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**Effect of Various Androgens on Regenerating Anal Fin of Adult *Platylocilus maculatus* Females.\***

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Previous experiments<sup>1, 2</sup> have demonstrated that the regenerating anal fin of adult *P. maculatus* females injected with testosterone propionate forms a clearly male-like structure but fails to form the typical gonopod characteristic of the male. The 3,4,5 complex remains short and differentiation of the various specialized structures within the complex is atypical. In seeking further factors which must be controlled in order experimentally to produce typical gonopod formation in the female, it seemed necessary to determine whether the nature of the morphogenetic agent itself, *i. e.*, of the injected androgen, is of any influence in determining the character of the response. Therefore, equal dosages by weight (2 mg/cc) of androsterone,<sup>†</sup> dehydroandrosterone, androstenedione, testosterone, methyl testosterone, and ethinyl testosterone have been tested on the regenerating fin and the induced responses compared with one another and with that obtained with testosterone propionate.

The technics employed were in all cases similar to those previously described.<sup>1, 2</sup> The anal fins were cut away across the bases of the rays and intraperitoneal injection was begun on the 9th or 10th day of regeneration. Each animal received 0.05 cc of sesame oil solution containing the appropriate androgen every fifth to seventh day until the response was complete. In most cases a concentration of 2 mg/cc was given. In the case of androsterone, however, several additional groups were run at higher and lower dosages (0.5-5 mg/cc). A total of 67 females were used, 35 receiving androsterone, 10 dehydroandrosterone, 6 ethinyl testosterone, 6 methyl testosterone, 5 testosterone, and 5 androstenedione. Controls received plain sesame oil.

*Results.* Clear-cut differences in the response of the regenerating anal fin to the various androgens tested have been obtained. An-

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<sup>1</sup> Grobstein, C., *Proc. Soc. Exp. Biol. and Med.*, 1940, **45**, 484.

<sup>2</sup> Grobstein, C., *J. Exp. Zool.*, 1942, **89**, 305.

<sup>†</sup> The androgens were generously supplied by Dr. Erwin Schwenk of Schering Corp.

drosterone proved by far the most effective substance in simulating male gonopod formation, although even here a typical gonopod was not produced. In the more favorable cases the 3,4,5 complex was longer than that produced by animals treated with testosterone propionate but nevertheless shorter than that of the characteristic male structure. The specialized ray segments in the distal portion of the complex were remarkably similar to the blade, terminal hook, proximal and distal serrae, etc., of the normal male. The more proximal segments were slightly less typically modified into spoon support, spoon, etc. In general, the response differed from typical gonopod formation chiefly in the incomplete elongation of the third, fourth, and fifth rays.

Methyl and ethinyl testosterone, on the other hand, induced the least typical responses. Injection of the former, in particular, resulted in the production of highly atypical, though clearly masculinized fins. Growth of the 3,4,5 complex was extremely limited and differentiation of the specialized structures within the complex abortive. The final structure produced both by methyl and ethinyl testosterone was decidedly less typical than that previously obtained with testosterone propionate.

The other 3 androgens tested gave responses intermediate to the 2 described. Dehydroandrosterone produced as much, or nearly as much, growth of the 3,4,5 complex as androsterone, but the subsequent differentiation was quite atypical. The testosterone response resembled that of testosterone propionate but proceeded more slowly. Androstenedione gave somewhat variable results, but in general also resembled testosterone propionate in its effect. More data are required before comparisons may be made among the effects of testosterone, testosterone propionate, and androstenedione.

If consideration is limited for the present to 3 substances on which the data are clearest, the order of effectiveness in simulating gonopod formation when administered in concentration of 2 mg/cc is: androsterone, testosterone propionate, methyl testosterone. If the rapidity of response induced by each of these substances be compared, *i. e.*, the interval between beginning of injection and completion of differentiation as judged by reduction of the fleshy cutis,<sup>3</sup> the order is just the reverse. Where the response to methyl testosterone was completed in 13 days, that to testosterone propionate took approximately 30 days, and that to androsterone was complete in only 3 out of 10 animals at 45 days.

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<sup>3</sup> Grobstein, C., *Univ. Cal. Publ. Zool.*, 1940, **47**, 1.