EDITORIAL NOTE

At a conference in Boston, Massachusetts, in December 1960, a number of leading workers on the structure of hemoglobins proposed a set of recommendations on nomenclature. These were submitted to the JOURNAL and were carefully considered by other workers in the field. We have now decided that their publication in the JOURNAL is desirable, although of course they do not have the official force of recommendations from commissions of the international scientific unions. The Editors regard the publication of these recommendations as an experiment, which we hope may have useful results. Publication of other proposals of this sort in the JOURNAL will be considered only in very exceptional cases, until there has been time for appraisal of the results of this experiment.

Contributors to the JOURNAL, who submit papers on the structure of hemoglobins, are not required to use the nomenclature here proposed. In the interest of developing clarity of communication among scientists, however, we recommend that contributors of such papers consider these proposals carefully and make use of this nomenclature unless they have specific reasons for considering it unsatisfactory. Obviously the proposals are subject to criticism and discussion. Correspondence concerning them should be addressed to Professor V. M. Ingram, Division of Biochemistry, Department of Biology, Massachusetts Institute of Technology, Cambridge 39, Massachusetts. The Editorial Office of the JOURNAL would welcome receiving copies of such letters.

The proposals follow.

CHAIN NOMENCLATURE

There is now general agreement on the naming of the peptide chains of the major components of normal human adult and fetal hemoglobins as the α, β, and γ chains; e.g. adult hemoglobin is written as α2β2γ4 and fetal hemoglobin as α2β2γ2. The superscripts A and F refer to the fact that the particular chain is the one found in the human adult and fetal hemoglobins. It is recommended that this practice be continued and that the symbols α, β, and γ, without superscripts, be reserved for those occasions when reference is being made to, for example, α chains in general.

Information concerning the structure of the chains of hemoglobin A2 is now sufficient to indicate that one of the chains is identical with the α chain, whereas the second differs in a number of residues from the three foregoing chains. In addition there is evidence (see for instance Copellini (1)) to indicate that the genetic control of this unique chain is independent of the genes for the α, β, and γ chains. It is therefore recommended that this chain be designated as δA2; Hb A2 is then written as α2β2γ2A. Again, one could refer simply to δ chains in the general case.

The simplest method of naming the tryptic peptides of a chain is to number them in the order in which they occur in the chain, beginning with the NH₂-terminus. The symbol for the chain is included as a part of the designation. The letters Tp are included to identify that these are the peptides obtainable by tryptic digestion. For example, the third tryptic peptide of the α chain would be αTpIII in this system. Where a lysyl bond is not attacked under the conditions used, the symbol for the resultant “dipeptide” or “double peptide” would contain the numbers appropriate to both tryptic peptides, e.g. αTpI,II. From the published structure of the α and β chains (Braunitzer et al. (2); Hill and Konigsberg (3); Konigsberg et al. (4)) and from the amino acid composition, it is evident that the α chain will contain the tryptic peptides αTpI to αTpXIV and the β chain the tryptic peptides βTpI to βTpXV. It so happens that the tryptic “peptides” αTpVIII and βTpVIII are lysine. In addition, the present methods of tryptic cleavage do not break the bond separating the expected tryptic peptides αTpXII and αTpXIII, nor the bond between the expected peptides βTpX and βTpXI. In view of the possibility that these bonds might be split in some experiments at a later date, it is felt that the numbering system should correspond with the theoretical number of tryptic peptides.

When the complete sequence of the chains is determined beyond question and is published, then a more specific designation involving residue numbers should be adopted. Thus, αTpI can be designated as αTp1-8.

NOMENCLATURE OF THE ABNORMAL HEMOGLOBINS

An ideal nomenclature system for the abnormal hemoglobins would provide for adequate designation of the chemical structure at each stage of the investigation. The following system is an attempt to meet this requirement.

When only the chain in which the abnormality resides is known, then the hemoglobin may be written as α2β2γ2 or α2β2γ2human. When the abnormality has been located in a particular tryptic peptide, as by fingerprinting, then the designation should be, for example, α2β2γ2I. When the amino acid composition of the tryptic peptide indicates a particular amino acid substitution, then this will be indicated as α2β2γ2TYP1 for Hb S. Finally, when the amino acid interchange has been located at a particular residue position in the chain, the fully descriptive formula, as in the case of Hb S, would be in the form: α2β2γ2I IV for Hb S.

Presumably, for use in formulas describing experiments such as reassociation, it will be necessary to define in a given paper a one letter designation for a particular hemoglobin. For example, the formula α2β2γ2 could be used, provided that wherever possible the individual hemoglobins have been defined, as, for example, Hb I as α2β2γ2 and Hb S as α2β2γ2 IV.

It is strongly urged that no further letters be assigned to abnormal hemoglobins. Newly discovered hemoglobins, prior to their chemical identification, should be known by the letter designation of the previously described hemoglobin whose electrophoretic mobility they most nearly resemble. To the letter should be attached a subscript indicating the geographic origin of the new hemoglobin.

Proposals similar to the above originated during a Hemoglobin Structure Workshop held in Boston, December 14 to 16, 1960.
These proposals have been modified at the suggestion of other workers in the protein structure field. In their present form they represent a compromise between the views of these two groups.

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REFERENCES

Recommendations for the Nomenclature of Hemoglobins


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