

Effect of Various Natural Steroids on the Phagocytic Activity of the Reticulo-Endothelial System

It was initially observed by Nicol¹ that, following the administration of oestrogenic hormones, there was stimulation of the activity of phagocytic cells in the endometrium. This work was extended later to include both natural and synthetic oestrogens²⁻⁴, and these findings indicated that in both male and female animals oestrogens possess a strong stimulating influence on the reticulo-endothelial system, which results in the appearance of large numbers of macrophages in the spleen, liver and lymph nodes, and the mobilization of these macrophages into the circulation. In the above researches, the trypan blue method was used to assess the activity of the reticulo-endothelial phagocytes. These results have since been confirmed by the carbon method, and it has been found that the strongest stimulants of the reticulo-endothelial system possess high oestrogenicity^{5,6}.

The following investigation was planned to ascertain the effect of various oestrogenic and non-oestrogenic natural steroids on the phagocytic activity of the reticulo-endothelial system.

The present experiments were carried out on 105 male white mice (*T.O.* Swiss strain) of 20-30 gm. body-weight. Five of the animals were used for assessing the effect of each compound on the phagocytic activity of the reticulo-endothelial system, each animal receiving one subcutaneous injection of 0.5 mgm. of each steroid in 0.05 ml. of arachis oil daily for six days. The phagocytic activity was then measured on the eighth day by the rate of disappearance of a known amount of carbon from the circulating blood⁷, the procedure being as follows. Each animal was given one intravenous injection of carbon of particle size 250 A., the dose of the carbon being calculated on the basis of 16 mgm. per 100 gm. body-weight. Blood was then taken at short intervals during the first 60 min. following the injection, and the concentration of the carbon in each blood sample was measured by means of an absorptiometer. The logarithmic values of the absorptiometer readings lie along a straight line when plotted against time, and the slope of this line has been taken as the measure of total body phagocytic activity or the phagocytic index, which is denoted in the present communication by the symbol *K*.

Twenty-five of the animals were used as controls. Each received one subcutaneous injection of 0.05 ml. arachis oil daily for six days and then showed an average phagocytic index or *K*-value of 13 ± 2.4 , the carbon completely disappearing from the blood in about 100 min.

Table 1 shows the *K*-values of the various natural steroids together with their relative standard deviations. These results show that the phagocytosis of particulate carbon may be modified by natural steroids. The oestrogenic steroids caused rapid removal of the carbon from the blood-stream due to stimulation of reticulo-endothelial activity. Progesterone caused very slight stimulation of the reticulo-endothelial phagocytes. Cortisone caused marked depression of phagocytic activity, thus providing further confirmation of our previous reports of experiments involving the method of *intravital* staining with trypan blue⁸. Testosterone and cholesterol and the other steroids shown in Table 1 had little or no effect.

Table 1. EFFECT OF VARIOUS NATURAL STEROIDS ON THE PHAGOCYTIC ACTIVITY OF THE RETICULO-ENDOTHELIAL SYSTEM

| Steroid used | Phagocytic index (K-value) |
|-------------------------------|----------------------------|
| Oestradiol benzoate | 81 ± 15 |
| Equllin | 77 ± 24 |
| α-Ethinyl oestradiol | 75 ± 8.9 |
| Oestrone | 65 ± 11 |
| Equilenin | 51 ± 8.2 |
| Oestriol | 47 ± 9.8 |
| Progesterone | 17 ± 2.5 |
| Ethisterone | 14 ± 1.7 |
| Testosterone | 13 ± 1.1 |
| Cholesterol | 11 ± 2.5 |
| Lanosterol | 11 ± 1.7 |
| Ergosterol | 10 ± 1.9 |
| Androstanolone | 10 ± 1.3 |
| Sitosterol | 10 ± 1.1 |
| Deoxycortone acetate | 10 ± 2.2 |
| Cortisone | 7 ± 0.9 |
| Control values for 25 animals | 13 ± 2.4 |

It is thus evident that the phagocytic activity of the reticulo-endothelial system is modified by hormones, and that the steroids possessing the power of inducing oestrus also induce stimulation of macrophage activity. Oestradiol benzoate has been found to be the most powerful of the natural oestrogens and gives a phagocytic index or *K*-value of 81 ± 15 , the carbon disappearing completely from the blood in about 15 min. compared with 100 min. in the controls; cortisone acetate was again the major depressant, the circulating blood not being clear of carbon for about 2 hr. after the injection.

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Action of Beta Radiation on the *Proteus* P18 Bacillus

WE have grown the *Proteus* P18 bacillus at 37° C. in an ordinary medium containing 20 per cent horse serum and varying amounts of radioactive phosphorus. With a dose of 4 μc. of phosphorus-32 per 100 ml. of medium the multiplication and microscopic appearance of the bacilli are scarcely altered. When the concentration of phosphorus-32 is raised to 8 μc. per 100 ml., growth is slowed down and a series of important morphological transformations can be observed.

Between 4 and 6 hr. after inoculation, besides the normal *Proteus* bacilli, filaments 20-80μ in length, that show rapid creeping movements, appear (Fig. 1b). After 6-8 hr., filaments with a globular formation at one end are observed (Fig. 1c); these move very fast, the globule foremost. After about 8-10 hr.