

## LETTERS TO THE EDITORS

*The Editors do not hold themselves responsible for opinions expressed by their correspondents. No notice is taken of anonymous communications.*

## Terminology of Nucleic Acids

So far as is known at present, nucleic acids are of two types, differentiation depending on the nature of the sugar which is present. In one type, the sugar is a pentose, and in those examples which have been sufficiently investigated, this pentose is *D*-ribose; the nitrogenous radicals are those of guanine, adenine, cytosine and uracil. In the other type, the sugar is a desoxy-pentose, and in those cases where examination has been adequate, this sugar is *D*-ribodeseose, and the nitrogenous radicals are those of guanine, adenine, cytosine and thymine (5-methyl uracil). A convenient source of an acid of the former type is yeast, and the acid from that source became known as 'yeast nucleic acid'. Pentose nucleic acids were also thought to be peculiar to plants, and as a result the term 'plant nucleic acid' came into use, with an implication that all pentose nucleic acids from whatever source are identical; consequently the terms 'yeast nucleic acid' and 'plant nucleic acid' became synonymous. A satisfactory source of an acid of the second type is the thymus gland of animals, so that the acid from that source became known as 'thymonucleic acid'; and since it was believed that acids of this type were characteristic of animal tissues only, the term 'animal nucleic acid' came into vogue, with the implication that all nucleic acids of the desoxy-pentose type are identical. Thus the terms 'thymonucleic acid' and 'animal nucleic acid' became synonymous.

With the progress of knowledge it became clear that these generalizations were inaccurate, and it was suggested<sup>1</sup> that it is necessary to define a nucleic acid by referring both to its origin and its type. In this way alone, in the light of present information, is it possible to avoid future confusion, until such time as it can be stated with certainty either that two (or more) individual nucleic acids exist and that all examples of each are identical in chemical constitution, or that two (or more) types of nucleic acid exist and that each type comprises a number of examples of related but different constitutions.

Recently, however, Pollister and Mirsky<sup>2</sup> suggested that the names 'chromonucleic acid' and 'plasmonucleic acid' should be used by biologists to denote the nucleic acids called by chemists 'desoxyribose nucleic acid' and 'ribose nucleic acid' respectively. It seems to us that this suggestion has little to recommend it, and is, in fact, retrograde.

The adoption of these terms would be open to the objections based on constitutional reasons mentioned below, and their application to denote the two types of nucleic acid, pentose and desoxy-pentose, would not clarify the present situation, and would merely replace names based on chemical structure or biological source by other terms not wholly accurate because based on an incorrect statement of biological distribution. Thus, Pollister and Mirsky state that "it is now clear that desoxyribose nucleic acid is normally restricted to the chromatin of the cell nucleus", and that it is "now certain that the ribose nucleic acid, by contrast, is found either in the cell cytoplasm or in the plasmosome (nucleolus) of the cell nucleus". This statement is barely tenable at the present time without special emphasis of the word 'normally', since it is known, for example, that

the viruses of psittacosis and vaccinia<sup>3</sup> contain desoxy-pentose nucleic acid and that the magnesium salt of ribonucleic acid forms part of the surface structure of Gram-positive organisms<sup>4</sup>. Who can predict what the future may bring in the way of other exceptions to Pollister and Mirsky's basis of definition?

Further, Pollister and Mirsky's proposed classification is founded on the recognition of certain chemical units detected only after the disintegration of complex molecules which occur in a considerable variety of biological sources. It ignores entirely in what ways those units may be joined together. There is at present no evidence to show whether the nucleotide components are united in the same mode and pattern in the different examples of each of the two types of nucleic acids, that is, that such examples have, in fact, identical chemical constitutions. The adoption by biologists of Pollister and Mirsky's proposed classification would obscure potential differences, which if they exist cannot fail to be significant.

It seems necessary, therefore, to reiterate the suggestion made more than five years ago that, until the position becomes clearer, a nucleic acid should be defined by reference to its origin and type (pentose or desoxy-pentose); closer specification of the type, for example, *D*-ribose or *D*-ribodeseose, is to be welcomed when justified on sound chemical grounds.

J. MASSON GULLAND.  
G. R. BARKER.  
D. O. JORDAN.

Department of Chemistry,  
University College,  
Nottingham. Jan. 10.

<sup>1</sup> Gulland, J. M., *J. Chem. Soc.*, 1722 (1938).

<sup>2</sup> Pollister, A. W., and Mirsky, A. E., *NATURE*, **152**, 692 (1943).

<sup>3</sup> Hoagland, C. L., Lavin, G. I., Smadel, J. E., and Rivers, T. M., *J. Expt. Med.*, **72**, 139 (1940).

<sup>4</sup> Henry H., and Stacey, M., *NATURE*, **151**, 671 (1943).

## Vitamin A Aldehyde

WITH reference to Dr. Morton's suggestion regarding the role of vitamin A aldehyde (axerophthal) in the chemical changes involved in photo-reception<sup>1</sup>, it may be of interest to mention that we prepared this substance some eighteen months ago by Oppenauer oxidation of vitamin A alcohol with aluminium isopropoxide in the presence of acetaldehyde. The ultra-violet absorption spectrum of the aldehyde showed maxima at 350 and 368  $\mu$  in cyclohexane and a band at 657  $\mu$  in the antimony trichloride reaction, and was characterized by the formation of a 2:4-dinitrophenylhydrazone, m.p. 207-209°. On Ponderff reduction, it regenerated vitamin A alcohol (abs. max. at 330  $\mu$  in the ultra-violet and at 620  $\mu$  in the antimony trichloride reaction) which was characterized by conversion into 'cyclized' vitamin A (abs. bands at 390, 370 and 350  $\mu$  in the ultra-violet and at 620  $\mu$  in the antimony trichloride reaction). On condensation with acetone in the presence of sodium ethoxide, the aldehyde furnished axerophthylideneacetone<sup>2</sup>.

R. F. HUNTER.  
E. G. E. HAWKINS.

Central Technical Department,  
Lever Brothers and Unilever, Ltd.,  
Port Sunlight.

<sup>1</sup> *NATURE*, **153**, 69 (1944).

<sup>2</sup> Batty, Burawoy, Harper, Heilbron and Jones, *J. Chem. Soc.*, 135 (1938).