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Book reviews

Developments in Food Carbohydrate — 3, Disaccharidases: edited by C. K. LEE AND M. G. LINDLEY, Applied Science Publishers, London, England, and Englewood, New Jersey, U.S.A., 1982, xii + 211 pages + Subject Index, £ 26.00; $52.00.

The objective of the editors of *Developments in Food Carbohydrate — 3, Disaccharidases* has been to assemble available and current information on the important disaccharidases, particularly their occurrence, isolation, properties, applications in the food industry, importance in nutrition, and role in health and disease. The list of disaccharidases includes the abundant and widely distributed enzymes invertase, lactase, α-D-glucosidase and the sucrase–isomaltase complex, and the less common enzymes trehalase, cellobiase, melibiase, and related disaccharidases. In addition, the book contains sections on the physiological, biochemical, nutritional, and medical aspects of disaccharidases, on the biosynthesis and metabolism of food disaccharides, and on enzymic deficiency, and malabsorption of food disaccharides. The editors have selected experienced workers in the area of research on disaccharidases to contribute chapters. The book contains information that should be useful to researchers investigating certain types of disaccharidase systems, but it is quite deficient in the coverage of, and interpretations of the literature on, others. In general, the volume constitutes an elementary treatment of enzymes of importance in the metabolism of disaccharides, presents few suggestions for new directions for further research, omits many significant research papers, and contains a number of inaccuracies and incorrect interpretations. Accordingly, the aim of the editors to bring together the diffuse literature on disaccharidases into one volume, with an up-to-date review of current research activity, has not been achieved. Documentation of these conclusions is presented in the remarks on the individual chapters.

In Chapter 1 (Invertase), the discussion of the hydrolase and the transferase activities of invertase is inaccurate. The author considers the two types of activities of invertase as separate reactions. However, there is good evidence in the literature showing that the activities are interrelated, and occur *via* a common intermediate, specifically, a fructosyl–enzyme intermediate. Also, the equation given for the transferase reaction shows a molecule of water as a reactant, but water does not participate in the transferase reaction! References to original papers dealing with the transfructosidase activity of invertase have not been given. The statements on the invertase of *Streptococcus mutans* and on the role of this enzyme in dental-caries formation are misleading. It is stated that the invertase from this organism hydrolyzes sucrose to fructose and glucose, and the glucose is then polymerized to dextran. However, although the synthesis of dextran does occur from sucrose, the polymer is produced by a dextransucrase of *S. mutans* that transfers the D-glucosyl group from a donor

sucrose-molecule to an acceptor sucrose-molecule, eventually yielding the dextran polymer. Many invertases are glycoproteins containing various types of oligo- and poly-saccharide chains attached to the protein, and much research has been conducted on the biosynthesis of the carbohydrate chains of such molecules. However, the Scheme presented in this Chapter for the mechanism of addition of carbohydrate residues to invertase is still unproved, and a statement to this effect should have been included. References 94, 95, and 96 have not been cited in the text of the article.

In Chapter 2 (Lactases), the discussion on the mechanism of hydrolysis of lactose by lactase is incomplete, and several important contributions to developments in this area have been omitted. Specifically, the evidence for the formation of a galactosyl–enzyme complex and its role in the synthesis of transfer products has not been discussed in sufficient detail. The trans-galactosidase activity of lactase is extremely important in many biological systems and industrial processes, and is closely associated with the hydrolase activity.

In Chapter 3 (Enzymes Capable of Hydrolysing Maltose), the enzymes having this type of activity have been classified into three groups: α-glucosidase, glucoamylase, and saccharogenic α-amylase. It seems unnecessary to introduce the third group into the classification scheme. The literature on saccharogenic α-amylase is scarce, and the establishment of a new group for this type of α-glucosidase is not warranted until such enzymes have been better characterized. The saccharogenic α-amylase appears to be a type of glucoamylase, and, contrary to the statements of the author, the action of this enzyme on starch is not different from the action of the glucoamylases from molds of the *Aspergillus* and *Rhizopus* groups. The glucoamylases are glycoproteins containing carbohydrate side-chains attached to the protein. The complete structure of the oligosaccharide side-chains of a fungal glucoamylase has been determined by methylation analysis and reductive alkaline-elimination reactions, and this work was published in 1980. The discussion on the structure of glucoamylase does not include this recent information. The author states that it is generally agreed that isomaltose is not hydrolyzed by glucoamylase, but, on the same page, a value is given for the relative rate of hydrolysis of isomaltose by glucoamylase! There is obviously a discrepancy between the statement and the analytical value.

In Chapter 4 (Trehalases), there is considerable discussion of trehalases from mammalian tissues. It is generally regarded that such enzymes are of little importance in the metabolism of carbohydrates in mammalian tissue.

In Chapter 5 (Sucrase–Isomaltase Complex), the concept is presented that the disaccharidase complex in the human intestine is composed primarily of sucrase and isomaltase. Each of these enzymes also exhibits maltase activity. This concept does not appear to this reviewer to be based on good experimental evidence. Maltase is a major disaccharidase in the human digestive-system, and hydrolysis of maltose arising from the breakdown of starch by amylases is effected by the maltase. The maltase is, therefore, an important enzyme, and should be given prominence in a discussion of these disaccharidases. Such statements as, that isolated sucrase had good activity against all α-D-(1→4)-glucosidic linkages, and that the sucrase-iso

maltase complex can initiate the hydrolysis of α-dextrin by removing α-linked D-glucose residues from the dextrin, cannot be rationalized in the light of the known specificities of carbohydrases. The presence of a carboxyl group in the threonine residue in the sequence shown for the polypeptide of the isomaltase molecule is unexplained in the text.

In Chapter 6 (Cellobiases and Others), the discussion on cellobiase does not include information on the β-D-glucosidase from almonds. There is a large volume of literature on this disaccharidase, and some discussion of this enzyme would appear to have been in order.

In the last two Chapters (7 and 8), information on the biosynthesis, metabolism, enzymic deficiency, and malabsorption of food disaccharides has been assembled. The information is complete, and should be of value to investigators in the area of food disaccharides. However, there is little discussion of the enzymology of disaccharides and, particularly, of the nature and the properties of the enzymes involved.

In conclusion, this volume of *Developments in Food Carbohydrate* deals with only a small segment of carbohydrate enzymology, and only contains information on the enzymes of hydrolysis and metabolism of disaccharides. The depth of coverage of these topics is somewhat superficial and fragmentary. It is questionable if the book would be useful as a text book in either a beginning or an advanced course, although it could be used for supplementary reading-assignments in an advanced course on carbohydrates. In view of the specialized nature of the book, it is probably more appropriate as a purchase for Libraries than for personal collections. The price, for a book of only 211 pages, seems high.

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Biotechnology: A Comprehensive Treatise in 8 Volumes, Volume 1, *Microbial Fundamentals*: edited by H.-J. REHM AND G. REED, Verlag Chemie, Weinheim, 1981, viii + 505 pages + Subject Index, DM 4.95.00.

This is Volume 1 in a series that, rather dauntingly, refers to itself as a "comprehensive treatise in 8 volumes". Future volumes will have to decide whether this description can truly be applied to the series. This first volume, "Microbial Fundamentals", does not seem to be a perfectly adequate beginning for such a self-imposed mission. It contains a mixture of topics that every biotechnologist should know and, indeed, probably already does know, but which every budding biotechnologist will have a hard time learning from the light treatments given in this book. The emphasis overall is on the biology that can be used in connection with work employing large industrial vats. The editors choose not to consider agriculture, or the more fanciful,