a single intraperitonial injection, all chicks (36 in number) developed typical and acute neurotoxic symptoms like inability to stand, head retraction, stiffening of the neck and extensor paralysis of the legs (Figs. 1, 2, Nos. 2-5). Administration through oral and subcutaneous routes required longer time (2-6 hours) to precipitate similar symptoms. At lower dosages (20-30 mg./chick) the birds recovered within 8-12 hours, while with larger dosages (30-60 mg./chick) or with continued daily dosage at lower levels the symptoms persisted even after 24 hours and became chronic in some and proved lethal to others. Injection of thiamine as hydrochloride (2 mg./chick) either before or after administration of the toxic principle neither prevented nor alleviated the toxic symptoms. It was also found that unlike the toxic substance intraperitonial injection of either α, β-diaminopropionic acid or L-homoarginine (recently isolated and characterized from *L. sativus*[14]) at comparable levels did not bring about any visible neural developments in experimental chicks. Detailed investigations are currently in progress in this laboratory to elucidate the biochemical and pharmacological basis of its neurotoxic action in this and other organisms.

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TRAINING PROGRAMME IN PHYSIOLOGY OF REPRODUCTION

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THE Department of Zoology, University of Delhi, organised in collaboration with Dr. S. J. Segal, Ford Foundation Consultant in Reproductive Biology, a series of seminars on Physiology of Reproduction as part of the training programme envisaged in the Ford Foundation grant to the Department. The programme was organised in order to enable scientists with varied background to acquire a competent appreciation of the advances in the different fields of reproductive biology. The series began on the 22nd October 1962 and was concluded on the 11th March 1963. The participants in the programme were drawn from the different medical colleges in Delhi, Directorate-General of Health Services, Directorate of Family Planning, Vallabhbhai Patel Chest Institute and the staff and students of the different departments of the Delhi University. A training programme of this magnitude and coverage was the first of its kind to be organised in India. The speakers in the series were drawn from the U.S.A., Israel, United Kingdom, Australia, Switzerland besides those from the All-India Institute of Medical Sciences and the Departments of Chemistry and Zoology of the Delhi University.

The series was inaugurated by Dr. C. D. Deshmukh, Vice-Chancellor, Delhi University, on the 22nd October 1962. Inaugurating the series, Dr. Deshmukh traced the development of the family planning programme in India as a Government-sponsored enterprise and stressed the need for research and training in effectively combating population growth. The series began with a seminar by Dr. B. R. Seshachar who discussed the cytological variants of the sex-determining mechanism in animals and concluded with a description of recent methods of

recognition of the structural and numerical variations in chromosomes and their importance in the diagnosis of sexual abnormalities. While sex is determined at the time of fertilisation, a favourable hormonal environment is necessary for the differentiation of the sex glands and the development of the duct system. Dr. M. R. N. Prasad gave experimental evidence in support of the view that the foetal testis secretes a morphogenetic substance which is masculinising while in its absence, the female type of development ensues. Dr. S. J. Segal traced the gradual evolution of the four types of reproductive patterns in mammals, namely seasonal breeders, estrus breeders, progestational breeders and menstrual breeders. The functions of the pituitary, which regulates the cyclical activity of the gonads, are controlled by higher brain centres located in the hypothalamus by a delicately regulated feed-back mechanism. Dr. M. T. Clegg showed that electrical lesions in different regions of the hypothalamus, pituitary transplantation to extra-hypothalamic sites, cannulation of the cavernous sinus and assay of the blood for gonadotrophins are the different experimental approaches for the elucidation of hypothalamo-hypophyseal interrelationships. Recent evidence points to the existence of different trophic hormone-releasing factors in the hypothalamus. Dr. B. K. Anand extended this observation and developed the hypothesis that the control of reproduction is perhaps not regionally localised in the hypothalamus alone but is more generalised to the lymbic system as a whole. Changes in the pituitary gland correlated with immaturity, maturity and other physiological states and the demonstration of the cell types in the pituitary gland by a variety of tinctorial reactions were discussed by Dr. B. I. Sundararaj.

The varying pattern of the biosynthesis of steroid hormones from acetate or cholesterol as precursors depends on the presence of different hydroxylases. Dr. G. P. Talwar pointed out that the exact mechanism of action of hormones at the cellular level was still not clearly understood but it was possible that the hormones may act in different ways, namely, by altering the permeability of the cell membrane or by stimulation of enzyme activity or by activation (or removal of repression) of the genetic apparatus. He reviewed his own work on the action of growth hormone and concluded that growth hormone might act by specifically activating release of messenger RNA which carries the genetic information from the nucleus to the cytoplasm where it initiates synthesis of specific proteins. Dr. M. R. N. Prasad and Dr. Anna Southam described the structure and function of the testis and the ovary from the prenatal stages to senility. Dr. Sabita Sujan discussed the components of the seminal plasma and the biochemical pathways for their utilisation by the spermatozoa. Two colour films, one showing various phases of reproduction in the rat and the phenomenon of ovulation and egg transport in the rat made by Prof. R. J. Blandau, University of Seattle, and another showing different aspects of fertilisation in the sea urchin and the limpet made by Prof. Albert Taylor, California Institute of Technology, were shown through the courtesy of the producers.

The delicate hormonal interplay controlling ovum implantation is a species specific phenomenon. Dr. M. R. N. Prasad reviewed the present status of the problem and pointed out the significance of using prevention of implantation as a method of fertility control. Dr. Sabita Sujan discussed the fluctuating levels of different hormones of placental and gonadal origin and their physiological significance in the maintenance of pregnancy. Dr. C. W. Lloyd, Director of the Worcester Foundation Training Programme in Physiology of Reproduction, participated in the discussions. The initiation and maintenance of lactation is an integrated climax to an orderly sequence of events occurring during pregnancy and culminating in parturition. Dr. M. R. N. Prasad discussed the factors regulating lactation and the relation between the nervous system and the milk-ejection reflex. Dr. V. V. S. Murthy reviewed the advances in the field of synthesis of protein hormones and discussed the biological and pharmacological action of a number of synthetic analogues of oxytocin and vasopressin which could be of use in clinical practice.

Immunological approach to fertility control has recently attracted considerable attention. Dr. N. R. Moudgal initiated the discussion on immunoreproduction by reviewing his work on immunochemistry of ovine and human interstitial cell stimulating hormone and pointed out that immunological methods could be used for testing the purity of hormones. A number of scientists who attended the VII International Congress of the International Planned Parenthood Federation in Singapore in February 1963 were present at the seminar and participated in the discussion which was moderated by Dr. S. J. Segal. Dr. Seymour Katsh, University of Colorado, showed that testicular extracts

elicited specific antibody responses which, when injected to normal males, resulted in destruction of all cell types in the seminiferous epithelium except the spermatogonia. The antibody response is possibly associated with the mucoprotein-complex of the acrosome which is antigenic. Dr. R. G. Edwards, University of Glasgow, reviewed his own work on the antigenecity of mammalian spermatozoa and its relation to induced infertility. It was pointed out that the application of the results of studies in immuno-reproduction for control of fertility has to await further experimentation. Prof. M. C. Shelesnyak, Weizmann Institute of Science, Israel, reviewed his classical work on the role of histamine in the induction of the decidual cell response as a prelude to implantation of the ovum. Histamine release is associated with a "surge" of estrogen from the ovary on the morning of day 3 of normal pregnancy in the rat. Dr. I. G. White, University of Sydney, reviewed the present status of biochemistry of Semen and discussed the pathways of utilisation of Glyceryl-Phosphoryl-Choline by spermatozoa.

A series of three special seminars was given by visiting scientists. Dr. M. J. Wells, University of Cambridge, described in *Octopus* the occurrence of a brain-optic gland-gonad axis similar to the hypothalamo-pituitary-gonad axis in higher vertebrates. Dr. Ernst Knobil, University of Pittsburgh, reviewed his work on placental transfer of TSH in monkeys. He described the elegant methods developed by him for the cannulation of foetal arteries and veins to characterise and measure the blood levels of transferred substances and their degradation products. Dr. H. P. Klinger, University of Basel, Switzerland, gave an account of the chromosomal abnormalities in sex. The application of the sex chromatin test and study of chromosomal patterns has led to a clear understanding of the role played by genes on the X-chromosomes in causing colour blindness and mongolism. Such abnormalities occur specially in children born of older mothers. In this context Dr. Klinger was particularly interested in the follow-up of children born of mothers who were exposed to the long-term action of ovulation-inhibiting oral contraceptives.

The concluding seminar in the series on Control of Fertility was given by Dr. S. J. Segal. Dr. C. D. Deshmukh presided. Dr. Segal reviewed the various methods of fertility control and pointed out that the use of one or more methods depended on the social, religious and economic conditions of the population. An ideal contraceptive satisfying the following criteria, namely, (*a*) absence of local action on coitus, (*b*) occasional treatment, (*c*) little medical attention, (*d*) easy availability and cheapness, and (*e*) freedom from side effects, remains to be developed. The extent to which oral contraceptives which have been successfully tried in the U.S.A., and other countries will be useful in India depends on considerations of cost and complexity of usage. Trials are being made with intra-uterine coils and rings.

Dr. Deshmukh, congratulating the participants and speakers on the successful completion of the Training Course, envisaged a bright future for the programme. He hoped that a more comprehensive programme including laboratory exercises would be given during 1963-64. He desired that the Department of Zoology, in collaboration with different organisations in Delhi, should develop the programme as a centre for training in Physiology of Reproduction for India on the lines of the Worcester Foundation Training Programme in U.S.A.

LINEAR POLARIZATION OF THE RADIO WAVES FROM SATURN

After the discovery by Sloanaker of the intense 10-cm. radiation from Jupiter, measurements at 960 Mc./s. by Radhakrishnan and Roberts, using a variable-spacing phase-switched interferometer technique, established that the planetary emission was strongly polarized. These observations have led to further researches on planets as polarized radio sources.

In a recent communication (*Phys. Rev. Letters*, February 1963), Sloanaker *et al.*, reporting their observations on the decimeter (3,200 Mc./s.) radio emission from Saturn, find that it is strongly linearly polarized, the degree of polarization being about 20%. The data were taken with a solid-state maser amplifier mounted at the focus of a 84-ft. radio-telescope.

In the case of Jupiter, the decimeter radiation has been interpreted as due to relativistic electrons spiraling in a magnetic field whose axis of symmetry is tilted by about 10° with respect to the rotational axis. If a similar model is assumed in the case of Saturn, the observations would require relativistic electrons radiating predominantly in the region of high latitudes.—(*Phys. Rev. Letters*, February 1963.)