Behavioural Changes in Spayed Female Guinea Pigs after Stilboestrol Administration

IN a recent assay of the oestrogenic potency of stilboestrol, the results of which will be published elsewhere, interesting behavioural changes were observed in our animals.

Altogether 25 spayed female guinea pigs were treated with subcutaneous injections of small priming doses (0.0005–0.0025 mgm.) of stilboestrol for 6–10 days, and at the disappearance of the vaginal closing membrane this treatment was followed by massive doses (0.5–1.0 mgm.) of stilboestrol for 2–5 days. Furthermore, five animals, 3–4 hours after the last massive dose of stilboestrol, received a subcutaneous injection of 0.2 mgm. of proluton.

Within a few days of the commencement of treatment, and while still receiving only small priming doses of stilboestrol, all our animals became extremely quarrelsome. Cage-mates previously living in peace and amity became pugnacious and bellicose, as shown in frequent fighting during which fairly severe injuries were inflicted, including lacerated wounds in the mid-dorsal region. Finally, it was necessary to house the animals separately during the whole period of the experiment.

There seems little doubt that this unusual and totally unexpected ferocity among the female of the species was a sequel to the administration of stilboestrol, which induced in our animals a masculine aggression—a component of the male sex-drive.

It appears, however, that the male behaviour such as the mounting activity described by Young and Rundlett¹ is a regular feature of the heat response of the female of many species in which it is integrated into the pattern reaction of a normal *libido*. The androgynous complex has been described in the female guinea pig², female rabbit³, female rat^{4,5}, the sow⁶, the cow⁷ and the ewe⁸.

Young, Dempsey, Hagquist and Boling² relate mounting activity in the female guinea pig to the synergizing action of the oestrin and progesterone of the mature follicles, and this is supported by the findings of Young and Rundlett¹, who produced mounting activity in spayed female guinea pigs by injections of oestradiol benzoate followed by progesterone.

The extension of the male effector responses into the domain of overt sexual behaviour in females seems to indicate that there is some common denominator in the psychic urge motivating the male and the female response, and that the subjective and objective manifestations of the sex drive need not exist as clear-cut sexual differentials but, as in the guinea pig, there may be a certain overlap—the production of a specific hormonal complex.

It is therefore perhaps not altogether surprising that some slight deviation from the normal stimulus such as might be produced by the difference in chemical structure of stilboestrol and the natural oestrogens should be reflected in the exhibition of masculine aggression. In other respects (copulatory response^{9,10}, mounting activity, and all the vaginal and uterine preparations) the oestrogenic response of stilboestrol is normal and complete. This invites the hypothesis that the study of behaviour offers a delicate test of hormonal balance, and is a plea not to neglect

altogether the reactions of the higher neurones in any biological assay of the internal secretions of sex.

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Counterpart of the Davidson Current

DURING the period of upwelling in the California Current, it has been said that the California and the Humboldt (or Peru) Currents, on opposite sides of the equator, are "mirror images" of each other¹ (p. 204). Since upwelling is almost a constant process in the Humboldt Current, the similarity disappears when upwelling ceases in the more northern current during late summer, and is not noticeable until upwelling starts again the following March.

Each current has a subsurface counter-current of equatorial subsurface water flowing at approximately 200 metres below the surface. The factor preventing the rise of the subsurface current to the surface in the California Current appears to be upwelling, for, when upwelling ends, the subsurface current rises to the surface and also continues to flow in subsurface levels. Therefore, along the coast of California, from approximately November to January, there is equatorial subsurface water flowing northward from the surface to the shallow sea bottom within the narrow limits of the coastal counter-current.

This inshore, northward-moving, winter current along the California coast was discovered by George Davidson, in charge of the first U.S. Coast and Geodetic Survey of the West Coast, and was named after him. Parenthetically, it is worth remembering that Davidson, who was a scholar as well as a surveyor, wrote the first "U.S. Pacific Coast Pilot". At the outset, it was published by a San Francisco newspaper, because Davidson had difficulty in persuading the Government to print the material since it was undertaken outside his regular duties. He began gathering and writing the first "Pilot" in 1850; the Government publication was in 1858. The book was so helpful to shipping that the demand brought three editions within the next eleven years. In 1880, Davidson was commissioned to revise the "Pilot" again. Evidently he was at last afforded sufficient time to carry out his desires, for, in the nine years that followed, he prepared the monumental contribution, which has not been superseded since its publication in 1889.

Sverdrup¹ (p. 79) states that, during upwelling, the surface waters of the Davidson Current are too disturbed to allow the rise of the subsurface current to the surface. Certain it is, that only when upwelling