In this connection it is interesting to refer to a recent paper of Kelsall (2), who emphasizes the relationship between lymphocytosis and cancer. If we reduce by a radiotherapeutic method the number of circulating lymphocytes, there is some hope to reduce also the growth and occurrence of tumors.

The activated gamma iron oxide (Ra B–Ra C or Th B–Th C) is interesting not only for therapeutic use but also from a biological point of view.[4] We could, for instance, follow from the outside the distribution of the activated iron oxide with a Geiger counter while trying, by means of a strong magnetic field, to influence the path of the activated magnetic cells (1).

Finally, using the method described by Rous (5) for separating Kupffer's cells by magnetic methods, the way would be open to a study of the influence of alpha particles on living cells.

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The Age Factor in Adaptability of a Sarcoma Virus to Other Animal Species

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An indispensable condition for the adaptation of avian sarcoma viruses to alien species of birds is the youth of the individual in which infection is attempted, this culminating in the case of ducks, which respond to the inoculation of viruses of the Rous and Fuginami sarcomata for only 24 hours after hatching (3, 4). The results that follow show that the age of the chicken bearing the tumor is also a factor of importance in determining the adaptation of the virus of the Rous sarcoma to ducks.

[4] An interesting paper on this topic was published by Maxfield and Mortensen (*J. appl. Phys.*, 1941, **12**, 197), who used, in experiments with rats, colloidal thorium dioxide. They found, by radioactive measurements, that six to eight hours after an intravenous injection, 99 per cent of the thorium was removed from the blood stream by the phagocytic action of the reticulo-endothelial cells. They recommend the use of this method for tests of the various theories of phagocytosis. However, using this method on man may be dangerous because of the aftereffects that are due to the long-life, daughter-product, mesothorium.

The experiments consisted of the inoculation into the breast of newborn ducks of cell suspensions from tumors grown in chickens varying in age from 15 days to 18 months, and of analogous inoculations into successive groups of ducklings of the tumors obtained in the preceding passages at intervals of from 1 to 3 weeks. In some cases, additional ducklings were injected in the vein with tumor filtrates, and the growths ("late tumors") that evolved several months thereafter were transferred to other groups of ducklings by means of cell suspensions.

The following results were obtained:

(1) The tumors grown in chicks from 2 to 4 weeks of age were very easily transferable into ducklings in 16 out of 17 lines, each started from a different chick tumor. Growth was fast, and the hosts often died although the tumors never became generalized. Transplantation of these tumors was successful, although irregularly, for a number of passages which, however, never exceeded 6, and always in the absence of generalization. The number of ducks developing tumors became progressively smaller in the course of the passages until none of the animals responded. The tumors in the surviving birds regressed in every case, and as a result, all the lines were lost, despite the fact that a total of nearly 350 ducklings were inoculated. Despite its long sojourn in a foreign species the virus did not show detectable signs of variation, since filtrates from the duck-grown tumors produced the customary lesions at the usual rate in chicks.

(2) The tumors grown in chickens 18 months of age did poorly in ducklings for in 6 of the 8 lines started, growth followed in only 3 out of 47 birds injected, and these two tumors could not be carried beyond a second passage. However, in the two other lines growth followed in 8 of the 11 ducklings injected, and adaptation was achieved after some passages with the customary succession of events accompanying the phenomenon.

(3) The tumors grown in chickens intermediate in age between the two above groups seemed to be the most adaptable to ducks. Most of the chickens of this group were from 5 to 10 months old, while another also supplying an adaptable tumor was 3 months old. Of the 6 duck-tumor lines which have been obtained, 4 were evolved by passages of cell suspensions, while in the other 2 cases ducklings were successfully injected with both cell suspensions and filtrates, but the lines were obtained by passages of the "late" tumors induced by filtrates. To these cases one has to add at least 3 more in which filtrates induced typical "late" tumors, but neither these growths nor those produced by cell suspensions were passed into other ducks. However, adaptation was not

achieved with another 6 tumors grown in chickens from 5 to 8 months old.

The signs of adaptation of the chicken tumor to ducks are quite obvious: progressive growth often followed by generalization in ducks of all ages, acquisition of new tissue affinities, total or partial loss of the power to induce tumors in adult chickens, and gross and microscopic changes in the tumors (*3*). Proper analysis revealed that no two of the variants are identical, each differing from the rest in degree of generalization, incidence of non-neoplastic (hemorrhagic) or neoplastic lesions, cell type and texture of the growths, and virulence and tissue affinities of the virus inductor. In regard to the last property special mention must be made of a neurotropic strain of sarcoma which induces in the central nervous system of young ducks a typical hemorrhagic disease, while the nervous tissue of older ducks is never affected by either hemorrhagic or neoplastic lesions. Also, some of the lines have been transmitted to full-grown pigeons, in several passages, by means of cell suspensions and filtrates. Large primary tumors followed by widespread generalization have often been obtained.

The above results have to be related to the diminishing susceptibility of aging birds to tumor viruses, which finds an expression in the progressive development of a suppressing power by the blood serum against these viruses (*1, 7*). When chickens ranging in age from embryos to 2 years are infected with the virus of the Rous sarcoma, the following lesions are observed to develop: (a) a non-neoplastic, hemorrhagic disease (*2*); (b) fast-growing tumors, first combined with, and later free of, hemorrhagic lesions (*1*); (c) moderately-growing tumors (*1*); and (d) slow-growing tumors which frequently regressed (*6*). Free virus can easily be demonstrated in filtrates from hemorrhagic lesions and fast-growing tumors, whereas it is only occasionally shown in filtrates from tumors grown in old chickens (*6*). Also, study of a series of 14 spontaneous chicken sarcomata suggests that these neoplasms cannot be transplanted if they arose in old chickens (*5*).

Therefore, chicken tumor viruses infecting a progressively older individual shift from a highly favorable to a highly unfavorable medium. The present experiments suggest that adaptation to a foreign species, the duck, takes place most easily between these two extremes when presumably conditions in the medium become adverse but without reaching as yet that phase in most old animals where the effect on the virus may go as far as complete suppression and causing the tumor to regress. The process may be compared to variation in bacteria in old cultures or in convalescents. It is not that the tumor virus varies as a consequence of the infection of the duck, but rather that ducks are infected by an easily adaptable virus because that virus has previously varied in the chicken.

Finally, the fact that the tumor virus from chicks failed to vary in ducks, despite successful growth in the latter host for several passages is in itself the ideal control, proving that the lines of duck tumors were evolved by variation of the chicken virus and not by activation of hypothetical dormant duck viruses.

Summary

The age of the chicken in which the Rous sarcoma is grown has an influence on the variation and subsequent adaptation of the causative virus to ducks. Adaptation is relatively easy to accomplish when the tumor has been grown in adult chickens several months of age. It has never been accomplished when the tumor has been grown in chicks and only occasionally when it has been grown in old chickens.

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The Effects of Sex Hormones on the Copulatory Behavior of Senile White Rats[1]

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There is a large body of literature covering the experimental work on various aspects of sex activity. However, most of the behavioral studies are limited to the period of growth and early maturity. This is especially true of such studies as those dealing with the influence of the estrogens and androgens.

The present investigation is concerned with the effects of hormonal action on animals of relatively advanced age. Twenty-five male white rats, 28 months old, were used. The rats were very large, the average weight being 342.0 grams. They were derived from four litters and were divided into groups according to

[1] Thanks are due to the Schering Corporation for supplying 380 mg. of oreton (testosterone propionate) and 450 Cartland Nelson units of anteron (pituitary-like hormone from pregnant mares' serum). Thanks are also due to Parke Davis and Company for supplying 100,000 I.U. of the estrogen compound, theelin.