

Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB)
Enzyme Nomenclature

Classification and Nomenclature of Enzymes by the Reactions they Catalyse

For Ukrainian translation [click here](#).

1. General principles

Because of their close interdependence, it is convenient to deal with the classification and nomenclature together.

The *first general principle* of these 'Recommendations' is that names purporting to be names of enzymes, especially those ending in *-ase*, should be used only for single enzymes, *i.e.* single catalytic entities. They should not be applied to systems containing more than one enzyme. When it is desired to name such a system on the basis of the overall reaction catalysed by it, the word *system* should be included in the name. For example, the system catalysing the oxidation of succinate by molecular oxygen, consisting of succinate dehydrogenase, cytochrome oxidase, and several intermediate carriers, should not be named *succinate oxidase*, but it may be called the *succinate oxidase system*. Other examples of systems consisting of several structurally and functionally linked enzymes (and cofactors) are the *pyruvate dehydrogenase system*, the similar *2-oxoglutarate dehydrogenase system*, and the *fatty acid synthase system*.

In this context it is appropriate to express disapproval of a loose and misleading practice that is found in the biological literature. It consists in designation of a natural substance (or even of an hypothetical active principle), responsible for a physiological or biophysical phenomenon that cannot be described in terms of a definite chemical reaction, by the name of the phenomenon in conjugation with the suffix *-ase*, which implies an individual enzyme. Some examples of such *phenomenase* nomenclature, which should be discouraged even if there are reasons to suppose that the particular agent may have enzymic properties, are: *permease*, *translocase*, *reparase*, *joinase*, *replicase*, *codase*, *etc.*

The *second general principle* is that enzymes are principally classified and named according to the reaction they catalyse. The chemical reaction catalysed is the specific property that distinguishes one enzyme from another, and it is logical to use it as the basis for the classification and naming of enzymes.

Several alternative bases for classification and naming had been considered, *e.g.* chemical nature of the enzymes (whether it is a flavoprotein, a hemoprotein, a pyridoxal-phosphate protein, a copper protein, and so on), or chemical nature of the substrate (nucleotides, carbohydrates, proteins, *etc.*). The first cannot serve as a general basis, for only a minority of enzymes have such identifiable prosthetic groups. The chemical nature of the enzyme has, however, been used exceptionally in certain cases where classification based on specificity is difficult, for example, with the peptidases (subclass [EC 3.4](#)). The second basis for classification is hardly practicable, owing to the great variety of substances acted upon and because it is not sufficiently informative unless the type of reaction is also given. It is the overall reaction, as expressed by the formal equation, that should be taken as the basis. Thus, the intimate mechanism of the reaction, and the formation of intermediate complexes of the reactants with the enzyme is not taken into account, but only the observed chemical change produced by the complete enzyme reaction. For example, in those cases in which the enzyme contains a prosthetic group that serves to catalyse transfer from a donor to an acceptor (*e.g.* flavin, biotin, or pyridoxal-phosphate enzymes) the name of the prosthetic group is not normally included in the name of the enzyme. Nevertheless, where alternative names are possible, the mechanism may be taken into account in choosing between them.

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In consultation with the IUPAC-IUBMB Joint Commission on Biochemical Nomenclature (JCBN)

Enzyme Nomenclature

Recommendations of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology on the Nomenclature and Classification of Enzymes by the Reactions they Catalyse

<http://www.chem.qmul.ac.uk/iubmb/enzyme/>

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To SEARCH for Information on Enzymes on the Database CLICK HERE.

This page contains general information on enzyme nomenclature. It includes links to individual documents, and the number of these will increase as more sections of the enzyme list are revised. Links to other relevant databases are provided. It also provides advice on how to suggest new enzymes for listing, or correction of existing entries. There is a list of abbreviations used in the database.

Historical Introduction

In *Enzyme Nomenclature* 1992 there was an historical introduction. This web version is slightly edited from that in the book.

Printed Version

Published in *Enzyme Nomenclature* 1992 [Academic Press, San Diego, California, ISBN 0-12-227164-5 (hardback), 0-12-227165-3 (paperback)] with Supplement 1 (1993), Supplement 2 (1994), Supplement 3 (1995), Supplement 4 (1997) and Supplement 5 (in *Eur. J. Biochem.* 1994, **223**, 1-5; *Eur. J. Biochem.* 1995, **232**, 1-6; *Eur. J. Biochem.* 1996, **237**, 1-5; *Eur. J. Biochem.* 1997, **250**, 1-6, and *Eur. J. Biochem.* 1999, **264**, 610-650; respectively) [Copyright IUBMB].

Each enzyme has recorded at the end details of when first published in *Enzyme Nomenclature* or when added to the database and its subsequent history.

Web Version of Enzyme Nomenclature

The complete contents of *Enzyme Nomenclature*, 1992 (plus subsequent supplements and other changes) are listed below in enzyme number order giving just the recommended name. Each entry provides a link to details of that enzyme. Alternatively if looking for a specific reaction used in the classification of enzymes the broad outline defined by the first two numbers are given below. Each of these subclass entries is linked to a location where the category is subdivided to sub-subclasses. These in turn are linked to a list of recommended names for each enzyme in the sub-subclass.