

## Nomenclature of the Hormone-Producing Cells in the Adenohypophysis

### A Report of the International Committee for Nomenclature of the Adenohypophysis

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The International Committee for Nomenclature of the Adenohypophysis calls attention to the necessity for improving the present chaotic situation in the nomenclature of the hormone-producing cells in the adenohypophysis.

A full description of the cell types must be based upon both morphological and functional criteria, but there will be cases in which a morphological description is the only practical one.

The Committee recommends a standard system of functional names for the cell types but is unable to recommend a standard system of morphological nomenclature. However, the Committee draws attention, to certain criteria that must be satisfied if morphological descriptions are to be satisfactorily reproducible.

The study of hormone-producing cells in the adenohypophysis has long been hampered by a lack of uniformity in the nomenclature of these cells. In order to try to overcome this difficulty, a provisional committee was formed during the symposium on the histophysiology and cytology of the adenohypophysis in Paris, September, 1963 (Benoit and DaLage, 1963). Members of this committee are P. G. W. J. van Oordt (The Netherlands, President), E. Allara (Italy), S. A. D'Angelo (USA), C. Ezrin (Canada), M. Gabe (France), N. S. Halmi (USA), M. Herlant (Belgium), R. L. Holmes (England), A. G. Everson Pearse (England), H. D. Purves (New Zealand), J. Racadot (France), R. Reinboth (Germany), and E. G. Rennels (USA).

It is the primary task of the Committee to help all histologists in understanding the cytological aspects of the adenohypophysis, and to facilitate discussion about the form

and function of the adenohypophysial cell types.

The Committee strongly recommends the cannot be done by imposing a rigid terminology, if only because such a terminology would never be unanimously accepted. Moreover, the Committee emphasizes that the first requirement is a detailed description of the cell types; no terminology, however acceptable, can replace such a description. It should also be emphasized that there exist two fundamentally different terminologies: a functional one, based on a description of both the form and function of the cell types, and a morphological one, based on a morphological description only.

#### FUNCTIONAL NOMENCLATURE

The Committee strongly recommends the use of a terminology that is both functional and internationally uniform. It considers that a functional name should be based on

the name of the hormone secreted by the cell type.

Little is known with certainty about the adeno-hypophysial hormones in many vertebrates. In some mammals, however, seven different hormones have been identified, and many students of adeno-hypophysial cytology suppose that each of these hormones is formed in a distinct cell type. One of their arguments is the fact that seven morphologically distinct, hormone-secreting cell types have been found in the adeno-hypophysis (Benoit and DaLage, 1963).

The Committee prefers logical and practical names for these hormones and the corresponding cell types. These names should be short and easy to pronounce; they should have different initial letters in order to facilitate abbreviations; and if possible there should be a common suffix.

A majority of Committee members prefers the suffix *-tropic* to *-trophic*. However, since the presence or absence of the letter *h* is only a matter of etymology, and has never led to misunderstandings, the Committee as a whole thinks it unnecessary to make a definite choice between the two possibilities at present. Thus the use of the suffix *-tropic* in this report is purely arbitrary.

The Committee proposes the following functional names for the cell types:

(1) *Somatotropic or STH cells*.

(2) *Lactotropic or LTH cells*. The letters *LTH* stand for the new name *lactotropic hormone* and not for *luteotropic hormone*. The latter name only applies in the rat, and should therefore be abandoned. It is true that the hormone has many other functions apart from the stimulation of milk production; but if this particular function is seen as one aspect of the parents care for their offspring, the name *lactotropic* is acceptable, and it has the advantage of not being completely new and unfamiliar. Moreover, the names *prolactin* and *lactogen* cells can still be used.

(3) *Corticotropic or ACTH cells*.

(4) *FSH cells* and

(5) *ICSH cells*. These two are the *gonadotropic* or *GTH cells*. Names with the suffix *-tropic*, e.g., folliculotropic and

interstitiotropic, were rejected as too long and too difficult to pronounce. The name *LH cells* resembles too closely that of the *LTH cells*, and therefore seems impractical.

(6) *Thyrotropic or TSH cells*. It is realized that the word *thyrotropic* is etymologically wrong, and that it should be spelled *thyreotropic*. In fact, it is only in English that the letter *e* has been omitted. The Committee does not, however, wish to reintroduce it, as this detail of spelling will not lead to any confusion.

(7) *Melanotropic or MSH cells*. Purists might prefer the name *melanophorotropic*, but this is thought to be too long and therefore impractical.

These functional names can be used in all congress languages without great difficulties. Colleagues in Romanic countries might logically prefer to place the letter *H* in front of the other letters, e.g., *HACT* instead of *ACTH*. This, however, would make their literature unnecessarily difficult to read.

A functional nomenclature must always be based on sufficient evidence concerning the endocrine function of the cell types. Such evidence may be derived from correlative changes in the cell types and target organs, from quantitative measurement of cellular activity and hormone content, and from the results of immunological methods. In all cases, however, great care has to be taken that the functional names are used correctly.

A description of the function of the cell types is valueless without a description of their form. Without an adequate morphological description the functional names can refer only to the endocrine function of the entire adeno-hypophysis and can have no cytological significance. The necessity of a detailed morphological description does not, however, imply that functional names can be based on morphological criteria only. Neither the affinity for certain dyestuffs, the histochemical characteristics, the size and shape of the cells or their cytoplasmic granules, nor any other morphological characteristic can ever constitute a functional criterion.

## MORPHOLOGICAL NOMENCLATURE

There are cases in which the function of the adeno-hypophysial cell types cannot be studied in sufficient detail because of a lack of material or appropriate methods. Moreover, experimental work will not always reveal the function of all cell types. Generally speaking, when the function of a cell type remains unknown or doubtful, a morphological name must be used instead of a functional name.

The morphological nomenclature has been the subject of many discussions because it is in this field that the confusion seems greatest. There are several causes for this unhappy situation: the large variety of fixation and staining techniques, not seldom ill-described; many different nomenclatures, often used indiscriminately and in a functional as well as in a morphological sense; and mistakes in the comparison of different descriptions.

A correct morphological nomenclature is based on morphological criteria only. Therefore, these should always be described in great detail, including the techniques used in visualizing the cell types (fixation, embedding, staining). A description of new techniques must include the names of the firms where the dyestuffs and other chemicals can be obtained, and, if impure dyestuffs are used, their batch number should also be included. In short, the morphological description of the cell types should be in sufficient detail to make it possible to reproduce the results without great difficulty. The use of chemically pure dyestuffs and of standardized staining techniques will greatly facilitate the reproducibility.

During the symposium in Paris it was suggested that the difficulties that have arisen in morphological nomenclature might be overcome if the nomenclature was based upon a limited number of well-standardized techniques. Considered in this connection were the widely used periodic acid-Schiff (PAS)-orange G method; the various aldehyde-fuchsin methods (Halimi, 1952; Gabe, 1953); Herlant's Alcian blue at low pH PAS-orange G, and his tetrachrome methods (Herlant, 1960), the latter including E. Gurr's acid Alizarine blue; and Ezrin's

aldehyde thionine method (Ezrin and Murray, 1963).

The Committee has discussed the advantages and disadvantages of the introduction of standardized methods. It fully recognizes their great value and strongly recommends their general use. Nevertheless, the Committee has come to the conclusion that it is not practical to insist on a morphological terminology based on a restricted number of standardized techniques. One difficulty is that such methods may not be accepted into general usage. Moreover, it is felt that a restriction in the number of techniques might hamper the development of new and better cytological and cytochemical methods, and thus harm the progress of knowledge of adeno-hypophysial cell types.

This does not mean, however, that the Committee wants to keep the present chaotic situation unchanged. It agrees with those who consider that terminologies that have been applied indiscriminately in the past, such as Romeis' Greek letter system, need to be abandoned. But a discussion of possible new names, such as erythrophil and aurantiphil, has shown that it is impossible to justify the introduction of such neologisms. Not only are most of them barbarous, but many stress the tinctorial affinities of the cell types and do not refer to other morphological characteristics.

A morphological nomenclature, acceptable to all students of adeno-hypophysial cytology, and applicable to all vertebrates, is therefore unattainable at present. However, the Committee is convinced that present-day confusions will be overcome if accurate morphological descriptions are published in the future. Such detailed descriptions will allow the introduction of new morphological names, or even the use of old ones, if the authors can show that such old names are used in their original meaning.

It may seem that such an attitude leads backward instead of forward. But the Committee considers that a retreat to the basis of accurate morphological description is essential before any progress can be made. Functional description can follow when all students of adeno-hypophysial cytology are

agreed about the morphological description of the cell types. It is this enlargement of our knowledge of the adenohipophysial cell types that will enable us to give them appropriate names.

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