

## X-RADIATION OF PHEASANT OVARIES<sup>1</sup>

RAYMOND J. GREB

South Dakota State College, Brookings

In 1951 a preliminary study (1) concerning X-radiation of pheasant ovaries based on an experiment in which pheasant ovaries were exposed to about 500 r. units of X-rays was presented. It was reported at that time that there were no evident changes observed in any of the structures usually controlled by ovarian hormones. Size of birds, plumage color, and size of spurs remained unchanged. Some of the birds laid eggs. Last year a more extensive experiment was set up to accord pheasant ovaries a much greater dosage of X-rays — a level of treatment that seemed reasonably certain to inactivate the ovarian cells.

Evidence from work, principally on mice, rats, guinea pigs, and rabbits, indicates that the most common early effects from radiation are: aplasia, neoplasms, and/or loss of immunity and spread of infection causing death. Later deaths, in some instances, may occur suddenly from unknown causes. According to the work of Quastler (2), Evans (3), Ellinger (4) and many others, lymphoid tissues are the most responsive to X-ray treatment. Germinal tissues may be regarded as second in order of response. In mice 500 r. units will produce a sterilizing effect on the ovaries. Similar dosages are known to have damaging effects on human ovaries.

Quastler (2) has shown in his work with mice that total body radiation has a fairly wide range of responses so far as survival time is concerned. When it has been possible to use sufficient numbers of individuals of the same strain, sex, and weight, a rather characteristic sigmoid curve results. He points out that even in a carefully selected population some individuals are extremely sensitive and a few are extremely resistant to any X-ray effects. It would seem reasonable to assume that various protoplasms exhibit a varying degree of responses to a given dosage of X-rays. It is difficult, therefore, to establish an X-ray dose that would be equally effective for all species of animals to be treated.

In this experiment twenty-three pheasant hens were available for study. The main objective was to inactivate the ovarian tissues with the aid of X-rays and then to observe the effect of this on the plumage color, size, etc. Sixteen animals were treated with X-rays and seven were held as controls. The first treatment was given at age 5 months and 11 days. The second treatment followed at 8 months and 26 days and the third treatment was administered at 10 months and 17 days. Each dose was approximately 800 r. units of high energy X-rays delivered to the ovary for a total dosage of 2400 r. units.

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Careful observation of the behavior of the birds for a week after each treatment revealed no apparent effect due to exposure. Birds released into their pens after each treatment began feeding and in all respects seemed "normal". (They are treated with high voltage equipment at Sioux Falls and hence are confined to a small container for 4 or 5 hours without food or water during the course of the trip.)

Our pheasants are kept in outdoor pens and are able to gain protection against wind and rain by entering a shelter. They are always exposed to external thermal conditions. All birds are weighed about every two weeks.

For the X-ray treatment the animals are forced into a lead cylinder whose diameter may be altered to suit the particular bird. The birds are thus held tightly so that they are unable to change their position during X-ray treatment. The animals are so held that the area directly over the ovary is exposed and the ovary can be X-rayed through the opening 27 mm. in diameter in the lead cylinder. A constant and exact control of the area and distance is thus possible.

The physical conditions of the X-ray equipment for each treatment were set as follows: 200KV, 15 MA; one  $\frac{1}{2}$  mm Cu filter and one 1 mm Al filter; time 11 min. and distance from target to tissue 5 cm.

Ovarian growth begins very early in the chick. At five months each ovary is composed of many follicles of varying diameters and measures about 3 x 7 mm. Each follicle is composed of an oogonium and many surrounding nurse cells. The nurse cells may be arranged in a single layer around the oogonium or there may be a stratification of several layers. The oogonium and the nurse cells are surrounded by and are held together by connective tissue. These are impregnated with numerous vascular tissues. The entire ovary is held in place by a wide and somewhat pedunculated mass of connective tissue—continuous with that of the connective tissue of the ovary.

Histological examination of ovarian tissue at intervals after treatment up to the present time has revealed no observable change in either the organization of the tissue or the organization of the cells.

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