BIOCHEMICAL JOURNAL LETTERS

Nomenclature: protease, proteinase and peptidase

There has long been widespread uncertainty about the exact meanings of the terms 'protease' and 'proteinase'. Now that the ambiguity about the related term 'peptidase' has been resolved (Barrett & McDonald, 1985; Dixon & Cornish-Bowden, 1985), the time may be right to attempt a further clarification of the nomenclature of proteolytic enzymes.

The term 'protease' was already very well established as the word for enzymes that degrade proteins by hydrolysis of peptide bonds when Grassman & Dyckerhoff (1928) recognized that there are two very different types of these enzymes. They noted that some proteolytic enzymes act best on intact proteins, whereas others show a preference for small peptides as substrates. In view of this, Grassmann & Dyckerhoff (1928) (in a footnote to the first page of their paper) proposed the new term 'proteinase' for proteases that show specificity for intact proteins. The nature of the differences in specificity between the two groups of proteases became much clearer as a result of work with synthetic peptide substrates with or without blocked terminal residues, and was neatly expressed in the terms 'endopeptidase' and 'exopeptidase' by Bergmann & Ross (1936).

It can be seen in Scheme 1 that there are two acceptable terms equivalent to 'peptide (bond) hydrolase' and also to 'endo-acting peptide (bond) hydrolase'. The 'peptidase' terms are undoubtedly the more rational, and probably should eventually become standard. In the shorter term, it would be difficult to recommend abandoning 'protease' completely until the

recent clarification of the meaning of 'peptidase' has had time to gain acceptance. 'Proteinase' also can continue to be used, although it is not entirely satisfactory, because some might expect the word to apply to exopeptidases that degrade proteins as well as to endopeptidases. The terms 'endoprotease' and 'endoproteinase' that have appeared in the literature are unnecessary, and should not be used.

It should be noted that some peptidases show both endopeptidase and exopeptidase activity (e.g. cathepsin B: Bond & Barrett, 1980; McKay *et al.*, 1983). These peptidases have normally been classified as endopeptidases (reviewed by J. K. McDonald in McDonald & Barrett, 1986), and it seems to us wise to maintain that convention.

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Scheme 1. The acceptable terms for the major types of proteolytic enzymes

The italicized, semi-systematic terms serve to describe the meanings of the words below. The terms introduced by Bergmann & Ross (1936), shown in bold type, are preferable on purely rational grounds, but the equivalent terms 'protease' and 'proteinase' have historical precedence, and are satisfactory when used correctly.

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