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ABSTRACTS

A. PHYSIOLOGY

INVIVO STUDIES ON PSORALEN IN RELATION TO GROWTH, ORGAN WEIGHT AND INCORPORATION OF P^{32} IN ALBINO RATS. *By* **Rashid Ali and S. C. Agarwala**. *Department of Biochemistry, Jawaharlal Nehru Medical College, Aligarh Muslim University, Aligarh and Division of Biophysics, Central Drug Research Institute, Lucknow.*

Feeding of psoralen to rats for nine weeks (with and without simultaneous ultraviolet irradiation, maximum emission 2537 A°) was not found to bring about any appreciable change in their growth. In the irradiated group, the animals were actually seen to grow better. Feeding of psoralen *per se* without ultraviolet irradiation did not bring any change in the weight of kidney, heart and brain, however, the weight of spleen was significantly enhanced. In rats fed with psoralen with subsequent irradiation, the weight of all the four organs including spleen was found to be unchanged. Furthermore, feeding psoralen with and without ultraviolet irradiation was once again not found to have any significant effect on the incorporation of P^{32} in different organs.

INFLUENCE OF URINARY CONSTITUENTS ON QUALITATIVE BENEDICT'S TEST FOR REDUCING SUGARS. *By* **B. K. Sur, V. S. Agashe and R. K. Shukla**. *Department of Physiology, G.S.V.M. Medical College, Kanpur.*

A semi-quantitative measure of the concentration of glucose in urine or pure solution is believed to be obtained by Benedict's qualitative test, in which appearance of green, brown (or yellow), orange and red precipitate indicates the presence of 0.5%, 1%, 1.5% and 2% reducing sugar.

We have observed however, that with pure solution of glucose only red precipitate in varying quantities is obtained, and green, yellow and orange precipitates are never formed.

In the case of urine containing glucose when the turbid solution appears green, greenish yellow or yellow, the precipitate is actually yellow only. Presumably one or more urinary constituents alter the course of reaction, so that the colour of the precipitate is yellow while that obtained with pure glucose solution is red. On investigating the influence of different urinary constituents, it was found that creatinine is responsible for this difference in reaction.

Differently coloured turbid solutions are obtained using pure glucose solution with creatinine. For the first time, evidence has been presented showing the presence of creatinine in the precipitate. The common belief that the precipitate formed in Benedict's test is entirely cuprous oxide requires modification.

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A STUDY OF CLOTTING AND FIBRINOLYSIC TESTS DURING PREGNANCY, LABOUR AND PUERPERIUM.

By **Anjali Kaul and R. P. Bhargava.** *Department of Physiology, Gandhi Medical College, Bhopal.*

It may be logical to expect alterations in the levels of blood clotting factors and fibrinolytic activity during pregnancy because of amenorrhoea, and during parturition because of blood loss. Pregnancy is also not infrequently associated with coagulation defects in cases of abruptio placentae, intra-uterine death of foetus, amniotic fluid infusion and pregnancy toxaemias. The present investigation was undertaken to provide standard normal values during physiological conditions of pregnancy, labour and puerperium, since the results of various workers have been inconsistent and inconclusive.

The investigations were carried out in 25 non-pregnant control group of healthy females between the ages of 18-35 years and in 55 healthy pregnant females of the same age group during the last trimester of pregnancy, labour and puerperium.

The blood was collected by 2-syringe technique. The investigations included determination of whole blood Clotting time (Lee & White method) Prothromlsin time (Quick's one stage method), Fibrinogen content (Harrisons Biuret method) Bleeding time (Ivy's method) Platelet Count (Rees Eckers technique) and Fibrinolytic activity (dilute blood clot lysis time by the method of Fearn lay). The results are summarised in the following table.

TABLE

Showing the average values obtained in the various tests.

S. No.	*Test*	*Control*	*Pregnancy last trimester*	*Labour 3rd stage*	*Puerperium 1st day—4th day.*	
1.	Bleeding time (minutes)	0.73	0.60	0.57	0.50	0.58
2.	Clotting time (minutes)	3.21	2.53	2.15	1.95	2.45
3.	Platelet count (Lacs/c.mm)	2.19	2.51	2.29	2.27	2.63
4.	Prothrombin time (Sec)	22.1	21.40	21.00	20.60	21.70
5.	Fibrinogen content (mg. 100 ml. Plasma)	271.4	426.0	456.00	455.00	500.00
6.	Fibrinolysis (in minutes)	362.00	671.00	396.00	350.00	310.00

It is apparent from the above table that blood clotting was hastened during pregnancy, labour and puerperium as evidenced by shortening of whole blood clotting time, bleeding time, Prothrombin time and increase in fibrinogen content. These findings differ from those of Ratnoff *et al.* (4) who did not find change in clotting and prothrombin time and reported fluctuations in fibrinogen level. Traver (7) also observed an increase in clotting time. The present findings are in consonance with those of Alexander *et al.* (1) and Kennen and Bell (3).

The hypercoagulability of the blood appears to be a protective device on the part of the body against the impending blood loss, and is most marked in the early postpartum period, when the need to prevent blood loss is maximum.

There are widely divergent reports regarding the platelet count. Ratnoff *et al.* (loc. cit) did ot find any significant change. Repina (1962) found an increase whereas Shaper *et al.* (1958) and ennen and Bell (loc. cit) found a decrease in the pletelet count during pregnancy and labour. The crease in the platelet count observed during 3rd stage of labour and early puerperium is probably ue to their disintegration and release of 5—HT and thromboplastinogens to ensure quick haeostasis.

Fibrinolytic activity is decreased during pregnancy upto 2nd stage of labour. It increased uring the 3rd stage and remained within normal limits thereafter. This in in agreement with the ndings of Shaper *et al.* (loc. cit) and Gillmen *et al.* (2). This also appears to be a protective echanism, as lysis of the fibrin clot may predispose to fatal bleeding during pregnancy and up to nd stage of labour, but during puerperium fibrinolysis is hastened to avoid possible intravascular lotting consequent on stagnation of blood due to the restricted mobility of the patient during uerperium.

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A STUDY ON PLASMA CALCIUM IN DIABETES MELLITUS. *By* **S. S. Dubey, Y. N. Gupta, J. P. Gupta and H. S. Bajpai.** *College of Medical Sciences, Banaras Hindu Uiniversity, Varanasi-5.*

The role of calcium in a variety of essential processes is well known. An enormous amount of work has been done in relation to the dynamics of calcium in various metabolic disorders but very little attention has been paid on the states of total calcium and its diffusible component in diabetes mellitus. So this study has been performed to evaluate the state of calcium in 30 patients of diabetes mellitus with different degrees of severity. The results obtained have been compared with that of normal healthy persons. In normal healthy persons the total calcium ranged from 9.1 to 11.5 *mgm.* per 100 *ml.* of plasma. The unbound calcium ranged between 58-63.6% of the total calcium. No significant change in total calcium as well as in unbound calcium is observed in mild and moderately severe diabetic patients. A significant rise in the percentage of unbound calcium was observed in advanced diabetic patients, though the total calcium remained within the normal limits. This change in the unbound calcium did not show any relationship with the duration of the diabetes.

A SIMPLIFIED TECHNIQUE FOR ESTIMATION OF BLOOD GLUCOSE. *By* **N. C. Sharma and B. K. Sur.** *Department of Physiology, G.S.V.M. Medical College, Kanpur.*

The Somogyi method for the estimation of the blood sugar has been simplified by changing the step of the preparation of blood filtrates. In place of barium hydroxide and zinc sulphate which are inconvenient to handle, an isotonic sodium sulphate - copper sulphate solution with sodium tungstate, to prepare deproteinized blood filtrates excluding non-sugar reducing substance present chiefly in the red cells, has been used. Blood glucose values were determined by the glucose oxidase method, Somogyi method and the present method. The results show that the values obtained by this simplified method are somewhat better than those obtained with the Somogyi method as the values agree more closely with the glucose oxidase method.

STARVATION AND AFFINITY OF HAEMOGLOBIN AND OXYGEN. *By* **V. Chiplunkar, G. D. Kalyankar, and K. N. Sharma.** *Department of Biochemistry & Biophysics and Department of Physiology, St. John's Medical College, Bangalore.*

Electrophysiological and behavioral analysis in a variety of animals shows that the responses of the individuals to the sensory and the metabolic qualities of the diet differ and is biased by the state of nutrition. However, the biochemical correlates underlying these changes have not been investigated and were, therefore, attempted in the present studies. The blood analysis in frogs and rats showed that depending upon the period of starvation the sugar content, and the total protein content decreases but the concentration of nonesterified fatty acids increases. It was also observed that in frogs dark green pigment deposits take place in the nervous tissue, and to a certain extent in the other tissues like liver. In order to determine the origin and nature of pigment, blood was further investigated for this purpose.

During spectroscopic examination of blood (in rats and frogs), it was observed that the blood from starved animals behaved differently as compared to well fed groups. The difference was much more pronounced as regards the conversion HbO_2—Hb. The starved blood binds O_2 more firmly as shown by requirement of dithionite addition. For quantitative estimation a micro method, based on spectrophotometric analysis, was developed. The results show that besides other changes in absorption, the absorption minima at 558 mu of HbO_2 disappears during its conversion to Hb with added sodium dithionite in well fed animals. However, the amount of sodium dithionite required to bring about similar changes in chronically starved animals, may range from three to five times or even more.

A STUDY OF ELECTROLYTE CHANGES IN PLASMA DURING HYPOTHERMIA. *By* **K. Somasundaram, P. B. Shah, N. C. Sebastian, R. M. Bhatty and J. P. Saxena.** *Department of Physiology, Medical College, Baroda.*

The effect of body cooling on the concentration of plasma electrolytes viz sodium, potassium, calcium, chloride and bicarbonate has been studied in thirty healthy dogs, using chloralose anaesthesia 80 *mg/kg* body weight. The dogs were cooled by surface cooling to 25°C and kept

n spontaneous respiration. Sodium and potassium were estimated by Flame photometer, alcium by Wilkinson's method using EEL titrator, bicarbonate by Van Slyke method and chloride by EEL chloridemeter.

Blood pressure and heart rate showed a linear fall with the fall of temperature.

There was no appreciable change in the sodium and calcium level at 30°C and 25°C as compared to normal temperature (38.6°C), but a significant rise occurred in potassium level at 30°C and still further rise at 25°C was noted (mean value 3.7 at 38.6°C, 4.1 at 30°C and 4.3 mEq/L at 25°C, P. value < 0.001). The chloride level in normothermic and hypothermic dogs did not show any change.

A definite and appreciable fall in bicarbonate level was observed in most of the animals with cooling, especially when levels at 30°C and 25°C are compared (Mean value 23.8 at 30° and 20.3 mEq/L at 25°C, P. value < 0.001).

The calcium level was almost unaffected by cooling, in contrast with the reports of early workers who attributed the rise as the cause of certain myocardial irregularities at low body temperature. The reduced general metabolism rather than a rise in calcium may be the reason for the fall in the heart rate during hypothermia.

REFLEX MEDIATED CONTROL OF MYOCARDIAL CONTRACTILITY. *By* **S. Srivastava. D. Laurent and S. Serossi.** *Centre d'etudes des technique chirugicales, Broussais Hospital, Paris.*

The morphology and timing of the auricular and ventricular borne coronary venous pressure waves were studied in dogs and then modified by inducing various arrhythmias altering the normal atriventricular sequence, namely by controlling under stimulation the auricular and ventricular rates independently but at very close rates to each other. Cyclic changes were observed in the left ventricular pressure when an auriculoventricular asynchrony was induced with the two periods close to each other. Simultaneous recording of left ventricular, coronary venous (intraluminal and transmural), and right auricular pressures showed that at some sites of registration the coronary venous pressure changes were slightly preceeding and were out of phase with the left ventricular pressure changes. The former were not accounted for by the concomitant changes in the right atrial pressure. The results suggested the possible role of a refex mediated control mechanism of myocardial contractility, originating from receptors localized in the venous part of the coronary bed.

CARDIOVASCULAR EFFECTS OF INCREASED PRESSURE WITHIN THE VENTRICULAR SYSTEM OF DOG BRAIN. *By* **Sarla Varma.** *Department of Physiology, M.L.N. Medical College, Allahabad.*

In α (-chloralose) anaesthetized dogs, sudden increase of pressure within the ventricular system was effected by means of a cannula inserted into a lateral cerebral ventricle. The cannula was connected to a pressure bottle and a mercury manometer attached in parallel. Increase of C.S.F. pressure in the ventricles to 200 mm Hg for a fixed period of 30 secs. induced transitory

cardiac effects, bradycardia followed by tachycardia, without significant change in blood pressure. These transitory cardiac effects were regularly followed by a delayed bradycardia lasting 2-3 min and a prolonged tachycardia lasting about 15 min. Pari passu with these cardiac effects a rise of blood pressure was observed within a minute following the compression which lasted for about 30 min.

Stabilization of blood pressure, by a mechanical buffer device, markedly reduced the delayed bradycardia although the immediate cardiac effects were unaltered. Bilateral cervical vagotomy eliminated the transitory cardiac slowing and reduced the delayed bradycardia. Transection of the spinal cord at C_2 (intact vagi) prevented the transient tachycardia and reduced the prolonged tachycardia. The combined procedure of bilateral vagotomy and spinal transection virtually eliminated the cardiovascular responses consequent to intraventricular compression. Bilateral extirpation of the adrenals prevented the prolonged tachycardia without significantly affecting the hypertensive response.

Since vagotomy eliminated the initial transitory bradycardia, it appears to arise from mechanical stimulation of the vagal nulei, whereas the delayed bradycardia must be reflex in origin as it was markedly eliminated when the blood pressure was stabilized. The initial transtory tachycardia and the initial rise in blood pressure appear to be neurogenic, whereas the prolonged tachycardia and the prolonged rise in blood pressure must be due to catecholamines both arising from a centrally induced sympatho-adrenal discharge.

ROLE OF CENTRAL NERVOUS SYSTEM IN THE REGULATION OF BLOOD SUGAR LEVEL IN THE ALLOXAN INDUCED DIABETIC RABBITS. *By* **R. K. Saxena, G. S. Chhina and B. K. Anand.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

Stimulation of hypothalamus and some limbic structures has been reported to produce changes in blood sugar. It is, however, not clear whether the changes are due to the participation of insulin or other factors.

Present investigations were carried out in animals made hyperglycaemic with alloxan to eliminate the participation of insulin. Stimulation of different parts of the brain was carried out through implanted electrodes using square wave pulses of 2.5 V, 0.1 msec duration and 50 cycle/sec frequency for one hour in the conscious fasting rabbits. Their blood sugar estimations were done by the method of Hagedorn and Jenson before and half hour after the stimulation was discontinued.

Before giving alloxan, stimulation of amygdala, septal region, orbital surface of frontal lobe and ventromedial nucleus of hypothalamus, produced an increase in blood sugar level. Whereas stimulation of caudate nucleus, fornix and hippocampus produced some fall in blood sugar. The alloxanised rabbits also gave similar responses but the magnitude of increase and decrease was much lower. Apparently the extra-pancreatic factors also play an important role in the blood sugar regulation from central nervous regions.

GLUCOSE TOLERANCE TEST IN INDIANS. *By* **S. R. Kapoor, B. K. Sur and Pretty Tandon.** *Department of Physiology, G.S.V.M. Medical College, Kanpur.*

Glucose tolerance Test was carried out on 49 normal Indians using a reliable and simple method for true blood sugar recently developed in this Department by Sharma and Sur (1969). The Fasting blood sugar level obtained was 122 *mg.*/100 *ml.* There was no difference in blood sugar values in different age groups or between vegetarians and non-vegetarians. There was no difference in the blood sugar values obtained when 50 or 100*gm.* of glucose was administered to the same subjects at an interval of one week.

ROLE OF VEINS IN THE CAROTID SINUS REFLEX. *By* **N. Jog, S. K. Manchanda and K. Khetarpal.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

In 31 dogs changes in venous tone were measured in the sephanous vein of the right hind limb by employing the technique of arrested circulation. Simultaneous recording of left femoral arterial pressure and blood flow in the forelimb by venous occlusion plethysmography was also done. Carotid sinus hypertension was produced either by inflating the balloons of the 'blind sac' preparation or by 'Moissejeff's perfusion technique. Carotid sinus hypotension responses were studied by simple bilateral clamping of the common carotid arteries.

Carotid hypotension always produced an increase in venous tone while carotid hypertension resulted in a decrease in venous tone. Carotid hypotension response was accompanied by a rise of blood pressure, tachycardia, and an increase in the blood flow. Carotid hypertension, on the other hand produced the typical fall in blood pressure, slowing of the heart rate, and a decrease in the blood flow.

Simultaneous electromyography of the limb muscles showed that these changes in venous tone due to carotid hypotension or hypertension were not due to changes in the tone of the surrounding muscles. These responses also did not change when respiration was paralysed by the infusion of flaxedil and the preparation put under positive pressure artificial respiration. Changes in venous tone therefore, were not secondary to respiratory changes which usually accompany the carotid sinus reflex. Similarly a simultaneous pressure recording of the precapillary vessels further demonstrated that venous tone changes were independent of the changes in the arteriolar pressure in the same circulatory bed.

Calculation of peripheral resistance before, during and after the carotid sinus hypertension and hypotension responses showed that the peripheral resistance changes did not have any constant relationship with the blood pressure response. This investigation therefore demonstrates that the arterial pressure changes that occur as a result of carotid sinus manipulation are essentially due to the changes in cardiac output as brought about by the changes in the tone of the capacity vessels i.e. the veins.

ESTIMATION OF CHANGES IN THORACIC BLOOD DISTRIBUTION USING THE BODY AS AN ACTIVE BRIDGE. *By* **S. K. Guha and P. Seth.** *Department of Biophysics, H.B. Technological Institute, Kanpur and Department of Physiology, G.S.V.M. Medical College, Kanpur.*

The Factor of thoracic blood distribution has been investigated previously in connection with electrical impedance plethysmography techniques for pneumography and cardiac stroke volume determination. But the regular four ring electrode plethysmography does not satisfactorily allow studies of changes of blood distribution.

In the present study the thorax itself has been taken as a bridge with two electrodes at the anterior-ventral position and two at the lateral position. From experimental studies it has been shown that such a technique can be effectively used to study changes in thoracic blood distribution. The results have been verified using an electrolytic tank analogue of the thorax. Theoretical confirmation has been obtained by analysis of the electric field distribution taking into account actual geometry and conductivities of various tissue in the thorax.

DIRECTIONS OF CARDIAC VECTORS IN MALE STUDENTS. *By* **S. R. Kapoor and I. K. Yagnik**. *Department of Physiology, G.S.V.M. Medical College, Kanpur.*

A vector analysis of a twelve lead conventional electro-cardiogram was done in 225 young, normal, male medical students using Grant's concept of cylindrical model and Zao's "Polarity" circles. Our averages and ranges for mean spatial P, QRS and T vectors in frontal and horizontal planes were within normal limits. There was slight verticalization of heart in young and thinly built subjects. The frontal plane QRS-T angle was within normal limits. The initial 0.01—0.02 sec. and terminal 0.03—0.04sec., QRS vector directions ranged throughout the 360° of the circle.

STUDY OF ELECTROCARDIOGRAPHIC FINDINGS IN AUTOIMMUNIZED DOG WITH MITRAL VALVE HOMOGENATE. *By* **R. M. Bhatty, P. Gopinath, S. D. Nishith and J. P. Saxena**. *Department of Physiology, Medical College, Baroda.*

In the present study 25 dogs were employed for the ECG findings in immunised dogs with mitral valve homogenate. They were divided into two groups. (1) 13 dogs of group I received mitral valve homogenate and (2) 12 dogs of group II received the same mixed with Fruend's incomplete adjuvant.

The ECG records were obtained under chloralose anaesthesia (70 *mg/kg*) by employing Cambridge Polychennel physiological recording equipment.

The study of ECG records from dogs before and after immunization and control dogs revealed that the immunization caused a number of cardiac abnormalities. In two dogs gross abnormalities were observed, one was having complete heart block while the other showed the absence of P wave.

Prolongation of PR interval ($>$ 0.20 seconds) was observed in 24% of the dogs. It is to be noted that, all these dogs had single dose of immunization. Notching of P waves, widening of QRS complex and inversion of T waves were also observed in the dogs immunized with more than six injections. Corrected QT interval (QTC), calculated according to Taran and Szilagyi (1967),

showed prolongation in only 8% of the dogs. No difference in abnormalities was observed between group I and group II.

Study of ECG records obtained from children suffering from acute rheumatic fever was also carried out. The results showed the prolongation of PR interval, inversion of T Waves, depression of ST segments in 35.9%,58.8% and 35.9% of the patients respectively. The characteristic observation was the prolongation of QTC interval, 88.2% of the patients showed prolonged QTC interval (above 0.42 seconds). According to Taran (1967) prolonged QTC reflects the presence of carditis in acute rheumatic fever.

The observations indicated that the immunization with mitral valve led to cardiac abnormalities which were substantially different from those observed in acute rheumatic fever.

Histopathologic findings in the hearts of the immunized dog corrobarated the observations of ECG records. It was found that those dogs which showed cardiac abnormalities, were having lesions in the heart, especially in the left aurricles and in the valves.

24% of the auto-immunized dogs, with ECG abnormalities, showed the presence of systolic murmur, and gross pathological findings in forms of adhesions of valves and verrucae formation.

The lesions were characterised by thickening of endocardium, focal myocardial necrosis and infiltration with mononuclear cells. It was interesting to note that the heart of the dog with complete heart block showed extensive fibrosis in the interstium and perivascular regions.

It should be noted that no typical Aschoff body was observed in any of the heart of the immunized dog. The lesions were just like what are observed in autoallergy as described by Waksman (1960).

In conclusion, the results of the present study showed that the immunization with mitral valve homogenate led to lesions in the heart and cardiac abnormalities. The findings of ECG records and histopathology were not comparable to those described in acute rheumatic fever.

CONTRIBUTION OF CAROTID CHEMORECEPTORS TO THE INITIAL HYPERPNOLA OF EXERCISE.

By **K. Khetarpal, S.K. Manchanda and B.K. Anand**. *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

Ventilatory response of anaesthetized cats in whom the carotid sinus had been denervated was studied when their hindlimbs were passively exercised. The first minute of exercise induced an increase of 11% to 46% of the volume at rest. This increase was found to be statistically significant ($t=4.4$).

It was compared with that obtained on the same animals after their carotid chemoreceptors had been denervated. The pulmonary ventilation of these chemoreceptor devervated animals was lower even at rest when compared to their minute volume before nerve section. During the first minute of passive exercise these chemodenervated animals could achieve much smaller

increase in minute volume. The difference of increase in volume was statistically significant (t=4.0)

Ventilatory response to passive exercise in anaesthetized cats was measured both at rest and during passive exercise before and after cutting the cervical sympathetic supply to carotid body on both sides. The minute volume at rest did not change significantly after cutting the sympathetic nerves but the increase of ventilation in the first minute of passive exercise was only 0% to 5% of the resting minute volume as compared to 27% to 50% increase with intact sympathetic nerves.

To confirm that these responses were neural in the operation the following experiments were performed. Electrical stimulation of the central end of the cut sciatic nerve brought about an increase in the electrical activity of the carotid nerve as well as the preganglionic and post ganglionic sympathetic fibres supplying the carotid body. Sciatic stimulation induced an increase of 16% to 64% in the minute volume if the sympathetic supply to carotic body was intact and only 3% to 20% if it was cut.

Electrical stimulation of the peripheral cut end of preganglionic sympathetic trunk in the neck in these animals induced an increase in the electrical discharge through the carotid nerve as well as a 5% to 16% increase in pulmonary ventilation. This increase in ventilation was observed only if the corresponding carotid nerve was intact. Keeping in view the autoregulation of blood flow through the carotid body the variations in arterial blood pressure do not seem to be contaminating the results. The neural stimulation experiments have been performed on animals, breathing 25% oxygen so that the chemical stimulation of chemoreceptors by hypoxia is avoided.

In the light of the above observations, it has been inferred that the sympathetic system by its effect on the activity of carotid body participates in the neural phase of regulation of respiration.

THE MEDULLARY MECHANISM OF THERMAL PANTING IN ANAESTHETISED DOGS. *By* **S. Kumar and S. Srivastava.** *Department of Physiology, King George's Medical College, Lucknow.*

The centre for thermal panting in anaesthetised dogs was thought to be in the medulla and in the optic thalamus. The medullary chemoreceptor trigger (CT) zone which is the site of mediation of vomiting to chemicals and physical agencies could also be mediating the respiratory effects of temperature. With this idea in view the present study was undertaken. Thermal panting was observed after producing hyperthermia in normal dogs and then in dogs in which the CT-zone was ablated. Thermal panting was observed in 80% of the normal dogs at a body temperature of 42.5 C., whereas it appeard in 10% of the CT-zone ablated dogs. The observations were statistically highly significant.

It is inferred that the medullary CT-zone is responsible for thermal panting in anaesthetised dogs to a very large extent.

THE EFFECT OF INTESTINAL SECRETION FROM DIABETES ON GLUCOSE ABSORPTION. *By* **S.D. Bhardwaj and M.L. Gupta.** *Upgraded Department of Physiology and Biochemistry, S.M.S. Medical College, Jaipur.*

Diabetes was induced in dogs by injecting alloxan as recommended by Goldner and Gomeri (1943) and only those animals showing blood glucose values greater than 350 *mg.* per cent were used. The thiry Vella loop was prepared as described by Markowitz (1954). The intestinal secretion was collected from the loop. The kinetics of intestinal absorption of labelled glucose in thirty Vella loops of normal and diabetic dogs were studied. The effect of normal and diabetic intestinal secretion on kinetics of glucose absorption in normal and diabetic dogs were also studied. Each animal served its control as the absorption was studied before and after experimental diabetes.

The percentage of glucose absorbed was 18% in control group and 37% in diabetics. Addition of diabetic juice to the glucose solution both in normal and diabetic dogs increased glucose absorption but decreased Km. This shows that the diabetic juice increases the affinity of glucose for carrier, which results in enhancement of glucose absorption of diabetics. The diabetic secretion loses this property on heating at 60°C for ten minutes. The normal juice has no significant effect on glucose absorption and Km both in normal and diabetic dogs.

The results indicate that the diabetic juice contains an "active factor" which increases the glucose absorption from the intestines and seems to be proteinous in nature. This factor is absent in normal juice.

EFFECT OF SEPTO-TEMPORAL STIMULATION ON URINE OUTPUT IN DOGS. *By* **T. Ramakrishna and E. Nijsten.** *Department of Biophysics, All India Institute of Mental Health, Bangalore and Department of Physiology, St. John's Medical College, Bangalore.*

Dogs of either sex weighing between 10-16 *kg* were anaesthetised by i.p. Diabutal and multibarrel electrodes implanted stereotaxically in septum, preoptic area, amygdala, hippocampus and pyriform cortex. For recording urine output the ureters, close to the renal pelvis, were cannulated and connected to a photo-cell triggered drop recording assembly. Continuous and simultaneous recordings of blood pressure respiration and urine output were done over a period covering 8-12 hours. Two minute bipolar stimulation with pulses of 30 cps, 1 msec duration and 3.0—4.OV, was due for each brain region and was repeated 2-3 times during the course of the experiment. Electrode sites were confirmed by examining serial paraffin sections of the brain stained with Weil stain.

Stimulation of the basolateral part of the amygdaloid nucleus (BLA) results in 50-200% increase in urine output. The increased response is consistent and is obtained 5-10 minutes after the stimulation. No such post stimulus changes are found in blood pressure and respiration. Stimulation of hippocampus and lateral hypothalamus also result in increased urine output, but the magnitude of response is not as conspicuous as that obtained after stimulation of BLA. The other areas like anterior amygdala, fornix, preoptic and supraoptic regions produce variable effects on the urine output and may vary from decrease to increase of the rate of urine forma-

tion. Also, such stimulations produce variable effects on respiration and blood pressure. The delayed response in urine output, resulting from the stimulation of BLA is suggestive of hormonal action. It remains to bed elucidated as to how this mediation is brought about.

CHANGES IN BLOOD SUGAR FOLLOWING INTRAMUSCULAR INJECTION OF MAGNESIUM CHLORIDE AND THEIR RELATIONSHIP TO BETA CELL METACHROMASIA IN THE ISLET OF LANGERHANS. *By* **Madad Ali, R.K. Mishra and K. Anand.** *Department of Biophysics, All-India Institute of Medical Sciences, New Delhi.*

The earlier work by us where intragastric administration of magnesium in rabbit and albino rat caused reversible degranulation of beta cells of the islets in 20-25 mts, without any gross evidence of necrosis, led us to investigate the changes in blood sugar at the time when degranulation was maximum so as to find out the role of magnesium in the discharge and synthesis of insulin.

The experiments were performed on 23 albino rats of either sex weighing between 100-150 *gms.* 0.5 *ml* of blood was taken from heart by a syringe at basal level, sodium citrate was used as anticoagulant. 2 *ml* (0.75 m molar) solution of $MgCl_2$ was injected intramuscularly. Blood samples from heart wes taken after 10, 20 ,30 mts. The blood sugar content was estimated by a modified Nelson and Smogyi method.

The mean blood sugar levels at 0, 10, 20 and 30 minutes were found to differ statistically highly significantly ($P<0.001$). The levels at 10 mts (137.19 *mg%*) were found to be significantly higher than the basal level (101.05 *mg%*) ($P<0.001$) and in turn the levels at 20 mts i.e. 172.59 *mg%* were found to be significantly higher than that at 10 mts ($P<0.05$). However, there was no statistically significant difference between levels at 20 and 30 mts (168.19*mg%*). The results are consistent with the previous observations and the hyperglycemia is maximum at the time of maximum degranulation in the beta cells.

EFFECT OF HAEMATINICS ON THE HAEMOGLOBIN LEVEL AND PHYSICAL PERFORMANCE OF MEDICAL STUDENTS OF GUJARAT. *By* **H. Jana and I.A. Haideri.** *Department of Physiology, Smt. N.H.L. Municipal Medical College, Ellis bridge, Ahmedabad.*

Low haemoglobin (Hb) level in so-called healthy medical students of Gujarat stimulated this investigation. 149 students (49 females and 100 males) of age 17-21 years were subjects.

In 1967, Fersolate, Haematrine and Livule were administered for 30 days to 31 subjects with Hb level (8.0 to 11.9*gm* %) in three drug groups in higher dosage (345-450 *mg.* iron salt per day) with 9 subjects as their controls (Group I) and 23 male subjects with Hb level (12.0 to 14.0 *gm%*) in similar three drug groups in lower dosage (115-195 *mg.* iron salt per day) with 9 male subjects as their controls (Group II). Their Hb level before and after 30 days of drug administration were compared. Percentage changes in Hb in control, Fersolate, Haematrine and Livule groups were —1.0%,+9.2%,+13.1% and+12.8% (Group I) and—0.5%,+6.4%, +7.6% and+6.5% (Group II).

In 1968, 64 subjects with average Hb level of 11.61 *gm%* were divided into four drug groups and one control group and their Hb level and physical performance in 50 Metre straight run, 100 Metre circular run and exhaustive run in 100 Metre circle were noted. Then Haematrine, Livule, Macrafolin Iron and Unihem$_{12}$ Forte were administered to the four groups with a dosage of 500-600 *mg.* iron salt per day for one month. Hb level and physical performance were noted after30 days in all the groups. Hb level was also determined on 16th day, 60th day and 90th day for the drug groups, though drugs were administered for only 30 days. Neoferrum was given to seven of the control subjects after the recording of the control observation from them. On 16th day rise in Hb was not at all conspicuous; after one month rise was as follows: Control+1.53%, Haematrine+13.4%, Livule+9.87%, Macrafolin Iron+7.99%, Unihem$_{12}$ Forte+11.2% and Neoferrum+6.3%.

Rise in Hb after the administration of the above drugs was statistically significant in all the drug groups studied in 1967 and 1968. It was also evident that iron preparation alone was less effective in raising Hb than the preparations containing iron and vitamins.

From the studies in 1968, physical performance was also found to improve with the rise in Hb level. This improvement was evident from significantly lesser time taken by most of the subjects to cover the same distance after drug administration. Of course the rise in work done in running per minute was not satistically significant. Raised Hb level was maintained more or less up to 60th day, but declined considerably on 90th day.

Inadequate diet of students of Gujarat appears to be the cause of low Hb level which is likely to be associated with low physical performance.

UPTAKE AND DISAPPEARANCE OF 1—^{3}H CHLORMADINONE ACETATE (CLA) IN VARIOUS TISSUES OF THE RAT. *By* **A.R. Krishnan and K.R. Laumas**. *Reproductive Biology Research Unit, All India Institute of Medical Sciences, New Delhi.*

Inspite of extensive work on the mode of action of oral gestagens very little is known about the distribution, uptake and metabolism in different organs. It was proposed to study the distribution, uptake and disappearance in various tissues of the rat after a single injection of CLA-^{3}H. The results showed that the radioactivity is rapidly taken up by the uterus, following which there is a rapid disappearance, with a subsequent slow disappearance. Ovary showed a higher uptake in comparison to the uterus. The disappearance pattern of the radio-activity from the ovary, vagina as well as the hypothalamus and pituitary were similar to that of the uterus. Liver, adrenal and kidney showed higher uptake with a almost rapid disappearance following the initial rise. Sub-cellular localisation of radioactivity showed more incorporation in nuclear and supernatant fractions.

In its pattern of uptake and disappearance in different tissues CLA shows similarities to progresterone, which also shows a rapid uptake and disappearance in the neural and genital tissues. There was some indication of retention of small amounts of radioactivity for a longer period. The higher uptake and retention in the ovary may indicate a direct action of CLA—^{3}H on the

ovary. Blood brain barrier does not exist for CLA—^{3}H as all the parts of the brain studied had the radioactivity.

THE POSSIBILITY OF ESTROGENIC ACTIVITY IN THE MILK OF LACTATING WOMEN AND GOATS AFTER ADMINISTRATION OF ORAL GESTAGENS. *By* **Vimla Laumas, P.K. Malkani and K.R. Laumas.** *Reproductive Biology Research Unit and Department of Obstetrics and Gynaecology, All-India Institute of Medical Sciences, New Delhi.*

Our previous work (Laumas, K.R., P.K., Malkani, S., Batnagar, and V., Laumas, *Amer. J. Obst. and Gynec.* 1967, **98**, 411) has shown that oral gestagens are excreted in the milk of lactating women. It would thus be of interest of study the biological activity of these gestagens and their metabolites excreted in the milk and the transmission of this biological activity to the infant being nursed. In view of this, oral gestagens were administered to women during lactation and milk extracted by an acetone extraction procedure. The pooled acetone extract was assayed for estrogenic activity by the three day immature mouse uterine weight assay. The results showed that after the oral administration of Enovid to lactating women estrogen activity could be found in 2 out of three cases. However, when Norethynodrel alone was administered, the significant increase in immature mouse uterine weight of the treated group occurred in 3 out of 6 cases. In the case of goats, administration of Norethynodrel and testing of estrogenic activity showed that it was present in 3 out of 4 cases. However, when Megestrol Acetate was administered to goats and chloromedinone acetate to human patients, no estrogenic activity was found in the treated milk samples. These results showed that after the oral administration of Norethynodrel, estrogenic activity may be found in few cases, while in others it may be absent. The possible reasons for the same would be discussed. The results also lead to the conclusion that those gestagens which are estrogenic in nature during or are converted into metabolites possessing estrogenic activity may be avoided for fertility control lactation.

CONVERSION OF 17-B-ESTRADIOL TO ESTRONE BY RABBIT UTERUS. *By* **S.A. Rahman, A.R. Krishnan, and K.R. Laumas.** *Reproductive Biology Research Unit, All-India Institute of Medical Sciences, New Delhi.*

The Physiological role of estradiol on endometrium, the prime target tissue, may be either due to the hormone acting as such or be associated with its transformation to some other chemical structure. Previous reports have shown that estradiol exerts its biological effect without undergoing metabolic transformation in rat uterus. The interest of the present investigation was to study whether estradiol undergoes any chemical transformation for its physiological role on rabbit uterus or acts as such.

In vitro incubation of rabbit endometrium, myometrium and intact uterus with 6-7-^{3}H estradiol—17-B showed the transformation of estradiol to estrone by both endometrium and myometrium, although the conversion in endometrium was of a higher order than those of myometrium or intact uterus.

These observations set forth the evidence that 17-B-estradiol dehydrogenase activity is present in both endometrium and myometrium. It is suggested that the hormonal activity of estradiol may be associated with the rate of its transformation to estrone in rabbit uterus.

IN VITRO INCORPORATION OF 14 C PROTEIN HYDROLYSATE INTO SUBCELLULAR FRACTIONS OF HUMAN PLACENTA FROM NORMAL AND PLACENTAL INSUFFICIENCY CASES. *By* **S.A. Rahman, P.K. Malkani, V. Hingorani and K.R. Laumas.** *Reproductive Biology Research Unit and Department of Obstetrics and Gynaecology, All India Institute of Medical Sciences, New Delhi.*

Our earlier reports (*Amer. J. Obstet. and Gynaec.* 1968, **101**: 1062) showed that the conversion of various androgenic precursors to estrogens by placental microsomes was lower in toxemia as compared with normal placenta. This was possibly due to either a defect or lack of microsomal enzymes ended for the aromatization of these precursors.

The interest of the present study was to investigate the possible defect in the aromatization reaction in toxemic placenta. In persuit of this objective, concentration of RNA, DNA and protein and the incorporation of ^{14} C protein hydrolysate into these components of various subcellular fractions of normal and placental insufficiency, placenta have been studied.

The concentration of DNA and protein per *gm.* placental tissue and DNA/protein ratio was found to be lower whereas, the ratio of RNA/DNA and RNA/protein tended to increase in placental insufficiency placenta as compared with the normal one. The total incorporation of ^{14} C protein hydrolysate into RNA, protein and lipid per *gm.* tissue was also lower in insufficiency placenta.

Among the various subcellular fraction, the microsomal fraction of insufficiency placenta was found to be lower in RNA and protein concentration, whereas the pH 5 enzyme precipitate was only lower in protein content. The relative percent distribution of RNA decreased in the mitochondrial and microsomal fractions of insufficiency placenta but that of protein was lower in microsome and pH 5 enzyme precipitate fractions.

The *in vitro* incorporation of ^{14} C protein hydrolysate into RNA, protein and lipid was significantly lower in the microsomal fraction of insufficiency placenta as compared with normal one. The incorporation of radio activity was also lower in the other subcellular fractions of insufficiency placenta but was not significant.

In cell-free system, incorporation of ^{14} C protein hydrolysate into RNA and protein increased with time in both groups of placentas, but in placental insufficiency, it appeared to be lower at various time intervals.

These observations lead to the conclusion that in placental insufficiency the synthesis of DNA is so affected that it alters the enzyme synthesis needed for protein synthesis and for aromatization reaction.

EFFECT OF LIMBIC SYSTEM LESIONS ON PROLACTIN SECRETION IN RATS. *By* **H.K. Kang, G.S. Chhina and B.K. Anand**. *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

Prolactin secretion is regulated by inhibitory influences operating from the hypothalamus. Since the limbic system is also very much related functionally to the hypothalamic mechanisms, its role in modifying the prolactin secretory activity was investigated. The method of Maccann and Friedman, using the extent of development of deciduoma in response to uterine trauma in estrus rat, was used for the determination of prolactin secretion.

Bilateral lesions were made in pyriform cortex (7 rats), anterior hippocampus (6 rats), amygdala (7 rats), lateral septal region (4 rats) and medial septal region (4 rats). After estrogen treatment, the cervix of animals was stimulated electrically, followed by traumatization of one horn of the uterus and inspection of uteri carried out for the presence of decidual reaction. The other horn of the uterus was used as a control. The extent of decidual reaction was graded as 0, 1, 2, 3, 4.

Animals with lesions of pyriform cortex showed variable grades of decidualization, but in majority it was of grade one. Hippocampal and lateral septal region lesions also produced variable responses. Amygdaloid lesions consistently produced grade 3 responses and medial septal lesions grade 2 responses. Control animals always showed 3 and 4 responses. Thus lesions of medical septal region seem to produce some decrease in the prolactin secretion whereas those of amydgala have very little effect. Lateral septal and hippocampal lesions had inconsistent effects.

EVIDENCE OF CHANGE IN ORDERED STRUCTURE OF THE MUSCLE FIBERS DURING ATP INDUCED CONTRACTION. *By* **S.S. Dubey**. *Department of Biochemistry and Biophysics, College of Medical Sciences, Banaras Hindu University, Varanasi-5.*

The behaviour of glycerinated muscle fibers in aqueous LiBr (6M) solution, initially contracted in ATP in KC (0.1M)a nd then crosslinked with formaldehyde was studied. Such fibers have demonstrated further detectable change in LiBrs solution(6M) both in length as well as in morphological structures. This change was significant only in those cases where ATP induced contraction was less than 50% of the native length. But no detectable change in length as well as in morphological could be observed in LiBr (6M) in those cases where ATP induced shrinkage was more than 50% of the original length. The band patterns of such fibers (after treatment with LiBr (6M) solution) showed the same characteristic band pattern as shown by the glycerinated fibers treated with solution of ATP at high concentration. Thus it is evident that at higher concentration both the salts affect the fibers in similar way changing the dimensions of both A and I bands. The regeneration of length and the morphological changes of contracted fibers when brought to water and washed over night in water have also been studied.

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ACTION OF ANGIOTENSIN ON SKELETAL MUSCLE AND ON NEUROMUSCULAR JUNCTION. *By* **G. Gopinathan Nayar and S.D. Nishith.** *Department of Physiology, Medical College, Baroda.*

Some of the hypotensive compounds have been observed to act on skeletal muscle. These reduce its tone thus reducing venous return and indirectly contributing to hypotension. It was thought whether angiotensin, which is a hypertensive compound, has got some hypertonic effect on skeletal muscle. Frog's sciatic gastrocnemius preparation was stimulated directly and indirectly, with different stimuli, before and after the addition of angiotensin in the dosage of 0.25 to 10 micrograms. It is concluded that under these experimental conditions angiotensin has got no effect either on neuromuscular transmission or on direct contraction of frog's skeletal muscle.

STATUS OF CHORDATYMPANI IN FROG : ITS EVOLUTIONARY SIGNIFICANCE. *By* **K.N. Sharma and V. Gopal.** *Department of Physiology, St. John's Medical College, Bangalore.*

The presence of chordatympani in frogs has not been mentioned in literature. Analysis of our data shows that a small nerve strand, branching from 7th cranial nerve and passsing over columella auris, contains afferent chemoceptive fibers distributed to the mucosa covering the angles of the lower jaw and margins of the mandible. The nerve enters the brain-stem close to V cranial nerve. Unit responses to salts, sugars, acids, quinine and water have been recorded from the peripheral cut end of this nerve on topical application of various substances confined to mucosa covering lower jaw. The responses are similar in many ways to those obtained from glossopharyngeal nerve on topical application of substances to the tongue papillae. Histological examination reveals fungiform and filliform like papillae distributed in the mucosa covering lower jaw and are particularly aggregated at the corners of the mouth,——the sites of maximal chemoceptive activity. Based on these electro-physiological, anatomical and histological examinations, it appears that the morphological and functional features of the nerve 'chordatympani' in the frogs are quite comparable to the chordatympani seen in mammals. The difference is that the 'chordatympani' of the frog receives impulses from the taste papillae and chemoreceptors distributed outside the tongue, and not in the tongue as seen in mammalian series. The distribution of these gustatory chemoreceptors outside the tongue in frogs suggests its evolutionary significance in the amphibious life of the animal and stands in contrast to the terrestrial life of the mammals, where gustatory receptors are localised to the tongue.

INFLUENCE OF VERATRINE ON CHOLINERGIC TRANSMISSION AT PERFUSED SUPERIOR CERVICAL GANGLION OF CAT. *By* **P. Brahmayya Sastry and D.V. Sampatkumaran.** *Department of Physiology, Andhra Medical College, Visakhapatnam.*

Torda and Wolf (1946) showed that Veratrine depresses acetylcholine synthesis. Burns *et al.* (1955) described typical after-discharging following a single stimulus applied to frog's sar-

totius muscle, only a small part of which was veratrinised; and evolved a postulation that this after-discharging is due to differential repolarisation. The structure of the synaptic junctions at cat's perfused superior cervical ganglion is such that it could possibly form a biological model analogous to frog's partly veratrinised sartorius. This study was designed to verify on such a model the reported after-discharging phenomenon, the nictitating response reflecting the nature of postganglionic firing and the acetylcholine released into the perfusate indicating the effect of veratrine on acetylcholine turnover.

The superior cervical ganglion of chloralosed cat was perfused with eserinised ($5x10^{-6}$ *g/ml*) phophate-buffered Locke's fluid and the acetylcholine released into the ganglionic effluent (perfusate) during stimulation of cervical sympathetic (pregaglionic nerve) was determined by bioassay on eviscerated cat's blood pressure. The stimulation was done at stimulus voltage of 5 to 8 volts, duration 0.4 m sec., and frequency 10/sec.; which stimulation gave a high acetylcholine turnover of 20-30 mug/min that fell exponentially with time to a low level.

Veratrine in concentrations ranging from $5x10^{-8}$ *g/ml* to $1x10^{-6}$ *g/ml*, added to perfusion fluid resulted in the enhancement slightly of the release of acetylcholine but depressed synthesis. While the ganglion was perfused with varatrinised Ringer-Lockes at varying concentrations, the stimulation parametres were also varied widely to find if the phenomenon of repetitive firing could be induced at the pre-ganglionic axons. These efforts failed in our hands though rising and falling tides of acetylcholine concentrations in the pefusate could be detected during the varying modes of stimulation.

Thus the cat's perfused superior cervical ganglion could not, in our experience, constitute a biological analogue to a partly veratrinised frog's sartorius for demonstration of repetitive firing based on the postulated differential repolarisation phenomenon of Burns. However, it could be demonstrated that veratrine increases acetylcholine release but depresses its synthesis.

ACKNOWLEDGMENT

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A STUDY OF EFFECTS OF Mg^{++} AND Ca^{++} ANATAGONISM ON ACETYLCHOLINE TURNOVER BY MINCED AND INCUBATED BRAIN OF RAT. *By* **P. Brahmayya Sastry, E. Lakshmi and G. Ramadas.**
Department of Physiology, Andhra Medical College, Visakhapatnam

Hutter and Kosital (2) reported the Ca^{++} (6.3 mM) could antagonise Mg^{++} depression (15mM) of acetylcholine (Ach) turnover by cat's perfused superior cervical ganglion. Raghavan and Brahmayya Sastry (3) showed that in the case of human placental mince incubated *In vitro*, a Ca^{++} concentration of 22.5 mM was needed for such antagonism. This study an extention of the same to rat's minced and incubated brain.

In 15 "*In Vitro*" incubation studies, using field rats, the right and left halves of brain including brain stem were seperately minced and incubated at 30° C in Eserinised (10^{-4} *g/ml*) and bicar-

bonate-buffered (pH 7.4) Ringer-Locke's (ERL) for 5-minute and 185-minute periods; the Ach concentration in the supernatant (Free Ach) and in the minced particles (Bound Ach) were determined by bioassay on arterial blood pressure of eviscerated field rat (Brahmayya Sastry and Lakshmi, 1969). The synthesis in the 3-hour incubation period was deermined.

The normal Ach synthesis in ERL was Free 12.3, Bound 4.7 and total 17.0; per *ug/g* of brain tissue. With Mg^{++} (15mM) in the incubation medium the synthesis was depressed to 50% of the normal; with Ca^{++} (6.3mM, 15 mM and 22.5mM) added to the Mg^{++} containing ERL the Ach synthesis was restored to 72% and 93% and even increased to 125 % of the normal for the respective concentrations of Ca^{++} in the medium. A study of Free-Bound relationship of Ach synthesis disclosed that the Mg^{++} inhibition was more on the free moiety than on the bound fraction. It is thus observed from these incubation studies that the Mg^{++}—Ca^{++} antagonism as it affects Ach synthesis by incubated brain mince follows the pattern seen in incubated placental mince rather than that seen in the perfused superior cervical ganglion.

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A STUDY OF THE EFFECT OF PHYSICAL EXERCISE IN MEDICAL GIRL STDENTS. *By* **S.R. Kapoor, B. K. Sur and V.K. Negi.** *Department of Physiology, G.S.V.M. Medical College, Kanpur.*

The effect of skipping was studied in 15 girl students of G.S.V.M. Medical College, Kanpur. Each girl started with 200 skipping/day and gradually increased it to 1500 skipping/day within a period of 6 months.

After 6 months there was a decrease in the weight of girls by an average of 2.4 lbs. in 66.6% cases. Pulse rate decreased by 9/mt. in 93.3% cases. Vagal tone was increased by 143% and efficiency seore on Harvard step test increased by 9.4% in all cases. B.M.R. increased in 86.7% by 65Kcal/sq. meter/hr.

Fasting glucose level was raised and the glucose tolerance value showed a lesser rise an our and a rapid fall to attain the normal value. Acute exercise produced a lesesr degree of hypoglycemia.

Serum cholesterol in 11 subjects decreased but increased in 4 cases.

Serum protein increased in 60% cases by an average of 36 *gm*% and decreased in 33.3% by .66 *gm.%.*

NEURAL AND NUTRITIONAL FACTORS IN MUCOPOLYSACCHARIDE SECRETION OF TASTE PAPILLAE. *By* **V. Gopal, K.N. Sharma and S. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore.*

The disc shaped taste buds in frogs show alcian blue stained finely granular particles confined predominantly to the cellular cytoplasm of nonciliated cylinder cells forming the apical zone.

Deeper in the basal cell region, which is packed with elongated group of cells, is found the PAS positive material appearing as fine pink granules. Fine to coarse pink granules can also be seen distributed throughout the papillae below this area of basal cell region. The combined alcian blue (AB) and PAS staining indicates highly reactive acid mucopolysaccharide, in the form of blue granules, confined to the non-ciliated cylinder cells only. Stimulation of glossopharyngeal nerve with pulses (0.25 V, 1.0 msec dur., 50 cps) passed for 7-10 seconds, markedly enhance the acid mucopolysaccharide secretion and the secretory substance may be seen being ejected from the apical zone. Influence of ipsilateral stimulation is more pronounced and bilateral stimulation effects are additive. Intramuscular injections of 0.2 *ml* pilocarpine (1 : 1000) given five times 3 hourly also produced enhanced acid mucopolysaccharide secretion from the papillae. Stimulation of hypoglossal nerve or severing glossopharyngeal nerves inhibited the secretion. Atropine injections (0.2*ml*, 1 : 1500) given intramuscularly for five times 3 hourly also inhibited the secretion.

In chronically starved frogs, the taste buds appear shrunken and may be seen in various stages of disorganisation and disintegration. The AB-PAS reactions show poorly staining, sparsely distributed, fine blue granules in the non ciliated cylinder cells. The PAS positive granules are also seen less densely distributed in the papillae. Depending upon the severity and duration of starvation, the staining reactions and the innervation of the papillae show varying degrees of changes ranging from fragmented and beaded nerve fibers to partial and complete disappearance of nerves entering the papillae.

ANTAGONISTIC VAGO-SYMPATHETIC MODULATION OF GASTRIC MECHANORECEPTORS. *By* **K.N. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore.*

Gastric mechanoreceptor analysis was undertaken by applying a standard tactile stimulus for 100 msec to the mucosa/serosa of the stomach. After establishing a basal response to the tactile stimulus, electrical stimulation with varying parameters, was applied to the gastric vagus or the cervical sympathetic nerves and the effect of these test stimuli on the basal tactile response was recorded. The basal tactile response is inhibited by stimulation of the gastric vagus and facilitated by stimulation of the cervical sympathetics. Unilateral vagal and sympathetic stimulation with pulses (0.34 V, 50-60 cps, 1 msec dur.) passed for 10 seconds produce 40-70% inhibition and 60-200% facilitation respectively. Bilateral stimulation effects are additive. In unilaterally served vagus/sympathetic nerve preparations, stimulation of either the peripheral or the central cut ends of vagus produces inhibition while facilitation is maintained on stimulation of the peripheral or central cut ends of cervical sympathetics. However, stimulating central cut ends in bilaterally served preparations, fail to show the vagal inhibition or the sympathetic facilitation though the peripheral effects can still be produced. Thus the central effects seen in unilaterally severed preparations are mediated via the contralateral uncut side of the vagus, in the case of inhibition, or the sympathetics in the case of facilitation. These observations suggest that as in the case of autonomic efferent functions, antagonistic effects are observed : vagal stimulation inhibits and sympathetic stimulation facilitates afferent discharge. Also, these observations extend the example of efferent modulation of somatic receptors to the efferent modulation of visceral receptors.

It was concluded that differences between the transverse cardiac diameters of athletes and non-athletes was inconsistent. On an average the transverse cardiac diameter was within the normal cardiac thoracic ratio of 1:2.

EFFECT OF HIGH ALTITUDE ON THE OPEN FIELD PERFORMANCE IN RATS. *By* **M. L. Gupta, B. D. Gupta, P. C. Dandiya and P. K. Pareek**. *Departments of Physiology and Pharmacology, S.M.S. Medical College, Jaipur.*

Thirty male albino rats of Haffkine's strain were treated with differential intensities of acute or repeated exposures of low barometric pressure, low-temperature or the combination of both (simulated high altitude) for two hours before subjecting them to the Open Field Test. The results indicate that the psycho-motor activity as defined by ambulation (locomotion), rearing (standing on hind limbs), and preening (scratching face with forelimbs) is facilitated by low-pressure and inhibited by low-temperature; the former treatment producing oxygen-deprived "drive" to increase activity in contrast to the latter treatment which produces shivering and muscular freezing to block activity in the Open Field Test. From an analysis of the "treatment × intensity" interaction, a complex set of relationships between adaptation to these stimuli emerges which suggests that the adaptation to low-temperature is different from that of the adaptation to low-pressure on Open Field performance. The results have tested the explanatory force of the theory of "drive".

ROLE OF HYPOTHALAMUS IN THE PHAGOCYTIC ACTIVITY OF THE RETICUO-ENDOTHELIAL SYSTEM. *By* **D. B. Konar and S. K. Manchanda**. *Department of Physiology, All-India Institute of Medical Sciences, New Delhi.*

In a previous study(1) we reported that discrete lesions produced in the hypothalamus can markedly affect the activity of the reticulo-endothelial system as indicated by the phagocytic indices estimated by employing the carbon clearance technique. The investigation was extended further to see the effect of hypothalamic stimulation on the phagocytic activity.

In 30 male cats hypothalamus was stimulated electrically through the electrodes implanted stereotaxically. Stimulation parameters were square wave pulses of 2—4 volts, 1—2 msec. duration, at the frequency of 80—100 per second for one to three hours. It was found that stimulation of regions located in the anterior hypothalamus led to a significant decrease in the phagocytic activity ($P<0.005$). Sitmulation of middle and posterior hypothalamus also produced a fall in the phagocytic activity but this fall was not statistically significant ($P<0.05$).

Effect of hypothalamic stimulation on the phagocytic activity was also investigated in animals in which the quantity of functioning RES was reduced by a previously induced partial blocking of the RES with a loading dose of carbon suspension. In these animals stimulation of middle and posterior hypothalamus led to an enhancement of the phagocytic activity while stimulation of anterior hypothalamus produced a decrease in this activity. Also in these animals

norepinepherine infusion which was enough to maintain the femoral artery pressure at 30 mm Hg higher than the control level produced a decrease in the activity of the RES.

These hypothalamic influences on the phagocytic activity of the reticulo-endothelial system can be analysed on the basis of hormonal and circulatory dynamics which are given to very profound changes when various hypothalamic regions are stimulated.

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REGIONAL CHANGES IN AMINOACIDS LEVEL IN RAT BRAIN FOLLOWING GLYCOSINE ADMINISTRATION.

By **P.K. Dey And Amal Mukherjee**. *Department of Physiology, College of Medical Sciences, Banaras Hindu University, Varanasi.*

Glycosine (C_{16} H_{14} O N_2, m.p. 155—156°), an alkaloid has been isolated from the plant Glycosmis pentapylla D.C., by Chatterjee rnd Ghose Mazumdar (1). Previously, we reported that the drug in general has got a tranquillizing action, and counteracts the convulsions induced by strychnine, metrazol and cocaine, potentiates the thiopental induced sleep, and blocks the central action of mescaline.

Its action has been studied on the glutamic acid, aspartic acid, GABA and glutamine levels in forebrain, midbrain and hindbrain of rat during the pre-peak, peak and post-peak period of drug action.

Glycosine, at 10 *mg/kg*, mainly brings an increase in GABA level in hindbrain with a concomittant decrease in glutamine level. This increase in GABA in hindbrain is more marked during the peak-period of drug action. Howevei, glutamic acid and aspartic acid levels remained unaltered in three parts of the brain.

The drug at 20 *mg/kg* causes decrease in glutamic acid in mid and hindbrain. GABA commenced to increase in hindbrain and at the peak period of drug response, GABA increased markedly both in hind and midbrain. Aspartic acid decreased in mid brain only. It is interesting to note that glutamine remains unchanged following the higher dose of the drug.

It may be suggested that with the lower dose of the drug, the primary site of action of glycosine lies in the midbrain;but with the higher dose of the drug, the changes in aminoacid metabolism extended to midbrain, and it was during this period only that the tranquillizing property of the alkaloid appeared.

It has been reported by several investigators that both glutamic acid and aspartic acid have powerful excitatory action on the central neurones whereas GABA has a geneial depressant effect and glutamine has no effect. Therefore, it may be suggested further that tranquil-

izing property of glycosine may be associated with the diminished level of both glutmic and aspartic acids in midbrain alongwith the simultaneous increase in GABA level.

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CHANGES IN SPINDLE BURSTS AFTER BRAIN—STEM LESIONS INVOLVING THE COMMISSURAL CONNECTIONS. *By* **G.S. Chhina and Baldev Singh.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

The role of neuronal connections located in the brain-stem influencing the activity of various cortical and subcortical structures in different states of consciousness is well known. Just as commissural fibres play a considerable regulatory effect on the interhemispheric responses, the importance of internuclear connections of the two halves of the brain-stem has also beeu emphasised in this connection.

In the present investigations the occurrence and distribution of spindle bursts in the cortical EEG after midline longitudinal splitting of the brain-stem in the pontine region have been studied in four monkeys. In one animal, the longitudinal cut was made about ½ centimeter on either side of the mid-line. In such preparations there was a marked increase in the spindle bursts as compared to the pre-operative control period. There were several stretches of the record consisting of almost 100% spindle burst activity. A simultaneous significant feature was the much reduced slow wave activity in the delta range. The spindle bursts consisted of 3 types of patterns of 5, 10 and 12½ waves per second respectively.

The control animal changes in the spindle bursts. These changes were comparable to those seen, in preoperative controls which showed a frequency of occurrence of 6 bursts per minute.

A NEW PROPOSED MECHANISM OF STRYCHNINE ACTION AT THF NEURONAL LEVEL. *By* **P.K. Dey.** *Department of Physiology, College of Medical Sciences, Banaras Hindu University, Varanasi*

Many workers have attempted to elucidate the mechanism of action of strychnine at the central nervous system level. The general view prevails that strychnine blocks the action of an unidentified inhibitory transmitter at the post—synaptic (1,2,3,4,). Recently, glycine has been claimed as that inhibitory transmitter (23) and it antagonises the action of strychnine (24). But other workers have recently questioned the role of glycine as inhibitory transmitter (25).

On the basis of certain earlier findings and present observations, a tentative theory has been formulated to explain the cellular mechanism of action of strychnine at the neuronal level. The salient observations noted by the author are as follows:

1. Administration of ascorbic acid (1*gm/kg*) completely nullifies the convulsive and lethal action of strychnine in mice (5,6).

2. Administration of xylose (1*gm/kg*) also shows the same protective action as ascorbic acid. Other sugars like glucese and fructose also exhibit marked protection against strychnine toxicity (7).

3. Thiol compounds like cysteine and reduced glutathione (1gm/kg) fully annul the convulsive and lethal action of strychnine. Cysteine and glutathione show this property only when strychnine solution is mixed with these thiol compounds *in vitro*. Cystine and oxidised glutathione are ineffective (7).

4. Administration of para-iodobenzoate and mercuric and chioride Sh-inhibitors) also counteract the convulsive action of strychnine.

5. Administration of adenosine triphosphate (ATP), 1*gm/kg*, completely protects the animal from strychnine toxicity. ATP is ineffective when either it is administered prior to strychnine administration or when it is given mixed with strychnine solution *in vitro*.

On the basia of the above observations the following hypothesis has been proposed: Strychnine probably combines with freely reacting-SH radical of Na-K activated ATPase present in the cell memberane and thereby accelerates the ATPase activity, resulting in enhancement of Na influx and Ca efflux across the cell membrane, a process directly related with the phenomenon of neuronal depolarisation. The agents which either protect the SH radical of ATPase from binding with strychnine in some manner (ascorbic acid, glutathione, cysteine) or counteracts Na influx and Ca efflux from the cell (by inhibiting ATPase activity with the help of SH radical inhibitor) or increasing the ATP concentration (by ATP administration) will exhibit the antistrychnine properties.

The above proposed theory derives support from recent observations made by other workers. Thus active transport of Na and K through cellular membrane is mediated by membrane bound ATPase (8). Strychnine, in convulusive does, accelerates the Na-K activated ATPase activity by two fold (9). ATPase is present in membrane part of neurone (10) and is found in highest amount in nervous system (11). A regional difference of ATPase activity is present in the brain (12). The enzyme contains free reacting-SH groups and 80% of its activity depends on this radical;cysteine, glutathione and ascorbic acid protect ATPase activity (13). The latter is inhibited by a number of-SH inhibitors (14-17)—ATP itself prevents release of microsomal Calcium, rather it promotes accumulation of the same (18). Calcium binding by brain microsomes is promoted by ATP (19) Low concentration of certain-SH inhibitors blocks Na-stimulated Ca efflux from brain microsomes (20). In developing rat brain, microsomal ATPase activity reaches to maximum on the 16th day (21) which also coincides with the appearance of *tonic seizure* induced by lethal dose strychnine (22).

EFFECT OF SEVERANCE OF THE COMMISSURAL CONNECTIONS ON THE OCCURRENCE AND DISTRIBUTION OF SPINDLE ACTIVITY IN EEG. *By* **S. Kesar, Baldev Singh, G.S. Chinna and B.K. Anand.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

It has been observed by Elsa Classes that the spindle burst activity ceases to be synchronous after section of the corpus callosum in 'encephale isole' preparation in cat. Bremer however, demonstrated that the disappearance of bilateral synchronization of spindles was not a constant finding.

Present study deals with recording cortical and subcortical spindle burst activity before and after commissurotomy during the course of natural sleep in cats. A total of thirteen adult cats were used. In the first stage electrodes were implanted under barbiturate anaesthesia and EEG records taken for studying control activity in sleep. Second operation was done to make a longitudinal cut in the corpus callosum and the anterior and posterior commissures and recording for sleep activity after the animal recovered from the effects of the anaesthesia.

The slow sleep electrical activity of amygdala, caudate nucleus, globus pallidus orbital surface of frontal lobes, frontal parietal and occipital cortex, thalamic nuclei and cerebellum was recorded before and after the severance of the corpus collosum and other commissures. The main effect of commissutotomy was the production of assymetry in voltage and waveform. The effect was more evident in the cortex than in the subcortical nuclei. Also, the cortex tended to show increase in the rate of spindles whilst the caudate showed the opposite effect. The thalamic spindle like burst activity did not show much consistency. These results seem to indicate that after commissurotomy, changes noticed in the spindle burst activity are due to the absence of the influences which the impulses transmitted via the commissure normally have to supplement the control from the upper brainstem and thalamus.

EVOKED RESPONSES FROM HYPOTHALAMUS IN RESPONSE TO STIMULATION OF MESENTERIC NERVES. *By* **Mohan Kumar, G.S. Chhina and B.K. Anand.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

Earlier observations has suggested the possibility of the role of intestinal afferents in regulating the activity of hypothalamic feeding centres. Studies were, therefore, instituted to investigate projections of mesenteric nerves into hypothalamus. In cats anaesthetised by chloralose loops of intestine were isolated and its mesenteric nerves stimulated with square wave pulses through bipolar and silver electrodes. Potentials thus evoked in hypothalamus were picked up by concentric bipolar and monopolar electrodes and monitored on oscilloscope. Mesenteric stimulation evoked responses in ventro-medial nucleus, lateral, anterior and posterior hypothalamus, as well as in midline thalamic nuclei. The polarity of the evoked responses varied from region to region. It was negative in VMN (8 cats), positive negative in the lateral hypothalamus (11 cats). The duration of the response was generally 50-100 msec and had a voltage of 50-150 uv. Latency was generally more than 40 msec.

Presence of negative evoked potentials in the VMN is suggestive of the possibility of the intestinal afferents influencing the activity of satiety centre located there.

A STUDY OF THE INFLUENCE OF OVARIAN HORMONES ON THE FALLOPIAN SECRETION. *By* **V. Dutt Mullick, O.P. Bagga and S. Diwan.** *Department of Physiology and Medical Biochemistry, Lady Hardinge Medical College, New Delhi.*

Fifty female rabbits weighing between 1.6-1.8 *kg.* were used for the study. Vaginal smears were taken to assess the phase of the cycle. Rabbits in oestrus and proestrous phases were selected for experimental intervention. The fallopian tube was reached by open leprotomy techique and continuous collection device was fixed between the muscles and the S/C tissue.

Animals were divided into 5 groups.

(1) Control
(2) Ligated
(3) Castrated
(4) Castrated + Oestrogen
(5) Castrated + Progestrone.

In each group the secretion was collected at the varying interval of 24, 48, 72, 96 and 120 hrs. and was analysed for various biochemical components viz: total proteins, amino N_2, aminoacids, glucose, lactic acid, total lipids, cholestrol, phospholipids, alkaline phosphatase, transminases and amylases.

After the biochemical investigations, the tubes were removed for histochemical examination. The tissues were stained for mucopolysacchride, glycogen, alkaline phosphatase, R.N.A., D.N.A. and for various amino acids.

The biochemical and histochemical data of all the five series were compared. On an average the volume of the secretion in the control group was 1.5 *ml*, 2.5 *ml*, 2.2 *ml* at 24, 48 and 72 hrs respectively. It increased in castrated on administration of oestrogen. The increase in volume was significant over both the control and the castrate group. Apart from changes in volume, there was also increase in total protein, amino N_2, amino acids, glucose, lactic acid, alkaline phosphatase and amylase. Further the hormone influence on the histochemical staining property of the various segments of the fallopian tube was studied.

EFFECT OF BODY TEMPERATURE ON MONOSYNAPIC REFLEX RESPONSE. *By* **Neena Bhattacharya, G.S. Chhina and Baldev Singh.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

The monosynaptic reflex response is an important index for studying the functions of motor neurones. Hypothermia has been used empirically for the relief of spasticity in spinal cord lesions, indicating changes in the excitability of motor neurones by decreased body tem-

perature. In the present investigations changes in monosynaptic reflex response at different body temperatures have been studied.

Sciatic nerve was exposed in dogs (under chloralose anaesthesia) and its branches severed. The nerve trunk was then stimulated through bipolar silver electrodes and the direct and reflex responses recorded oscillographically from the medical branch. The reflex response was recorded at normal body temperature. Subsequent hypothermia was induced gradually in the dogs with surface cooling and extra-corporeal shunt. Rectal temperature was recorded to indicate the body temperature. The monosynaptic reflex response at normal body temperature was obtained after a latency of about 10 msec. With the decrease in body temperature upto about 30°C, the threshold was increased several folds. Further lowering the temperature brought amplitude and threshold of the response back to normal except for the latency.

It is likely that the body temperature at which there is a maximum suppression of the motor neurone excitability may be more effective in decreasing the spasticity.

CHANGES IN CHOLINESTERASE ACTIVITY IN THE GENITAL TRACT : EFFECT OF OLFACTORY LOBE LESIONS. *By* **S. Sharma, M. Savithramma and K.N. Sharma.** *Department of Physiology, St. John's Medical College, Bangalore.*

Risley and Skrepetos (1964) reported that cholinesterase (ChE) distribution in different parts of reproductive tract of male rat is dependent on male sex hormones but no such comparable studies are available for female reproductive tract. The present studies were, therefore, instituted to see the changes in the reproductive tract of female rats during estrus cycle. Since olfactory cues are so intimately concerned in sexual functions, the effect of olfactory lobe lesions on ChE activity in the gential tract of the male rats was also investigated. Bilateral surgical removal of olfactory lobes was done and the rats sacrificed in batches at varying intervals ranging from 4 to 32 days. Tissues were removed in etherized animals and kept in refrigerated 10% formol-saline. Gomori's (1952) method, with some modifications, was followed for demonstration of ChE. For studies on female rats, animals with regular estrus cycles observed for a month, were taken and sacrificed on particular days of the estrus cycle.

Maximum ChE activity, confined predominantly to the follicles and to a lesser extent to the corporalutea, is seen during proestrus. The ChE activity of the uterus, on the other hand, is more during di-and met estrus and less during proestrus and estrus. Ablation of olfactory lobes seems to increase the ChE activity in tests during the first 4 days after which there is a gradual decline with almost complete disappearance obtained in about 28 days. There is no appreciable change in the ChE activity of vas deferens (Supported by Mysore State Board of Medical Research).

ALTERATION IN THE ACTIVITY OF SOME UTERINE ENZYMES IN THE PRESENCE OF AN IUD. *By* **S. Chatterjee and K.R. Laumas.** *Reproductive Biology Research Unit, All-India Institute of Medical Sciences, New Delhi.*

The effect of the IUD on some uterine enzymes have been studied in ovariectomised as well as in intact cycling and pregnant rats (on day 4 and 5). The enzymes studies were

Glucuronidase, Alkaline and acid phosphatase, and lactic dehydrogenase. The activity of β-Glucuronidase, Alkaline and Acid phosphatases were always found to be higher in IUD horn compared to control horn of the same animal, however, lactic dehydrogenase was found to be lower in IUD horn in all the experimental conditions mentioned above. The increase and decrease of the enzymes in IUD horn compared to the control horn was highly significant. The weight as well as protein content of IUD horn were also significantly higher than the control horn in all experimental conditions.

The activity of β-Glucuronidase was increased in ovariectomised rat uterus when treated with exogenous estrogens for seven days, in both the horns. Progesterone treatment depresses the activity of the above enzyme. β-Glucuronidase was significantly higher in estrus than diestrus both in control and IUD horn. The enzyme was also lower on day 4 and 5 of pregnancy. This may be due to low circulating estrogen on those days. Alkaline and acid phosphotases were also high in estrus than diestrus thus indicating its estrogen dependency. Lactic dehydrogenase activity was lower in ovariectomised rats uterus and it was further lowered with exogenous estrogen in presence of an IUD. In intact cycling rat uterus, lactic dehydrogenase was found to be higher in estrus than diestrus, highest on day 4 of pregnancy which indicates that lactic dehydrogenase is more dependent on metabolism than on circulating hormone.

EFFECTS OF PROTEIN DEFICIENCY ON PLASMA PROGESTERONE LEVEL IN ADULT FEMALE RHESUS MONKEYS. *By* **S.R. Gupta, B.K. Anand and S. Logawney** *Reproductive Biology Research Unit and Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

Four female monkeys of 4 *kg* body weight and regular menstrual cycles were used. Two of these were fed 20% protein diet while the other two had laboratory food containing 9% protein. After three months all four were fed a nonprotein diet for a period of six months, when they were reversed to 20% protein diet. They were sacrificed five months after the second diet, change, and ovaries were histologically examined.

The composition of diets and method of feeding was as described by Deo *et al* (1965). The diet was adequate in all nutrients and provided 100 Calories per *kg* of body weight daily. Casein was used as protein and was replaced by sugar in the non-protein diet.

Plasma was obtained from blood samples collected on alternate days, from day 10 to 20 of the menstrual cycle and progesterone was assayed by the competitive protein binding method described by Neil *et al.* (1967). Serum proteins were estimated by Lowry's method (1951).

On 20% protein diet, the mean body weight of monkeys was 5.5 *kg* and the mean serum protein 8.6g%. Progesterone in plasma increased on day 12 and reached a peak value of 5-6 *mu/ml* by day 16 and this was maintained for a week, when it gradually fell to 1 *mu/ml* before menstruation.

On the deficient diet the monkeys lost weight and serum protein fell to almost half the original value. The plasma progesterone levels were, 3.5-4 *mu/ml* at peak, during the first two cycles. The cycles became shorter, progesterone peak receded to day 14 and showed a sharp decline. In following cycles progesterone values fell below 1.5 *um/ml.* Prolonged amenorrhea then occurred and even when the diet was changed to 20% protein, it lasted for another two months.

On reversal to control diet, serum proteins increased and menstruation spontaneously appeared. The plasma progesterone values increased progressively to normal levels and ovarian histology of such animals was fairly normal.

The altered pattern of plasma progesterone curve, decrease in levels, and amenorrhea are suggestive of disturbed ovarian function. Ovarian histology confirms these findings. However, these changes may return to normal when diets of high protein value are provided.

The initial nutritional status, infection and duration of deficiency influence the reversal to normality.

Further studies on gonadotrophins in plasma and pituitary of protein deficient monkeys are in progress.

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EFFECT OF GROWTH HORMONE ON HEXOKINASE ACTIVITY OF RAT ADIPOSE TISSUE IN VITRO. *By* **L.M. Srivastava and G.P. Talwar.** *Department of Biochemistry, All India Institute of Medical Sciences, New Delhi.*

Earlier work in the laboratory has shown that growth hormone (GH) stimulates *in vitro* the uptake of glucose-U-C^{14} and its conversion to fatty acids in adipose tissue obtained from hypophysectomized rats (Pandian *et al*, 1970). GH fails to increase lipogenesis when pyruvate is used as substrate instead of glucose. This suggests that one of the stimulatory action of the hormone on lipogenesis is exercised on a metabolic step somewhere between glucose and pyruvate stage of glycolytic pathway. In a variety of tissues hexokinase has been shown to be one of the regulatory enzymes in controlling the rate of glycolysis through a mechanism mediated by hormones (Weber *et al*, 1966). Hence the effect of GH on hexokinase (EC 2.7.1.1) from epididymal and mesenteric adipose tissues has been investigated. These tissues were incu-

bated in Kreb's Ringer bicarbonate buffer pH 7.4 at at 37° with or without GH and hexokinase activity of the supernatant of the tissue homogcnates was estimated. Experiments have indicated that *in vitro* incubation of the epididymal and mesenteric adipose tissues (obtained from hypophysectomized rats) for 10 min with growth hormone led to an increase in the hexokinase activity by 68% and 59% respectively, Epididymal adipose tissue from old male rats exhibited a response similar to the tissue from hypophysectomized rats. This action of growth hormone on hexokinase and possibly other glycolytic enzymes may be responsible for increased lipogenesis in adipose tissue of the hypophysectomized rats.

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EFFECT OF SEX HORMONES ON THE FREQUENCY OF DRUMSTICKS IN THE POLYMORPHS OF RABBITS. *By* **B.N. Raman and B.B. Maitrya.** *Department of Physiology and Biochemistry, S.P. Medical College, Bikaner.*

Drumsticks, usually observed in the female polymorphonuclear neutrophil leucocytes, are nuclear formations, and may be considered as sex specific appendages at the nuclear level. Differences in their percentage do exist in either sex. In human females 1-3% while in female rabbits 6-8% of drumsticks have been found. The variations in their frequency during starvation, malignancy and antibiotic thereby have been reported. In the present work the effects of commonly used sex hormones—oesterogen, progesterone and testosterone have been studied on the frequency of drumstick pattern in rabbits. They were divided into three groups, each containing five albino rabbits of either sex and were administered oesterogen (100 *ug/kg*), progesterone (2.5 *mg/kg*) and testosterone (2.5 *mg/kg*) daily for seven days. Drumsticks were counted in 1000 polymorphs of each speciman taken before, 1, 3, 7, 14, 21 and 30 day after starting these treatments. Oestrogen brought about a significant rise in the drumsticks of the female rabbits but failed to induce significant variations in male rabbits. Progesterone and testosterone, however, lowered the percentage of drumsticks in both the sexes.

A STUDY OF SOME NITROGENOUS CONSTITUENTS OF BLOOD IN THE NEW BORN. *By* **Uma Joshi and M.L. Gupta.** *Upgraded Department of Physiology and Biochemistry, S. M. S. Medical College, Jaipur.*

Blood urea, uric acid and creatinine level and serum proteins and their electrophoretic pattern have been studied in fifty New-borns. The blood urea was 27.88 ± 4.50 *mgm%*, uric acid 2.85 ± 0.50, Creatinine 1.31 ± 0.40 *mgm.%*, total serum proteins 5.20 ± 0.60 *gm.%*, albumin 2.85 ± 0.36 *gm.%*, globulins $alpha_1$ 0.27± 0.09, $alpha_2$ 0.44 ± 0.19. Beta 0.58 ± 0.18,

gama 1.01 ± 0.24 *gm.%*. The serum total proteins is lower as compared to their foreign counterparts, while the gama globulin level is higher. This may be due to poor nutritional status of the mothers and their higher exposure to the various infectious diseases.

These have been compared with the values obtained in their mothers. The total serum proteins, albumin and difference globulin fractions in infants are significantly lower while that of blood urea levels are significantly higher in infants than their mothers. With the increase in parity the serum proteins of both mothers and infants show a significant fall. There is no significant difference in the mean uric acid and mean creatinine levels of the cord blood and maternal blood.

The various nitrogenous constituents have not shown any significant sex difference. The urea and creatinine values are higher, while total proteins and their fractions (except gama globulin) are lower in prematures than in full term infants. This is possibly due to increased nitrogen metabolism in premature infant.

STUDIES ON CORI CYCLE AT HIGH ALTITUDE. *By* **G. Goyal and M.L. Gupta**. *Upgraded Department of Physiology and Biochemistry, S.M.S. Medical College, Jaipur*

The effects of acute exposure to low temperature (—10°), low barometric pressure (simulated altitude of 27,000 ft.) and to simulated high altitude (27,000 ft. and —10°C) for two hours have been studied on liver and muscle glycogen, glucose-6-phosphatase, blood glucose and lactic acid in albino rats. In the second series of experiments, the effects of exposure to the above treatments, after partially acclimatizing them to low temperatures (0°C and —5°C) and low barometric pressure (9,000 ft. and 18,000 ft.) have been studied. The animals were exposed for two hours on alternate days for one week at each of low intensities of treatments. After the final exposure the animals were sacrificed. Blood glucose and lactic acid, muscle and liver glycogen and liver glucose-6-phosphatase activity were estimated by standard techniques.

In non-acclimatized rats exposure to cold or to low barometric pressure did not cause any significant changes in blood glucose and lactate level while high altitude showed a significant rise in blood lactate level (from 16.80 ± 9.96 *mg.%*; to 30.36 ± 17.41 *mg.%*; ($t = 2.77$). Similar results were observed in acclimatized rats except that the increase in lactate level was greater after acclimatization (48.16 ± 5.90 *mg.%*; $t = 8.80$).

In both acclimatized and non-acclimatized rats, low barometric pressure, cold and high altitude, caused significant decrease in liver glycogen (control = 22.31 ± 8.99 m.eq. of glucose; Low barometric pressure — non-acclimatized rats = 10.05 ± 6.35, $t = 5.13$, acclimatized rats = 4.80 ± 3.34, $t = 9.16$; cold—non-acclimatized rats 2.89 ± 0.32, $t = 10.83$, acclimatized rats = 6.52 ± 4.74, $t = 6.61$; high altitude—non-acclimatized rats = 7.08 ± 0.12, $t = 8.41$, acclimatized rats = 5 01 ± 0.99; $t = 8.41$).

The glucose-6-Phosphatase activity was significantly increased in non-acclimatized and acclimatized rats on exposure to high altitude (control = 532.00 ± 186.50; *mg*/P/half an hour at 37°C; High altitude—non-acclimatized = 870.00 ± 525.90; $t = 2.42$; acclimatized = 916 ± 11.54 $t = 8.2$), and to cold (Cold—non-acclimatized = 1061.00 ± 433.47, $t = 4.48$, acclimatized = 637.50 ± 51.70, $t = 3.12$) while low barometric pressure did not cause any significant effect in non-acclimatized rats but significant decrease in acclimatized rats (acclimatized = 332-50 ± 141.56, $t = 3.41$).

Both in acclimatized and non-acclimatized rats, the exposure to low barometric pressure or to cold caused significant increase of muscle glycogen while high altitude had no significant effect (Control = 2.82 ± 0.53 : Low barometric pressure—non-acclimatized rats = 4.87 ± 1.48 ± $t = 5.39$; acclimatized rats = 3.86 ± 2.85 ; cold — non-acclimatized rats = 1.48 ± 0.76, $t = 6.12$; acclimatized rats = 1.90 ± 1.23, $t = 2.09$).

INCIDENCE OF COLOUR BLINDNESS IN LOCAL POPULATION WITH REFERENCE TO ABO BLOOD GROUP DISTRIBUTION. *By* **N.L. Vaishya, Santokh Singh, K.P. Bhargava and Parmanand Rajani.** *Departments of Ophthalmology and Physiology, Gandhi Medical College, Bhopal.*

A study was undertaken to find out if a correlation existed between colour blindness and ABO blood groups, both being inherited traits. Out of 5000 cases surveyed by Ishihara's chart colour blindness was detected in 136 (5.17%) males and 12 (0.5%) females. Noc orrelation could be observed with regard to age, occupation and dietetic habits (i.e. Vegetarian and non-vegetarian). Amongst Hindus the Brahmins exhibited the highest incidence of colour blindness. Among males 77 (56.6%) were protodeuteranopic, 57(41.8%) were deuteranopic and 2(1.4%) were protanopic. 11 females were proto-deuteranopic and 1 was deuteranopic. The findings are broadly speaking, in agreement with those reported earlier by us (Bhargava, Rajani, 1968) and by other workers in India and abroad, according to whom the incidence of colour blindness ranges in Indian people from 2.5. to 7.53% in males and 0.367 to 0.8% in females.

These cases were further studied with respect to their blood groups. It was found that majority 77(47.9%) of the colour blind persons belonged to group B, 33 (22.3%) of the cases were found to be of group A and 22(14.8%) each of O and AB groups.

Patel *et al.* (1969) in their study of 89 colourblind persons with respect to their Blood group showed that 24.7% were of group B, 21.3% of group A, 48.4% of group 0 and 5.6% group A.B. According to them gene frequency of blood group pA was 0·145, of qB was 0.159 and of rO was 0.696 where as present study bears out the gene frequency as follows : pA 0.233, qB 0.407 and rO 0.384.

The results do not agree with those of Patel *et al.* (the only other work of this nature reported) and are near the phenotype percentage of a random sample of population in India studied by us (Bhargava and Rajani 1967) and others.

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FFECT OF HIGH ALTITUDE ON BLOOD LIPIDS. *By* **M. L. Gupta, C. M. Soni, S. D. Bhardwaj and .K. Jain.** *Upgraded Department of Physiology and Biochemistry, S. M. S. Medical College, ipur.*

The effect of acute exposure to low barometric pressure (18,000 ft.), Low temperature —10°C) and to simulated high altitude (18,000 ft. at —10°C) for three hours has been studied n blood total lipids, phospholipids, total cholesterol and lipase activity.

Exposure to cold and high altitude caused significant increase in total lipids, total holesterol, phospholipids and lipase activity while low barometric pressure had no significant ffect.

FFECT OF FENFLURAMINE ON THE SINGLE CELL ACTIVITY OF THE HYPOTHALAMIC FEEDING CENTRES. By **S. Khanna, U. Nayar and B. K. Anand.** *Department of Physiology, All India Institute of Medical Sciences, New Delhi.*

Fenfluramine has been reported to decrease the appetite and weight without producing ny adrenergic effects. As hunger and satiety are regulated from hypothalamic centres, and hese are influenced through change in glucose utilization, studies were nudertaken to observe ffects of Fenfluramine on these mechanisms.

Administration of the drug in animals was observed to produce increased glucose utilization in the body, as evidenced by increase in the arteriovenous glucose differences.

Activity of hypothalamic single neurone units was studied in cats and then exposed to I. V. administration of Fenfluramine in dosage of 3 *mg/kg* body weight. The animals were anaesthetized with ether for the cannulation of femoral vessels and for making a window in the skull for introduction of micro-electrodes. The activity of single neurones from hypothalamic satiety and feeding centres was recorded oscillographically, and then the drug administered. Changes in the rate of firing of units in response to this were observed.

Out of several hypothalamic neurone units studied only 3 units were confirmed to be located in the satiety centre. All these showed increase in their rates of firing 15-25 minutes following the administration of the drug. None of the units studied so far were located in the feeding centre.

Although these observations need to be further substantiated by more experiments, increase in the rate of firing of satiety units in response to I. V. administration of drug appear to be related to increased glucose utilization in the body resulting from Fenfluramine.

STUDIES ON PYRUVATE METABOLISM AT HIGH ALTITUDE. *By* **M. L. Gupta, S. D. Bhardwaj and R. K. Jain.** *Upgraded Department of Physiology and Biochemistry, S. M. S. Medical College, Jaipur.*

The effect of exposing the albino rats to low barometric pressure (simulated altitude of 7,000 ft. and 14,000 ft.), low temperature (−10°C) and simulated high altitude (−10°C at 7,000 and 14,000 ft.) for two hours was studied on blood pyruvic acid and on the conversion of pyruvic acid into glucose, glycogen, citric acid and lactic acid by liver slices.

Exposure to cold and high altitude diminished blood pyruvic acid while low barometric pressure had no significant effect (Control=3·45 ± 1.1 ; Cold=2.14 ± 0.9 ; t=1.85 ; 7,000 ft. at −10°C=2.07 ± 0.8 ; t=2.04 ; 14,000 ft. at −10°C=1.98 ± 1.1 ; t=1.90).

The liver slices showed a significant increase in pyruvate utilization after exposure to cold and high altitude while low barometric pressure had no significant effect (Control=265.8 ±32.5; Cold=320.4 ± 41.8; 7,000 ft. at −10°C=357.4 ± 59·9; 14,000 ft. at −10°C=380.8 ± 57.9). The conversion of pyruvic acid to glucose and citric acid was increased while biosynthesis of glycogen was depressed on exposure to cold, low barometric pressure and high altitude.

ELECTIVE COUNTERSHOCK WITH INTRACARDIAC ELECTRODE. *By* **S. C. Jain, V. M. Bhatnagar, P. Awasthey and G.N. Vajpeyi.** *Departments of Cardiology, Physiology and Medicine, G. S. V. M. Medical College, Kanpur.*

A new technique of administering elective D. C. Countershock with an intracardiac electrode catheter has been described. In this technique, one electrode was placed, transvenously, in contact with the right atrial wall and the other, over the praecordium.

In a preliminary study, 10 shocks of 200 Watt-seconds each, were given in quick succession to 6 anaesthetised dogs. 3 dogs were sacrificed immediately after the procedure and their hearts examined very carefully. No anatomic ill-effects were observed either in the right atrial wall or the ventricular wall. The other 3 dogs were observed for 72 hours and then sacrificed. In these also, no ill-effects, anatomic or functional, were discernible. Conversion to sinus rhythm was thereafter, accomplished in another group of 3 anaesthetised dogs with digitalis induced ventricular tachycardia diograms, recorded to rule out any possibility of and ventricular fibrillation.

The first 2 studies on human beings were made on 2 patients who had artial fibrillation with refractory chronic congestive heart failure. Their atrial fibrillation had failed to revert to sinus rhythm either with drugs (Quinidine and I. V. Dilantin Sodium) or with external

D. C. Countershock of 400 Watt seconds intensity. These cases reverted to sinus rhythm with 75 and 100 Watt-seconds respectively, given with intracardiac technique. Frequent electrocardiograms, recorded to rule out any possibility of atrial or ventricular damage, did not reveal any evidence of damage.

SERUM TOTAL PROTEINS AND THEIR ELECTROPHORETIC PATTERN AS AN INDEX OF HEPATIC FUNCTION IN HUMAN BEINGS. *By* **I. C. Sogani, K. P. Khuteta, M. L. Gupta and K. S. Ratnu.** *Upgraded Department of Physiology and Biochemistry, S. M. S. Medical College, Jaipur.*

Serum total proteins and their electrophoretic pattern was determined in fifty patients with hepatocellular damage and compared with twenty-five normal healthy persons of both sexes of different status who were clinically free from any manifestations of disease and gave no history of any illness attributable to liver in immediate past.

Total serum protein was normal (6.0 to 7.6 *gm* %) in 76% and low in 24% cases. Albumin fraction was normal (2.98 to 4.49 *gm*%) in 10% while in 90% it was below normal. Alpha$_1$ globulin fraction was normal (0.22 to 0.49 *gm* %) in 78%, low in 14% and elevated in 8% cases. Alpha$_2$ globulin was normal (0.42 to 0.79 *gm* %) in 48%, low in 38% and high in 14% cases. Beta-globulin was normal (0·59 to 1.21 *gm*%) in 90% cases, low in 6% and high in 4% cases while gamma globulin fraction remained high in all the cases as compared to the normal (1.14 to 1.65% *gm* %).

Thus serum total protein does not give any significant information about the protein metabolic function of liver. Decreased serum albumin fraction indicates parenchymatous liver damage (hepatitis, cirrhosis and malignancy etc.) which can be used as an index for assessing the prognosis and treatment. Variation in alpha$_1$, alpha$_2$ and beta globulin fraction do not have any diagnostic and prognostic importance while elevated gamma-globulin, being the constant feature of any type of liver damage, definitely indicates the extent of hepatocellular damage.

B. PHARMACOLOGY

PHARMACOLOGICAL EVALUATION OF (—) QUEBRACHAMINE. *By* **D.K. Ganguly, S. K. Chaudhuri, B. B. Bhattacharya, R. Bhattacharya, and L. Shah.** *Indian Institute of Experimental Medicine, 4, Raja Subodh Mullick Road, Calcutta.*

(—) Quebrachamine ($C_{19}H_{26}N_2$, m.p. 147°C), is an alkaloid obtained from *Rhazya stricta Decaisne.*

(—) Quebrachamine (2 mg/kg; iv) caused a biphasic rise of mean arterial pressure of 15 to 25 min duration in normotensive rats i.e. an initial sharp rise of blood pressure followed by a persistent pressor response. Propranolol (5 *mg/kg*; iv) and phenoxybenzamine (2.5 *mg/kg*; iv) abolished the initial sharp pressor and the secondary persistent pressor responses respectively. Vascular responses were completely abolished when the rats were pretreated with both phenoxybenzamine and propranolol simultaneously. The drug caused bradycardia which was unaffected by adrenergic blockade. Positive inotropic effect was observed on isolated rabbit auricles after addition of (—) quebrachamine (0.5×10^{-6} *g/ml*) to the bath fluid. This was antagonised by propranolol. (—) Quebrachamine produced vasoconstriction of the perfused rabbit ear artery. Vasoconstriction was antagonised when the perfusion fluid contained phenoxybenzamine. No vasoconstriction was observed in reserpinised preparations.

Contraction of isolated vas deferens were observed after the addition of (—) quebrachmin to the bath. There was complete tachyphylaxis after 8 to 10 doses. The contractions were blocked by phenoxybenzamine. Quebrachamine produced dose - dependent relaxation of the maximum height of histamine induced spasm of guinea pig tracheal chain. (—) Quebrachamin (0.5 to 1.0×10^{-4} *g/ml*) also completely inhibited the histamine induced spasm of the guinea pig tracheal chain.

It was concluded that (—) quebrachamine, an indole alkaloid, possesses considerable sympathomimetic effects.

SOME PHARMACOLOGICAL PROPERTIES OF THE ALCOHOLIC EXTRACT OF CYPERUS SCARIOSUS. *By* **R. C. Sharma, S. K. Gupta, S. C. Khurana and R. B. Arora.** *Department of Pharmacology, All-India Institute of Medical Sciences, New Delhi.*

Cyperus scariosus R. Br. commonly known as 'Nagarmotha' has long been used in the indigenous system of medicine for the treatment diarrhoea and syphilitic affections and as a diuretic. The plant was extracted with alcohol (three times) and concentrated under reduced pressure. A brown sticky mass was obtained.

The extract antagonised the stimulant effects of histamine, bradykinin and serotonin on smooth muscles. Six μg of the extract produced about 50% blockade of histamine (1*mg*) induced

contraction of guinea pig ileum. Similary, 4 μg of the extract produced about 60% blockade of bradykinin (200 *mg*) induced spasm of guinea pig ileum. On the rat uterus 4 μg of the extract produced about 80% blockade of serotonin (500 *ng*). The extract (50 and 100 μg) produced a marked fall in blood pressure when given intravenously in rats. Hypotension was abolished by atropinisation of the rat. In higher doses in mice the extract showed marked anti-tremorine and anti-convulsant activities.

A STUDY OF THE PHARMACODYNAMIC PROPERTIES OF EMBLICA OFFICINALIS. *By* **S. C. Khurana, S. K. Gupta, R. C. Sharma and R. B. Arora.** *Department of Pharmacology, All-India Institute of Medical Sciences, New Delhi.*

Pharmacological actions of phyllemblin, an active principle of *Emblica officinalis* commonly known as 'Amla' were investigated.

Phyllemblin antagonised the spasmogenic effects of acetylcholine, bradykinin and serotonin on the guinea pig ileum. Phyllemblin (50-100 μg) antagonised serotonin and acetylcholine induced contractions of oestrogenised rat uterus. The isolated rabbit heart was perfused with Ringer Locke solution at 37 $\pm$ 0.5°C under constant pressure by Langendroff's method. Phyllemblin (50-400 μg) increased the amplitude of cardiac contraction and heart rate transiently. A transient increase in coronary flow was followed by persistent decrcase. On perfused rat hind limb and rabbit ear preparations, phyllemblin, in small doses increased the amount of perfusate whereas in larger doses (100-400 μg) it decreased the flow significantly.

The effects of the drug in 50-100 μg doses were studied on the blood pressure and respiration in urethane anaesthesised albino rats weighing 150-200 g. A triphasic response, initial transient rise followed by a transient fall and then sustained rise of blood pressure was seen. The sustained rise was blocked by phentolamine (1 *mg/kg*).

Phyllemblin was tested foı its anti-convulsant and anti-tremorine activities in mice weighing 25-45 *g*. It produced 80% protection in leptazol seizure threshold test when given intraperitoneally in the dose of 20 *mg/kg*. Phyllemblin (10 and 20 *mg/kg* intramuscularly) injected 10 and 30 min prior to nicotine, protected effectively against tremors and clonic and tonic convulsions. Phyllemblin also antagonised tremorine induced tremors and other cholinergic symptoms.

STUDIES ON SENSATION OF TASTE. *By* **Meena Dave, B. D. Miglani, R. K. Sanyal and G. B. West.** *Department of Pharmacology, Maulana Azad Medical College, New Delhi and British Industrial Biological Research Association, Carshalton, England.*

It is known that there is a bimodal distribution of normal population with regard to threshold sensitivity to taste of phenylthiourea carbamide (PTC). This has now been compared with the distribution of threshold sensitivity to bitter (Naringin), sweet (glucose),

sour (citric acid) and salt (sodium chloride). It was observed that the distribution of threshold sensitivity was unimodal in all these cases.

Alcohol as well as glucose administered orally increased the acuity of sensation of bitter taste. The sour, sweet and salt sensations were only insignificantly enhanced. Caffeine did not have a similar action.

EFFECT OF ACETYLSALICYLIC ACID, PHENYLBUTAZONE AND INDOMETHACIN ON RETICULOENDOTHELIAL FUNCTION. *By* **K. Kapila, C. Smith and A.A. Rubin.** *Endo Laboratories Inc.*, 1000 *Stewart Avenue, Garden City, N. Y.* 11530 (*U.S.A.*)

The effect of acetylsalicylic acid, phenylbutazone and indomethacin on phagocytosis was studied by determining the change in the rate of carbon clearance from blood.

Acetylsalicylic acid, phenylbutazone and indomethacin were given orally to CF1 and C-57 B16 mice in the following time schedules : (1) a single injection 3 hr before the carbon clearance test and (2) daily for three days ; carbon clearance was determined 4 hr after the last dose. Carbon was injected intravenously (160 *mg/kg*) and 25 μl blood samples were collected from the orbital venous plexus at 5 and 10 min intervals. The blood was then diluted in 3 *ml* of 0.1 per cent sodium carbonate, optical density determined and phagocytic index calculated.

Acetylsalicylic acid was given in doses of 100 and 300 *mg/kg*. Neither one nor three day treatments affected carbon clearance. Phenylbutazone, given in doses of 30 and 100 mg/kg, had no effect on the one day schedule but decreased the rate of carbon clearance on the three day schedule at 100 *mg/kg*. There was no effect at the lower dose level. Indomethacin at 10 and 30 *mg/kg* was also without effect following the one day treatment but when given for 3 days slightly stimulated carbon clearance at 10 *mg/kg* and depressed it at 30 *mg/kg*.

MODIFICATION OF THE EFFECTS OF LEPTAZOL AND PENTOBARBITONE BY CORTICOSTEROIDS IN RABBITS. *By* **S.K. Bapat, A.C. Jauhari, Vimal Chandra, K.U. Ansari and S.S. Mishra.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

Normal healthy albino rabbits of either sex, weighing 1-2 kg were used for the study.

Intravenous doses of pentobarbitone sodium required to produce an immediate loss of righting reflex and loss of corneal reflex within 1-2 min were determined. The procedure was repeated 40 min after the injection of corticosteroids in doses of 0.4 *mg/kg* (iv) in groups of 10 animals each.

In another series of experiments the intravenous doses of leptazol required to produce convulsions lasting for 2 min were determined in a group of 10 animals. The

corticosteroids were injected (iv) in different groups of 10 animals each and the doses of leptazol required to produce convulsions lasting for 2 min were determined 40 min later. The results showed that increased amounts of pentobarbitone and leptazol were required to produce the same effects as in control animals after injections of the four corticosteroids. In this respect hydrocortisone was the most effective and triamcinolone the least effective.

HYPERGLYCAEMIA AND ANAPHYLACTIC REACTION. *By* **H.L. Dhar.** *Department of Pharmacology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry.*

Effect of hyperglycaemia was studied on various steps of anaphylactic reaction and it was seen that glycaemic state did not interfere with antibody formation, antibody uptake and antigen antibody union. However, hyperglycaemia induced in the rat either by injection of alloxan or by infusion of hypertonic glucose produced slow release of tissue histamine. In isolated tissues glucose reduced the sensitivity to histamine but not to 5-HT. Results with bradykinin were not clearcut.

Isoprenaline but not noradrenaline reduced the sensitivity to histamine in sensitised rats. Propranolol or phenoxybenzamine under similar condition did not alter the sensitivity to histamine.

IS ADRENALINE REVERSAL A PHENOMENON PURELY OF α-ADRENERGIC BLOOK? *By* **C.L. Kaul and R.S. Grewal.** Ciba *Research Centre, Goregaon East, Bombay*-63.

In anaesthetized cats, phentolamine (0.2 *mg/kg*; iv), phenoxybenzamine (0.15 *mg/kg*; iv) and dihydroergotamine (0.5 *mg/kg*; iv) produced reversal of adrenaline pressor response whereas responses to noradrenaline were not much affected by phentolamine and phenoxybenzamine. Dihydroergotamine, however, produced some reduction in the noradrenaline pressor response. This difference between the two amines was absent in rabbits. The depressor response to adrenaline produced by α-adrenergic blocking agents was converted into a pressor response by propranolol (0.4 *mg/kg*). Phenoxybenzamine, phentolamine and 1—(5-methyl—1-phenyl-4-pyrazolyl-3-[4-(0-tolyl)-1-piperazinyl]-1-propanone hydrochloride (CIBA 100-Go) increased the sensitivity of the rat uterus to adrenaline. Cocaine (4.5 *mg/kg*; iv) and imipramine (4.5 *mg/kg*; iv) given after the α-adrenergic blocking agents blocked the depressor response to adrenaline and converted it into a pressor one. Thus at the doses studied both phentolamine and phenoxybenzamine did not produce any significant α-adrenergic block although a reversal of adrenaline effect was seen. Other factors like potentiation of the vasodilator effects of adrenaline seem to be involved in the phenomenon of adrenaline reversal.

POTENTIATION BY PERSANTIN OF ADENOSINE ACTION ON DOG BLOOD PRESSURE. *By* **A.P. Saraf, and C.B. Seth.** *Department of Pharmacology, M.G.M. Medical College, Indore.*

Persantin, a pyrimido-pyrimidine derivative dilates the coronary vessels and is used to treat angina pectoris. Persantin in a does of (500 *μg/kg*) selectively potentiated the hypotensive

action of adenosine (50 $\mu g/kg$) in dogs, since blood pressure responses to acetylcholine, isoprenaline and histamine remained unchanged.

Further, in order to study the probable mechanism of this potentiation, the effect of persantin on phosphodiesterases of various rat tissues was studied. Perasantin ($1x10^{-8}$ to $6x10^{-8}$) was found to inhibit phosphodiesterases of rat heart, rat liver and rat brain, the effect was more marked on alkaline phosphatase of rat heart. As persantin is a weak inhibitor of adenosine deaminase, it seems likely that inhibition of phosphodiesterases can also contribute to the potentiation of adenosine by persantin.

CARDIOPULMONARY ACTIONS OF NEW ADRENERGIC β-RECEPTOR ANTAGONIST. *By* **R.S. Gupta and B.R. Madan.** *Department of Pharmacology, S.P. Medical College, Bikaner.*

Cardiopulmonary effects of new adrenergic beta receptor antagonist, N-isopropyl-1-amino-3-(*m*-tolyloxy)-2 propanol-Ko-592 were investigated in the anaesthetized dogs. Administration of the drug directly into the left lower lobe of the lung, perfused at constant rate by mixed venous blood derived from the animal's own right atrium, caused decrease in perfusion pressure (indicative of local pulmonary vasodilatation), decrease in the pulmonary arterial pressure of the intact lobe (due to direct pulmonary vasodilatation and reduction of cardiac output), depression of cardiac rate and contractility (due to blockade of cardiac beta receptors) and fall of systemic arterial blood pressure (attributable to the elimination of endogenous sympathetic tone to the heart and direct systemic vasodilator action independent of β-receptor blockade).

CARDIOTONIC ACTIVITY OF THEVETIA NERIIFOLIA GLYCOSIDES AND THEIR COMPARISON WITH OUABAIN. *By* **K.C. Mishra, S.D.S., Seth, E.V. Rao and R.B. Arora.** *Department of Pharmacology, All-India Institute of Medical Sciences, New Delhi.*

The present communication is a preliminary report and deals with the cardiotonic activity of glycosides from *Thevetia nerifolia* viz. cerbroside, neriifolin, acetyl—neriifolin, ruvoside and peruvoside and their comparison with ouabain on the isolated frog heart.

A total of 92 experiments were performed. Frogs weighing 200-250 g were used. Isolated frog heart in Straub's arrangement was mounted. Contractions with frog Ringer followed by 1/4th calcium Ringer were recorded. After the contractions stabilized, the fluid in the cannula was replaced by 1/4th calcium Ringer containing the drug and the observations were made. All the glycosides initially produced a positive inotropic effect which was followed by negative inotropic and chronotropic effect with the heart stopping in systole.

Peruvoside was more potent than ouabain, the potency of neriifolin, ruvoside, acetyl-neriifolin and cerbroside was found to be in the decreasing order.

A COMPARATIVE EFFECT OF CENTRAL NERVOUS SYSTEM DRUGS ON THE OPEN FIELD PERFORMANCE IN RATS. *By* **P.C. Dandiya, B.D. Gupta and M.L. Gupta.** *Departments of Physiology and Pharmacology, S.M.S. Medical College, Jaipur.*

One hundred male rats of Haffkine strain pre-treated with increasing doses of double distilled water (placebo) or LSD or mescaline or iproniazid were subjected to Open Field Test and their scores on ambulation (locomotion) and rearing (standing up on hind limbs) were analysed. All the three drug groups produced a higher rate of ambulation than the placebo. Both LSD and iproniazid produced an equal performance and their individual score was higher than that of the mescaline group. On the other hand, although LSD increased rearing as well, both mescaline and iproniazid failed to affect this response.

The results have taken the "treatment × dose interaction" into consideration to suggest that ambulation may be simpler than the rearing as a drug induced stereotyped performance and the differential deviations of the drug groups on these two responses may be caused by the difference in the complexity of the responses.

THE EFFECTS OF CORTICOSTEROIDS ON TWO BODY MEMBRANES. *By* **S.K. Bapat, Vimal Chandra, K.U. Ansari and A.C. Jauhari.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

The changes in the permeability of peritoneal membrane and the blood-brain membranes induced by the corticosteroids were investigated.

For peritoneal membrane the method employed was based on the rate of absorption of drugs injected intraperitoneally. Rats of either sex weighing 80-100 g were used. Urethane (1.2*g*/*kg*) was injected intraperitoneally as a 10% aqueous solution and the interval between the injection and the production of anaesthesia, (when the animal offered no resistance to being placed on its side) was referred to as the "urethane absorption time".

The activity of corticosteroids on the permeability was tested by their power to counteract the rate of absorption of urethane which was evidenced by a change in the absorption time following the corticosteroids (0.4 *mg*/*kg*) injected intraperitoneally at varying intervals. The four corticosteroids used were hydrocortisone, prednisolone, dexamethasone and triamcinolone. For blood-brain membrane the method employed was based on the changes in the intravenous dose of urethane required to produce loss of righting reflex in rats after the administration of corticosteroids (0.4 *mg*/*kg*) injected intraperitoneally.

In the case of peritoneal membrane it was seen that in all the cases the peak action of corticosteroids occurred after 40 min of the injection except for triamcinolone where the peak action was seen after 20 min. The most potent drug in this respect appeared to be prednisolone which caused a maximum increase in the absorption time (220.3 sec) and it was the only corticosteroid among the four which caused a significant increase after 10 min ($P < 0.01$).

In the case of blood-brain membrane the results showed that increased amounts of urethane were required after corticosteroids to produce the loss of righting reflex. In this respect hydrocortisone was the most potent and triamcinolone was the least potent.

MECHANISM OF THE ANTAGONISM OF THE HYPOTENSIVE ACTION OF GUANETHIDINE BY PROPRANOLOL. *By* **R.S. Grewal and C.L. Kaul**. *Ciba Research Centre, Goregaon East, Bombay.*

The mechanism by which propranolol blocks the hypotensive action of guanethidine was investigated using normal and adrenal demedullated renal hypertensive rats. Propranolol did not antogonise the antihypertensive effect of guanethidine in adrenal demedullated renal hypertensive rats but blocked the effect in normal renal hypertensive rats with intact adrenal medullae. Guanethidine did not interfere with the release of catecholamines from the adrenals following different stimuli. It is concluded that propranolol blocks the antinypertensive effect of guanethidine mainly by potentiating the vasopressor effect of catecholamines released from the adrenal gland.

LOCAL ANAESTHETIC AND ANTIARRHYTHMIC ACTIONS OF DEXTRO AND LAEVO ROTATORY ISOMERS OF 1-(O—ALLYLPHENOXY)-3-ISOPROPYLAMINO-2-PROPANOL HYDROCHLRIDE. *By* **B.R. Madan, S.N. Misra and V.K. Khanna**. *Department of Pharmacology, S.P. Medical College, Bikaner.*

Antiarrhythmic activity of dextro and laevo rotatory optical isomers of 1-(O-allylphenoxy)-3-isopropylamino-2-propanol hydrochloride (H 56/28) was investigated in 28 dogs. Ventricular arrhythmias were produced by 2-stage ligation of the anterior descending branch of the left coronary artery and by toxic doses of k-strophanthoside administered in a graded manner. In the former test-procedure, both isomers reduced the total and ectopic heart rates in all the dogs. In some of these animals, there was complete elimination of ventricular ectopic activity with restoration of normal sinoatrial rhythm. Likewise, both isomers suppressed glycoside induced ventricular automaticity. Since dextro rotatory variety has only 1/100th the adrenergic β-receptor blocking activity of laevo isomer, the antiarrhythmic action seems to be independent of β-receptor antagonism. As tested by the rabbit's corneal and guinea pig's wheal methods, both isomers exhibited local anaesthetic activity which may be responsible for the antiarrhythmic property.

EFFECT OF TESTOSTERONE AND MEPROBAMATE ON SMOOTH MUSCLE. *By* **Dinesh Chandra and S.S. Gupta**, *Department of Pharmacology, Gandhi Medical College, Bhopal.*

Testosterone (2×10^{-4}) and meprobamate (2×10^{-4}) inhibited the pendular movements of rabbit ileum completely. Testosterone however, did not inhibit the acetylcholine (5×10^{-8}) induced contractile response of rabbit ileum, though significant inhibition was observed after meprobamate. The latter drug in a concentration of (5.3×10^{-5}) caused 50% inhibition of the contractile response to acetylcholine. Further, both testosterone and meprobamate inhibited the contractile response to histamine (1×10^{-7}) of guinea pig ileum. The I.D. 50's for testosterone

and meprobamate were 6.6 x 10^{-6} and 5.1 x 10^{-5} respectively. The contractile responses to 2.5 x 10^{-8} concentration of serotonin of oestrogenised rat uterus were reduced to 50% after 3.2 x 10^{-5} and 7.4 x 10^{-5} concentrations of testosterone and meprobamate respectively.

STUDIES ON TRIPHOSPHOPYRIDINE NUCLEOTIDE. *By* **C. K. Chauhan, G. Datta and Pawan S. Chauhan.** *Departments of Pharmacology. G.S.V.M. Medical College, Kanpur and JIPMER, Pondicherry.*

Intravenous injection of coenzyme TPN produced, abrupt, transient but profound, dose-dependent and reproducible fall in the blood pressure of urethane anaesthetized rats. Bivagotomy reduced this hypotensive response. Atropine, either abolished or significantly reduced response to smaller doses of TPN; however, response to relatively higher doses was affected to a lesser extent. TPN, also, elicited this response in pithed rats following mepyramine and pronethalol treatment but the response was slightly reduced after ganglion blockade. TPN produced insignificant peripheral vasodilation. Cumulative administration of TPN reduced or reversed transiently pressor response to adrenaline and depressor response to histamine. Bradycardia inducing action of TPN was a consistent observation. Vagotomy and atropine treatment reduced; physostigmine potentiated and mepyramine, pentolinium and pronethalol treatments did not affect negative chronotropic response. Also, atropine antagonized the negative chronotropic effect of TPN on isolated perfused frog heart but not on isolated rabbit heart. TPN elicited a contraction of isolated rabbit intestine in lower doses but inhibited spontaneous rythm of the tissue at relatively higher doses.

EFFECT OF TESTOSTERONE AND MEPROBAMATE ON PEPTIC ULCERATION IN RELATION TO GASTRIC-AMINES AND ADRENAL ASCORBATE LEVELS. *By* **Dinesh Chandra and S.S. Gupta.** *Department of Pharmacology, Gandhi Medical College, Bhopal.*

Gastric ulcers were produced in albino-rats by (i) ligation of pylorus followed by injection of histamine or by (ii) subjecting the animals to restraint, according to techniques of Shay *et al* (4) and Brodie and Hanson respectively (1). The lesions were scored on the basis of inflammatory and ulcerative changes in control and treated rats. The score for control rats was 22.50 $\pm$ 4.27 as compared to scores of 11.50 $\pm$ 2.66 and 10.50 $\pm$ 5.83 respectively of the animals treated with testosterone (8 *mg/kg*; im) and meprobamate (8 *mg/kg*; im) respectively for three days. In another set of rats treated with testosterone and meprobamate which were subjected to restraint, the scores of ulceration were 5.32 $\pm$ 2.77 and 3.92 $\pm$ 2.07 respectively as compared to 7.56 $\pm$ 2.12 for the controls.

Histamine content in the stomach of normal rats estimated according to the method of Parratt and West (3) was 20.34 $\pm$ 4.08 $\mu g/g$ but the histamine content of stomach of rats in which gastric ulcers were produced according to techniques described under (i) and (ii) was 21.81 $\pm$ 3.34 and 23.43 $\pm$ 3.11 $\mu g/g$ respectively. Gastric histamine content in testosterone and

meprobamate treated animals subjected to ulcer production according to method (i) was 17.39 $\pm$ 2.10 and 17.64 $\pm$ 2.12 $\mu g/g$ respectively ($p < 0.05$) while of those subjected to ulcer production according to method (ii) was 18.32 $\pm$ 2.00 and 20.95 $\pm$ 6.40 $\mu g/g$ respectively ($p > 0.05$).

Serotonin content of stomach of rats subjected to ulcer production by methods (i) and (ii) was lower (1.18 $\pm$ 0.44 and 0.95 $\pm$ 0.26 $\mu g/g$ respectively) as compared to that of normals (1.25 $\pm$ 0.32 $\mu g/g$). The reduction of serotonin content was inhibited in animals treated with testosterone and meprobamate.

The adrenal ascorbate level estimated according to technique of Kuether (2) was found to be 33.54 and 37.90 per cent less in animals subjected to ulcer production by methods (i) and (ii) respectively as compared to the normal. However, after treatment with testosterone, the reduction in adrenal ascorbate level was found to be 25.07 per cent only though in the case of rats treated with meprobamate, there was no significant reduction.

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STUDIES ON TACHYPHYLAXIS TO DOPAMINE. *By* **Pawan S. Chauhan, S.K. Chowdhury and C.K. Chauhan**. *Department of Pharmacology, JIPMER, Pondicherry-6 and Indian Institute of Experimental Medicine, Calcutta.*

Dopamine caused a contraction of the isolated rat seminal vesicles. The response was slow and it took sometime for the contraction to mature. The response declined after successive doses of dopamine, suggesting development of tachyphylaxis to the amine. However, tissue tachyphylactic to dopamine, responded unaltered to adrenaline. Adrenaline incubation of the tachyphylactic tissue restored dopamine response considerably indicating adrenaline involvement, in dopamine—induced contraction of the tissue. Dibenamine treatment abolished seminal vesicle response to dopamine as well as to adrenaline.

Considering the tachyphylactic nature of the excitatory response elicited by dopamine, its restoration by adrenaline incubation and its blockade by dibenamine, it may be concluded,

that, dopamine acts on α-adrenergic receptor like an indirectly acting sympathomimetic amine.

The nature of the effect of intravenous dopamine on rat blood pressure depended upon the size of dose. Pressor response was generally dominant. Repeated administration of relatively higher amounts of dopamine in rat led to tachyphylaxis, which could not be established in lower doses. Adrenaline infusion partially restored the reduced pressor response. In rabbits, dopamine produced purely a depressor response which was not found to be tachyphylactic after repeated administration.

DIURETIC ACTIVITY OF ACHYRANTHES ASPERA SAPONIN. *By* **A.K. Ram and S.S. Gupta**. *Department of Pharmacology, Gandhi Medical College, Bhopal.*

Effect of the saponin fraction of *Achyranthes aspera* (Apamarga) was investigated on urine output in adult male albino rats and anaesthetised dogs. Two groups of eight male albino rats weighing 150-200 g were kept in separate metabolic cages and were fed anidiet from Chelsea Laboratory. Food was withdrawn 18 hr before the test and the saponin of *Achyranthes aspera* (10 *mg/kg*) was given im to half the animals of groups I and II. The remaining half in each group were injected equivalent volume of distilled water (control). The urinary outflow was recorded at 2, 4, 6 and 24 hr intervals. Cross-over was done after 10 days. The average 24 hr urinary output in control group was 22.12 ± 2.16 *ml* as compared to 32.98 ± 2.23 *ml* and 31.39 ± 2.22 *ml* in animals treated with *Achyranthes aspera* saponin and mersalyl respectively. The difference in the urinary output in treated and the control was significant ($P < 0.01$).

In another set of experiments the saponin, fraction of *Achyranthes aspera* (10 *mg/kg*) and mersalyl (3 *mg/kg*) were administered im for 10 days and the urinary output was recorded daily. The diuretic effect was well maintained (36.56 ± 1.78 *ml* and 33.98 ± 0.98 *ml* respectively for saponin and mersalyl treated groups as compared to the control 22.16 ± 2.16 *ml*.).

Urinary output was also recorded in anaesthetised dogs via rubber cathater inserted in the lumen of urinary bladder. The urine output in the control group was 4.30 ± 0.68 *ml* per 5 min as compared to 8.25 ± 0.50 *ml* in saponin treated animals.

In a few other dogs the saponin was injected directly in the right renal artery and polythene tube inserted in each ureter for collection of urine every 1/2 hr interval. The average urinary output from right kidney was 5.33 ± 2.45 *ml* as compared to 2.35 ± 0.01 *ml* from the left control kidney at half hr interval. The difference was statistically significant.

HYPOGLYCAEMIC ACTIVITY OF FEW SYNTHETIC COMPOUNDS. *By* **A.K. Sanyal and M.K. Raina**. *Department of Pharmacology, College of Medical Sciences, Banaras Hindu University, Varanasi.*

Sulphonylureas are now established hypoglycaemic agents in clinical practice. Benzimidazole nucleus is also credited with hypoglycaemic activity. It was therefore thought

worthwhile to synthesize benzimidazole sulphonylurea (BZS) and bis-benzimidazole-sulphonylurea (BBZS) compounds and study their hypoglycaemic activity. These synthetic derivatives were administered in a dose of 250 *mg/kg* orally and the effects compared with a known sulphonylurea compound tolbutamide, under the same experimental conditions. A study of the effect of five BZS and eight BBZS derivatives on the normal blood sugar of albino rats showed that on the whole BZS derivatives were not potent as hypoglycaemic agents, whereas all the BBZS derivatives showed significant hypoglycaemic activity.

EFFECT OF GRADED DOSES OF MALE SEX HORMONE ON WEIGHT AND PROTEIN CONTENT OF ACCESSORY SEX ORGANS AND SKIN OF OLD ALBINO RATS. *By* **S.L. Sarkar and K.V. Jogi.** *Department of Pharmacology, M.G.M. Medical College, Jamshedpur.*

Thirty old male rats (3—3½ years) were equally divided into five groups. Group 1 was kept as normal control and groups 2, 3, 4, and 5, were treated with 25,50, 500, 1000 μg of testosterone propionate (TP) per rat per day for a period of 7 days. All rats were sacrificed on the 8th day from the commencement of treatment and weights of seminal vesicle (SV), coagulating gland (CG) ventral prostate (VP) and levator ani muscle (LA) were taken. Total protein content of skin, seminal vesicle and levator ani muscle and water content of skin were determined. It was observed that at 1000 μg dosage level weights of sex organs and LA were significantly increased but administration of lower dosage viz, 25, 50, μg produced statistically significant reduction in the weights of CG and SV. At these dosage levels weight of VP was not influenced. At 500 μg dosage level weight of VP was increased but the weight of LA was reduced. At 25 μg dosage level protein content of skin, SV and LA were increased but at 50 and 500 μg dosage level they were reduced except that total protein content of SV was not altered by 50 μg of TP. Water content of skin in all groups remained unaltered. The results suggest that in old male rats the sex hormone does not uniformly stimulate the weights of sex organs and the levator ani muscle and protein content of different organs studied ; rather it produces a paradoxical inhibitor effect in many cases.

EFFECT OF TETANUS TOXIN ON ADRENERGIC MECHANISMS. *By* **P.P. Reddy, H.P. Vaishnava and R.K. Sanyal.** *Departments of Pharmacology and Medicine, Maulana Azad Medical College, New Delhi.*

Tetanus toxin produces an increase in peripheral resistance (1). Further experiments have shown that this effect was potentiated by cocaine, was absent in reserpinised animals and was blocked by suitable doses of phenoxybenzamine. The sympathomimetic amines and tetanus toxin resembled in producing pressor effects in the dog and the rat, splenic contractions in the dog, stimulant effects on frog and rabbit heart and contractions of guinea pig vas deferens. Further, both were blocked by suitable adrenergic blocking agents.

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COMPARATIVE STUDY OF CURARE-LIKE ACTIVITY OF A FEW INDOLE BASES. *By* **A.K. Sanyal and S.K. Bhattacharya**. *Department of Pharmacology, College of Medical Sciences, Banaras Hindu University, Varanasi.*

The role of oxy substituents, such as hydroxy, acetoxy and methoxy, at position 5 of indole-3-alkylamines and at position 6 of tetrahydro-β-carbolines on acetylcholine induced spasm in isolated frog rectus abdominis muscle was evaluated. 5-hydroxyindole-3-al kylamines and 6-hydroxytetrahydro-β-carbolines exhibited antiacetylcholine effect without affecting the potassium chloride induced response. The antagonism was of the *d*-tubocurarine type, since the reversal of blocking of the tetanic response of sciatic nerve-gastrocnemius muscle preparation induced by neostigimine was quickened in the presence of the compounds. Hydroxy or methoxy substituent at other positions, viz. 4, 6 and 7 of the indole-3-alkylamines and 5, 7 and 8 of the tetrahydro-β-carbolines, did not affect the acetylcholine response. Most of the unsubstituted β-carbolines and the indole-3-alkylamines potentiated, to a varying degree, the acetylcholine response. The quaternary nature of the basic nitrogen, contrary to observations by previous workers, is not the only criterion for the *d*-tubocurarine type activity. The environ of the Nb (Basic Nitrogen of indole side chain) only influences the degree of the curare activity and follows the order : quaternary > tertiary > secondary > primary nitrogen.

PHARMACOLOGICAL STUDIES WITH A QUINOLINE DERIVATIVE. *By* **Reeta Chakrabarty and A.K. Sanyal**. *Department of Pharmacology, College of Medical Sciences, Banaras Hindu University, Varanasi.*

A preliminary study of the hypotensive activity of 2 quinoline and 13 quinozoline derivatives was reported earlier. One of the quinolines, (4-2-(piperidinoethoxy) quinoline methiodide) showed a potent and prolonged hypotensive effect. This compound was further studied with a view to find out its mode of hypotensive action.

Pharmacodynamic studies indicated that the compound acted at the level of autonomic ganglia. Ganglion blocking effect of the compound was confirmed. The compound :

(*i*) blocked the response of the anaesthetised dog's blood pressure to nicotine,

(*ii*) blocked the nictitating membrane contraction to pre-ganglionic nerve stimulation,

(*iii*) blocked the bradycardia induced by stimulating the distal cut end of vagus,

(*iv*) blocked the nicotine induced contraction of isolated guinea pig intestine and dog intestine *in situ*.

(*v*) inhibited gastric juice secretion (both volume and free acidity) and

(*vi*) partially blocked salivary secretion induced by stimulating the nerve supplying the submandibular gland.

The compound did not elicit any effect on the central nervous system, heart and skeletal muscle.

Acute toxicity studies indicated that the compound had wide margin of safety.

Further, 11 more quinoline derivatives were got synthesised and were screened for their ganglion blocking activity on isolated guinea pig ileum. A rough estimate about the structure activity relationship was obtained after determining the spasmolytic ED_{50} of all the derivatives. It was found that substitutions at position 2 and 8 in the quinoline compounds and the presence of a morpholino ring in the side chain enhanced the potency.

ACTION OF CHOLINERGIC DRUGS ON HUMAN SPERMATOZOA. *By* **S.K. Khanna, P.K. Lahiri** and **R.K. Sanyal**. *Department of Pharmacology, Maulana Azad Medical College, New Delhi.*

Acetylcholine in concentrations varying from 1×10^{-7} to 1×10^{-3} *g/ml* did not produce any change in the overall motility of spermatozoa *in vitro* after incubation upto 2 hr. However, when the motility count was made separately for round and oval cells, the motility of the latter cells was found to be enhanced. The maximum amount of increase in motility was seen at a concentration of 1×10^{-9} *g/ml*, and this lasted for about 5 hr. The action of acetylcholine was potentiated by physostigmine and antagonised by atropine. Carbachol, but not pilocarpine had a similar action.

ACETYLCHOLINE AND CARBACHOL INDUCED VASOCONSTRICTION IN FROGS. *By* **S.S. Gambhir and P.K. Das**. *Department of Pharmacology, College of Medical Sciences, Banaras Hindu University, Varanasi.*

The effects of acetylcholine and carbachol were studied on systemic blood vessels of frogs perfused with frog Ringer solution. Both acetylcholine and carbachol produced marked vasoconstriction. Other cholinergic drugs like choline and pilocarpine were much weaker. The vasoconstrictor effects of acetylcholine and carbachol were only slightly affected by pentolinium and were not at all affected by tolazoline, reserpine, gallamine and *d*-tubocurarine. Atropine, however, completely blocked the vasoconstrictor effects of acetylcholine and carbachol without affecting the skeletal muscle spasm produced by these choline esters. Acetylcholine and carbachol did not produce vasoconstriction in rabbit, guinea pig and albino rat. It is proposed that the vasoconstriction by these choline esters in frogs is not due to release of catecholamines, skeletal or smooth muscle spasms but is due mainly to their effects on atropine sensitive receptors.

MECHANISM OF BLOCKADE OF NEUROMUSCULAR JUNCTION INDUCED BY 4-(2-ISOPROPYL AMINO-1-HYDROXYETHYL)-METHANESULPHANILIDE. *By* **M.N. Jindal, V.K. Patel and V.V. Kelkar**. *Depaatment of Pharmacology, B.J. Medical College, Ahmedabad.*

The present report concerns elucidation of the mechanism of neuromuscular blockade with 4-(2-isopropyl amino-1-hydroxyethyl) methane sulphanilide (MJ 1999).

The neuromuscular blockade produced by MJ 1999 differed from that produced by *d*-tubocurarine.

Effect of MJ 1999 was antagonised by adrenaline, isoprenaline and choline. Noradrenaline was less effective. Antagonistic effect of adrenaline was not blocked by tolazoline. Effects of *d*-tubocurarine were antagonised by adrenaline and noradrenaline but isoprenaline was completely ineffective.

MJ 1999 had no effect on neuronal conduction.

Larger doses of α-adrenergic blocking agents yohimbine and phenozybenzamine quickly and totally antagonised the effect of MJ 1999 but potentiated the effect of *d*-tubocurarine.

It is proposed that MJ 1999 acts specifically on β-adrenergic receptors and not on cholinergic end plate receptors.

It is also proposed that a functionally active β-adrenergic receptor is essential for the manifestation of not only the effect of sympathomimetic amines on the muscle but also for neuronally evoked contraction of skeletal muscle.

REVERSAL BY IMIPRAMINE AND NORTRIPTYLINE OF THE EFFECT OF RESERPINE AND SPARTEINE ON THE SPONTANEOUS MOTOR ACTIVITY OF MICE. *By* **I.S. Gandhi and C.B. Seth.** *Department of Pharmacology, M.G.M. Medical College, Indore.*

Measurement of spontaneous movements of laboratory animals constitutes an important facet in the drugs affecting the central nervous system. Since sparteine, imipramine and nortriptyline sensitize the peripheral adrenergic system it was thought of interest to study their relationship with central adrenergic mechanisms.

In normal mice sparteine (40 *mg/kg*; ip) had depressant effect on spontaneous motor activity (SMA) but in methedrine treated mice it not only increased the SMA but also brought about an early end of methedrine induced hypermotility. Since methedrine induced hypermotility is due to noradrenaline and/or by its direct action on adrenergic receptors in the central nervous system potentiation of its effects was suggestive of sensitisation of central adrenergic mechanisms. This was further confirmed when sparteine was injected intra-cerebroventricularly in mice. Like caetcholamines it produced sedation in normal mice. In methedrine treated mice results were like those on intraperitoneal administration.

Nortriptyline and imipramine both reversed the actions of reserpine and sparteine on the SMA of mice.

Both nortriptyline (20 *mg/kg*; ip) and imipramine (20 *mg/kg*; ip) decreased the SMA in normal and methylamphetamine treated (6 *mg/kg*: ip) mice but increased the SMA in mice pretreated with reserpine (1 *mg/kg*; ip). These drugs also increased the SMA in mice pretreated with sparteine (20 *mg/kg*; ip).

The results suggest that sparteine and reserpine are similar to each other in following respects :

(a) both increased the effect of excitant amines such as methylamphetamine and amphetamine (in some experiments a group of amphetamine treated mice was also employed for comparison);

(b) their actions were reversed by imipramine and nortriptyline. This is particularly significant because imipramine and nortriptyline are selective in this respect as they don't inhibit the actions of chlorpromazine and hexobarbitone.

The present results indicate that the reversal by imipramine and nortriptyline of the effects of sparteine and reserpine on SMA of mice may be due to sensitisation of central nervous effects of catecholamines.

ANTICONVULSANT EFFECTS OF PYROGALLOL. *By* **Vimal Chandra, S.K. Bapat, A.C. Jauhari and K.U. Ansari.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

Pyrogallol was tested as an anticonvulsant by supramaximal electroshock seizure pattern test (SMES) and by leptazol threshold test.

In SMES test albino rats of either sex were used in groups of 10 animals each. A current of 150 ma of 0.4 sec duration was delivered through corneal electrodes. The test compound was given orally 1 hr before the shock. Abolition of the extensor component in drug treated animals was taken as the criterion of protection. The ED 50's of pyrogallol, phenytoin and phenobarbitone were 13.2 *mg/kg*, 9.2 *mg/kg* and 4.3 *mg/kg* respectively.

In determination of the onset, peak and duration of action, ED_{50} was employed. The effect of pyrogallol started in 30 min, the peak effect was reached in 1 hr and at 7 hr there was still 20% protection. The effect disappeared after 8 hr.

In the case of phenytoin the effect was seen even after 15 min and at 8 hr when the effect of pyrogallol had passed off, phenytoin still gave 20% protection.

Pyrogallol was inactive by the leptazol threshold test.

ANALGESIC ACTIVITY OF TRANYLCYPROMINE IN RATS. *By* **S.K. Bapat, A.C. Jauhari, Vimal Chandra and K.U. Ansari.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

Tranylcypromine a potent MAO inhibitor was tested for its analgesic activity n aibino rats by the radiant heat method using the hot nichrome wire analgesiometer.

The animals were given graded doses of tranylcypromine orally. Analgesia was tested after varying intervals till the effect disappeared.

Tranylcypromine was analgesic in all the eight doses tested. The analgesia lasted for a period of 6-7 hr. The ED_{50} was 7.493 *mg/kg*. The analgesia disappeared completely when the animals were pretreated with reserpine ip 24 hr previously. DOPA administered after tranylcypromine completely antagonised the analgesia. 5-HTP was unable to antagonise the analgesic action.

It was observed that tranylcypromine caused maximum analgesia after a period of 1 hr which is also the period of maximum MAO inhibition and there was a dose-response relationship with respect to the degree of analgesia. This can be explained if we assume that more the MAO inhibition, more the rise in the concentration of catecholamines and 5-HT and more the analgesia. The disappearance of analgesia after reserpine, can be explained by the depletion of catecholamines and 5-HT from the brain.

The antagonism of analgesia by DOPA but not by 5-HTP suggests that there is a definite role of catecholamines in tranylcypromine analgesia and that 5-HT plays no role.

STUDY WITH MESCALINE-8-C ^{14} IN MICE : EFFECT OF AMINE OXIDASE INHIBITORS ON METABOLISM.

By **Nandkumar S. Shah**, *Department of Pharmacology, Medical College, Baroda.*

Although many reports have shown that mescaline is oxidatively deaminated to 3, 4, 5-trimethoxyphenylacetic acid (TMPAA) *in vivo* as evidenced by the presence of the latter compound in the urine, there has been no conclusive evidence in the literature that this biotransformation takes place in the brain. In the experiments to be reported, the metabolic fate of injected labeled mescaline was determined by assaying the levels of unchanged mescaline, N-acetylmescaline and TMPAA in the brain, liver, plasma and urine of mice pretreated with iproniazid or semicarbazide. From the findings the following conclusions are drawn : In the brain the inactivation of mescaline depends chiefly on the removal of the drug as unchanged free mescaline and on the formation of N-acetylmescaline. The results of the present study provide no evidence of deamination of mescaline by amine oxidases as a major route of inactivation of this drug in the brain ; if the monoamine oxidase pathway plays any role it may be of minor importance in the central nervous system. Unlike in the brain, in the liver the principal route of metabolism of mescaline appears to be through the monoamine oxidase rather than through the N-acetylation.

The distribution of mescaline in various subcellular fractions revealed that in the brain from 70 to 85 per cent and in the liver from 60 to 70 per cent of mescaline could be accounted for by the supernatant fraction. Neither reserpine nor iproniazid pretreatment significantly altered the pattern of subcellular distribution.

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EFFECTS OF MORPHINE AND PICROTOXIN ON THE RECTAL TEMPERATURE IN RABBITS. *By* **Vimal Chandra, S.K. Bapat, K.U. Ansari and A.C. Jauhari.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

Albino rabbits of either sex weighing 1-2 *kg* were chronically implanted with intraventricular cannulae. The observations were made between 10 A.M. to 4 P.M. The normal temperature variation of every animal was studied twice a day for one week before each drug was tested, and the animals showing marked variation were not used. The animals were used in groups of 10 each. The drugs were given intravenously (iv) and intracerebroventricularly (icv). For iv injections the drugs were dissolved in pyrogen free distilled water and injected in the ear vein of rabbit under perfect aseptic conditions. For icv injections the drugs were dissolved in artificial CSF prepared by the technique of Leusen (1).

Intravenous saline (2 *ml*) and icv artificial CSF (2 *ml*) caused an insignificant rise in temperature in the control animals for about 2 hr after which the temperature gradully came down to normal.

Morphine in the doses of 500 $\mu g/kg$ and 1 *mg/kg* iv caused a gradual rise in temperature which was maximum after a period of 2 hr, after which there was regular and slow decline. Picrotoxin in the doses of 500 *ug/kg* similarly caused a rise which was maximum at 2 hr. The decline was irregular and slow.

With icv administrations, the rise was more marked than with iv administration. Morphine (100 $\mu g/kg$) caused a greater rise than picrotoxin (50 $\mu g/kg$). The temperature remained raised for 4-5 hr. Though the maximum temperature was recorded only after 2 hr with icv administration the fall was slower than with iv administration. Reserpinised animals did not show a marked rise after iv morphine and icv picrotoxin and morphine.

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MODIFICATION OF PYRETOGENIC EFFECTS OF LSD $_{25}$ BY SOME DRUGS IN RABBITS. *By* **S.K. Bapat, K.U. Ansari, Vimal Chandra and B.N. Dhawan.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

Albino rabbits of either sex weighing 1-2 *kg* were used in the study. Pyrexia was produced by subcutaneous injection of 50 $\mu g/kg$ of lysergic acid diethylamine LSD $_{25}$. Each drug was studied in a group of 5 animals. The rectal temperature was recorded by a clinical thermometer at the start of the experiment and after every hr for 5 hr.

All the antidepressants tended to potentiate the response to LSD $_{25}$ but the significant potentiation (more than $\pm$ 2 S.E.) was seen with iproniazid, isocarboxazid, nialamide and tranylcypromine. Potentiation by imipramine, amitryptiline and nortryptiline was not significant. Cyproheptadine, a potent 5-HT antagonist did not cause a significant potentiation.

Guanethidine produced a significant reduction in the LSD_{25} response. When tetrabenazine and reserpine were given immediately before LSD_{25}, the response was potentiated. When the two drugs were given much earlier, the response was significantly reduced. Of the three tranquillizers tested, only two (chlorpentixol and hydroxyzine) were found to be effective in antagonising the response to LSD_{25}.

Our findings suggest that the agents causing an increase in the concentration of adrenaline and noradrenaline in the CNS (hypothalamus) cause a potentiation of LSD_{25} pyrexia and agents either causing a decrease in the concentration of adrenaline and noradrenaline or bringing about a blockade of their effects cause a decrease in the LSD_{25} pyrexia.

A STUDY OF CHANGES IN BLOOD LEVELS OF CERTAIN ORGANIC COMPOUNDS DURING PREGNANCY IN ALBINO RATS. *By* **J.I.V. Jeyapaul and L. Kameswaran.** *Department of Pharmacology, Madurai Medical College, Madurai.*

Changes in blood levels of glucose, cholesterol, bilirubin, non-protein-nitrogen, (NPN), urea and creatinine were estimated by standard methods throughout pregnancy in the normal virgin mated Wistar rats. Thymectomy, adrenalectomy and unilateral-ovariectomy were performed on virgin rats, and they were allowed to mate. The blood levels of the different constituents were estimated throughout pregnancy in these animals also.

The blood glucose level remained fairly constant throughout pregnancy in all the animals and shot up to a peak just before parturition as occurs in human pregnancy. In the adrenalectomized rats the blood glucose level was at a higher level followed by unilaterally-ovariectomized, normal and thymectomized rat in that order.

Blood cholesterol level increased progressively in all animals as pregnancy advanced, except in the adrenalectomized rats in which the cholesterol level was the lowest of all animals and the increase in cholesterol level was seen only till the end of second week of gestation. Cholesterol level was higher in the normals than the other rats.

Serum bilirubin increased during pregnancy in all animals. Its level was the highest in the thymectomized rats followed by unilaterally-ovariectomized rats and normal rats in that order. Bilirubin level was the lowest in the adrenalectomized rats. The bilirubin level might well be proportionate to the litter size.

The blood NPN and urea levels showed a common pattern of changes during pregnancy in all the animals. In the normal and adrenalectomized rats their levels increased and in thymectomized and unilaterally ovariectomized rats the levels did not show much variation. Throughout pregnancy, both NPN and urea levels were the highest in the adrenalectomized rats and the lowest in the normal rats.

The level of creatinine showed a different pattern of alteration. Its level was the highest in the thymectomized rats and the lowest in the unilaterally-ovariectomized rats. Its level in

the adrenalectomized rats was higher than that of the normal but in both the groups there was no appreciable change in its level during pregnancy.

The levels of blood organic constituents were more markedly altered by adrenalectomy than by unilateral ovariectomy or thymectomy. In adrenalectomized rats the changes in levels of these organic constituents were suggestive of thyroid hyperfunction.

EFFECT OF INDUCING GASTRIC SECRECTION BY VARIOUS PHARMACOLOGICAL AGENTS ON HISTAMINE CONTENT OF STOMACH IN ALBINO RATS. *By* **L. Kameswaran and S. Subramaniam**. *Department of Pharmacology, Madurai Medical College, Madurai.*

Many workers have suggested that histamine is the local chemostimulator of the parietal cells of the gastric mucosa. A correlation between the volume of gastric juice and the actual output of histamine in it has also been demonstrated. Specific histamine depletors affect histamine content in mast cells but not in the stomach. Many cholinergic substances as well as histamine are known to stimulate gastric secretion. Hence the effect of secretomotor chemicals on histamine content of stomach was studied by injecting them into several groups of female albino rats. The rats were killed after half an hr. Histamine content of fundic and pyloric stomachs was estimated and compared with normal levels.

Subcutaneous treatment with histamine increased the histamine content of both the pylorus and fundus showing that certain sites had probably bound the extrinsic histamine and there was no loss of tissue histamine.

In acetylcholine treated group, there was a slight fall in pyloric histamine content while there was a slight increase in the histamine content of the fundus indicating that probably the secretomotor activity was due to histamine release and that part of the liberated histamine was taken up by the binding sites in the fundus.

Since pilocarpine molecule resembles partly acetylcholine and partly histamine, it was used to see whether it would behave like acetylcholine or directly stimulate parietal cells like histamine. Strangely, the histamine content of all tissues tested was reduced. Thus pilocarpine seems capable of liberating or displacing histamine from all binding sites. The powerful secretomotor action of pilocarpine may be due to a combination of an acetylcholine-like action, a histamine-like action and histamine liberation.

Combined treatment with pilocarpine and atropine did not alter the fall in histamine content occuring after pilocarpine indicating that the fall in histamine level occured independent of cholinergic mechanism. But combination with mepyramine completly prevented the fall showing that the liberation of histamine could be blocked by an antihistamine like mepyramine even though it has been reported that gastric secrection cannot be blocked by antihistamines.

ANTI-INFLAMMATORY (ANTI-HYALURONIDASE) ACTIVITY OF CROTALABURNINE COMPARED TO PHENYLBUTAZONE AND SODIUM SALICYLATE. *By* **Hardyal Singh* and M.N. Ghosh.** *Department of Pharmacology, H.P. Medical College, Simla.*

Crotalaburnine, an alkaloid from dried seeds of *Crotalaria laburuifolia* Linn., has already been reported to have some anti-inflammatory properties while tested against formalin induced arthritis in rat, carrageenin induced rat hind paw oedema and cotton pellet granuloma in rats. This alkaloid was further investigated for its anti-hyaluronidase activity in rats. Hyaluronidase induced oedema was produced and the foot volumes of rats wers recorded with the help of a modified plethysmometer. Groups of albino rats comprising six animals each and weighing between 100 and 180 *g* were taken for different compounds. Crotalaburnine (10 *mg/kg*) was injected subcutaneously 2 hr before hyaluronidase injection; phenylbutazone (100 *mg/Kg*) was given 3 hr before hyaluronidase by intragastric tube and sodium salicylate (500 *mg/Kg*; ip) was given ½ hr before hyaluronidase. The group without any prior drug served as control. Similar series of tests were carried out in adrenalectomised animals.

The results suggested that crotalaburnine had anti-hyaluronidase activity which was intermediate between phenylbutazone and sodium salicylate, the latter being most potent. Phenylbutazone failed to produce anti-hyaluronidase activity in adrenalectomised animals. Crotalaburnine and sodium salicylate inhibited the oedema even in the adrenalectomised animals suggesting that their activity was independent of adrenal cortex.

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EFFECT OF BARBITURATE PRETREATMENT ON HEPATOTOXICITY OF CARBON TETRACHLORIDE IN RATS. *By* **S.D. Gadgil, N.L. Sadre and N.M. Tiwari.** *Department of Pharmacology, Miraj Medical College, Miraj.*

This study was undertaken to see if pretreatment with different barbiturates could protect rats against the hepatotoxic action of carbon tetrachloride. It was observed microscopically that barbituric acid pretreatment did not give any protection against carbon tetrachloride. With pentobarbitone sodium also, no protecting effect was found.

STUDIES ON PROSTAGLANDIN AS A MEDIATOR OF INFLAMMATION. *By* **Satish Arora, P.K. Lahiri and R.K. Sanyal.** *Department of Pharmacology, Maulana Azad Medical College, New Delhi.*

Prostaglandins have been shown to be widely distributed in animal and human tissues. Injections of prostaglandin E_1 in rats produced rupture of mast cells, increase in oedema formation and capillary permeability. Fibrous tissue formation around implanted pellets was augmented as well. There was no effect on leucocytic emigration. On a dosage basis prostaglandin was more effective than either histamine or 5-HT. Prostaglandin was more effective in phlogistic action than either histamine or 5-HT. In animals, depleted of tissue histamine and 5-HT the phlogistic action of prostaglandin was reduced, but not annuled.

Thus it is possible that a part of prostaglandin action is direct and a part is mediated through the release of histamine and 5-HT from the mast cells.

THE ANTI-ACETYLCHOLINE ACTION OF ATROPINE AND FOUR ATROPINE SUBSTITUTES AS DETERMINED BY SEVERAL pA VALUES. *By* **M.B. Gharpure**. *Department of Pharmacology, Medical College, Aurangabad.*

The Schild's pA method is one of the important methods for testing drug antagonism. This method determines two values namely, pA_2 and pA_{10}. It was felt that to describe an antagonist completely, not two but several pA values would be needed. In an attempt to find different values were selected. At the APPI meeting held in Baroda, in Dec. 1968, 17 pA values for the anti-histaminic action of three compounds were reported (1). It was felt that it would be worthwhile investigating if the observations made with the histamine antagonism applied to acetylcholine antagonism as well. The present work deals with the determination of several pA values for the anti-acetylcholine action of trihexyphenidyl, adiphenine, oxyphencyclimine and cyclopentolate. In another paper presented at the 35th Annual Meeting of the Indian Academy of Sciences held in Dec. 69, at Aurangabad, data on atropine were reported (2).

The procedure is described below:—

In the first instance, 5 values, namely pA_2, pA_{11}, pA_{101}, $pA_{1,001}$ and $pA_{10,001}$ were determined. (In some cases, the sixth value namely, $pA_{100,001}$ was also determined). If the comparision of pA_{101} and $pA_{1,001}$ showed that the compound was competitive and if the comparison of $pA_{1,001}$ and $pA_{10,001}$ showed that it was 'non-competitive', following additional pA values were determined to find out the exact level upto which it acted competitively:—

(i) pA_{501} & $pA_{5,001}$
(ii) pA_{251} & $pA_{2,501}$
(iii) pA_{126} & $pA_{1,251}$
(iv) $pA_{63\cdot5}$ & pA_{626}

In a given case, the exact additional values to be determined were decided on the basis of the level at which, the compound turned 'not-competitive'.

One interesting finding was that oxyphencyclimine and atropine as judged from their pA_2 and pA_{11} values were 'not-competitive' but as judged from their higher pA values, were competitive towards acetylcholine.

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HYPOGLYCAEMIC EFFECTS OF TWO INDIGENOUS PLANTS. *By* **S.K. Bapat, K.U. Ansari, A.C. Jauhari and Vimal Chandra.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

Two indigenous plants namely *Bambusa dendrocalamus* (Bans) and *Cryptostegia grandiflora* (Vilayti Bhakandi) have been screened for their hypoglycaemic activity in rabbits.

Normal healthy albino rabbits weighing 1.5-2 *kg* were fasted overnight and different doses of 25% water extract of leaves of the plants were administered orally. The blood was collected from the ear veins after 4, 8, 24, 48 and 96 hr. Blood glucose was estimated by the micromethod of Folin and Wu (1). Similar studies were made in rabbits treated with alloxan (200 *mgm/kg*; *iv*). A compound was isolated from the watery extract of *Bambusa dendrocalamus* which was insoluble in water but soluble in propylene glycol. Solution of this compound in propylene glycol when injected intaperitoneally in normal and alloxan treated rabbits caused a significant lowering of blood sugar in both types of rabbits and the hypoglycaemic response was dependent upon the dose.

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STUDIES ON MECHANISM OF ACTION OF ENDRIN. *By* **P. Sen, H.B. Kaur and M.L. Dave.** *Department of Pharmacology, Maulana Azad Medical College, New Delhi.*

Experimental studies were undertaken to elucidate the mechanism of fatal action of endrin, an agricultural pesticide which has been used extensively in recent years and has produced several casualties characterised by acute pulmonary oedema. In the mouse, the rat, the rabbit, the cat and the dog, endrin produced convulsions and pulmonary oedema. The syndrome was absent or reduced in intensity in animals under deep anaesthesia and in 'encephale isole' preparation ; the pulmonary oedema was reduced but not abolished in animals pretreated with reserpine or phenoxybenzamine. It seems that the fatal result is due to a combination of central stimulation and peripheral release of catecholamines.

ON THE PHENOMENON OF VAGAL ESCAPE IN DOGS. *By* **S. Srinivasan and J.H. Balwani.** *Department of Pharmacology, B.J. Medical College, Poona.*

Stimulation of the cut peripheral end of the right vagus nerve in anaesthetised mongrel

dogs produced cardiac asystole followed by recovery of heart beats despite continued stimulation (vagal escape). Chlorpromazine, imipramine and ouabain significantly shortened the duration of asystole and increased the escape rate. Bretylium tosylate prolonged asystole and decreased the escape rate. These effects may indicate a role of adrenergic mechanisms in the escape phenomenon.

MODIFICATION OF THE EFFECT OF DIFFUSATE FROM BURNT RAT SKIN BY CERTAIN ANTIHISTAMINICS POSSESSING PERIPHERAL ANTISEROTONIN ACTIVITY. *By* **Vimal Chandra, S.K. Bapat, K.U. Ansari and A.C. Jauhari.** *Department of Pharmacology, M.L.N. Medical College, Allahabad.*

The effects of the antihistaminics cyproheptadine, chlorprothixene, chlorpentixol, diphenylpyraline and mebhydroline were studied against the lethal activity of diffusate from burnt rat skin.

Albino rats, after being anaesthetised by pentobarbitone sodium (30 *mg/kg*), were injected with 30 *ml* of air beneath the dorsal skin. This produced a pouch of about 7 x 4 x 3 cm. The dome of the pouch was scalded by submerging it in water at 96°C for 15 sec. The animal was now suspended by its paws and 5 *ml* of Tyrode solution was injected into the pouch. The animal was gently shaken for 2 min after which the diffusate was removed by syringe. The washing was repeated at regular intervals after burning. A maximum of 5 washings of 5 ml each were obtained from each rat.

The peripheral antiserotonin effect of the antihistaminics was studied by (i) antagonism of spasmogenic effect of serotonin and (ii) antagonism of oedema induced by local injection of serotonin in rats.

All the five antihistaminics were found to possess peripheral antiserotonin activity. The order of potency was cyproheptadine>chlorprothixene>chlorpentixol>diphenylpyraline >mebhydroline. All the drugs also afforded marked protection against th elethal effect of the diffusate. The protective effects of the antihistaminics investigated in the present study in burns may be due to both the antihistaminic and antiserotonin properties. Antihistaminics may therefore be clinically tried in cases of extensive burns.

STUDIES ON THE MYOCARDIAL METABOLISM OF CARBOHYDRATES IN THE PRESENCE OF CARDIOACTIVE DRUGS USING THE ISOLATED PERFUSED RAT HEART. I. SOME ASPECTS OF THE METHODOLOGY OF STUDY. *By* **P.M. Stephen and Ranita Aiman.** *Department of Pharmacology, Christian Medical College, Vellore.*

Perfused coronary vessels of the isolated beating rat heart proved a particularly attractive preparation for studying drug effects on cardiac carbohydrate metabolism. The continuous recirculating perfusion system employing small volumes (15.0 *ml*) was assembled mostly from indigenous equipment and the assembly in its simplicity was compatible with efficiency and precision. Hearts of albino rats weighing 200-250 g removed immediately after decapitation

were subjected to a 5-10 min period of pre-perfusion with substrate-free Krebs Henseleit bicarbonate buffer in a wash-out perfusion system which was an essential pre-requisite to stabilise the mechanical and metabolic behaviour of the heart for a subsequent 75 min period of continuous re-circulating perfusion with glucose enriched (8.33 mM) buffer containing half the strength of calcium and magnesium as recommended by earlier workers to maintain a steady contractile rate and force.

The general behaviour and stability of the preparation was assessed by visually monitoring the cardiac rate and rhythm, force of contraction, coronary flow rate and perfusion pressure observed on a side-arm mercury manometer. The heart rate was steady; 200 $\pm$ 20 beats/min throughout the perfusion period. The coronary flow rate increased with the heart rate linearly, the ideal being a coronary flow rate of 8.0 $\pm$ 1.5 ml/min obtained at the steady heart rate. A linear relationship was also observed between coronary flow rate and perfusion pressure, the ideal being 55 $\pm$ 5 mm Hg yielding the desired coronary flow rate ; the perfusion pressure could be altered to obtain this by adjusting the pressure screw in the perfusion pump. A duration of 75 min perfusion yielded consistent results in the metabolic profiles as observed by other workers also and was deemed adequate. A comparison of the dry weight/wet weight % in groups of hearts before and after perfusion revealed minimal oedema after perfusion compatible with myocardial efficiency, as reported by other workers.

The indices of carbohydrate metabolism measured were : glucose uptake (expressed as the disappearance of glucose from the medium) measured at specified intervals, glycogen change in the heart muscle and lactate-pyruvate changes in heart and perfusate after 75 min perfusion in the presence and absence of drugs and the difference expressed as the 'drug-effect'. Estimations of glucose were done by the method of Folin and Wu, the results of which were not significantly different from parallel estimations by the Somogyi-Nelson and the enzymatic glucose-oxidase methods. Pyruvate, being an unstable keto-acid was estimated after adequate refrigeration to -70°C using mixtures of solid CO_2 + ether, the results obtained being significantly higher than less adequate methods of refrigeration. Lactate estimations with and without refrigeration were not significantly different. While increases in glucose uptake with increases in glycogen content suggested glycogenesis, decreases in glycogen with increases in lactate suggested anaerobic glycolysis. Since the final end-product of muscle metabolism—CO_2 was not measurable with the existing facilities in this laboratory, a mathematical device was employed to arrive at this, and this yielded results comparable with those of other workers who had estimated CO_2 as labelled $^{14}CO_2$.

A CLINICAL TRIAL OF A COMBINATION OF PIPERAZINE AND THYMOLAN. *By* **Meena Kelkar and J.H. Balwani.** *Department of Pharmacology, B. J. Medical College, Poona.*

The anthelmintic effects of a pharmaceutical combination of piperazine and thymolan as granules were evaluated on 51 patients with various worm infestations and compared with

the two drugs given together as a physical mixture. The response was evaluated by ova-counts and clinical improvement.

It was found that the granules were as effective as the physical mixture in cases of ascariasis, trichuriasis and enterobiasis, but less effective in cases of ankylostomiasis. This may be due to a reduction in the activity of thymolan in the granule form.

FURTHER STUDIES ON FICUS BENGALENSIS, LINN. ANTIDIABETIC STUDIES. *By* **S.B. Vohora* and G.C. Parsar,** *Department of Pharmacology, Jawahar Lal Nehru Krishi Vishwa Vidyalaya Campus: Veterinary College, Mhow.*

Ficus bengalensis, Linn. is reputed to be useful in the treatment of diabetes. In a previous communication (2), a preliminary screening report on the phytochemical and pharmacological properties of this plant was presented. This study deals with investigations of its hypoglycaemic properties.

Normal fasting and alloxan diabetic rabbits were given the aqueous extract of the bark orally. Blood sugar estimation was done by the micro method of Folin and Wu as described by Kleiner and Dotti (1). It was found that the extract exerted no significant action on the fasting blood sugar (FBS) of normal rabbits but a moderate lowering in FBS was observed in the alloxan diabetic rabbits. A dose equivalent to 5 g of the crude drug, when given for 3 days lowered the FBS levels in alloxanised rabbits by the average of 12.61 *mg* per cent.

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HYPOTENSIVE ACTION OF EPHEDRINE IN DOGS. *By* **D.S. Salunkhe.** *Department of Pharmacology, V.M. Medical College, Sholapur.*

This is a preliminary report about the effect of a large dose of ephedrine on blood pressure of the dog after ephedrine tachyphylaxis. Tachyphylaxis to ephedrine (5 to 10 *mg/kg*) was induced. Subsequent administration of 10 *mg/kg* of ephedrine produced fall of blood pressure. No apparent alteration in blood pressure responses to subsequent administration of acetylcholine, adrenaline, noradrenaline, histamine and 5-HT was observed. However, isoprenaline tested after ephedrine tachyphylaxis elicited a consistent pressor response.

Tolazoline abolished the depressor response to ephedrine. Atropinisation did not alter hypotensive action of ephedrine.

ANTAGONISTIC EFFECT OF ACHYRANTHUS ASPERA ON UTERINE CONTRACTILITY INDUCED BY OXYTOCIN.
By **S.S. Gupta and I. Khanijo**. *Department of Pharmacology, Gandhi Medical College, Bhopal.*

The effect of the alkaloidal fraction (1×10^{-5} to 2×10^{-5}) obtained from the alcoholic extract of the root bark of *Achyranthus aspera* inhibited the contractile response of isolated rat uterus suspended in oxygenated modified Ringer solution at 30°C to 0.01 and 0.015 units of synthetic oxytocin (Syntocinon). The alkaloidal fraction (1×10^{-5} to 2×10^{-5}) did not inhibit the responses to serotonin and acetylcholine of rat uterus and to histamine of guinea pig uterus. Antagonism against Syntocinon seemed to be of competitive type as the maximum responses could be obtained (in the presence of the alkaloid) by increasing the concentrations of the Syntocinon. The concentration of the alkaloid causing 50% inhibition of the contractile response to 3.5×10^{-6} mM Syntocinon was found to be 7.65×10^{-5}. The alkaloid may thus prove useful for the treatment of dysmenorrhoea.

EFFECT OF SOME ANTIBIOTICS ON HEXOBARBITONE SLEEPING TIME IN RATS.
By **A.G. Phansalkar and J.H. Balwani**. *Department of Pharmacology, B. J. Medical College, Poona.*

Effect of antibiotics inhibiting protein synthesis was studied on hexobarbitone sleeping time in female albino rats. Tetracycline, erythromycin and spiramycin were administered orally and streptomycin was administered intramuscularly daily for five days. Hexobarbitone sleeping time was studied on the tenth day of the study. The sleeping time was significantly reduced in all the cases except tetracyclines. The speculated mechanism of this finding is probably altered enzyme kinetics under the influence of these antibiotics.