This matter is dealt with more fully in another publication at present in the press.

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[1] *Nature*, **151**, 642 (1943).
[2] *Nature*, **150**, 525 (1942).
[3] *Nature*, **154**, 179 (1944).
[4] *Nature*, **150**, 607 (1942).
[5] *Nature*, **152**, 693 (1943).

Effect of Temperature on Fertility of the Male

EXPERIMENTAL work on many mammals, including dogs, rabbits, cats, rams and bulls, has shown that in those species with the testicles enclosed in an external scrotum, there is normally a significant temperature difference between the testicles and the body. This temperature difference varies in different species from 1° to 8° C. and is essential for the proper functioning of the testicles. If the temperature of the testicles is artificially raised to body temperature, sperm production is greatly lowered and the animals concerned may to all intents and purposes become sterile. There is, of course, no diminution of desire.

The experiments of Young[1] may be cited as typical of the work which has been carried out on this subject. Young ran hot water (46–47° C.) over the testicles of guinea pigs for periods of 15–30 minutes. He found that some degeneration of the germinal epithelium began immediately and that the consequent diminution of fertility was apparent for twelve days.

This knowledge has important practical application in animal breeding. For example, the sterility of a valuable strain of rams in Australia was shown recently to be due to nothing more than a thick growth of wool on the testicles. When this source of warmth was removed, the fertility of the rams was restored. The sterility of an undescended testicle is apparently due to its being kept at body temperature. If the testicle can be massaged down into the scrotum, it produces sperms.

McLeod and Hotchkiss have reported[2] experiments in this connexion on the human subject. Healthy young men were exposed in a fever cabinet to a temperature of 110° F. for a period of 32 minutes. For eighteen days after the experiment, their sperm counts remained at a normal figure of 300–400 million. The counts then fell to as low as 20 million and remained subnormal for sixty-seven days. Medical evidence quoted in the same paper indicates that with a sperm count less than 60 million a man is almost certainly sterile.

No mention was made in McLeod and Hotchkiss's paper of the possible adverse effects of hot baths on mature males. I investigated this important possibility. The matron of a London hospital told me that the temperature of a patient's bath is about 105° F., which is well above body temperature. The temperature of a domestic hot bath is nearer 110° F., the temperature of the fever cabinet experiments. Dr. John Hammond, with whom I discussed this problem, is of the opinion that such a temperature might reduce human male fertility. He added the interesting information that the fertility of white men is much reduced in the tropics, and that more native children are conceived there in the cooler months. Dr. John Baker, of the School of Comparative Anatomy, Oxford, has raised the question of the possible adverse effects of hot baths purely on the evidence of work on lower mammals[3].

It is not suggested that the hot-bath habit is the sole cause of male infertility, but it would seem to be a fruitful line of research, according closely as it does with the general rise in male infertility, the reduction of the birth-rate in 'civilized' as opposed to backward nations, the greater reduction of the birth-rate in the richer sections of the community, and the peculiar fillip given to the birth-rate by the present War and the War of 1914–18.

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[1] *J. Expt. Zool.* (1927).
[2] *J. Endocrin.* (1941).
[3] *J. Hyg.*, **27** (1928).

Naturally Occurring Polyesters

MAY I add to the recent note[1] on the isolation of a natural elastic polyester[2]? The natural occurrence of polyesters was observed as early as 1908 by Bougault and Bourdier[3], who showed that the waxes obtained by extraction of the leaves of a variety of conifers are linear polyesters of hydroxy-acids such as juniperic acid (ω-hydroxypalmitic acid) and sabinic acid (ω-hydroxylauric acid). These polyesters, or 'etholides', have average molecular weights of the order 1,000–2,000, and were afterwards shown to have the same general properties as the synthetic polyesters obtained by heating ω-hydroxy-monocarboxylic acids[4]. The average molecular weights of the natural esters show that they belong to the α-polyester type rather than the ω- or linear superpolyester type synthesized by Carothers and Hill[5]; Bougault appreciated the analogy between the etholides on one hand and polysaccharides and polypeptides on the other.

The etholides (natural and synthetic), which are polyesters derived from the self-condensation of ω-monohydroxy-monocarboxylic acids, are to be distinguished from the second class of linear polyesters synthesized by Carothers and Arvin[6] by the condensation of dihydric alcohols and dicarboxylic acids. The properties of the natural elastic polyester constituting the skin enclosing the seeds of *Smilax rotundifolia* indicate that it is not a *linear* polyester but that a degree of cross-linking of the polymer chains occurs[2].

Kemp and Peters suggest that the principal hydrolytic product of the polyester, an acid of the approximate molecular formula $C_{18}H_{36}O_5$, is a trihydroxy-monocarboxylic acid; if this suggestion is correct, the elastic properties of the natural polymer may be reproduced in synthetic polyesters derived from polyhydroxymonocarboxylic acids.

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[1] *Nature*, **154**, 762 (1944).
[2] Kemp and Peters, *India Rubber World*, **110**, 639 (1944).
[3] *C.R.*, **147**, 1311 (1908); **150**, 874 (1910); **186**, 1746 (1928); *J. pharm. chim.* [6], **29**, 561 (1909); **30**, 10 (1909); [7], **1**, 425 (1910); [7], **3**, 101 (1911).
[4] Lycan and Adams, *J. Amer. Chem. Soc.*, **51**, 635, 3450 (1929). Chuit and Hausser, *Helv. Chim. Acta*, **12**, 463 (1929).
[5] *J. Amer. Chem. Soc.*, **54**, 1559 (1932).
[6] *J. Amer. Chem. Soc.*, **51**, 2560 (1929).