114. A NOTE ON THE EPIDERMIS OF THE RAT ON A FAT-FREE DIET

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THE following histological observations were made on rats described in the previous papers by Smedley-MacLean & Hume.

Sections of the skin from a rat on a full normal diet, a rat on a fat-free diet for about 11 months and a rat on a fat-free diet with a supplement of methyl arachidonate or linseed oil for the same period were examined. Two rats which had been on a fat-free diet with and without a supplement of unsaturated acid and in which tumours had been implanted and grown were also examined. There were no changes in the skins of the tumour-implanted rats, other than those produced by diet; it will therefore be convenient to describe the skin of the normal rat and those of the rats on fat-free diet and on fat-free diet with the addition of unsaturated acid respectively.

The whole animal was first placed for a short time in formaldehyde-saline and the tissues partially fixed in order to facilitate the removal of portions of tissue which could be cut at right angles to the surface so as not to produce apparent increases in the thickness of the epidermis through cutting at a slight angle from the vertical. In each case portions of skin were examined from different parts of the body, care being taken to remove them from as near the same place in each rat as possible. Every care was taken in embedding and cutting the sections to ensure that they were cut as near to a right angle from the surface of the skin as possible.

The epidermis of the rat on a normal diet was very thin, about one to two cells deep, except at the opening of hair follicles where it was slightly thicker. In the rat there is very little differentiation into layers. Next to the corium there is a layer in which one or two rows of nuclei can be seen; cell outlines are very indistinct; above this layer there is an extremely thin line of granules which represents the stratum granulosum and attached to this are a few horny flakes (Fig. 1 (a)).

The epidermis of the rats on fat-free diets was thicker, and showed greater differentiation than that of the normal rat. Two to three layers of cells could be distinguished with more definite cell outlines than in the normal. The nuclei of cells next to the corium stained rather more deeply than those farther away. There was a particularly well developed stratum granulosum with granules which stained intensely with haematoxylin. Above this layer there was a thick stratum corneum which was in places thicker than the rest of the epidermis. Just below the epidermis there was a slightly greater infiltration of cells than in the normal skin (Fig. 1 (b)).

The skins of two rats which had had fat-free diets with the essential unsaturated acids in addition were examined. In one the skin could hardly be distinguished from that of the normal rat; in the other it was intermediate in appearance between the skin of the normal rat and those on fat-free diets. In neither was the skin as thick as in rats on fat-free diets; the keratinization was less, and the stratum granulosum was also less distinct (Fig. 1 (c)).

Fig. 1. Camera lucida drawings illustrating the skin of the flank of (a) normal rat, (b) rat on fat-free diet, (c) rat on fat-free diet plus linseed oil.

The measurements of the thickness of the epidermis excluding the horny layer were as follows:

	mm.
Normal	0.011
Rat on fat-free diet (1)	0.028
" (2)	0.021
Rat on fat-free diet plus linseed oil (1)	0.014
" (2)	0.011

SUMMARY

The epidermis of rats on fat-free diets becomes thicker, and more differentiated than that of normal rats, the stratum granulosum becoming especially distinct and the horny layer thick. When rats were fed on fat-free diets with supplements of unsaturated acids the epidermis was found to be nearly normal.