LETTERS TO THE EDITORS

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

Structure of Nucleic Acid in the Dividing Cell

RECENTLY Donovan and Woodhouse[1] advanced a speculation on the nature of the chemical structure which is the essence of the malignant cell. Their idea is the formulation of a molecule in the chromosome capable of splitting into two similar symmetrical portions, and this is envisaged specifically as a nucleic acid linked through pyrophosphoric acid to nucleotide groups. It is a moot point whether or not they are justified in regarding nucleic acid as the 'master constituent' to the exclusion of other known nuclear components. In this communication, however, it is desired to emphasize certain points concerning the chemistry of nucleic acids which arise from their communication.

Donovan and Woodhouse suggest that "when engaged in ordinary cellular activities, the cell has, as its essential basis, molecules of nucleic acid joined by pyrophosphoric linkings to nucleotides similar to" co-dehydrogenase I, thiamine pyrophosphate, riboflavine-adenine dinucleotide and phosphagen "which subserve its normal metabolic activity. When cell division is about to take place the metabolic nucleotides on one side of the linkage are replaced by, or are converted into, nucleotides which are the mirror image of those on the primary nucleic acid portion. The symmetrical, double nucleic acid then splits, with resultant division of the chromosomes accompanied by the associated phenomena which comprise 'cell division'. In the case of the malignant cell, however, [they postulate that] the symmetrical development of the dual nucleic-acid molecule proceeds directly and continually instead of via the usual attachment of the metabolic type of nucleotide groups."

The use of the phrase 'mirror image' is unfortunate, since it implies that the new molecule of nucleic acid will be the enantiomorph of the original. This would involve the existence of a molecule of nucleic acid differing profoundly from the original in its stereochemical structure, and as a consequence the two daughter chromosomes would be different, not identical, as is in fact the case in cell mitosis. Further, no nucleic acids containing enantiomorphic sugars have so far been recorded.

The structural diagram given by Donovan and Woodhouse for their proposed double nucleic acid is entirely without experimental basis since, so far as is known, no nucleic acid contains both pentose and desoxypentose sugars in the same molecule. It would, however, have been reasonable to assume that the nucleic acid entering into the cellular reactions postulated would be desoxyribonucleic acid, in view of the claims by Caspersson and others that it is comprised in the chromosomes.

Although it is true that the pyrophosphate group is common to several naturally occurring nucleotides, there is no evidence of its presence in isolated ribo- or desoxyribo-nucleic acids. That does not, of course, exclude the possibility of its occurrence in the living nucleus, but it should be realized that, in the formulation of the double nucleic acid by Donovan and Woodhouse, there are no dissociating groups in the phosphoryl radicles; such groups are generally regarded as participating in the union with the basic protein to form the nucleoprotein.

It is felt that, although simple chemical interpretations of the dividing chromosome and the malignant cell are much to be desired, it is unwise at present to attempt to limit consideration to one cell constituent alone. Furthermore, interpretations must be based on well-established facts, both biological and chemical, and simplification of the problem must not assume such importance that those facts are subordinated to it.

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

Chemistry Department,
University College,
Nottingham.
Nov. 27.

[1] Donovan, H., and Woodhouse, D. L., NATURE, 152, 509 (1943).

Aerial Disinfection

THE bactericidal action of propylene glycol vapour against air-borne bacteria has been recently discussed by Robertson[1]. The considerations he puts forward seem capable of general extension.

In order to kill bacteria suspended in the air, a lethal amount of the bactericidal agent must accumulate on the bacteria-carrying particles. The purely physical processes involved in this are at least as important as the bactericidal power of the substance itself. Condensation of the bactericide on to the bacterium will be favoured by: (*a*) saturation or near-saturation of the air with the bactericide; (*b*) solution of the bactericide in the bacteria-carrying particles, which may usually in this context be regarded as a watery solution. When equilibrium between the particle and the bactericidal atmosphere is established, the partial vapour pressures of bactericide and water in the atmosphere and over the particle will be equal. This equilibrium will be attained very rapidly with particles of a few microns in diameter. Death of the bacteria will follow if the concentration of bactericide in the final solution is lethal.

Working on this basis, desiderata for an aerial antiseptic would seem to be, in addition to bactericidal activity and lack of toxicity to man: (*a*) low vapour pressure, so that it is possible to work near to saturation; (*b*) water solubility, so that the bactericide will condense readily on to moist particles; (*c*) stability in room atmospheres, that is, freedom from liability to oxidation or other chemical decomposition, or to absorption by walls and textiles.

In addition to the phenols and the glycols, other classes of compounds appear likely to contain members fulfilling these conditions, for example the hydroxy acids or the amino alcohols. Tests have been made on the bactericidal activity of vapours of lactic acid, mandelic acid and triethanolamine. All these have given good kills of the organisms of sprayed saliva (*S. salivarius* and others) at concentrations of 10, 8 and 150 mgm./cu. metre respectively with relative humidities about 70 per cent and temperatures of 60–70° F.

More detailed experiments have been carried out with lactic acid, and good kills (better than 90 per cent in 5 minutes) have been obtained on the organisms of sprayed saliva at relative humidities ranging