

The specification of

There are many enzyme products available on the market, all making various claims of efficacy, both qualitatively and quantitatively. However, the nomenclature is often confusing. A simple, comprehensive generic nomenclature, specifying acronyms for main and side activities would make marketing and purchasing decisions much easier.

By Gordon D. Rosen



Incomplete product specifications handicap efficient use of exogenous feed enzymes. Vague descriptors, such as *multi-enzyme complex*, *enzyme cocktail* and *Product X*, hinder comparisons, selections and optimal dosages in productivity improvement and pollution abatement. Few, if any, enzyme preparations merit presentation as singular enzyme products and sole declared activities given as product guarantees may or may not be the sole determinants of *in vivo* potencies. Also, confusion ensues from single declared activity approvals when such products are marketed as multiplex enzyme admixtures. At the other end of the scale there are concoctions, such as 'Unizyme A', comprising 'fungal endoglucanases + fungal exoglucanases + cellulase + lichenase + laminarinase + xylanase + bacterial beta-glucanase + fungal alpha-amylase + bacterial gluco-amylase + a protease complex with neutral and acid proteases', without enzyme concentrations (Jeroch, 1991). Hence, an explicit specification system is

needed to optimise practical application of exogenous feed enzymes.

Enzyme types

As background to the proposal herein of a translucent working system, *Table 1* lists 10 key enzyme activities from the European Union Feed Additives Directive 70/524 and publications of the USA Food & Drug Administration, the Association of American Feed Control Officials and Agriculture & Agri-Food Canada. Of these, amylases, beta-glucanases, cellulases, phytases and xylanases are the most ubiquitous, followed by peptidases (also known as proteinases or proteases) and a few galactosidases, lipases, mannosidases and polygalacturonases. Seven of these are classified as α -glycosyl glycosidases, with two ester hydrolases and the endopeptidases (mainly aspergillopepsin, bacillolysins and subtilisin) in the Recommendations of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (Enzyme Nomenclature

Committee, 1992). The term *peptidase* (synonymous with peptide hydrolase) is now used for all enzymes hydrolysing peptide bonds in peptides and proteins.

Specification system

The scheme propounded herein employs singular, self-explanatory acronyms constructed from the *Table 1* nomenclature codes, to which are attached the enzyme concentrations in units per milligram (u/mg) of product. Xy-ase, BeXy-ase, AmBeliXy-ase, GaMaPeXy-ase, BeCeGaPhyXy-ase and AmBeCePePoXy-ase are examples of the single, diase, triase, tetrase, pentase and hexase product categories. Singles are articulated in full or as letter pairs. Pronunciation of the pentase and hexase names is facilitated by a momentary pause after the initial triplet, i.e. AmBeCe...LiBeXy.

In recent research, 1,322 Brozyme publications on broiler exogenous enzymes (Rosen, 2003a) and 1,282 Pigzyme publications on weaner, grower and fatterer pig

feed enzymes

enzymes (Rosen, 2003b) contained 507 unique enzyme products differing in components and/or potencies. This collation contracts to the 52 product types shown in Table 2. Each acronym specifies the components to which product enzyme potencies are then attached, e.g., Xy 4u/mg, Ph 5u/mg, BeCeXy 18/8/26u/mg, BeCePhyXy 40/9.1/5.8/19u/mg and am.Be.ce.po.Xy .55/.80u/mg with side activities.

Summary comment

The above system has been useful in effecting and presenting Brozyme and Pigzyme comprehensive multi-factorial analytical research on models for the prediction of exogenous enzyme responses in praxis, relative to genetic, environmental, dietary and posological variable factors. The validity, utility and viability of this schema, in relation to the exigencies of scientific

journal/trade press reporting of experiments, application in regulatory control systems, marketing activities and consumer affairs is open for discussion.

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References

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Table 1 - Main exogenous feed enzyme types

NC - IUBMB ¹ no.	Sub-sub-class	Working name	Nomenclature codes ²
3.1.1.3	carboxylic ester hydrolase	lipase	Li li
3.1.3.8/26	phosphoric mono-ester hydrolase	phytase (3-/6-)	Ph (or Phy ³) ph
3.2.1.1	o-glycosyl glycosidase	amylase	Am (or Amy ³) am
3.2.1.4	o-glycosyl glycosidase	cellulase	Ce ce
3.2.1.6	o-glycosyl glycosidase	betaglucanase	Be be
3.2.1.8	o-glycosyl glycosidase	xylanase	Xy xy
3.2.1.15	o-glycosyl glycosidase	polygalacturonase	Po po
3.2.1.22	o-glycosyl glycosidase	galactosidase	Ga ga
3.2.1.25	o-glycosyl glycosidase	mannosidase	Ma ma
3.4.21.62	Endopeptidases	peptidase	Pe pe
3.4.23.18	(serine/aspartic/ metallo)		
3.4.24.28			

1 NC-IUBMB Nomenclature Committee of the International Union of Biochemistry and Molecular Biology

2 the code (e.g. Xy) indicates enzyme units/mg product known; lower case (e.g. xy) indicates unquantified side-activity

3 when needed to facilitate acronym enunciation

Table 2 - Working acronyms for single and multiplex exogenous feed enzyme products

CATEGORY	WORKING ACRONYMS
Single	Am, Be, Ce, Ga, Li, Ma, Pe, Ph, Po, Xy, ambeCepo, ambephyXy
Diase	AmBe, amBecepoXy, AmPe, AmyXy, BePo, BeXy, CePe, CeXy, PeXy, PoXy
Triase	AmBeCe, AmBePe, AmBePo, AmBeXy, AmCePe, AmCeXy, AmPePhy, AmPeXy, BeCeXy, BePeXy, BePoXy, CePeXy
Tetrase	AmBeCeXy, AmBeceliPePhy, AmBePeXy, AmBePoXy, AmCegaPeXy, BeCePeXy, BeCePhyXy
Pentase	AmBeCeLiPe, AmBeCePePo, AmBeCePeXy, AmBeCePhyXy, AmBePePhyXy, AmBePePoXy, AmCeLiPePo
	AmCePePhyXy, BeGaPePoXy
Hexase	AmBeCeLiPeXy, AmBeCePePoXy