BIOCHEMICAL JOURNAL LETTERS

Eosinophils and connective tissue catabolism

Hibbs *et al.* (1982) have presented good evidence for specific degradation of types I and II collagens by guinea-pig peritoneal eosinophils. Their results amplify our discovery of collagenase activity in eosinophil fractions from rat peritoneal exudates (Bassett *et al.*, 1976). However, in the recent papers of Davis *et al.* (1981) and Hibbs *et al.* (1982), describing collagen destruction or degradation by eosinophils, the emphasis has been on the application of such findings to pathological or inflammatory states. It is timely, therefore, to resurrect an earlier publication (Bassett, 1962) in which I postulated a role for eosinophils in connective tissue catabolism in normal conditions. This conjecture was based on observations of these cells in modified connective tissue in sex hormone-sensitive sites in animals from various species in oestrus, late pregnancy and early postpartum involution. It was thought that the eosinophils which infiltrate such tissues could be involved in the removal of connective tissue proteins (collagen and 'ground substance') newly synthesized during gestation or oestrus and subsequently surplus to the needs of the organism. From these considerations came the idea of testing eosinophils for collagenase activity (Bassett *et al.*, 1976).

In a later publication (Bassett *et al.*, 1977), it was shown that eosinophils increase in number and change in morphology (shown in colour illustrations) also during the post-inflammatory or remodelling phase of healing dermal wounds, after the disappearance of neutrophils, when simultaneous collagen synthesis and degradation is taking place (Woessner, 1968). The concept that eosinophils could play a role in connective tissue catabolism, whether normal or pathological, was again discussed in relation to these findings and to information from a retrospective literature search. There have been many accounts of situations, mostly pathological but some normal, in which the numbers of tissue eosinophils paralleled the extent of connective tissue change. Only two authors could be found, however, who postulated a causal relationship between these two phenomena. Schwarz (1914), who extensively reviewed the earliest literature, considered such a possibility but discarded it with reluctance since it was entirely foreign to the (then) knowledge of leucocyte function. Voss

(1935), in describing an influx of eosinophils into the seminal vesicles of castrated male mice treated with androgens, did think that eosinophils could be implicated in catabolism of the associated loosened connective tissue.

In our 1976 paper we also reported collagenase activity in neutrophil-rich preparations, confirming similar findings in other laboratories (since expanded; Murphy *et al.*, 1980). We discussed, in this and in our 1977 paper, the likely roles of the two kinds of granulocyte within connective tissue. Neutrophils, which are confined to the early acute inflammatory phase of healing wounds, could be responsible for the concurrent drastic degradation of collagen. Eosinophils, occurring in the absence of neutrophils in remodelling tissues of sex hormone-sensitive sites and in the later phases of healing wounds, could perform a more subtle regulatory function in connective tissue metabolism.

Although there has been so much circumstantial, and now more direct, evidence for eosinophil involvement in connective tissue change, such a premise has received little attention in comparison with other theories for the purpose of these cells (Mahmoud & Austen, 1980), for which the indications are no stronger than those which support a function integral to connective tissue metabolism. One of the most commonly held notions is that eosinophils play a role in some immune reactions. The report of Chase & Hunziger (1974) of new collagen and eosinophils in sites of contact sensitization suggests that these apparently different hypotheses could have a common basis and thus need not be mutually exclusive.

In the above comments the wording 'connective tissue' rather than more specifically 'collagen' has been deliberate. It must be borne in mind that collagenous fibres do not exist in isolation in the tissues and that in situations where there is collagen breakdown, the non-collagenous components of the extracellular matrix must be degraded too. It is not unlikely that eosinophils could be implicated in this process also; for instance, arylsulphatase, another eosinophil enzyme (Weller *et al.*, 1980), could be responsible for catabolism of the proteoglycans.

E. Gertrude BASSETT
Connective Tissue Research Laboratory,
Nelson Hospital,
Nelson, New Zealand

(Received 22 April 1983)

- Bassett, E. G. (1962) *Nature (London)* **194**, 1259–1261
- Bassett, E. G., Baker, J. R., Baker, P. A. & Myers, D. B. (1976) *Aust. J. Exp. Biol. Med. Sci.* **54**, 459–465
- Bassett, E. G., Baker, J. R. & de Souza, P. (1977) *Br. J. Exp. Pathol.* **58**, 581–605
- Chase, M. W. & Hunziger, N. (1974) in *Progress in Immunology* (Brent, L. & Holborow, J., eds.), vol. 3, pp. 369–372, North-Holland, Amsterdam
- Davis, W. B., Gadek, J. E., Fells, G. A. & Crystal, R. G. (1981) *Am. Rev. Resp. Dis.* **123**, 55a
- Hibbs, M. S., Mainardi, C. L. & Kang, A. H. (1982) *Biochem. J.* **207**, 621–624
- Mahmoud, A. A. F. & Austen, K. F. (eds.) (1980) *The Eosinophil in Health and Disease*, Grune and Stratton, New York, London, Toronto, Sydney and San Francisco
- Murphy, G., Bretz, U., Baggiolini, M. & Reynolds, J. J. (1980) *Biochem. J.* **192**, 517–525
- Schwarz, E. (1914) *Ergeb. Allg. Pathol. Pathol. Anat. Menschen Tiere* **1A**, 616
- Voss, H. E. (1935) *Tr. Din. Razvit.* **10**, 249–251
- Weller, P. F., Wasserman, S. I. & Austen, K. F. (1980) in *The Eosinophil in Health and Disease* (Mahmoud, A. A. F. & Austen, K. F., eds.), pp. 115–128, Grune and Stratton, New York, London, Toronto, Sydney and San Francisco
- Woessner, J. F. (1968) in *Treatise on Collagen* (Ramachandran, G. N. & Gould, B. S., eds.), vol. 2B, p. 313, Academic Press, New York