a positive chrono and inotropic effect on isolated spontaneously beating reserpinised atria of rabbits. Premedication with Serpasil (5 *mg/kg* subcutaneously) was done 24 hours earlier. Addition of phenoxybenzamine and phentolamine resulted in a depression of control contractile amplitude. Practolol, however, was devoid of this effect. The positive chrono and inotropic responses to phenylephrine were significantly ($P < 0.05$) antagonised by all the three blockers used. It is, therefore, suggested that phenylephrine exerts its cardiostimulant effect through mediation of both, alpha and

beta$_1$ adrenoceptors. A probable mechanism of action could be, that phenylephrine acts on some specific chemical group, shared by alpha and beta$_1$ receptors. This specific group is probably blocked by both alpha and betaceptor antagonists separately, since phenylephrine becomes ineffective in the presence of these antagonists.

FREQUENCY DEPENDANT HYPERTENSIVE RESPONSE OF SPLEENIC NERVE STIMULATION. **B. V. Thapliyal, S. N. Shukla and H. N. Mehrotra.** *Department of Physiology, L.L.R.M. Medical College, Meerut (U.P.).*

This study was carried out on 10 adult healthy mongrel dogs of both sexes. Weight of each dog was around 10 *kgs*. Nembutal was used as an anaesthetic. The duration of the stimulus to the splenic nerve was kept constant at 10 secs. Farradic current was used (8 volts). The frequencies used were 5/sec., 10/sec., 20/sec., 30/sec. & 50/sec. Rise in blood pressure was seen in all but the maximum rise in blood pressure was observed only at the frequency of 30/sec. It has also been observed that the rise in blood pressure was less with increased frequencies above 30/sec., and with decreased frequencies below 30/sec.

RESPONSE OF ISOLATED MAMMALIAN HEARTS OF DIFFERENT SPECIES TO OXYGEN LACK. **S. Datta, G. Ahmed and R. P. Bhargava.** *Ghandhi Medical College, Bhopal (M.P.).*

Isolated hearts of rabbits, guineapigs, white rats and domestic rats were perfused with Ringer Locke's solution but without bubbling O_2 through the perfusion fluid. It has been an interesting observation that mammalian hearts of different species behave differently to the lack of oxygen in the perfusion fluid. Hearts of domestic rats withstood the oxygen deprivation surprisingly well. On an average the heart continued to beat for 3 hours although after about 1½ hours it was observed that the heart rate slowed down and the heart ultimately stopped in diastole. The response varied in the different species. Such a species difference in respect of response to O_2 lack could not be traced in literature. A comparative histochemical study of the cardiac muscle in different species may perhaps reveal the underlying cause for such a variation in response to O_2 lack.

EFFECTS OF ACUTE HYPERCALCEAMIA ON THE HEART - AN EXPERIMENTAL STUDY IN MONGREL DOGS. **Veena Agarwal, Nawal Kishore, K.M. Agarwal, R. V. Sharma and B.B. Sharma,** *S.N. Medical College, Agra (U.P.).*

The effect of 10% calcium was studied on blood pressure and electrical activity of the heart in mongrel dogs. B.P. rose significantly after infusion of calcium solution ($P < .001$). Heart rate lowered and P-r Interval prolonged. Mean QRS duration prolonged while QT internal was shortened. QTC interval was significantly altered ($P < .01$) which indicated that cations, shortened the mechanical systole of the heart. The effect of calcium started within one hour of infusion, peak response came after two hours and the activity remained increased for 3-4 hours. Direct action of the cation on the heart is suggested.

CERTAIN STUDIES OF SEROTONIN ON BLOOD PRESSURE AND RESPIRATION. **K. Seetha Devi and R.G.N. Sumponia Hartwig.** *Department of Physiology, Guntur Medical College, Guntur (A.P.).*

Intravenous serotonin on the arterial blood pressure in dogs under anaesthesia has a pressor effect followed by a depressor effect. Respiratory hyperapnoea followed by apnoea is produced. Thyroxine is known to change the body catecholamine content and the sympathetic tone (Von Euler U.S.). After L-triiodothyronine, intravenous injection of serotonin had only a depressor effect. The fall in blood pressure was 36 mm. $\pm$1 mm. The apnoea was absent. Atropine did not interfere the respiratory changes due to serotonin in animals pretreated with triiodothyronine though it increased the arterial blood pressure by 4 mm. $\pm$2 mm. followed by a fall of 10 mm. $\pm$2 mm. This fall reduced the pressor effect of serotonin considerably. Intravenous propranolol did not abolish the depressor effect of serotonin in thyroxine pretreated animals. The fall in blood pressure was by 12 mm $\pm$1 mm while without propronolol the reduction was by 36 mm $\pm$ 1mm.

It is known that serotonin acts through the carotid nerves and reflexly modifies the respiratory movements and blood pressure (Goodman L.S. and Gilman A., 1975). After sinus denervation, serotonin elicited a fall in the blood pressure of 14 mm $\pm$1 mm while there was no change in respiration.

Respiratory changes produced by serotonin may be through sinus afferent nerves while the effect on blood pressure is dependent on the sympathetic tone.

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EFFECTS OF PROSTAGLANDINS A_1, B_1, E_1 & E_2 ON HEART RATE AND BLOOD PRESSURE OF DOG. **Sarla Varma, N. Vohra and S. Mehrotra.** *Department of Physiology, G.S.V.M. Medical College, Kanpur (U.P.).*

Prostaglandins A_1, B_1, E_1 and E_2 injected intravenously into anesthetized dogs, produced a fall in systemic blood pressure. PGE_1 was most effective and PGB_1 was least effective in this respect. The depressor effect of prostaglandins is not mediated through either the sympathetic or parasympathetic nervous system since the fall in blood pressure was not abolished by bilateral vagotomy or spinal section at C_2. A direct relaxant action on vascular smooth muscle appears to be responsible for the fall in blood pressure.

Accompanying the depressor response an increase in heart rate was observed. This tachycardia is mostly of reflex nature secondary to the fall in blood pressure. However, a

direct action on the heart muscle may also be a contributing factor since tachycardia was not completely abolished by bilateral vagotomy and spinal cord section at C_2.

STUDY OF ALPHA AND BETA ADRENERGIC BLOCKING AGENTS IN EXPERIMENTAL HAEMORRHAGIC SHOCK. **B. K. Maini, R. K. Marya and Gurbachan Kaur.** *Department of Physiology, Medical College, Rohtak.*

Dogs pretreated with alpha adrenergic blocker (phenoxybezamine 1 *mg* & 2.5 *mg/kg*) and beta adrenergic blocker combinations were bled to achieve and maintain the blood pressure at 40 mm Hg for 1/2 hour and then 2/3rd amount of the blood removed was retransfused. Blood lactate & lactate pyruvate ratio were determined (i) before haemorrhage, (ii) 30 minutes following bleeding and (iii) 3 hours after retransfusion. The results were compared with those in dogs in which adrenergic blocker was given.

Pre-treatment with 2.5 *mg/kg* phenoxybenzamine produced a significant improvement in the metabolic status but there was an increase in the vascular capacity of the animals. Pre-treatment with propranolol alone led to deterioration of metabolic status of the animals. Administration of combination of phenoxybenzamine 2.4 *mg/kg* and propranolol 0.1 *mg/kg* was found to be ideal in the treatment of haemorrhagic shock in dogs since it provided an adequate metabolic status without producing any significant increase in the vascular capacity.

EFFECT OF ACUTE GASTROINTESTINAL DISTENSION ON RESPIRATION IN DOG. **N. K. Satpathy and Z. Haque.** *Department of Physiology, S.C.B. Medical College, Cuttack.*

Acute gastro-intestinal distension is a condition commonly encountered in clinical practice. It is produced due to imprisoned gases and secretions inside the lumen. Effect of acute gastro-intestinal distention on circulatory functions have been studied by many workers. But studies on its effect on respiration are few. This work was undertaken to study the nature of respiratory changes during gastro-intestinal distension at two grades of pressure ranges i.e. P_1 (40-50 mm Hg) and P_2 (60-70 mm. Hg) produced by balloon tamponade in six dogs anaesthetised by i.v. chloralose. Studies were also made to find out if the respiratory changes are of a reflex nature and if so the pathway for such a reflex.

It was observed that distension of stomach, jejunum, ascending colon and rectum all increased the rate of respiration with slight decrease in amplitude. The effect was more marked with distension of stomach but was gradually decreased as one discends down the alimentary tract. The respiratory effects could not be blocked by atropinisation. But after bilateral vagotomy the respiratory effects were negligible though not absent suggesting that a part of this respiratory effect is of reflex in nature and vagal efferents take part in the reflex. The significance of the observations was discussed.

RESPIRATIORY RESPONSES IN RESTING PERSONS DURING ACUTE THERMAL STRESS. **S.S. Srivastava, S. K. Rastogi, C. Venkataraman, S. C. Lakhera and Balakrishna.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt.-110010.*

Breathing pattern and ventilatory response on exposure to hot environment was studied in resting Indian subjects. From the results it was concluded that the rise in deep body temperature in resting condition was accompanied by a rise in heart rate and increase of pulmonary ventilation. The increase in ventilation was due to increase in VT and rise of Rf, and this was associated by a rise in blood pH, and a fall in $PACO_2$, PCO_2 and HCO_2. The other pulmonary functions did not reveal any significant change. A mean rise of 1.53°C in deep body temperature did not produce any symptoms relating to hypocapnia. The role of important factors leading to an increase of pulmonary ventilation when men in resting conditition were subjected to heat stress was briefly discussed.

LUNG VOLUMES AND CAPACITIES IN NORMAL ADULTS OF GUJARAT. **K. P. Skandan and Y. B. Mehta.** *Department of Physiology, Govt. Medical College, Surat.*

Normal Pulmonary function varies from region to region and race to race. We undertook a study to secure the norms for people belonging to the region of Gujarat. Parameters included tidal volume, inspiratory reserve volume, expiratory reserve volume, vital capacity and maximum breathing capacity. The results of the study were pressented.

MEASUREMENT OF NASAL PATENCY. **Anuradha Prabhakar Deshpande, Vidya Moorthy and V. G. Ranade.** *Department of Physiology, B.J. Medical College, Poona.*

Functional patency of the nasal passages was determined in terms of total, right and left nasal patency indices. The relations of the nasal patency to the anatomical position of the nasal septum and slide test were studied. The results were used to predict the cases which are likely to suffer from dyspnoeic symptoms and which are likely to be benefitted by surgical correction of the nasal septum. The work is being extended to the clinical cases.

PROGRESSIVE CHANGES OF LUNG SURFACTANT ACTIVITY IN GUINEA PIGS AFTER VAGOTOMY. **D. P. Thombre, B. Krishnan, V. Srinivasan, O. P. Bhatnagar and A. Srinivasa Rao.** *Department of Physiology and Physics, Jawaharlal Institute of Post-graduate Medical Education and Research, Pondicherry-605006.*

Evidence has been presented previously that vagotomy leads to depletion of the granule content of pneumonocytes in guine pig lungs. It was suggested that this leads to reduction in surfactant material. The present work was, therefore, undertaken with a view to estimate systematically the pulmonary surfactant activity following bilateral and unilateral cervical vagotomy in guinea pigs. The surfactant activity was measured by using modified Wilhelmy type of surface tension balance.

The results indicate that there is a progressive decrease in surfactant activity after vagotomy. But in groups wherein, unilateral vagotomy was performed, the decrease in surfactant activity was restricted to the vagotomised lung only. Assessment of pulmonary oedema shows that the oedema increased progressively after vagotomy.

EFFECT OF HYDRATION AND DEHYDRATION ON THE ALVEOLAR STABILITY OF LUNGS OF RATS AT GROUND LEVEL AND AT HIGH ALTITUDE. **R. K. Srivastava, A. S. Sachan and S. K. Sharma.** *Defence Research & Development Establishment, Gwalior (M.P.).*

Alveolar stability has been evaluated in control (normal fed), hydrated (normal saline 5% body weight administered orally) and dehydrated (water deprived for 7 days but fed with food containing 50% water) rats at ground level (GL) and in rats at a simulated high altitude (6100 m 5 hours-HA). The degassed excised lungs were inflated to a peak pressure of 40 cm H_2O and then deflated to 0 cm H_2O intrapulmonary pressure. Stability and expansion indices were calculated from pressure volume deflation curves. Results show a significant increase ($P<0.05$) in the stability index (SI), in control rats at HA and in hydrated rats at GL & HA but the SI remained unaffected in both these conditions in dehydrated rats. Similarly the expansion (EI) was found to be elevated in hydrated rats both at GL & HA but was not affected in dehydrated rats. Furthermore at 10 cm H_2O intrapulmonary deflation pressures a greater portion of maximum volume of air was left in the alveoli in control rats at HA and in hydrated rats both at GL & HA. At high altitude the turnover of lung surfactant is reduced resulting in a greater inward retractive force in the terminal units during deflation causing premature closure of small airways. Therefore seemingly higher SI & EI values could possibly be due to trapping of greater quantum of air in the alveoli. Dehydration effectively counteracts this effect of high altitude. Hydration on the other hand, seems to have an opposite effect.

LUNG FUNCTION TESTS IN RAJASTHANI SUBJECTS. **P. Gupta.** *Department of Physiology, University College of Medical Sciences, New Delhi—110016.*

Lung function tests (PEFR, MMER, AVI, VC, FEV_1 and other lung volumes and capcities) were investigated in Rajasthani subjects drawn from students and staff of medical college, Jaipur. The subjects were divided into four groups : Gr. I (Male 17 to 27 yrs), Gr. II (male 28 to 40 yrs), Gr. III (Female 17 to 27 yrs), and Gr. IV (Female 28 to 40 yrs). The values of VC decreased in males with the increasing age group and were more than in females of comparable age. Intergroup differences in VC and the effects of posture on it were significant ($P<0.001$). There was high correlation of VC with BSA in all the groups. Though ERV showed a decrease from 35.4% of VC to 32.1% in the higher age group, the value of 36.1 % in female remained vertually the same for both age groups. By comparison IC showed a gradual fall in the values from 1.96 to 1.28 in Gr. I to Gr. IV in that order. The values for MMER and PEFR also showed a decrease from Gr. I to Gr. IV and ranged between

118.48 to 137.15 L/min and 488.5 to 362.9 L/min. respectively. The MVV ranged from 108 45 L/min to 72.19 L/min. the highest figures being obtained in Gr. I and lowest figures in Gr IV. The AVI ranged between 1.21 to 0.97 and were highest in Gr. I and lowest in Gr. III. The results indicate that the values for respiratory functions are generally lower as compared to the ones reported for Western subjects and also show some differences with stratified population samples of Bombay, Bengal, Gujarat and Madras.

VENTILATORY CAPACITY OF HEALTHY YOUNG INDIAN WOMEN. **B. R. Goyle.** *Institute of Naval Medicine, I.N.H.S. Aswini, Colaba, Bombay.*

This study presents the average values of dynamic lung function tests of 79 healthy Indian young women, 18 to 24 years old. Data on Physical Characteristics like height, weight and BSA, Forced vital capacity (FCV), Force Expiratory Volume (EFV_t) FVC/FEV_t ratio, indirect maximum voluntary ventilation (IMVV) and Expiratory Peak Flow Rate (EPFR) have been reported. The subjects were drawn from nursing students.

All the tests reported here were measured on the standing subject with Toshniwal's Vitalometer fitted with automatic electronic time device. The IMVV was obtained by formula of Kennedy by multiplying the FEV 0.75 values with 40. EPFR was measured with Wright. peak flow meter.

The average height, weight and BSA of the subjects were 152.5 cm, 45.9 *kg* and 1.394 m^2 respectively. The average values for FVC, FEV 1.0, FEV_t /FVC ratio, IMVV and EPFR were 2.66 L, 2.24L, 83.8%, 81.2 L/min and 405 L/min respectively. There was no increase observed in the lung function tests with the age after nineteen years of age. Comparison of lung function values of the present study has been done with similar studies reported by Indian workers.

NORMS OF PEAK EXPIRATORY FLOW RATE IN HEALTHY INDIAN BOYS. **J. Subba Rao, K.J.R. Murthy, Syed Kabeer Ahmed and P.S.R. Raju.** *Ghandi Medical College, Hyderabad (A.P.).*

Measurement of air flow rate gives a good indication for the patency of the Bronchi. Peak Expiratory Flow Rate (PEFR) is one of the many investigations used to assess the airways obstruction. It is simple and has been used as a screening method especially in children for mass surveys in different parts of the world. There is no large scale studies of PEFR in children from this country and it is difficult to estimate the predicted values for different ages. At present the Western figures are taken to determine the normality.

680 children of ages 5-17, going to a local school in Hyderabad city were studied. They were screened with careful history and detailed examination of chest to eliminate the children with respiratory disease. Standing Height and Weight were measured. PEFR

was measured with a peak flow guage. PEFR was correlated with the age, height and weight. There was a statistically significant correlation between PEFR and age, height and weight respectively, but the linearity was greater between Height and PEFR. There appear to be a spurt in PEFR values as well as height and weight at the age of 14 to 15 years. The highest and lowest PEFR values were similar to those observed in the Western studies.

A NEW RESPIRATORY REFLEX. **S. Kumar and R. Sexena.** *Department of Physiology, K.G. Medical College, Lucknow (U.P.).*

In dogs anaesthetised with pentobarbitone sodium, raising the body temperature from 37°C to 42°C increased the rate of respiration and pulmonary ventilation but decreased the tidal volume. A similar change though of a lower magnitude, was observed in these parameters after "cold-blocking the vagi." At 40°C body temperature, however, the vagal block was not effective in reducing the rate. The significance of hyperthermic panting mechanism dominating the Hearing-Breur mechanism at 40°C. It has been postulated that the vagi carry temperature dependent afferents that block the Hearing-Breuer reflex. At 42°C when respiratory failure usually sets in, the temperature regulationg function of respiration is also lost.

INHIBITION OF GROWTH IN REGENERATING LUNG. **K. V. Kuppu Rao, D. P. Sakunthala and C. L. Vimala Bai.** *Institute of Physiology and Experimental Medicine, Madras Medical College, Madras—600003.*

Addis *et al.* have observed compensatory growth in the contralateral lung after unilateral pneumonectomy. The regenerating lung shown several reparative and compensatory changes. Increased alveolar cell division response as indicated by mitotic index reached maximum by six or seven days after operation. The growth of regenerating lung as indicated by tissue protein estimation was continuously rising during the experimental period. The wet weight of the remaining lung tissue increased by 25% of initial weight. These responses were retarded if the cavity created by the operation is packed with sponge. It has been suggested that compensatory growth of the lung may be controlled by chemical factors whose local concentration depends upon the variation in the rate of blood flow. Our observation does not agree with this belief.

SPIROMETRY IN SCHOOL GIRLS. **H.D. Singh and K. Meenakshi.** *Madras Medical College, Madras—600003.*

Forced Vital Capacity (FVC) tracings were obtained with a McKesson Vitalor in 101 healthy school girls between 7 and 16 years of age. Forced Expiratory Volumes (FEVt) in the first half, three-quarter and one second, as well as Maximual Expiratory Flow Rate between 200 and 700 *ml* (MEFR), Maximal Mid-Expiratory Flow Rate (MMF) and the Expiratory Flow Rate over the third quarter (EFR $_{50\text{-}75}$) were calculated from the tracings. The volu-

mes and flow rates are somewhat lower but FEVt% are slightly higher than the values observed in schoolboys (Singh *et al*. 1971, 1976). The mean FEV_t% in 0.5, 0.75 and 1.0 seconds for the whole group are 72.5, 84.8 and 92.2 respectively, the values younger children being slightly higher than in the older ones. All volumes and flow rates show a highly significant positive correlation with age, height weight and BSA. The following regression equiations with height in cms. as the independent variable gives satisfactory estimates of expected values at BTPS.

$$FVC = 28.2XH - 2100$$
$$MMF = 1.43XH - 75$$
$$MEFR = 2.15XH - 144.5$$
$$EFR_{50-75} = 1.1\,XH - 44$$

Unlike boys, girls reach near about values by 16 years.

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VENTILATORY INDICES. **Sundaresh Peri and H. D. Singh.** *Kakatiya Medical College, Warangal (A.P.).*

In view of the lack of uniformly acceptable equations for estimating Forced Vital Capacity (FVC) and Forced Expiratory Volume (FEV_{10}), Khosla (1971) proposed three indices which satisfy the criteria of being i) highly correlated with the ventilatory parameter and (ii) independent of age and height. The proposed indices derived from two large British populations are :—

(1) Index $FVC = \frac{FVC \times Age^{\frac{1}{8}}}{Height^2}$

(2) Index $FEV_1 = \frac{FEV_1 \times Age^{\frac{1}{2}}}{Height^2}$

(3) Index $FEV_1\% = FEV_1\% \times Age^{0.5}$

Giving a method for rapid calculation of the indices, he suggested that their validation in other populations would be of interest.

Using his method in data obtained previously (Singh *et al*. 1970) in 61 healthy men between 30 and 60 years, we found that the correlation of the Indices FVC and FEV_1 with the volumes FVC and FFV_1 were highly significant, the values of 'r' being 0.85 and 0.82 respectively, whereas with age and height they were not significant ($r = -0.21$ and $+0.07$ for FVC and -0.11 and -0.08 for FEV_1. In the case of FEV_1% the advantage of

the index was marginal, the 'r' value of the Index FEV% with the FEV% being 0.92, whereas with age and height the values were ±0.26 and —0.28 respectively. Since FEV_1% is about 80 to 85 in almost all populations, an Index FEV_1% may not be necessary. The exact values of the Indices of FVC, FEV_1 and FEV_1% in our group using height in inches as done by Khosla are 2.65, 3.99 and 170.25 respectively, and the Indices Approximate/Exact % are only 100.9, 101.3 and 100.3 respectively. While confirming the applicability of the Khosla ventilatory indices in our small group, it is suggested that further observations in other populations may be useful.

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INTESTINAL ABSORPTION OF AMINOACIDS FROM EVERTED MICE JEJUNAL SACS IN VITRO: EFFECT OF DIFFERENT TETRACYCLINES. **Samir Dutta and Sachchidanands Banerjee.** *Research & Development Division, Dey's Medical Stores (Mfg) Ltd., Calcutta.*

The effect of addition of different tetracyclines in the mucosal fluid on the active transport of glycine, tryptophane and methionine was studied using mice everted jejunal sacs. The transport of the aminoacids was also studied using everted jejunal sacs prepared from mice after they received 7 daily intravenous injections of different tetracyclines. Tetracyclines diminished the intestinal transference of the different aminoacids possibly due to insufficient energy as a result of diminished ATP-ase activity.

EFFECT OF BILATERAL ADRENALECTOMY ON GASTRIC MUCOSAL MAST CELL POPULATION IN PYLORUS-LIGATED RATS. **A. K. Ganguly, S.S. Sathiamoorthy and O. P. Bhatnagar.** *Department of Physiology, Government Medical College, Surat and J.I.P.M.E.R., Pondicherry—605006.*

The influence of adrenal glands on gastric secretion is well-known. Our previous work in this field has demonstrated that the adrenal action on stomach is through the histamineladen mast cells of gastric mucosa. The present work was planned to study the effect of bilateral adrenalectomy on gastric mucosal mast cell population (MCP) in rats subjected to pylorus ligation (Shay Rats) a week after adrenalectomy. The results indicated a significant increase in MCP in adrenalectomised Shay rats in comparison to the control group—Shay Rats with adrenals intact. This is consonant with our previous finding that the volume, acidity and pepsin content of gastric juice are decreased in adrenalectomised Shay rats under similar conditions. In the adrenalectomised Shay rats, the mast cells, inspite of the stress of pylorus ligation, remain intact due to lack of adrenal hormones and the consequent

deficiency of histamine release is probably the reason for decrease in activity of gastric glands. It is reasonable to conclude from these findings that adrenal hormones, particularly corticosteroids, influence the release of histamine from gastric mucosal mast cells and the latter may act as the chief mediator on the stomach.

HISTAMINE CONTENT OF THE STOMACH OF PYLORUS LIGATED ALBINO RATS AND THE EFFECT OF SUBDIAPHRAGMATIC VAGOTOMY. **A. K. Ganguly and P. Gopinath.**
Department of Physiology, Government Medical College, Surat.

Our observations provide evidence that confirmed vagotomy as well as bilateral vagotomy reduces the ulcer index in albino rats to a very low level in stressful situations by influencing gastric physiology. Metiamide, a histamine blocker has been shown to block the gastric response to vagal stimulation, which suggests that histamine possibly acts as the final mediator to influence the gastric physiology. The incrimation of histamine natually involves the mast cells. We have observed that vagotomy increases the gastric mucosal mast cell population whereas overactivity of vagus brings about a decrease in their number. It appears, therefore, that vagus influences the release of histamine from gastric mucosal mast cells. We have observed that vagal stimulation for 5 and 10 min in different groups of rats bri gs down the histamine content of stomach, the decrease being more in animals exposed to stimulation over a period of 10 minutes.

The object of the present experiment was to study whether the vagal pathway is involved in influencing the histamine content of stomach of albino rats under streessful situation. Our observation indicates that following pylorus ligation in "6 and 16 hours groups," the histamine content of stomach comes down to a very low level, being lowest in the "16 hours" group whereas following pylorus ligation and subdiaphragmatic vagotomy the fall in histamine content was little in both "6 and 16 hours" groups, which could be due to the effect of other aneasthesia alone. Thus our results provide evidence that the gastric response due to vagal stimulation is meditated through histamine released from the stomach wall itself.

HISTOMORPHOLOGIC AND GLUCOSE ABSORPTION CHANGES IN RAT INTESTINE ON PERFUSION WITH HYPERFUSION WITH HYPERTONIC SOLUTIONS. **Veena Mehta.**
Department of Physiology, University College of Medical Sciences, New Delhi-110016.

Isotonic and hypertonic solutions (280, 680, 850 and 890 mosm/L) containing Nacl, glucose, urea/mannitol/magnesium sulphate were employed to study the effect of tonicity on glucose absorption and histomorphology of rat intestinal mucosa. Use of in-vivo preparations of 5-7 cms. long segments from jejunum, ileum and colon showed uniform absorption during the four study periods of 15 minutes each following perfusion of the gut lumen with 2 *ml* isotonic solution. The temperature, pressure and rate of perfusion were

kept constant. Irrespective of the nature of the perfusate, hypertonic solutions above 680 mosm/L impaired the glucose absorption. The serverity of impairment being related to the osmolarity of the solution and the duration of exposure.

The mucosal histomorphology showed no obvious changes after perfusion with isotonic solutions. With hypertonic solutions, on the other hand, there was observed a generalised shrinkage of the intestinal wall, congested blood vessels at places with specific changes localised to the tips of the villi presenting various degrees of necrotic changes such as deep eosinophilic staining of the cytoplasm, clumping of cells at places and pyknosis of the nuclei coupled at times with desquamation of cells.

ROLE OF CAROTID SINUS AND SEROTONIN ON INTESTINAL MOVEMENT IN DOGS. **K. Seetha Devi and R.G.N. Sumponia Hartwig.** *Department of Physiology, Guntur Medical College, Guntur (A.P.).*

Serotonin administered intravenously in dogs under anaesthesia results in increase in the tone, frequency and amplitude of the small intestinal movements for five minutes. Administration of intravenous atropine abolished the basal rhythmic movements and serotonin has no action after pretreatment with atropine. Intravenous injection of periactin resulted in reduction in tone, frequency and amplitude of movements but the normal movements persisted.

Bilateral carotid artery occlusion resulted in decrease in the tone of the muscle while normal movements persisted. Intravenous adminstration of alpha and beta adrenoceptor blockers resulted in sudden increase in the tone of the muscle for 2 to 3 min before reaching the base line. Bilateral carotid artery occlusion with serotonin infusion resulted in similar result as that of bilateral carotid occlusion. Bilateral sinus nerve denervation followed by intravenous injection of serotonin resulted in relaxation of the intestinal muscle with abolition of basal rhythmic movements.

It can be concluded that serotonin specifically acted on the tone of the muscle. The basal rhythmic movements may not be due to serotonin activity. Carotid sinus on bilateral occlusion relaxed the intact intestinal muscle with persistance of basal rhythmic movements. This relaxation does not seem to be through adrenergic receptor system. Perhaps it acted through either histamine or nonadrenergic receptors.

STUDIES ON LIPIDS FROM BOVINE GASTRO-OESOPHAGEAL JUNCTION. **K. Narayanan and Ramachander.** *Department of Anatomy, Kilpauk Medical College, Madras*

The characterization of major fatty acids in the Gastro-Oesophageal Junction was done by both Thin Layer Chromatograph (TLC) and Gas-Liquid Chromotography (GLC).

The presence of C-18 fatty acids was noted. An Infra-red spectrum of the original extract was also done. Their implications in Biodynamics of tissue metabolism needs further study

A STUDY OF URINARY CREATININE AND CREATININE COEFFICIENT IN MEDICAL STUDENTS. **S. P. Singh, A. K. Sisodia, S. P. Barthwal, Shasi Bhushan, S. I. B. Rizvi, Sudha Agrawal and P. Seth.** *Departments of Biochemistry & Medicine, B.R.D. Medical College, Gorakhpur (U.P.)*

Urinary creatinine excretion and creatinine coefficient are among the most intersting and important parameters of kidney function tests because of its constancy and narrow range of variations in normal subjects. For the above reasons the present study has been taken. Observations in this regard have been in conformity with those of other Indian workers but with remarkable differences.

Creatinine is a nitrogenous waste and product of protein catabolism and is excreted mainly through urine and to some extent in sweat. Daily urinary creatinine excretion and creatinine coefficient of eightyfour healthy medical students have been studied for three consecutive days. Creatinine excretion ranged from 0.376—1.789 g/day with an average of 1.130 g/day $\pm$S.D. 0.297. However, the creatinine excretion value has been observed to remain constant for an individual subject irrespective of variations in daily fluid intake and urinary output.

Daily creatinine excretion has been observed to be significantly higher in male students (1.241 $\pm$S.D. 0.218 g/day) as compared to female counterparts (0.777 $\pm$0.239 g/day). Creatinine exc etion has been observed to be predominantly dependent on body weight of the subjects. The difference was found to be statistically significant ($P<001$).

Creatinine coefficient expressed as milligrams of creatinine excreted per kilogram of body weight per day has been found to be a better index which has been 24.45$\pm$S.D. 4.008 and 16.23$\pm$S.D. 5.006 for male and female subjects respectively ($P<.001$).

Besides creatinine excretion and creatinine coefficient fluid intake and urinary output have also been studied in both the sexes. Fluid intake has been observed to be 2.125 $\pm$0.5834 and 1.551 $\pm$0.3433 litres in males and females respectively ($P<.001$). Similarly urinary output has also been found to be 1.413$\pm$0.4585 and 1.117 $\pm$0.3630 litres in males and females respectively.

EFFECT OF EXERCISE ON CERTAIN URINARY CONSTITUENTS IN ATHLETES. **V. K. Negi, G. K. Tandon, M.C. Pant, S. R. Arora and H. N. Mehrotra.** *Departments of Physiology & Biochemistry, L.L.R.M. Medical College, Meerut(U.P.).*

The volunteers of this study were the medical students (athletes) aged 18-22 years

having no past history of any renal disease all residing in the hostel and getting the same diet. Each student was made to evacuate the bladder completely just prior the commencement of exercise and then he was subjected to undertake exercise on bicycle ergometer by plying the pedal against a constant load of 5 *kg*. The subjects got exhausted within 12 to 18 minutes after pedaling 4,000-6,000 times and during the period they were given one litre of water to drink in fractions. The bladder was again evacuated and both the samples of urine were contrifuged and examined under microscope for casts and chemical analysis was done for proteins. It was observed that most of the cases had fairly good number of hyaline casts (occasional granular casts) in their post-exercise urine samples associated with proteinuria which ranged from traces to massive clouds.

The probable explanation for this phenomenon is (a) that during active exercise the blood is shunted through exercising muscles and the blood flow to the kidney may be reduced to as 50-60 percent thus causing hypoxic damage to the nephron, and (b)increased glomerular permeability due to increased blood acidity. Thus the injury caused by exercise to filtration mechanism permits protein to leak through it and as injury progresses (because of increased intensity of exercise) casts also appear.

FUNCTIONAL STUDIES DURING EXPERIMENTAL HYDRONEPHROSIS. **D. P. Sakunthala and K. V. Kuppu Rao.** *Institute of Physiology & Experimental Medicine, Madras Medical College, Madras—600003.*

Much work has been done in various experimental animals following unilateral nephrectomy on the mechanism of compensatory renal growth. But still the exact mechanism remains obscure.

The present work has been undertaken on rats to investigate the probability of the functional changes acting as a triggering factor for compensatory renal growth. Renal growth and functional studies were assessed after elimination of one kidney by unilateral hydronephrosis. The functional parameters investigated were glomerular filtration rate (GFR), renal plasma flow (RPF) maximal tubular excretory capacity and blood clearance of ^{131}I hippuran.

From the present work, it is seen that the glomerular filtration rate and renal plasma flow increase as early as 18 hours after unilateral hydronephronis, reach a plateau from one to two weeks followed by a gradual decrease after two weeks. Tubular functions as indicated by maximal tubular excretory capacity and ^{131}I hippuran clearance decrease sufficiently at 24 hours. This is followed by a continuous increase after 24 hours. These functional changes are correlated with the morphological changes during compensatory renal growth.

CARBOHYDRATE METABOLISM IN THE MUSCLES OF RANA CYANOPHLICTIS ACCLIMATED TO LOW TEMPERATURE. **Shakunthala Sridhara and R. V. Krishnamoorthy.** *Departments of Vertebrate Biology & Zoology, University of Agricultural Sciences, G.K.V.K. Campus, Bangalore.*

Reports on the metabolism of carbohydrates in amphibians during thermal acclimation are conflicting. In the present investigation levels of glycogen, pyruvate, rates of activity of hexokinase, aldolase, glycogen phosphorylases, *in vitro* glycogen synthesis and glycogenolysis were studied in different skeletal and cardiac muscles of the frog, Rana cyanophlictis acclimated to low temperature (12 ± 1°C). On acclimation glycogen content increased and pyruvate levels remained unaltered. Rate of *in vitro* glycogen synthesis decreased while epinephrine sensitive and anaerobic glycogenolytic rates were different in different muscles. Patterns of acclimation (Prosser, 1958) exhibited for *in vitro* glycogen synthetic rates were translation, reverse translation, counter-clockwise rotation and translation cum clockwise rotation. Hexokinase activity did not show any changes. However aldolase and glycogen phosphorylases exhibited muscle specific changes. These results were discussed with reference to possible changes in the permeability of muscles on cold acclimation.

AGE RELATED CHANGES IN ACID MUCOPOLYSACCHARIDE CONTENT IN THE MUSCLE OF RAT. **S. Mohan and E. Radha.** *Department of Zoology, Bangalore University, Bangalore.*

Acid mucopolysaccharide and its catabolic enzymes in slow, fast and cardiac muscle of rat of 5, 10, 15, 20 and 25 months age were studied as part of the age related changes in muscle connective issue. AMPS content was estimated in terms of its components, uronic acid and hexosamines. Uronic acid showed a sharp decline in all the three muscles between 10 and 25 months of age whereas the hexosamine content increased upto 10 months in cardiac and 15 months in slow and fast muscle and decreased thereafter. Hexosamine content in fast and cardiac muscle of a 25 month old animal had decreased almost to the level of a 5 month old. Unlike in uronic acid there was no significant difference in hexosamine content between the three muscles. The results of B-N-acetylglucosaminidase and B-glucuronidase, the enzymes involved in the breakdown of AMPS complex showed higher activities with increase in age. The activity of B-N-acetylglucosaminidase increased by 38%, 30% and 22% in slow, fast and cardiac muscle respectively between 5 and 25 months. B-glucuronidase activity increased from 101-132 units in the slow, 95-125 units in the fast and 110-148 units in cardiac muscle between 10 and 15 months and was more or less constant thereafter in slow and fast muscle while in cardiac tissue there was an increase even after 15 months. The cardiac muscle showed higher activity with reference to both these enzymes. The activitiy of these enzymes seems to have a bearing on the decrease in AMPS content with increase in age. The ratio of AMPS/Collagen as a function of age and its significance were discussed.

NERVE CONDUCTION AND RESIDUAL LATENCY IN THYROID DISEASES. **V. Anantharaman and Sarada Subrahmanyam.** *Department of Physiology, P.G. Institute of Basic Medical Sciences, Velachery, Madras.*

Ulnar nerve conduction velocity was determined by stimulating the nerve at two distances from the hypothener muscle and recording their evoked potentials on the Cathode ray oscilloscope with suitable amplification. Then the residual latencies were calculted. Basal metabolic rate was determined in the usual way with adequate precautions using Benedict Roth type apparatus. Simultaneously the plasma Bound Iodine was estimated.

The above parameters were recorded normal controls and patients suffering from Hyperthyroidsm and Hypothyroidsm. It is found that the significant change in conduction velocity of ulnar nerve was noticed only in patients suffering severely from the disease.

THE EFFECT OF BODY TEMPERATURE ON CONDUCTION VELOCITY OF A NORMAL MOUSE SCIATIC NERVE-AN *IN VIVO* STUDY. **P. B. Vidyasagar, P. S. Damle and N. H. Antia.** *The Foundation for Medical Research, Bombay.*

The effect of body temperature on conduction velocity of the normal mouse sciatic nerve was studied. The change in conduction velocity is caused by a drop in body temperature due to anesthesia. *in vivo* experiments maintainance of constant temperature is difficult in comparison with *in vitro* experiments. This can introduce an error in the measurent of conduction velocity *in vivo*. However, this error can be eliminated if we know the effect of body temperature changes on conduction velocity over the particular temperature range of study. In the present sutdy the variation of conduction velocities for average and large size fibres with change in body temperature were studied. Q10 was calculated for large and average size fibres for the temperature range 29°C to 39°C.

CONDUCTION RATE AND RESIDUAL LATENCY IN HANSEN DISEASES. **V. Anantharaman.** *Department of Physiology, P.G. Institute of Basic Medcal Sciences, Velachery, Madras.*

Twenty five cases suffering from Hansen Disease were studied against twenty five normal controls. Latencies were measured by the usual method of stimulating the ulnar nerve at two distance from the hypothener muscle and recording their evoked potentials on the Cathode ray Oscilloscope with suitable amplification. The conducted velocities were determined and the residual latencies were calculated.

It was found that in cases of persons suffering from Hansen disease the conduction velocity decreased highly significantly 48.8 ± 2.6 mps. $P0 < .001$ (Normal 57.5 ± 1.08) as well as the residual latency 1.86 ± 0.29. $P < 0.001$ (Normal 2.54 ± 0.09).

NOISE SPECTRUM AND HEARING LOSS IN MAN. **R. C. Chaturvedi, R. K. Gautam, R.M. Rai, Bal Krishna and M.S. Malhotra.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt.—110010.*

The effect of noise on the human ear is basically related to three important parameters viz intensity, frequency components and duration of noise exposure. The effect of noise consisting of some prominent frequencies has been studied on the development of hearing loss, when the other two parameters were kept constant. After recording the audiograms in a group of volunteers, they were exposed for 20 minutes to white noise of 105 dB sound pressure level. The experiments were repeated on different occasions for three dominent frequencies namely 670, 1000 and 2000 Hz at 105 dB superposed on white noise of 85 dB. Changes in hearing threshold were determined by repeating audiometry after exposure to selected frequency.

It was observed that the white noise affected the region of 4 k Hz maximally. In other three conditions, where the noise was dominated by the single-frequency component, the threshold shift was maximum at one half octave above the dominating tone. The hearing loss was of a temporary nature, since all the subjects regained their original hearing level in 18 hours. Hearing loss at other frequencies in relation to the noise spectrum was discussed and the mechanism of middle ear impedence under noise stress was described.

ADOLESCENCE AND SWEET TOOTH. **S. Dua-Sharma, R. Kanaka and K. N. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore—560034.*

Gustatory responses both for intensity and pleasantness for 6 different concentrations of Glucose ranging from 0.06 M to 2 M. were studied in 13 school girls of 10-11 years age. For the pleasantness rating, a seven category rating scale was used. The tests were carried out before breakfast for 2 days.

The intensity ratings, represented on 6-point scale, showed a rising curve with increase of strength of solution. As for the hedonics, the subjects did not care for the lower concentrations and appreciated the sweetness only at 0.5 sol. The pleasantness rating kept on increasing with increasing strength of solution upto 2 M. The adult male have the maximum acceptance for 1 M whereas it shifts between 0.5 and 1 M. for adult females during different phases of menstrual cycle.

MYOPIA AND BLOOD GROUP. **L. B Vad and P. S. Gokhale.** *B. J. Medical College, Pune.*

Myopia a common type of refractive error, has been observed to show some familial tendency and is strongly suggestive of genetic origin. It is also known that ABO blood group system has genetic basis. So an attempt has been made to find the evidence of a specific gene in the causation of myopia and whether the same gene is responsible for a specific blood group, in the ABO system. As myopia becomes manifested more commonly in adolescence, 600 students volunteers, admitted to the 1st M.B.B.S. class (between age

group 17-20 years) were selected. Their blood groups were determined and a detailed examination for myopia and colour blindness made.

COLOUR BLINDNESS IN RELATION TO ABO BLOOD GROUP SYSTEM. **P. Seth, S. Bhushan, S. P. Singh, S.I.B. Rizvi, B.B. Lall and J. L. Agarwal.** *Departments of Physiology & Opthalmology, B.R.D. Medical College, Gorakhpur (U.P.).*

The defect of colour blindness and existence of a particular blood group in an individual are genetically determined entites. Colour blindness more common in individuals having blood group B (Singh *et al.* 1972). The present study was undertaken to confirm the association of colour blindness with the blood groups.

The subjects of this study was taken from amongst the persons attending the out patient department of the hosiptal of the Medical College, Gorakhpur, U.P. The blood group of the persons were tested by the agglutination method and the colour vision by Ishihara's colour vision chart.

Of the 1,400 persons examined for their blood groups 36.0% had blood group 'B' while only 7% had blood group 'AB'. Colour vision defect was highest in persons having blood group 'B' and lowest in the persons having blood group 'AB'. Our findings confirm the results of Singh *et al.* (1972).

SOME OBSERVATIONS ON COLOUR BLINDNESS. **H.P. Pispati, J. V. Bhatt and V. G. Parulkar.** *Department of Physiology, T.N. Medical College, Bombay—400008.*

A survey of colour blindness using Ishiharas chart in 1000 Bombay medical students showed that out of 3.3% of the total subjects, 4.5% were males and 0.9% were females.

'Strong deutan' was the commonest type of colour blindness.

Study of distribution of 'ABO' blood groups among normal and colour blind students showed that 'AB' blood group had a more number of colour blind students suggesting that 'AB' blood group had a predilection for colour blindness which was confirmed statistically.

TASTE INTENSITY AND TASTE HEDONICS DURING MENSTRUAL CYCLE. **S. Dua-Sharma, R. Kanaka and K. N. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore—560034.*

Thirteen adults unmarried females formed the subjects of this study. Their taste intensity (6-point scale) and taste pleasantness (7 point category scale) ratings were recorded before breakfast for 6 different concentrations of glucose ranging from 0.06 to 2.0 M solutions for 30 days representing the different phases of menstrul cycle. The taste intensity showed a linear relationship to the strength of the solution. The pleasantness ratings on the other hand, varied during the different phases of menstrual cycle. The maximum pleasantness was shown for 0.5 M solution during the menstruation. During ovulation, however, the highest rating for pleasantness shifted to 1 M without showing a break point upto 2 M. Before ovulation, 1 M conc was maximally liked but the preference declined to 0.5 M after the ovulation. It seems that sweet preference during pre-

ovulatory phase is comparable to the values obtained in the males of similar age and cultural background, but the values in females are significantly less during menstruation, ovulation and post ovulatory phase.

EFFECT OF HYPOXIA AND COLD ON THE PHOSPHOLIPID COMPOSITION OF LUNG SURFACTANT OF RATS. **Ratan Kumar, Bal Krishna, K. S. Hegde and R.S Sharma.**
Defence Institute of Physiology and Allied Sciences, Delhi Cantt.-110010.

The phospholipid composition of the lung tissue and saline lavage of lung in rats exposed to acute hypoxia, chronic hypoxia, acute and chronic hypoxia associated with cold has been estimated and compared with normal controls. Phospholipids (Phosphatidyl choline, phosphatidyl ethanolamine, lysophosphatidyl choline, Lysophosphatidyl ethanolamine and sphingomyelin) were separated by thin layer chromatography, to assess whether there was any change in the composition of phospholipid, specially phosphatidyl choline, which is mainly responsible for the suffactant activity of the lung.

The results indicate that acute hypoxia lowered phospholipids in lung lavage only. When cold stress was superimposed, phospholipids were lowered in lavage and lung tiusse. This may be due to the catabolic action of cold. In chronic hypoxia phospholipid contents of lavage and lung tissue were decreased while addition of cold showed no further reduction in lung tissue phospholipids, on the contrary phosphotidyl choline content lavage was increased.

It is concluded that the effect of hypoxia alone in the lowering of surfactant is related to the duration of exposure. Cold lowers the phospholipids in acute stage while in increasing the duration of exposure (i.e. chronic exposure) there is no further reduction of phospholipids, there is an increase in the phosphatidyl choline fraction. Perhaps chronic exposes to cold *per se* does not adversely affect the phospholipid synthesis.

PULMONARY ALVEOLAR MACROPHAGES IN HIGH ALTITUDE, HYPOXIC AND HYPOTHYROID RATS. **Bal Krishna, K. S. Hegde, Ratan Kumar and R. S. Sharma.**
Defence Institute of Physiology & Allied Sciences, Delhi Cantt.-110010.

Pulmonary alveolar macrophages were studied in four groups of rats. Rats rendered hypothyroidic were also used. Rats were exposed to atmospheric pressure at 3500 meters and at 7620 meters for 5 hours. Rats were rendered hypothyroidic by administering 1 mCi of Na ^{131}I. A few Alveolar macrophages were obtained by washing the lungs for about 12 times, with 5 *ml* of isotonic saline on each occasion. Aliquotes of the washings were counted in haemocytometer to obtain the total count. The washings were pooled and centrifuged at 1500 rpm for 20 mins. Macrophages settle down to the bottom of the tube. They were suspended in 1 *ml* saline. A smear of the cell sediment was prepared on a glass slide. It was air dried, fixed in a Bouin's solution and stained with hexatoxylin and eosin. The results showed a decrease in the number of macrophages/*gm* of lung tissue in all the three groups as compared to controls. The total number of macrophages were increased with the rise in altitude. But since weight of the lung tissue was relatively

more when compared to other groups, the macrophages per gram of lung tissue were decreased. The percentage of mature macrophages was increased only in rats exposed to high altitude. The results were discussed in relation to the defence mechanism and surfactant system of the lung.

BODY FLUID COMPARTMENTS IN HUMANS DURING ACUTE HIGH ALTITUDE EXPOSURE. **S.C. Jain, J. Bardhan, A. Grover, Y. V. Swamy, Bal Krishna and M. S. Malhotra.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt.-110010.*

Body fluid compartments were studied in a group of low-landers during 12 days of acute exposure to an altitude of 3,500 m. Measuements of total body water and extracellular compartments were done on the 3rd and the 12th day of exposure, while blood volume measurements were on the 12th day only. The intracellular water, plasma volume and red cell mass were computed from the above parameters. Total body water and intracellular water decreased progressively, the decrease being 32% ($P<0.005$) and 26% ($P<0.025$) respectively on the 12th day. Extracellular water decreased insignificantly. The decrease in plasma volume was found to be 15.2% ($P>0.025$) with a corresponding increase of 23.3% in red cell mass ($P<0.025$). Blood volume did not show any change. The results have been compared with the findings of other workers. Hypohydration was observed on acute altitude exposure but there was no significant change in extracellular water. The significance of these changes in adaptive mechanism were discussed.

CHANGES IN AUTONOMIC BALANCE OF HIGH ALTITUDE NATIVES DURING SOJOURN TO PLAINS AND ON RETURN TO HIGH ALTITUDE. **W. Selvamurthy, M. S. Malhotra, R. K. Saxena and N. K. Murthy.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt—110010.*

The study has been conducted on 20 natives living in high altitudes (HAN-I), to evaluate the changes in autonomic balance during their sojourn to plains, and on return to high altitude (HA) after a stay of 2 months in the plains. The age group varied from 19 to 32 years. The autonomic indices measured, were heart rate (HR), blood pressure (BP.), Oral temperature (Tor), mean skin temperature (Tsk), respiratory rate (RR), cold pressor response (CPR), HR-response to 70° head-up tilt and alpha index of EEG (Occipital). The recordings of these parameters have been done periodically during their stay in the plains and thereafter on their return to HA, for a period of one month. For comparison, the same responses were also studied on 10 low landers (LL) in the plains and on induction to HA alongwith the HAN-I. The study was also repeated once on 10 HAN who had never been to the plains (HAN-II). The AR, B.P., Tor, CPR and HR response to orthostasis were lower and Tsk was higher on arrival in the plains as compared to the altitude responses of HAN-II indicating the manifestation of a relatively higher degree of parasympathetic tone due to the abolition of hypoxia induced by sympathetic excitation. During their further

stay, there was a gradual build-up in all these responses reaching a level higher than the altitude values of HAN-II and closer to that of LL. On return to HA, there was increase in HR, B.P., Tor and HR response to tilt and decrease in Tsk, CPR and alpha index indicating sympathetic hyperactivity, as was observed in LL on induction to HA. The magnitude of these responses, however, were relatively lower than that of LL. All these responses showed a trend to faster return towards altitude values of HAN-II while the resppnses of LL were maintained relatively at a higher level. These findings indicate that the autonomic balance shifts towards sympathetic predominance due to relaxation of parasympathetic tone, in high altitude natives on their sojourn to the plains; on return to high altitude they also exhibit sympathetic excitation as observed in lowlanders on sudden induction to high altitude. It is concluded that the change in automomic balance towards parasympathetic predominance occured during adaptation to high altitude and is primarily determined by the environmental factor rather than the genetic factor.

SPONTANEOUS CHROMOSOME ABERRATIONS IN MEN STATIONED AT HIGH ALTITUDE. **Hari Bharadwaj, T. Zachariah and S. Kishnani.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt—1100010.*

Metaphase chromosomes of 15 young and healthy men exposed to 3962 m (13,000 ft) altitude or above for more than six months were studied. Microcultures of the whole blood were made at a barometirc pressure of 760 mm Hg in a compression chamber at 3505 m above sea level. This procedure was adopted to avoid the influence of hypoxia during cellular growth. For control cultures, another batch of 15 young and healthy men who were never exposed to high altitudes was selected. Their b'ood was cultured under normal conditions in Delhi.

Metaphase chromosome plates of the high altitude group showed a significant elevation in the frequency of polyploidal cells. Amongst the well spread ones these were usually identified as tetraploid. Karyo type analysis of the well spread ordinary metaphases revealed that aneuploid cells were also present in small numbers. Trisomy and monosomy of D and G group chromosomes was frequently encountered and the acro centric chromosoes of these groups were most frequently associated with each other. Chromatid or chromosome breaks were also seen but their frequency was not significantly greater than that observed in the control metaphases. Ring and dicentric chromosomes were not encountered in any group.

HAEMATOLOGIC RESPONSES IN MEN DURING AND AFTER STAY AT HIGH ALTITUDE. **S.C. Jain, A. Grover, J. Bardhan, Ratan Kumar, Y. V. Swamy, Bal Krishna and M.S.Malhotra.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt.—110010.*

Haematologic changes were studied in a group of low landers who moved from sea level to an altitude of 3,500 m and returned to sea-level after a stay of 65 days. Haemoglo-

bin, haematocrit and erythrocyte count increased rapidly in the 1st week and attained maximum levels by 22nd day. Reticulocyte count rose above normal, reaching a peak on the 18th day and then declined rapidly and remained at significantly higher level. These parameters returned to control levels on return to sea level by the 2nd week. The erythrocytes formed at high altitude were found to be macrocytic and remained so even on return to sea level. Erythrocyte Glutamic Oxaloacetic Transaminase decreased significantly at high altitude but returned to mormal level on return to sea level. No change in blood volume and erythroctye life span were found in various phases. Plasma volume decreased and red cell mass increased significantly at high altitude but returned to normal levels on deacclimatisation. Serum bilirubin did not change at high altitude but increased slightly during 2 weeks of deacclimatisation. Erythrocytes were more fragile at high altitude. These studies indicate macrocytic response of erythrocytes to low oxygen tension and increased red cell mass formed at high altitude was reduced on deacclimatisation possible due to accelerated red cell destruction. The results were also compared with a group of low landers who have been at high altitude for more than six months.

UNILATERAL CAROTID OCCLUSION IN RATS AS A CHRONIC HYPOXIC MODEL. **R. Subramanian and B. Bhatia.** *School of Environmental Sciences, Jawaharlal Nehru University, New Delhi* **and H.H. Siddiqui.** *Department of Pharmacology, All-India Institute of Medical Sciences, New Delhi—110016.*

The left common carotid artery of the rat was ligated with an attempt to produce hypoxia of the brain and for chronic studies. The urine output of the unilateral carotid lighted rats was more as compared to sham-operated, confirming our earlier observations on "hypoxic diuresis". The oxygen percentage saturation of blood in the Jugular vein of above rats fell to 54% as compared to 65% before ligation. The rectal temperature of these rats fell by 4°c at an air temperature of 20°c, thus tallying with our prior observations on "hypoxic hypothermia". These results suggest that the unilateral ligation of common carotid artery produces hypoxia of the brain and that these animals could be used for chronic hypoxic studies. Since the hypoxia is localized to the brain, the model could be helpful in determining whether any of the adaptive changes in response to hypoxia are mediated through the direct effect of hypoxia of the brain.

STUTY OF CARDIO-VASCULAR RESPONSE IN SOJOURNERS TO HIGH ALTITUDE ON PROLONGED STAY. **B. R. Goyle, G. L. Dua and M.S.Maihotra.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt.—110010.*

Baseline measurements of heart rate and blood pressure on 120 healthy army personnel were initially made at sea level prior to their induction to an altitude of 4116 m. Thereafter, the observations were made periodically viz after 1st, 6th, 50th week of arrival at H.A. They were also investigated on return to S.L. after the 1st, 4th and 12th week.

The heart rate and blood pressure, both systolic as well as diastolic increased significantly in the 1st week of arrival at H.A. and showed further significant increase of heart rate and diastolic blood pressure after 6 weeks of stay at H.A.

After about one year's stay at H.A., the heart rate slowed down significantly while the systolic blood pressure further increased. On return to sea level, the bradycardia became more pronounced in the 1st week, while there was a significant fall in systolic and diastolic blood pressure. After 4 weeks of arrival at S.L., there was further significant slowing of heart rate while blood pressure readings reversed to baseline values. The heart rate took 12 weeks to return to baseline values.

STUDY OF THE TISSUE DAMAGE IN DIFFERENT GRADES OF HYPERTHERMIA. **U. Sachdev, G. S. Chhina, B. Singh and S. Roy.** *Departments of Physiology and Pathology, All-India Institute of Medical Sciences, New Delhi-110016.*

Hyperthermia of various degrees and durations tends to affect the performance of cardio-respiratory renal and certain neural functions. The mechanisms of these changes are not very clearly understood. Thus histopathological changes of various organs like liver, intestine, kidney, brain, adrenals and testes were studied on 3 groups of rats, consisting of 5 rats in each group. They were made hyperthermic (40-41°C) for 10-15 minutes, 2-3 hours and for 24 hours respectively. The short lasting hyperthermia was produced by increasing the ambinent temperature and pyrexia by injecting yeast subcutaneously Liver, kidney and adrenals showed marked congestion, focal haemmoragic spots and cloudy swelling within 10-15 minutes of hyperthermia. Brain did not show any significant change in hyperthermia even after 24 hours. Simultaneously recorded cardiac and respiratory rate as well as, O_2 consumption showed an increase. These selective histopathological changes are not related to cardio-respiratory and metabolic activity but may reflect the vulnerability of different tissues to the metabolic activity of individual organs and their local blood supply. The order of protection observed in different tissues in heat stress may be due to the selective preferential sparing of autoregulatory mechanisms which may be the reason for sparing the brain even in hyperthermia of longer duration.

THERMOGENIC ALTERNATIONS IN THE WOMAN. **Shakuntala Sharma, Sandhya Agarwal and S. B. Gupta.** *Department of Physiology, S.N. Medical College, Agra.*

Thermogenesis in the human being is an extra ordinary complicated phenomenon, being further complicated in women because of the effect of progesterone in temperature regulation. Basal body temperature has remained an important and easy method of finding out the exact day of ovulation. However, it may not be possible for all the women to record the temperature accurately. So we have treid to record the temperature at 5 P.M. and at bed time and compared it with basal body temperature in 50 student nurses of similar age groups living under same conditions and having the same work routine. Their

cycles were made anovulatory with preparations like Ovulen and the basal body temperature recorded at 5 P.M. and at bed time. The afternoon temperature was 8 degrees (Fahrenheit) higher than the basal temperature and 0.4 degrees (Farenheit) higher than the recorded at bedtime. In this study the same subjects were used as controls. The results were discussed.

ROLE OF ANTIDROMIC IMPULSES IN MR SENSITIVITY TO HYPERTHERMIC TEMPERATURES. **Neena Bhattacharya, G S. Chhina and B.Singh.** *Department of Physiolog, All India Institute of Medical Sciences, New Delhi--110016.*

A significant depression in monosynaptic reflex response (MR) was found to occur in anaesthetised cats at hyperthermic body temperatures of $\pm 1°C$. In this group of cats MR was recorded from the nerve to gastrocnemius soleus group of muscles on stimulation of the main sciatic nerve trunk. The response however, contained an element of interference due to antidronic impulses apart from thermal effects. Experiments were conducted on anaesthetized cats in which MR was recorded from the proximal part of severed ventral root on stimulation of muscle nerve at different body temperatures during the course of induced hyperthermia by surface heating MR was depressed on raising the body temperature above 40°C as observed earlier but the degree of this depression was less than that observed in earlier expression was less than that observed in earlier experiments. The role in the depression of motoneurone pool brought about by hyperthermic temperatures and contribution of antidromic stimulation in the total inhibition effect was thus observed. Data supporting this conclusion was presented and discussed.

PSYCHOPHYSIOLOGICAL FACTORS INFLUENCING HUMAN PERFORMANCE. **R. L. Bijlani and K. N. Sharma.** *Department of Physiology, Univeristy College of Medical Sciences, New Delhi—110016.*

The effect of dehydration on human performance was investigated on 14 male subjects during may and June in Delhi. Each subject had eight experimental sessions of about 3 hrs each. The session started with the measurement of, among other perameters, endurance time for 80% of the maximum isometric tension exerted by the extensors of the forearm. After that, the subject was dehydrated by 3% of body weight through sweating induced by the combined effects of heat and mild exercise. The dehydrated subjects performance was then measured. The mean performance after dehydration was significantly impaired and was fairly constant. But the performance before dehydration (control) was found to fluctuate considerably from day to day. When the data were arranged in terms of the sequence in which the experiments were performed, the control performance revealed a declining trend. The mean endurance time from the first to the eighth session was 88.5, 87. 2, 70.8, 74.1, 58.0, 63.9, 61.5 and 60.8 sec. The mean dry and wet bulb temperatures (in °C) from the first session through the eight were respectively (30.5, 22.6); (30.2,22.7); 31.0, 23.4); (32.0,23.8); (32.7,24.6); (32.7,24.2); (34.3,25.4) and (34.0, 24.8). The

deterioration of control performance may be related to the diminishing enthusiasm of the subjects with succeeding sessions, or to the rising ambient temperature, or both. However, the fact that performance after dehydration remains virtually constant in spite of these factors indicates that postdehydration impairment is independent of them.

THERMOREGULATORY RESPONSES OF HIGH ALTITUDE NATIVES TO ACUTE COLD STRESS. **Lazer Mathew, S.S. Purkayastha, Jayashankar and R. P. Sharma.** *Defence Institute of Physiology and Allied Sciences, Delhi Cantt.—110010.*

Studies have been conducted to see the thermoregulatory responses to cold of natives living in high altitude, when they descend to sea level. Two groups of subjects (18 each, one representing high-landers from 3500 m and the other of low-landers were exposed to a standard cold test at 10°C, wearing only shorts, for a period of 2 hours. There heart-rate, blood-pressure, minute-ventilation, O_2-consumption, Oral temperature (Tor), mean skin temerature (TS.) finger and toe temperatures and the shivering activity were measured initially in a thermoneutral room, and thereafter at every 30 minutes during the cold exposure. The responses were statistically compared between the groups. The high landers showed significantly lower heart-rate, BP, O_2 consumption and body temperature initially, as compared to other group. During cold exposure, the fall in TS & Tor and rise in O_2 consumption and the shivering activity were significantly lower in the altitude natives. The thermoregulatory mechanisms during cold exposure of altitude natives was discussed.

INTERACTION OF LIGHT SCHEDULE WITH MEAL TIMING IN THE REGULATION OF CIRCADIAN VARIATION OF BODY TEMPERATURE RHYTHM IN THE RAT. **C.V.R. Indira and V. Gopal.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P.G. Centre, Coimbatore.*

The behaviour of an organism in its natural environment is the sum total of responses to external stimuli and is conditioned by internal physiological readiness. The internal readiness fluctuates rhythmically to the external stimuli and is expressed as capacities of various sorts, such as locomotor activity, hormonal rhythmicity, oxygen consumption, lipogenesis, blood sugar level, etc. The fact that food intake (Gopal *et al*. IUPS'77) on one hand, sleep and wakefulness on the other (Aschoff, 73) influences the body temperature rhythm prompted us to investigate the int ractions of mealtiming and meal frequency with light and dark cycle which is associated with activity and rest.

Groups of healthy male albino rats of same age in their prepuberty stage were selected and maintained under standardised conditions. One group of rats were kept *ad libitum* feeding, the food being available arond 24 hours during natural day light (06.00 to 18.00 hrs) and darkness (18.00 to 06.00). These rats showed a series of temperature oscillation in tune with the feeding times. From a morning-minima of 98.6°F during 02.00 to 04.00 hrs and a

minima of 98.6°F during 09.00 to 11.00 hrs to a peak of 100.5°F around 19.00 to 20.00 hrs after which, it gradually came down to follow the cycle again to form a rhythm. Thus the interval between the minima and maxima extended for a fairly long period of 8 to 10 hrs. The rats kept under reversed light conditions (opposite of first group) and fed for 12 hrs during artificial light (18.30 to 06.00) and kept unfed during artificial dark (06.00 to 18.00) condition; thus the light schedule was coupled simultaneously to feeding schedule. These rats showed an abrupt rise of temperature and high amplitude, shortening the maxima and minima interval to 2 to 3 hrs from a minima of 97.2°F at about 16.00 hrs to a maxima of 100.5°F at 18.00 hrs. Thus coupling of light schedule with feeding schedule seems to influence the body temperature rhythm.

MODULATION OF THE CIRCADIAN VARIATION OF CLOACAL TEMPERATURE RHYTHM IN THE FOWL BY ALTERING THE MEAL TIMING. **R. Srinivasan and V. Gopal.**
Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P. G. Centre, Coimbatore.

Circadian variation of light and dark is supposed to be the primary synchronizer to trigger the circadian physiological rhythms. Recent investigations reveal that other factors such as sound, elctromagnetic waves, social clue, sleep wakefulness also act as synchronizers. The present investigation was undertaken to find out whether meal timing can bring change in the circadian variation of cloacal temperature rhythm in fowls.

Fowls of same strain (white leghorn) and age, in their prepuberty stage (4-5 months) were grouped and housed under standardised conditions of natural light-dark cycle and fed *ad libitum*. The fowls were maintained in cages designed to record automatically food and water intake and locomotor activity. The cloacal temperature was measured continuously at every 1, 2 or 3 hour intervals, as the case may be. First group of fowls, fed from 06.00 to 06.00 hrs for 24 hrs, showed gradual build up of temperature rhythm from morning to evening reaching a peak of 42.5°C around 16.00 to 17.00 hrs, after which it gradually came down to 41.0°C around midnight (24.00 to 02.00 hrs) till next morning. This was in tune with the day maxima and nightminima of diurnal animals. The second group of fowls kept in the natural light and dark conditions (L = 06.00 to 18.00; D = 18.00 to 06.00) but feeding the fowls, during 17.30 to 21.00 hrs restricted day time schedule showed a rise of temperature pattern in relation to feeding schedule (i.e., 17.30 to 21.00 hrs) and low temperature during deprivation of food, in contrast to *ad libitum* fed animals for 24 hrs.

Also, fowls kept under natural light and dark conditions, but reversing food schedule only to night-dark conditions (18.00 to 06.00 hrs) showed a raised temperature pattern during night, in contrast to the decrease obtained in animals fed normally, and is in accordance with the night feeding schedule. These experiments reveal that meal timing can change the pattern of cloacal temperature rhythm, independent of lighting schedule.

HAEMATOLOGIC CHANGES DURING EXPERIMENTAL HYPOTHERMIA IN DOGS. **Gummadi Joseph, P. Ananda Rao and T. Sarojini.** *Upgraded Department of Physiology, Osmania Medical College, Hyderabad.*

Earlier workers on experimental hypothermia have reported an increase in the red blood cell count and a decrease in white blood cells with fall in body temperature. But none of them seem to have investigated the nature of those changes whether the rise or fall was sudden, gradual or varied in an irregular manner with the stepwise fall in body temperature.

The haematologic picture (R.B.C., W.B.C., Hb.%) of ten dogs during acute hypothermia produced by surface cooling was studied. The white blood cells were found to be decreased while the red blood cells, and the haemoglobin percentage were increased. The increase in haemoglobin concentration was found to be not in proportion with the increase in red blood cells as judged by colour index and Mean corpuscular haemoglobin concentraation. The probable causes for polycythemia have been discussed and the significant contribution by the bone marrow has been stressed. The increase in red blood cells also seen to depend upon the state of the shivering of the animal which in turn reflects the nature and duration of hypothermia.

Ingestion of Magnesium produces hypothermia and plasma Magnesium is said to increase to a variable extent during hypothermia. To increminate increased red blood cells observed in experimental hypothermia, estimation of plasma Magnesium levels have been undertaken and they were increased 50% rise in five dogs, 25% rise in three dogs while it was only 6% rise in other two dogs. The possible cause for this increase in plasma magnesium levels was discussed.

INFLUENCE OF AGE AND SEX IN THE REGULATION OF CIRCADIAN VARIATION OF CLOACAL TEMPERATURE RHYTHM IN THE FOWL. **V. Gopal and R. Srinivasan.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P. G. Centre, Coimbatore.*

It has been shown that during the ontogeny of the animals, the circadian physiological rhythms of various sorts show some variations in their pattern and amplitude. The basis of the present study is to observe the circadian variation of cloacal temperature in different stages of growth both in male and female fowls.

Both sexes of fowls of same age and strain (white leghorn) were chosen. Taking into consideration the crowing of cocks and egg laying of hens as parameters of three maturity stages (Parkes, Marshall 1960), such as (i) Prepuberty (4 to 5 months); (ii) Transition to puberty (5 to 6 months); (iii) Puberty (6 to 7 months), the cloacal temperature was measured continuously every 1,2, or 3 hrs during the above three stages of maturation. Preceeding stage served as a control to the succeeding stages, and helped to evaluate the circadian temperature pattern on a comparative basis. Formulated balanced fowl-feed and tapwater was

given *ad libitum*. The lighting schedule coincided with the natural light and dark conditions of 12 hrs of day and 12 hrs of night.

Both the sexes exhibit significant differences in the amplitude of temperature rhythm at different stages of maturity. In their prematurity stage, the maxima of day, and the minima of night, is higher in hens, as compared to the maxima of day, and the minima of night of cocks. The h ns show a general increased cloacal temperature as compared to cocks in their prematurity stages (precrowing stage of cocks and preovulatory stage of hens). A s milar trend is seen in the post-maturation stage (crowing stage of cocks and oviposition of hens), i.e. the day-maxima of ovulating hen is higher than the cocks; the night minima of ovulating hen also is higher than the night-minima of cocks. This is supported by the fact that the transitional stage from one to another also show similar trend during transition. Interesting observation to note is that the night minima of ovulating he.n is significantly raised than the night-minima of crowing cocks, where, the temperature is significantly lower than the ovulating hens. This is discussed in the background of the interplay of physiological changes involved in the development of reproductive function.

OBSERVATION OF CIRCADAIN VARIATION OF BODY TEMPERATURE RHYTHM IN UNDERNOURISHED HUMAN SUBJECTS. **V. Gopal and A. R. Rajavel.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P.G. Centre, Coimbatore.*

It has now been well established that rhythms (Biological or Physiological) of many frequencies which extends from cycles of less than a second to cycles of a year or more corresponding to physical environmental frequencies from all levels of biological organization, and at all levels of animal life, is very essential to the very survival of the organisms. Reported results indicate that such a rhythm exists for body temperatue.

Circadian variation of body temperature rhythm is associated with sleep and wakefulness (Aschoff '77). However, experiments with human subjects have shown that meal time and meal frequency play a dominant role in the regulation of body temperature rhythm. With a view to explore the effect of undernourishment on the pattern of body temperature rhythm, undernourished human subjects (beggars) were chosen based on the age, height, weight, health and food intake and temperature was recorded continuously every 1,2 or 3 hrs as the case may be.

The results indicate that body temperature rhythm in undernoruished human subjects deviates from that of the normal human beings. The gradual build of temperature rhythm following breakfast, lunch, dinner and snacks in between as seen in normal human being were not seen in undernourished human. The oscillation and amplitude of temperature were different from that of normal human subjects. The significance of the result was discussed in the background of food intake and nourishment.

STUDIES ON CHANGES IN BLOOD GLUCOSE AND SERUM FREE FATTY ACID LEVELS DURING ACUTE HYPOTHERMIA IN DOGS: AN EXPERIMENTAL STUDY. **P. Ananda Rao and G. Joseph.** *Department of Physiology, Guntur Medical College, Guntur (A.P.).*

Blood glucose and serum free fatty acid levels were determined in 20 anaesthetised dogs before subjecting them to hypothermia and after inducing hypothermia (27 ± 0.08°C). Increase in glucose and free fatty acid levels have been observed indicating a definite tendency for the mobilization of both glucose and free fatty acid levels during hypothermia. It has been recorded that whenever the initial serum free fatty acid level is low, the percentage rise is more. Similarly the percentage elevation of glucose observed to be moderate if not significant if the initial blood glucose level is low. The possible mechanisms involved in anaesthetised dogs leading to the above changes have been discussed.

STUDIES ON CERTAIN ASPECTS OF ASCORBIC ACID METABOLISM IN PROGENY OF MALNOURISHED MOTHER RATS. **Ajay K. Chatterjee.** *Department of Physiology, Calcutta University College of Science, Calcutta.*

The metabolism of ascorbic acid has been studied in 2-day, 7-day and 14-day old progeny of mother rats receiving 22% or 8% protien in the diet. The total ascorbic acid content of liver, kidney, adrenal, brain and intestine has been measured. The biosynthesis of L-ascorbic acid by the liver of progeny has also been studied. Progeny of mother rats receiving a 8% protein diet showed diminished ascorbic acid content in each of the tissues studied with the exception of intestine. The biosynthesis of L-ascorbic acid from both D-glucuronolactone and L-gulonolactone was reduced in 2-day, 7 day and 17-day old progeny of protein malnourished rats. The possible significance of these findings was discussed.

EFFECT OF ELECTRIC FIELDS ON BONE ATROPHY OF DISUSE IN THE RAT. **T. A. Perumal, T. K. Bullard and C. Jayachandran.** *Department of Physiology and Department of Radiotherapy, Christain Medical College, Vellore.*

The effect of capacitively coupled electric fields on the development of disuse atrophy in bone was studied in the rat. One hind limb of a rat was immobilized in a plaster cast containing two insulated brass plate electrodes which were located on the lateral and medial surfaces of the limb. Electric pulses of 1 msec duration (100 volts, Hz and 200 volts, 500 Hz) were applied to the electrodes producing an electric field around the limb between them for a period of 6 hours per day. The contralateral limb was free and not restricted in any way. A dose of tetracycline (100 *mg/g*) was given (i.p.) on the 1st and 14th day of the experiment. Control animals were subjected to the same procedures without application of the electric fields. At the end of 21 days of treatment all animals were sacrificed and the following parameters were measured in tibia of both limbs; dry weight, % ash, new bone deposition rate (as measured by tetracycline labeling) and x-ray density. Differences obtained between electrically treated and normal bones in experimental animals were compared with differences

observed between "sham-treated" and normal bones in control animals. Results indicate that while bone atrophy of disuse was produced to some extent in both experimental and control animals the electric fields used were effective in decreasing the degree of bone atrophy of disuse caused by immobilization.

PROGRAMMING OF CELLULAR EVENTS IN INTRAUTERINE UNDERNUTRITION IN RATS. **Kumudini Deo, Veena Bijlani and M. G. Deo.** *Departments of Neurology, Anatomy and Physiology, All India Institute of Medical Sciences, New Delhi—110016.*

Protein-calorie malnutrition is one of our major public health problems. It affects growth of every tissue of the body including brain. The retardation of brain growth is shown to have long term and permanent effects on the intellectual and behavioural performance of an individual in the later life. There is a precise programming of cellular events in developing brain. The present investigation was undertaken to study the effects of intrauterine undernutrition on this aspect of brain development. Undernutrition was induced by feeding pregnant dams a diet containing 5% casein throughout gestation. Controls received a diet containing 25% casein. On the day of birth newborns were administered a pulse of H^3—thymidine and sacrificed at specific time intervals. Rate of cell formation was assessed by measuring the mitotic and labeling indices in the ventricular zone cells. In another study mothers received 1 mc of H^3—thymidine on 20th day of pregnancy. Litters were sacrificed when they were 21-day old. By this age lamination of the cortical layers is fully developed. The final position of the labeled cell in the autoradiography in the 21-day old animals, would therefore indicate if the programming of cell genesis is modified by intrauterine malnutrition. In both studies the somato-sensory area of the cerebral cortex was subjected to autoradiography. It is concluded that malnutrition affects the cell proliferation but the programming of cellular events remains unaffected.

PRELIMINARY STUDY IN SKINFOLD MEASUREMENTS OF VEGETARIANS AND NON-VEGETARIANS. **M. J. Barua and J.V. Bhatt.** *Department of Physiology, T.N. Medical College, Bombay*-400008.

An attempt has been made to study the effect of vegetarian and non-vegetarian diet on the skin fold measurements in 200 Maharashtrian adults of both sexes.

Skin fold measurements of non-vegetarians are found to be greater than vegetarians in all 4 selected sites.

An assessment of lipogenic effect of non-vegetarian diet is advocated. Further studies to document these effects are proposed. Methods to avoid the hazard of obesity by proper diet were discussed.

ROLE OF NUTRITION & EXPOSURE TO SUNLIGHT IN ANTICONVULSANT OSTEOMALACIA. **R.K. Marya, V.P. Khattar and R.K. Bansal.** *Medical College, Rohtak.*

Serum Calcium, inorganic phosphate and alkaline phosphatase, T.R.P. estimation and radiological examination of skeleton were conducted in 40 patients (18-50 year age) on anticonvulsant therapy and on 20 controls. Results are shown in the table.

	Patients on anticonvulsant therapy (40)	*Controls (20)*	*P value*
Serum Calcium (*mg*%)	10.10±0.61	10.18±0.61	0.2
Serum Inorganic Phosphate (*mg*%)	3.71±0.65	3.91±0.57	0.2
Serum Alkaline Phosphate K.A.U. %	12.43±7.80	8.71±2.40	0.01
Tubular Reabsorption of Phosphate (%)	86.82±7.45	90.10±3.92	0.05

The epileptic group showed statistically significant rise in serum alkaline phosphatase and fall in T.R.P. In none of the case however, there was clinical or radiological evidence of osteomalacia. In European countries the incidence and severity of anticonvulsant osteomalacia is far greater than observed in our cases. The abundant sunshine in this part of the country seems to have a protective role against the development of anticonvulsant osteomalacia.

The biochemical abnormalities were observed mainly in subjects in 18-22 years age group. It seems the critical factor for the development of anticonvulsant osteomalacia is the lack of dietary vitamin-D/ solar exposure or increased body requirement of the vitamin.

EFFECT OF ASCORBIC ACID DEFICIENCY ON BRAIN, LIVER AND SERUM CHOLINESTERASES IN GUINEA PIG. **B.S. Bharaj and Z. M. Verjee.** *Department of Biochemistry, University of Nairobi, Kenya.*

The effect of ascorbic acid deficiency on the activities of brain, liver and serum cholinesterases was studied in scorbutic guinea pigs. The activities of these enzymes were studied in six scorbutic guinea pigs. No decrease in the activity of acetylcholinesterase was observed in the whole brain homogenate and the subcellular fractions. However, a decrease in the activity of acetylcholinesterase was observed in the serum of scorbutic guinea pigs. No activity of this enzyme was detected in the liver. Butyrylcholinesterase

activity did not alter in the brain sub-cellular fractions but liver whole homogenate and liver mitochondria showed a decrease. Liver post mitochondrial fraction did not show any change in activity. Serum butylpIcholinesterase showed a significant decrease. These results were discussed in the light of the fact that such a decrease may increase the intensity and duration of action of hydrolysable muscle relaxants, the systemic toxicity of ester-type local anaesthetics and organophosphorous compounds.

FURTHER STUDIES ON THE EXISTENCE OF RELATIONSHIP OF BODY TEMPERATURE RHYTHM TO FOOD INTAKE MODULATION IN HUMAN SUBJECTS. **V. Gopal, C.V.R. Indira, R. Srinivasan, Rathna Gopal and A.N. Rajavel.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P.G. Centre, Coimbatore and Department of Pharmacology, Madurai Medical College, Madurai-620020.*

Reported results indicate that body temperature rhythm is associated with sleep and wakefulness (Aschoff '73) and reflect an apparent relationship between activity and rest. Our previous series of investigations (Gopal *et al.* IUPS, Paris, '77) in human subjects consuming vegetarian and non-vegetarian diet revealed the existence of relationship of body temperature rhythm to meal time and meal frequency.

The present series of experiments were therefore designed to explore the involvement of different types of food, (Balanced, Protein, Carbodhydrate and Fat) in regulating the circadian variation of body temperature, by following the rise of temperature oscillations continuously every 5, 7 or 10 minute intervals in human subjects kept under rigorous feeding schedule.

The findings indicate that there is a steady build up of temperature from the minima of about 95.5°F at about 05.00 to 06.00 hrs, to the maxima of about 99.0°F or more at 20.00 to 21.00 hrs following breakfast, lunch, dinner and snacks in between. The amount of rise of temperature varied from diet. The temperature rise was high for protein food and this was followed by balanced diet, carbohydrate diet and fat in that order. No significant rise was noted in subjects who did not consume food at a particular meal time. The mode of rise of temperature was also different from diet to diet. Temperature rise for protein was abrupt, reaching its peak within 30 minutes after consumption. This rise of temperature was sustained for a fairly long time. A similar but delayed rise was observed for balanced diet and carbohydrate diet. The rise of temperature for carbohydrate was less than that of Protein and balanced diet and sustained for lesser time. Behavioural observations revealed that subjects consuming carbohydrate diet felt hungry earlier than other subjects who consumed other types of food. These experiments coupled and decoupled sleep and wakefulness reflected that food intake modulation is another factor that influences the circadian variation of body temperature rhythm as does sleep.

INFLUENCE OF CARBOHYDRATE, FAT, PROTEIN AND BALANCED DIET IN THE REGULATION OF CIRCADIAN VARIATION OF BODY TEMPERATURE RHYTHEM IN THE RAT. **V. Gopal and C. V. R. Indira.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P.G. Centre, Coimbatore.*

Various sorts of physiology oscillations help to build up circadian rhythms of various frequencies and amplitude. The body temperature rhythm is considered to be one such vital circadian oscillations of physiological rhythms and is one among the fundamental properties of all living organisims. Since food intake is a vital process to keep the same active, a series of experiments were designed to find out the inter-relationship of food intake and body temperature rhythm in the rat.

Four groups of adult male rats in their prepuberty stage were housed under standardised conditions. They were maintained in rooms, where, the natural day-light (06.00 to 18.00) and night-dark (18.00 to 06.00) conditions were available. The rats were fed with 96% carbohydrate, 100% fat and 96% protein diets against which the balanced (basal) diet (74% carbohydrate; fat 3%, 13% protein, along with vitamins and minerals) served as control food. Depending upon the necessity, measurement of rectal temperature was made every 1/2, 1, 2 or 3 hrs intervals, continuously for 24 hrs.

Rats fed *ad libitum* balanced diet showed a series of oscillations leading to gradual build up of temperature rhythm, following a series of oscillations in tune with the feeding times, from morning to evening reaching a peak of 100.5°F around 19.00 hrs, after which it gradually came down to a minima of 98.6°F at 02.00 to 04.00 hrs next morning, the average being 99.6°F. Comparison of body temperature rhythm of rats fed with carbohydrates, fat and protein diet showed variation in the maxima and minima of body temperature rhythm as compared to animals fed with balanced diet. The temperature rise was high for protein food and this was followed by balanced diet, carbohydrate diet and fat in that order. The present experiments reveal that the circadian oscillation of body remperature of rat can be modulated by difference in food composition.

RELATIONSHIP OF MATERNAL SERUM PROTEIN WITH PREMATURITY. **Uma Banerjee.** *Department of Biochemistry, Medical College, Nagpur and* **R.B. Survey.** *Department of Obst. & Gynaec., Medical College, Nagpur (Maharashtra).*

Nutritional status was studied in 70 cases of premature delivery and compared with 100 cases of full term pregnancy.

The incidence of premature deliveries was common among the young mothers under 30 years of age

Mothers of premature babies were found to have comparatively low haemoglobin and serum proteins than mothers of the control group.

Comparative study of the weights of infants and the maternal haemoglobin value showed that the anaemia was an important factor in arresting the growth of the foetus in anaemic mothers.

AN ELECTRONIC RECORDER TO EVALUATE ANIMAL BEHAVIOUR. **M. Palaniswamy and V. Gopal.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P.G. Centre, Coimbatore.*

We have, for sometime been interested in the mechanisms of circadian rhythms of animal behaviour. An increasing array of electronic gadgets is used in modern laboratories to evaluate the pattern of animal behaviour. But they are very expensive and are beyond the reach of an ardent research worker.

The present investigation describes a method of evaluating the animal behaviour by a simple but efficient wiring which can record the activity pattern such as feeding, drinking and locomotion of the animals. The activity marker consists mainly of a relay. The moving contacts of the relay are removed from the armature. A rod of 20 cms. length and 2 mm diameter is obtained from bicycle spokes. This is fixed on the armature in such a way that about 5 cms. of the threaded portion of the spokes is projecting backward. The marking pen is attached to the front portion of the rod. A small cylinder (7mm x 5mm) having thread in its centre, is soldered to the threaded portion of the spokes and is used as counter weight. An inverted 'U' shaped copper wire (205 w.g.) is soldered by which marking stroke can be controlled by changing vertical height from soldered point. This modified relay can be activated by the following electronic circuit.

Initially transistor Q_1 is on, and transistor Q_2 is off, because its base returns through R_2 (1 8K) resistor is positive. When a switch S_1 is closed it turns Q_1 off which increases the collector voltage of Q_1. This increace couples into the base of Q_2 through the capacitor C, turns this transistor on. But this condition of Q_2 is only temporary, because as the charge of the capacitor changes, the forward bias on the base of Q_2 disappears. After an amount of time determined by the R_2C time constant the base circuit Q_2 is turned off. Each time S_1 is closed, the relay R_2 is energized by the action of Q_2 as described above. The switching points can be directly coupled either to activating levers of food cup, water cup and to the titling base plate of the activity cage or to the leaf switches of the mechanical lever system described elsewhere.

A SIMPLE AUTOMATIC MECHANICAL RECORDING SYSTEM FOR SIMULTANEOUS EVALUATION OF FEEDING CYCLES, WATER INTAKE LOCOMOTOR ACTIVITY. **V. Gopal and M. Palaniswamy.** *Division of Neurophysiology and Behaviour, Department of Zoology, Madras University Autonomous P.G. Centre, Coimbatore.*

To determine the circadian locomotor activity of animals, often tilting cage arrangement is resorted to, in which it is difficult to place water and food without getting them-

selves tilted along with the cage. In its simpler form this is very crude and often will lead to other physiological feed-back disturbances caused by the abrupt tilting of animal itself. In its complex form, the Skinner box is often expensive and involves electronic circuits. A method for evaluating simultaneously the locomotor activity, feeding cycle and water intake is described in which an inexpensive, easy-to-make recording lever attachment can be fabricated by utilising muscle twitch recording lever, on which bicycle spokes with its screws can be affixed with specific bendings to suit the feeding cup, water cup and the tilting base plate.

The tilting base plate is made up of teak wood frame with 3 x 3 cm. wire mesh floor spread. Its dimensions are slightly less than the inner dimension of the cage (50x50x50 cms). An half inch knife edge arrangement is fixed on the centre of the opposite sides of the frames of the base plate. This knife edge rests on the slightly inward projecting 'V' shaped groove of a pair of detachable frame of the cage. When the animal moves inside the cage from one side to another over the tilting plate, the knife edge arrangement causes up and down motion in the base cover. This motion is very small to record directly on to the kymobgraph drum. It is amplified by a 'Z' shaped lever arrangement, which couples the base plate and the recording lever through muscle twitch lever system. One end of the 'Z' shaped steel rod is attached to the base cover of the cage and the other end passes through a hole in the freely rotating axle of 3.5 mm diameter. The axle is pivoted between hardened centres. The outside neck of the 'Z' shaped lever is fitted with spokes' nuts. The threaded free end of the spokes can be screwed as an when necessary to this spokes' nut which is projecting outside the cage and can be utilised as writing point on the kymograph.

COMPUTERIZATION OF EEG AND ITS USE IN BIOFEEDBACK SPECTRAL ANALYSIS. **M. V. Kamath, T. M. Srinivasan and R. Kalyana Krishnan.** *Computer Centre, I.I.T., Madras.*

Any objective method of analysis of EEG entails the charecterization of EEG by its statistical parameters such as power spectrum, auto-correlation etc. EEG is treated as stationary time series. It is quantized and the samples are fed into a computer. Past Fourier Transform algorithm is used to calculate the components of the spectra.

Instrumentation used for the feedback consists EEG amplfiers, filters for extracting the various components of EEG (such as delta, theta, alpha, beta) and a power amplifier for visual feedback. The type of feedback is termed as 'nonvolitional' as it invokes no volitional effort on the part of the subject.

This paper presents the study of the effects of visual biofeedback on normal subject using the above methods. The results of the computer analysis are presented in graphical form for easy interpretation. As EEG varies from person to person, effects of biofeedback on

different persons can also be expected to vary. Thus the EEG is evaluated so that the statistical parameters mentioned above provide reference indices for comparison before during and after feedback.

THE ORGANIZATION OF AN ELECTROMYOGRAPHIC LABORATORY IN A COMMUNITY HOSPITAL IN A DEVELOPING COUNTRY. **Srinivas Krishnamoorthy.** *Consultant in Neurology, V.H.S. Medical Centre, Adyar, Hony Clinical Professor of Neurology, Institute of Neurology, Madras Medical College and Hony. Electroencephalographer, Govt. General Hospital, Madras.*

Ever since Adrian and Bronk defined the concentric needle electrodes in 1930's, Electromyography has come to stay. Herein after the abbreviation EMG will be used to connote this term.

The Voluntary Health Services was founded in 1958 and the Madras Race Club Hospital is a part of this centre. The Neurology Department was established in 1965, and Electromyography commenced in 1971. Since May 1971 to date, 1000 EMG's and Nerve Conduction Studies have been carried out by myself.

Electromyography is an absolute necessity for the specialities of Neurology, and Physical Medicine and Rehabilitation, and very often needed by the specialists in Diabetes, Renal diseases ect. Diagnosis and prognosis of peripheral nerve injuries are in the domain of the specialist. In a developing country the need for early diagnosis of Hansen's disease is of paramount importance and here Nerve Conduction Studies and EMG are of vital assistance.

A commercially sold well known EMG apparatus (MEDELEC) is used for all the studies. This consists of a CRO (Cathode Ray Oscilloscope), Preamplifier box, bipolor-nerve stimulator, needle and surface electrodes and accessories are used as and when required. To save on a two way mirror, the help of an expert photographer was sought. An extra camera was used to photograph the potentials, directly off the oscilloscope.

The structure of the room, earthing, type of equipment, the difficulties and travails of proper maintenance are discussed in detail in the list of problems in developing countries.

To emphasis the usefulness of the procedure illustrative case reports were given.

PRELIMINARY PHARMACOLOGICAL STUDIES OF THE ESSENTIAL OIL OF ACACIA FARNESIANA (GANDH BABUL). **C. P. Trivedi, N. T. Modi and B. G. Chavan.** *Department of Pharmacology, G.R. Medical College, Gwalior (M.P.).*

The essential oil of Acacia farmesiana pods was obtained by steam distillation and thus subjected to pharmacological studies. A negative ionotropic and chronotropic action of perfused Rabbit's and Frog's heart uninhibited by atropine was observed with a dose of

2-4 *mg* of the essential oil. Intravenous injection of the oil in a dose of 300 *mg* to 500 *mg* per *kg* produced a long lasting fall of blood pressure. This depressor action was not blocked by atropine, propranolol and avil. It inhibited pressor effect obtained by carotid occlusion but did not affect the pressor effect of nicotine. These drug interactions ruled out the hypotensive effect of essential oil mediated through Cholinoceptive, Beta-Adrenoceptive histaminergic receptors and ganglionic sites. The volatile oil in a dose of 300 *mg* to 500 *mg* per *kg* increased the volume of the out flow perfusate of the perfused hind limb of dogs and this effect was not blocked by propranolol and atropine, which further excluded the role of cholinergic and B-Adrenergic receptors in vasodilator effect. The oil in a concentration of 3×10^{5} produced relaxation of Rabbit's isolated intestine which remained unaffected by priscoline and propranolol. A slight increase in the out flow perfusate of perfused isolated lung of guinea pig uneffected by propranolol was also observed. The volatile oil in a dose of 100-200 *mg/kg* increased the pentobarbitone sleeping time in rats and decreases their spontaneous motor activity. These studies showed that the volatile oil possessed a direct plain muscle relaxant, cardiac depressant and sedative action on experimental animals.

PHARMACOLOGICAL STUDY OF LAWSONIA INERMIS 'LINN'. **L. C. Lahon and N. Singh.** *Division of Pharmacology & Toxicology, I.V.R.I., Izatnagar (U.P.).*

Screening of different extracts (1-6) of leaves of Lawsonia inermis 'Linn' (L. inermis Linn) and different fractions with RF values 0.60, 0.62, 0.77 and 0.92 & 0.85, 0.75 and 0.70 indicated their anti-bacterial and antifungal activity. However, the glucoside obtained from extract No. 6 did not show any anti-microbial activity. Other pharmacological studies carried out with Methanol extract (ME), Methanol extract after adsorption (MEA) and glucoside (GL) indicated that these neither show their own effect nor could alter the spasm induced by Acetylcholine, Histamine, Barium chloride and Nicotine sulphate on isolated guinea pig ileum and Rabbit jejunum. ME (1 *mg*) could not alter the contractions of isolated frog heart but 10 *mg* dose caused positive inotropic effect which was blocked by propranolol and not by reserpinization indicating its B-stimulant activity. This could not be confirmed on oestronized rat uterus at the dose of 20 *mg*. ME could induce negative inotropic and chronotropic effect and is not blocked by atropine. Glucoside upto 100 *mg* could not show any effect on the isolated heart but 1 μg could cause cessation for a while followed by positive inotropic effect. With consecuitve doses, it blocked its own effect.

Studies by incubating hemolysed RBCs with ME and GL did not show any anti-acetylcholinestrase activity. ME (10-100 *mg*) could not interact the effect of Ach (10 μg) and nicotine sulphate (0.1×10^{-4}) on frog rectus abdominus muscle. ME, MEA & GL could not alter normal blood pressure and respiration of dog or interact the effect of Ach (1 $\mu g/kg$ i/v), Histamine (1 $\mu g/kg$ i/v), Adrenaline ($0.1 \times 10^{-4}/kg$) and Nicotine sulphate

0.1 x 10^{-4}/*kg* i/v). ME and M.E.A. do not increase pentobarbitone induced sleeping time in rats indicating that none of these are metabolized by liver microsomes.

PHARMCODYNAMICS OF DRAVYAS IN AYURVEDA. **S. P. Dixit and M. Padmanabhachar.** *Department of Ayurveda, The Indian Institute of Research in Yoga & Allied Sciences, Tirupati (A.P.).*

Ayurveda is an ancient medical science of India. It owes its allegiance to Atharvaveda - a major source of medical knowledge. There are quite many branches in Ayurveda. Dravyaguna Vijnan (materia medica) is one among the many offshoots. This deals with as the name implies, knowledge of Dravyas (substances) which include both "drugs and foods". In the present context only medicinal substances are referred. About 2000 medicinal substances of vegetable, mineral and animal origin have been recorded in Ayurvedic literature. These drugs in various forms have been in vogue in the treatment of diseases since centuries. Their actions in the human body are based on certain basic principles. According to Ayurveda all the Dravyas whether drugs or foods are composed of, by a 'pentad' of Panchamahabhutas like Prithvi, Ap, Tejas, Vayu and Akash and the human body where they act is too Panchabhautic. The sublime concept of the Pharmacodynamics of the drugs in Ayurveda is based on certain fundamental principles like, Rasa, Gunda, Veerya, Vipaka, Prabhava and Karma, which have also got Panchabhautic base. Details regarding these concepts and their interpretation in the light of modern science were discussed.

PRELIMINARY STUDIES OF THE ANTIDEPRESSANT EFFECTS OF TETRAMISOLE ON THE CENTRAL NERVOUS SYSTEM. **D. A. Joseph.** *Department of Pharmacology, T.N. Medical College, Bombay-400008.*

Tetramisole an anthelmentic on the dose of 5 *mg/kg* and 10 *mg/kg* when administered to rats produced a marked reversal of reserpine induced depression. The effects of tetramisole on chlorpromazine induced depression, extensor seizures in mice and food consumption in rats were observed and the results were discussed.

PHARMACOLOGICAL STUDIES ON "DIARNIL" (A SIDDHA PREPARATION). **R. Dhananjayan and C. Gopalakrishnan.** *Department of Pharmacology, P.G. Institute of Basic Medical Sciences, Madras.*

"Diarnil" is a siddha preparation used in diarrhoeas. Chemical analysis of the preparation was made. It does not contain alkaloids of opium. The drug was screened for its pharmacological actions. The drug does not affect behaviour in animals. In anaesthetised dogs and isolated ideal preparation the compound exhibited anticholinergic action. The drug did not exhibit any significant antibacterial action against of E Coli & Staphy

aureus. The drug was found to be relatively nontoxic in rats when observed over a period of three months. Our observations were discussed in detail.

ANTIFUNGAL ACTIVITY OF CERTAIN RHIZOMES-CURCUMA LONGA, C. AMADA, ETC. **S. Venkitraman.** *Department of Pharmacology, P.G. Institute of Basic Medical Sciences, Madras.*

Alcohlic extracts of the plant material cited above were studied for their antifungal activity, as per the method of Ajello *et al*, in cases of dermato phytes. The results were discussed.

PHARMACOLOGICAL ACTIONS OF TYLOPHORINE. **C. Gopalakrishnan and R. Dhananjayan.** *Department of Pharmacology, P.G. Institute of Basic Medical Sciences, Madras.*

The alkaloid tylophorine was obtained from the plant tylophora Indica. The alkaloid produces depression of the C.N.S. in doses of 250 *mgs* 1 *kg* in white mice. The alkaloid does not exhibit analgesic action when tested by the radiant heat method in rats. The alkaloid exhibits positve inotropic effect on the frogs ventricle. It also exhibits anti-inflammatory action. Our observations were discussed.

ANTIFERTILITY ACTION OF DIETHYLCARBAMAZINE. **T. R. Ramanujam and V.S. V. Subbu.** *Department of Pharmacology, P. G. Institute of Basic Medical Sciences, Madras.*

Diethyl carbamazine inhibits oestrus in albino rats, when observed over a period of three months. The results of our experiments were discussed.

ANALGESIC ACTION OF KETAMINE.**V .S.V. Subbu and M. Bhaskaran.** *Department of Pharmacology, P.G. Institute of Basic Medical Sciences, Madras.*

The analgesic action of Ketamine was compared with that of Morphine and Analgin. Ketamine is less potent as an analgesic when compared to morphine in white rats. The results were discussed.

METRONIDAZOLE AS AN ANTACID IN THE MANAGEMENT OF PEPTIC ULCER. **T.R. Ramanujam and V. S. V. Sabbu.** *Department of Pharmacology, P. G. Institute of Basic Medical Sciences, Madras.*

It was reported earlier (Drs. Prasad and Subbu) that metronidazole acts as a H_2 blocker, and its effects were compared with burimamide. 18 patients with peptic ulcer were exposed to metronidazole in doses ranging from 2 *gms* to 6 *gms* per day. With doses of 4 *gms* per day many patients were free from pain and were able to relish food. Biochemical analysis of the gastric contents of these patients revealed marked lowering of free and total acid. The results were discussed.

ASSESSMENT OF YOGA THERAPY IN BRONCHIAL ASTHMA. **B. L. Meti, B. S. Harinath, G. Mohan, K. Krishna, G. S. Melkote, G. Raghava Rao, and T. M. Srinivasan.** *Indian Institute of Research in Yoga and Allied Sciences, Tirupati (A.P.).*

We report here management of Bronchial Asthma through Yogic therapy. Twelve cases of clinically assessed Bronchial Asthma were admitted as inpatients. These twelve cases consisted of Ten male and two female patients, their age group ranging between twenty to fifty five years the duration of their disease varying between one year to fourteen years. The inpatient treatment period varied from twenty to one hundred days. The treatment consisted of Yoga Asanas, Kriyas and Pranayama; Bronchodilators were given for a few days after admission and tapered off and afterwards were administered only if patients had moderate to severe attacks.

Two female patients and one male patient were in asympotomatic phase of their disease and continued to be so during their hospital stay. Of the remaining nine patients, one patient had good response to Yoga therapy, two had satisfactory relief, three patients had partial relief and three cases did not show any relief.

All the patients were examined and investigated for pulmonary function tests before, during and at the end of their hospital stay. The details of the results of pulmonary function tests were presented.

This preliminary study shows that Yoga practices have beneficial effect in relieving bronchial asthma.

PREDICTION OF MAXIMAL AEROBIC POWER IN MAN FROM ANTHROPOMETRIC MEASUREMENTS. **S. S. Verma, H. Bhardwaj and M. S. Malhotra.** *Defence Institute of Physiology & Allied Sciences, Delhi Cantt.—110010.*

Maximal aerobic power (VO_2 max) and anthropometric data were obtained on 120 active human subjects using standard techniques. Twenty seven anthropometric variables were examined for their possible relationship to maximal aerobic power using stepwise linear regression analysis. Four variable :— 1. Stature, 2. Weight, 3. Elbow width, and 4. Juxtanipple skinfold thickness accounted for 34.9% of the variation in maximal aerobic power. The addition of the remaining 23 variables accounted for only 46.39% of the variation, an increase of only 11.49%. The equation constructed for predicting aerobic power from these four anthropometric variables had multiple correlation coefficient amounting to 0.591 ($P<0.001$). This would serve well as preliminary screening procedure for selecting suitable personnel.

ASSESSMENT OF PHYSICAL FITNESS (FITNESS INDEX AND VALSALVAS RATIO) AND THEIR CORRELATION WITH BODY PARAMETERS. **P. Balasubramanaim, J. V. Bhatt and Vidya G. Parulkar.** *Department of Physiology, T.N. Medical College, Bombay—400008.*

Body parameters, as index of physical development may not run parallel with physical fitness which is a dynamic value. Proper assessment of physical fitness on a large scale can be done only with the determination of Fitness Index and Valsalva's Ratio because of their simplicity. A study of 60 medical students (Boys) was undertaken to determine their Fitness Index as assessed by Harvard's Step Test and Valsalva's Ratio as ascertained by Valsalva's manoeuer performed in a standardised mannner with heart rate recorded by E.C.G. An attempt to correlate these results with some body parameters like height, weight, maximum chest expansion, leg length, vital capacity, resting pulse rate is made. Results and their significance were discussed.

EFFECTS OF YOGIC POSTURES ON SOME PHYSIOLOGICAL PARAMETERS. **A. Maini, P. Varma, S.A.H. Rizvi and Sarla Varma.** *Department of Physiology, G.S.V.M. Medical College, Kanpur (U.P.).*

Fifty healthy medcial students of both sexes ranging between 17-23 years of age were subjected to practice of various Yogic postures daily for a period of six months. Several physiological paramaters viz. height, weight, heart rate, blood pressure, EKG pattern, breath holding time, tidal volume, inspiratory and expiratory reserve volumes, vital capacity, FEV 1.0 sec, maximal voluntary ventilation, chest expansion, cardiorespiratory efficiency, general blood picture, blood sugar and serum cholesterol levels, were studied before starting the Yogic 'Asans'. All these parameters were recorded again after the subjects had practiced the asans for six months.

An increase in height, weight and chest expansion was seen in majority of the subjects. Heart rate decreased in 50% of the subjects and remained unchanged in the rest 50%. In fifty percent of the subjects the blood pressure also decreased. In another 20%, an increase in B.P. occured and the rest 30% showed no change in B.P. The respiratory volumes and capacities showed an increase. The cardiac and respiratory efficiency also improved. The changes in blood sugar and cholesterol were variable.

EFFECT OF EXERCISE ON THE ACTIVITIES OF SARCOLEMMAL ATPASES CARDIAC MUSCLE IN RATS. **Karri Radhakrishnamurthy and Indradeva Saxena.** *Department of Physiology, Institute of Medical Sciences, Banaras Hindu University, Varanasi—221005.*

Swimming was chosen as an exercise to train the rats for studying the effect of exercise on sarcelemmal ATPase activities of myocardium. Rats were made to swin 180 minutes per day for a total period of 250 hours. The ventricles were subjected to hypotonic treatment and pure sarcelemma free from myofibrillar contamination was obtained. The sarcolemmal fraction was analysed for the specific activities of Na-K ATPase, Mg ATPase and Ga

ATPases. The specific activities of all these ATPases were obsereved to be higher in the exercise trained group compared to sedentary group of animals. In particular the increased specific activity of Ga ATPase was found to be highly significant.

YOGA AND THE HEART. **C. Lakshmikanthan, P. V. Balakrishnan, B. Ramamurthi, S. Thanikachalam, T. R. Viswanathan, S. Krishnamurthy, Ramabadran and R. Alagesan.** *Institute of Cardiology, Madras Medical College & Govt. General Hospital, Madras—600003.*

Medical men invariably prescribe some kind of exercise so as to retain good health. We have to-day various systems of exercises like walking, running calisthenics etc. The yogic system of exercises is the most ancient and has been claimed by Yoga experts, by far the best. For deeper understanding of the medical and scientific aspects of the yogasanas especially the effect of yoga on the Cardiovascular system a planned research was undertaken by a team consisting of the staff of the Institute of Cardiology, Govt. General Hospital, Madras and the Yoga experts.

This study was undertaken with following objectives :

To study the heart rate, blood pressure, clectrocardiogram with the help of Telemetry, Oxygen consumption and the left ventricular performance using non-invasive techniques for the various yogasanas. Similar studies using modern electronic gadgets to study the effects of various yogasanas on the Cardiovascular system so far has not been undertaken or reported any where. This study has been completed for certain yogasanas which has varied effects on the Cardiovascular system.

Whether certain yogasanas will help to treat high blood pressure and other cardiac like ischemic heart disease so that they can supplement or be additives to drug therapy?

The above studies were undertaken on yoga experts, volunteers and the cardiac patients with high blood pressure, ischemic heart disease and patients who have cardiac failure.

1. Shava—Asan (Dead pose).
2. Rama—Karani (Modified yogasana)
3. Viparitakarani (Elbow stand)
4. Sarvangasana (shoulder stand)
5. Halasana (Plough posture)
6. Padmasana (Lotus posture)
7. Vajrasana (diamond posture)

This preliminary study indicates that Shava Asan and Rama—Karani are likely to be useful for the treatment of high blood pressures, rehabilitating a patient after heart attack because in addition giving rest to heart, it improves the cardiac performance.

In Viparitakarani, Sarvangasana and Halasana the work of the heart has increased. In Yoga experts and healthy volunteers the work of the heart increased and the cardiac performance improved. The physiological parameters simulates other physical exercises where it has been shown to lower the risk factors associated with coronary artery disease. In the similar way these Asanas may be helpful in the primary prevention of ischemic heart disease. In cardiac patients with subnormal cardiac function the Viparitakarani, Servangasana and Halasana increased the work of the heart with decreased cardiac performance.

The Asanas which increase the cardiac work and those that decreases the cardiac work can be combined for the rehabilitation of cardiac patients with good cardiac reserve. In cardiac patient with poor cardiac reserve only the Asanas which decrease the cardiac work and improves the cardiac performance can be undertaken (Shava-Asana and Ramakarani). The cardiac patients who started practicing yogasanas after the preliminary investigations felt a sense of well being, more energetic and slept well than before.

STUDIES ON THE EFFECT OF EXERCISE ON ELECTRO CARDIOGRAM IN HEALTHY ADULT MALE SUBJECTS. **J. Subba Rao and Syed Kabeer Ahmed.** *Gandhi Medical College, Hyderabad (A.P.)*

Quantitative exercise electrocardiography has been widely used in the evaluation of patients with suspected or proved ischemic heart disease. Such exercise testing not only may provide confirmation of an uncertain diagnosis of angina pectoris but also may permit the detection of certain asymptamatic but high risk individuals with coronary artery disease. It may offer a means for serial objective evaluation of the functional capacity of patient with known ischemic heart disease. Bruce & Horsten (1969).

Although there had been many studies on exercise electrocardiography in patients with coronary heart disease or in suspected heart diseases, the studies of exercise electrocardiography in healthy subjects are few. The present study was undertaken to evaluate the effect of exercise on E.C.G. pattern in normal healthy individuals (Medicos &Technicians) in age group between 25 to 35 years.

Bicycle Ergometer was used as an exercise test and individuals were allowed to work till exhaustion over a constant resistance.

E.C.G. recordings were taken at rest, both in sitting and after the exercise was over. E.C.G. was again recorded immediately and after 15 minutes of rest.

E.C.G. recording include standard leads the augmented limb leads and the precordial leads V1, V2, V3, V4, V5 and V6. Each lead was assessed for amplitude of P wave, PR, interval, QRS complex & ST depression or elevation. Results were recorded and evaluated.

BASIC DOCTOR AND HIS ROLE IN THE FULFILMENT OF HEALTH NEEDS OF THE COMMUNITY —A PRELUDE TO CURRICULUM PLANNING IN PHYSIOLOGY AND BIOCHEMISTRY. **O. P. Bhatnagar, S.S. Satiamoorthy, Madan Mohan Trakroo, V. Srinivasan and S. Ramakrishnan.** *Department of Physiology and Biochemistry, J.I.P.M.E.R., Pondicherry –605006.*

The departments of Physiology and Biochemistry, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, held a workshop in April, 1977 to suggest improvements in the existing curriculum in Physiology and Biochemistry for the training of a Basic Doctor, within the constraints of University syllabus. To achieve this objective, the health needs of the community were first listed in order of priority in consultation with the members of community and staff of Primary Health centres and subcentres in urban, semi-urban and rural areas. This paper lists the duties and obligations of the Basic Doctor in relation to the fulfilment of health needs of the community.

IMPROVING THE EXISTING CURRICULUM IN PHYSIOLOGY AND BIOCHEMISTRY FOR THE TRAINING OF A BASIC DOCTOR. **O. P. Bhatnagar, R. Rajan, S.S. Sathiamoorthy, N. V. Adinarayana Murthy, G. Anuradha and S. Ramakrishnan.** *Departments of Physiology and Biochemistry, J.I.P.M.E.R., Pondicherry—605006.*

The Departments of Physiology and Biochemistry Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry, held a workshop in April, 1977 to suggest improvements in the existing curriculum of Physiology and Biochemistry for training a Basic Doctor, within the constraints of University syllabus. Initially, the health needs of the community and the duties and obligations of the Basic Doctor in the fulfilment of these needs were listed in order of priority. The objectives in relation to the fulfilment of each health need and the respective duties and obligations of the Basic Doctor were then enumerated. In this paper, only the content and method of teaching to be followed in the fulfilment of each objective for the departments of Physiology and Biochemistry have been drawn out. Teaching/Learning experiences, Institutional media, resources and evaluation are left to the discretion of the individuals according to their local availability.

NEEDS OF THE COMMUNITY IN RELATION TO HEALTH CARE—A PRELUDE TO CURRICULUM PLANNING IN PHYSIOLOGY AND BIOCHEMISTRY. **O. P. Bhatnagar, D. P. Thombre, S. S. Sathiamoorthy, Susheela Veliatha and S, Ramakrishnan.** *Departments of Physiology and Biochemistry, J.I.P.M.E.R., Pondicherry—605006.*

The present day aloofness of medical teaching from the basic health needs of the

community makes it imperative that the present system of Medical Education be reoriented to enable training of the medical graduate to cater to the health needs of the community. With this in view the departments of Physiology and Biochemistry, J.I.P.M.E.R. conducted a workshop in April, 1977 to improve the curriculum in Physiology and Biochemistry within the constraints of the university syllabus in training a basic doctor to orient himself with the health needs of the community.

The health needs of the community were first enumerated and they were then listed in the following order of priority. The order was decided in the list of the current state of health care and the attitude of the community towards the existing national health programmes.

I Curative
II Preventive
III Promotive

CURRICULUM PLANNING IN MEDICAL EDUCATION TO SUIT THE CHANGING CONCEPT. **K. Medavan Kutty.** *Medical College, Trivandrum.*

It is thirty years since our Country has attained independence. There has been a large amount of quantitative expansion, an almost five fold expansion in medical education. But this explosive growth in the number of colleges and in the number of students admitted has not helped to improve over-all peripheral health care-delivery system in our country nor in evolving a type of doctor suited to the needs of our country; especially of the villages. There are several reasons for this unsatisfactory state of affairs in which the young doctor tends to because a member of an exclusive "elite" and is not capable of carrying on his role as physician, leader of the health team and leader of health education to the public at large. The most important reason however, seems to be that we have not evolved a curriculum for modern medical education in our country where the emphazis should be on preventive aspects of medicine, immunization programmes, environmental sanitation, applied nutrition, family welfare and rural health programmes including maternal and child health projects. Our students should be taught to be independent, self supporting and being capable of working with the minimum amount of sophisticated instruments and gadgets. They must be capable of working in the rural set-up without the background of a regular full-fledged hospital and should have greater involvement with people and their problems. The detailed revision of curriculum for effective implementation of the above project has of necessity to be multi disciplinary in character and requires deeper thinking and more elaborate planning. Some of the desiderata of a new curriculum for such a programme was discussed.