Differences in the Action of Steroids on Amphibian Embryos

IN addition to their actions on the sexual organs, the steroids have some characteristic effects on cellular division. Von Möllendorff¹ showed that the frequency of mitosis in tissue cultures of fibrocytes is influenced by alcoholic solutions of 1:10,000 to 1:5,000,000 testosterone. G. Töndury² demonstrated that abnormal mitotic divisions may be produced in amphibian ova by alcoholic solutions of 1:100,000 to 1:1,000,000 testosterone, oestriol, oestradiol and stilboestrol.

A study of amphibian embryos has revealed that steroids may retard the rate of development to a varying extent. The following experiments deal with the actions of equal concentrations (1:100,000) of testosterone, progesterone and stilboestrol on the developing amphibian embryo (*Triton taeniatus*).

Eggs in identical stages of development (four-cell, morula, blastula or gastrula) were put into jars of equal size, containing the same amount of artificial pond water (at 18°C.) in which the hormone had been dissolved. 84 specimens were used. Three sets of experiments were carried out, each starting with eggs in one of the embryonic stages mentioned above, and the rate of development was observed under a binocular microscope through thirty stages of development.

Testosterone treatment. Embryos in the four-cell stage develop into a tail-bud stage on the fifth day. The morula stage becomes a blastula in 24 hr. and a gastrula in another 24 hr. Normal young larvae (stage 33) develop in a fortnight. Development from the blastula stage is normal.

Progesterone treatment. Embryos in the four-cell stage develop into gastrulae on the fifth day but do not develop further; they die on the seventh to the

ninth day, during the process of gastrulation (stage 10-12).

The rate of development of the morula is retarded; it develops into a blastula only after two days. Gastrulation occurs on the third day, but most of the gastrulae die during the process of gastrulation. The few that develop into neurulae die on the twelfth to thirteenth day.

A blastula develops into a gastrula in 24 hr., but usually dies without further development after four to five days. A few pass through the neurula stage and die later as tail-bud stages. Gastrulae also pass through the neurula stage and die as tail-bud stages after seven days.

Stilboestrol treatment. No further development occurs in embryos which began the experiment in the morula, blastula or gastrula stages, and they die after two to three days.

These experiments show that while testosterone does not affect the development of common newt embryos, stilboestrol prevents all development. Treatment with progesterone prevents complete development, the embryo dying during gastrulation or in the limb-bud stages.

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¹ Möllendorff, W. v., *Klin. Wschr.*, **18**, 1098 (1939); *Z. Zellforsch.*, **29**, 323, 706 (1939); *Roux. Arch. Entw. Mech. Organ.*, **141**, 58 (1941); *Z. Zellforsch.*, **32**, 35, 445 (1942).

² Töndury, G., *Schweiz. med. Wschr.*, **71**, 329 (1941); *Roux. Arch. Entw. Mech. Organ.*, **142**, 1 (1943).

Acetate as a Possible Precursor of Ruminant Milk Fat, Particularly the Short-Chain Fatty Acids

THE origin of the short-chain fatty acids (C_4-C_{14}) of milk fat has been the subject of much speculation; some believe they originate by degradation of long-chain acids^{1,2}, others that they are synthesized from carbohydrate³. Their occurrence in appreciable quantities only in the milk fat of herbivores, more particularly ruminants⁴, may be significant in the light of the fact that considerable quantities of acetate are produced in the rumen and absorbed into the blood⁵. These considerations, together with the demonstration that the body can build fatty-acid chains from acetate⁶, suggested in 1945 that acetic acid might be the precursor of a portion of the milk fat, especially the short-chain acids⁷.

In 1946 a fruitless attempt⁸ was made to verify this theory by intravenous infusion of acetate into lactating goats during inanition, when the short-chain acids of the milk fat are much diminished. These negative results, and others in the cow⁹, were probably due to avid utilization of the intravenously administered acetate by the fasting tissues, for ex-

	0.017 M glucose			0.02 M sodium acetate		
	Q _{O₂}	Q _{acid}	R.Q.	Q _{O₂}	Q _{acid} *	R.Q.
6 Rats	- 8.7 ± 1.0	+ 2.0 ± 0.6	1.66 ± 0.07	- 4.8 ± 0.3	+ 0.6 ± 0.2	0.75 ± 0.06
6 Goats	- 4.5 ± 0.3	+ 1.5 ± 0.2	0.85 ± 0.04	- 6.2 ± 0.5	- 4.2 ± 0.7	1.20† ± 0.08

37°C.; 95 per cent oxygen + 5 per cent carbon dioxide; Ringer-bicarbonate; pH 7.4.

* In the case of acetate a negative value for Q_{acid} is a measure of substrate utilization.

† Significantly greater than unity (P = 0.03).