

7351 P

Artificial Production of the "Wedding Dress" in *Chrosomus Erythrogaster*.*

WILLIAM SAPHIR. (Introduced by W. Thalhimier.)

From the Nelson Morris Institute for Medical Research, Michael Reese Hospital, Chicago.

Recent reports^{1, 2, 3} have made it probable that certain species of fish may be used successfully as test animals for the demonstration of either the gonadotropic or the sex hormones. For some time it has been known that certain male fish, such as *Rhodeus amarus*, *Gastrosteus*, *Phoxinus laevis*, belonging to the Cyprinidae group, assume striking color changes during the spawning period, lasting for several weeks in the spring. This so-called "wedding dress" or "mating coat" is due to the expansion of the chromatophoric cells of the skin and is considered to be an expression of heat in order to attract the females. Thus it would be comparable to the well-known estrus of the rodents.

Wunder,¹ working with *Rhodeus amarus*, obtained a "wedding dress" with subcutaneous injection of testis extract, variable results with prolan, and no effect with the female sex hormone. Glaser and Haempel² reported the castrated Bitterling as a suitable test animal for the demonstration of the male sex hormone. Zondek³ used the expansion of the erythrophores of *Phoxinus laevis* as a test for the demonstration of his pituitary pigment hormone intermedin.

While these experiments were conducted on fish, domestic and very abundant in central Europe, they are not inhabitants of this country and are difficult to obtain. For this reason and for the purpose of producing the "wedding dress" artificially in an American fish, *Chrosomus erythrogaster* was considered the most suitable fish. This attractive and hardy fish, commonly called "red bellied dace", belongs to the group of Cyprinidae and is found in various parts of this country from Maine to Alabama in small, clear streams, where it breeds in May and June. No record exists of its having bred in

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¹ Wunder, W., *Z. Wiss. Biol. Abt C, Z. Vergl. Physiol.*, 1931, **13**, 696; *Abst., Biol. Abst.*, 1932, **6**, 15908.

² Glaser and Haempel, *Deutsch Med. Wchnschr.*, 1932, **58**, 1247; *Endokrinologie*, 1932, **11**, 81.

³ Zondek and Krohn, *Klin. Wchnschr.*, 1932, **11**, 405, 849, 1293.

captivity.⁴ The breeding dress consists in a vivid and brilliant red discoloration of the otherwise white belly and the part just below the mandible on each side.⁵

As the experiments were undertaken in winter, I am unable to state whether the natural spawning habits of this fish in spring may interfere with the results of this study reported at this time.

The fish are kept in a common aquarium aerated with compressed air. The optimum temperature of the water is 50-60°F. For injection the fish is taken from the net and held between index finger and thumb of the left hand. The needle is introduced in midline between back fin and tail fin. The needle is kept superficially and pushed slightly forward. The amount injected is 0.1 cc. Care must be taken not to injure the air bladder which is followed by immediate death. This will be avoided by keeping the needle strictly in the midline and superficially. The deprivation of water during this manipulation is well tolerated. The fish is placed thereafter in a glass bowl for the period of observation. The "wedding dress" becomes visible after 30 minutes and lasts from several hours to 24 hours or more.

Injections of physiologic saline solutions, urines of males, females, and of pregnant women, adrenalin solutions, female sex hormone (progynon and theelin), testis hormone, hebin (pituitary extract, Wilson), antuitrin (Parke Davis) were not followed by any visible changes. A fully developed brilliant wedding dress was rapidly and regularly produced by Yohimbine hydrochlor. 1:10,000, as also was noted in other species of fish by other investigators.^{1, 2, 3} Prolan, prepared from the urine of pregnant women by Zondek's alcohol precipitation method,⁶ acted inconstantly. While the percentage between positive and negative reactions amounted to about 50% with a urine extract concentrated 1:5, the impression was gained that the more prolant excreted by the patient, the more likely a positive reaction will result. Thus a fully developed mating coat was regularly obtained with a urine extract of a case of chorionepithelioma. The quantitative analysis of this urine revealed the presence of 333,000 mouse units of prolant per liter, while in normal pregnancy the amount of prolant excreted would not exceed 20,000 m.u. per liter. Further study along these lines is contemplated.

⁴ Mellen, *Fishes in the Home*. New York, 1927.

⁵ Smith, Bertram G., *The Spawning Habits of *Chrosomus erythrogaster* Rafinesque*, *Biol. Bull.*, Woods Hole, 1908, **15**, 9.

⁶ Zondek, B., *Die Hormone des Ovariums und des Hypophysenvorderlappens*, Julius Springer, Berlin, 1931.

Summary and Conclusions. While the results are not complete enough to reach definite conclusions, it would seem that in view of similar and better known conditions in rodents the mechanism of the production of the "wedding dress" in *Chrosomus erythrogaster* is due to the action of substances having either a stimulating effect upon the sex glands of the fish, such as prolan, or having an effect similar to that of the estrus producing hormones, such as Yohimbine.

7352 C

Effect of Prolonged Feeding of Raw Carrots on Vitamin A Content of Liver and Kidneys in the Dog.

R. G. TURNER.

From the Department of Medical Research, Wayne University, College of Medicine.*

The function of carotene in nutrition has been established.¹⁻⁴ The advisability of feeding large amounts of raw carrots over a prolonged period of time is still questioned. Carotinemia has been observed in the dog,⁵ and in man.⁶ Investigations of Moore,² Capper,⁷ and Drummond⁸ have shown that conversion of carotene to vitamin A takes place in the livers of vitamin A-free rats or fowls. Olcott and McCann⁹ later confirmed these observations and further concluded that this change may take place *in vitro* if incubated with fresh liver tissue. Rea and Drummond¹⁰ failed to obtain a carotinase in liver preparations from vitamin A-free rats and further obtained no increase in vitamin A content of cat livers after carotene administration.

Table I presents the results obtained by feeding dogs fresh car-

* Formerly Detroit College of Medicine and Surgery.

¹ Euler, Euler and Karrer, *Helv. Chim. Acta.*, 1928, **12**, 278.

² Moore, T., *Biochem. J.*, 1930, **24**, 692.

³ Green, H. N., and Mellanby, E., *Brit. J. Exp. Path.*, 1930, **11**, 81.

⁴ Turner, R. G., and Loew, E. R., *J. Inf. Dis.*, 1933, **52**, 102.

⁵ Duhig, J. V., *Med. J. Australia*, 1931, **1**, 260.

⁶ Curtis, A. C., and Kleinschmidt, E. E., *Ann. Internal Med.*, 1932, **6**, 751.

⁷ Capper, N. S., *Biochem. J.*, 1930, **24**, 980.

⁸ Drummond, J. C., Ahmad, B., and Morton, R. A., *J. Soc. Chem. Ind.*, 1930, **49**, 291 T.

⁹ Olcott, H. S., and McCann, D. C., *J. Biol. Chem.*, 1931, **94**, 185.

¹⁰ Rea, J. L., and Drummond, J. C., *Z. Vitaminforsch.*, 1932, **1**, 177.