From this observation we may conclude that there is also an interlocking of the tonofibrils of the basal cells, and dermal fibres, as part of the system by which the epidermis adheres to the dermis.

Examining the silver-stained sections counterstained with periodic acid–Schiff reagent, no homogeneous periodic acid–Schiff-positive layer, as reported by Gersh and Catchpole[6], was observed between the dermis and epidermis. However, fine periodic acid–Schiff-positive fibrils were observed to extend from the silver-stained dermal fibres and to project into the epidermis. These fibrils appeared to be continuous with the dermal fibres and to be free ending. They varied in length, the longer fibrils at the tips and base of the papillæ. No epidermal structures were stained in these preparations. Fig. 1*b* shows these fine fibrils projecting beyond the silver stained dermal fibres. Fig. 1*c* shows at a lower magnification the fibrils forming a fringe above the dermal fibres.

Such free-ending periodic acid–Schiff-positive fibrils extending from the subepithelial argyrophilic network have not previously been described. As the fibrils stained intensely with periodic acid–Schiff reagent we may conclude that they are closely associated with mucopolysaccharides, and so it is unexpected that the silver failed to deposit on them. The relationship of these fibrils with the epidermal cells remains to be established.

Betty M. Haines

British Leather Manufacturers' Research Association, Milton Park, Egham, Surrey.

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Enzyme Changes in the Ageing Periosteum

Acid and alkaline phosphatase, cytochrome oxidase and succinic dehydrogenase activities of the periosteum of the femora of 100 normal and 100 traumatized animals were studied histochemically. The animals ranged from newborn to more than one year of age. Trauma was induced by drilling a hole in the midfemoral region.

A steady state of phosphatase activity was revealed in the osteogenic layer of the periosteum of normal animals except for a slight rise at a time comparable to the period of maximum bone formation and a reduction at about the time of sexual maturity. Animals exhibited a rise in dephosphorylating activity throughout the different age groups at the trauma site (Fig. 1, top).

The respiratory enzyme activity of the periosteum of normal animals was high at birth and increased at five weeks; a drastic reduction, however, was observed in all the older animals. At the site of trauma an increase in respiratory enzyme activity occurred but to a lesser degree with increasing age of the animal (Fig. 1, bottom).

Zorzoli[1] has reported an increase in acid phosphatase activity in the cells of old animals. Weinbach and Garbus[2] have shown that in the liver and brain of old animals the respiratory level was maintained.

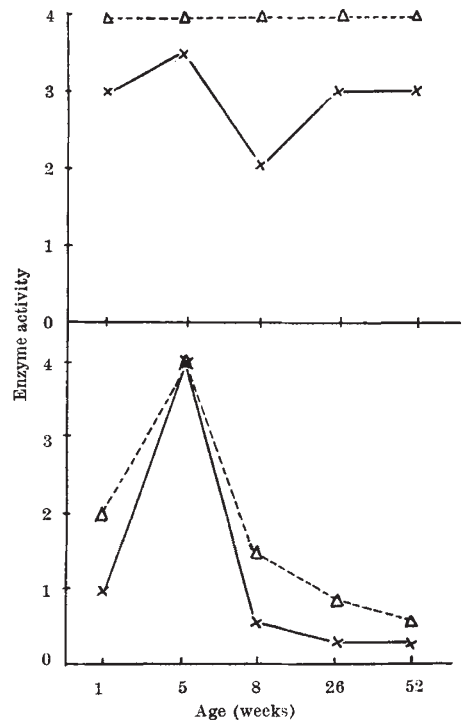

Fig. 1. Enzyme activity based on intensity of precipitate and colour in the osteogenic layer of the periosteum of rat femora taken at different ages. ×, Normal periosteum; △, traumatized periosteum. Top, phosphatase activity; bottom, respiratory enzyme activity

This was supported by Bourne[3]. Bourne[4] further indicated that there was evidence of some increase in cytochrome oxidase and succinic dehydrogenase activity in the tissues of older animals.

It appears that, at least in the periosteum of rats, phosphatases do not increase with ageing, and the respiratory enzyme activity decreases to a low level. This is further supported in the observation that the cells of the periosteum of traumatized animals are less able to increase their respiratory enzyme activity with increasing age to levels seen in younger animals.

Bourne[3] states that the consequence of dephosphorylation of metabolically important substances may be behind the fundamental processes involved in cellular senescence. Trauma to bone at any age leads to increased dephosphorylation which is essential for bone repair mechanisms. This brings renewed life to an injured area. The respiratory enzymes, however, are associated with the reactions which make energy available to cells for various activities. The reduction in the activity of these enzymes is believed to be involved with cellular changes which bring about the gradual disappearance and death of the osteoblasts, which in turn reflect a reduction in bone repair rate and growth with increasing age.

The present results will be published elsewhere in greater detail.

E. A. Tonna

Dept. of Histo-Cytochemistry, Hospital for Special Surgery, New York.

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