

FERTILITY IN MAMMALS AND BIRDS

THE problem of fertility in mammals and birds has been critically and comprehensively reviewed by John Hammond in a recent issue of the *Biological Reviews* (July 1941), under three main heads:—(1) the number of ova shed, (2) the number of ova fertilised, and (3) the number of embryos developing to birth.

That the number of ova shed and fertilised does not depend on the number of ova present in the ovary in every species was demonstrated by several workers. It was shown that the number of follicles that ripened at any one time, did not depend on the mass of ovarian substances but it depended upon the age of the animal and the level of the gonadotrophic hormone of the anterior pituitary gland circulating in the blood. Considerable amount of work has been done on this hormone, the hormones of the urine of pregnant women and the hormone in the blood serum of pregnant mare. Of late, these hormones are being extensively used in the field to increase the fertility in mammals.

In early life, while growth is rapid the ovaries remain inactive and in old age, senility inactivates the ovaries. It is only in the middle age, that the maximum number of ova are ripened. As a result of several investigations, it has been shown that it is the age of the animal which influences the ripening of follicles and immature animals lack sufficient gonadotrophic hormones of the anterior pituitary circulating in the blood. Though the growth hormone and the gonadotrophic hormone of the anterior pituitary have something to do with each other, the exact relationship between them is not yet clear. In some species the lactogenic hormones in some way, inhibit the ripening of follicles.

Seasons definitely influence the rate of reproduction in mammals and birds; breeding is at the maximum in most of the species when the duration of the day is longer. This is due to the increased activity of the anterior pituitary gland stimulated by the nerves of the eyes which are acted upon by light rays. In non-breeding seasons the lowered output of the follicle stimulating hormone of the anterior pituitary may be raised by the injection of follicle stimulating hormone. But before fertility can be induced other conditions such as the occurrence of oestrus and correct timing of this in relation to ovulation must be satisfactory. Under these favourable conditions, successful mating and fertilising may be effected.

Ovarian cysts and a persistent corpus luteum interrupt the normal course of fertility. Ovarian cysts are of two kinds. The follicle, under certain conditions, does not rupture but progressively increases in size to form a cyst. In extreme cases the female with cystic ovaries assumes male sexual characters. Though the cause of cyst formation is not known, it can be artificially produced by injecting Prolan. The cysts either prevent further ovulation or produce large quantities of Oestrin which prevents the implantation of the ovum or cause abortion.

The number of ova fertilised is not only affected by the number and vitality of the

duration of life of the sperm in the female genital tract and the time relation between mating and ovulation. The sperm and the ovum have a very limited independent life in the female tract and hence the chances of fertility are very remote if the time relations between mating and ovulation are not properly synchronised.

For maximum fertility it was observed that the production of large number of vigorous sperm is essential. In many of the mammal species defective sperm production leads to low fertilisation of the ova. Defective sperm production is produced by infections and obstructions in the tubules of the epididymis, faulty nutrition, deficiency in one or other vitamin, especially Vitamin E, the semen becoming alkaline under certain conditions and small differences in temperature.

Artificial insemination is playing an important role in the science of breeding. By this new method the fertility of males of high genetic value has been augmented. Recently, this has attained greater importance than the problem of curing certain forms of sterility in males.

In many species mating is limited to a short period of oestrus which occurs just before ovulation, and if mating does not occur within that short period the ovum is wasted. Other factors that affect fertility are the conditions in the female tract such as the presence of inflammation and leucocytes or the incomplete liquefaction of the mucus of the cervix at the time of oestrus.

During the course of pregnancy in mammals and incubation in birds, numerous conditions may interfere with the development of the embryo. In the event of conception, the corpus luteum formed at the ruptured follicles and progesterin, the internal secretion of the corpus luteum, watch over the implantation of the embryo in the uterus and persist right through the pregnancy until a few days before the first oestrus following parturition. Under certain conditions, the progesterin secretion is absent or deficient which leads to the failure of implantation. In certain species lactation at the period interferes with the process of pregnancy.

Progesterin which is essential for the maintenance of pregnancy is produced also by the placenta. Under certain conditions the influence of Oestrin will over-ride that of progesterin when, if it is in the early stages of pregnancy, absorption occurs, but in the later stages of pregnancy, abortion takes place. Certain infections as those due to Bang's bacillus and inflammatory conditions as those due to metritis also lead to abortion.

In many species certain lethal genetic factors will cause the death of one or more embryos at or before birth or hatching. In these cases only those embryos involved perish and others undergo the full term of development. These dead ones may become atrophied and mummified. There is every reason to believe in the existence of a substance in the blood which limits the number of young that develop normally to birth. The nature of this substance awaits future investigation.