Seed Agglutinin with Specificity within the Rhesus Blood Group System

MANY specific agglutinins from seeds are known for human blood groups; most are specific within the ABO and MN blood group systems[1,2]. Some apparently non-specific seed agglutinins are, in fact, specific; for example, the agglutinin from *Ricinus communis* seeds[3] reacts with the chemical ground structure of the ABH and Le^a blood group specific substances and is specific for the chemically similar pneumococcus Type XIV capsular polysaccharide.

We report here a hitherto undescribed agglutinin for human erythrocytes in extracts of the seeds of *Clerodendron trichotomum* (N.O.; Verbenacae). When tested in identical conditions against a comprehensive panel of red blood cells of comparable age and stored in the same conditions, the agglutinin was found to be distinctly less avid with only one sample of red cells—the very rare Rh_{null}. The panel included –D–/–D– cells. Titration showed a clear difference between normal and Rh_{null} cells, the titre scores being as follows: normal cells, 113; Rh_{null} cells, 22. There was no essential difference between normal and –D–/–D– cells.

Landsteiner[4] defines serological specificity as the disproportionate action of a reagent on a variety of related substrata. The agglutinin from *Clerodendron trichotomum* may therefore correctly be described as specific.

We must mention that the Rh_{null} red cells (obtained through the kindness of Dr Philip Sturgeon) had other blood group peculiarities, in that they were also H-negative, U-negative and i-negative. H-negative and U-negative red cells, which had normal Rhesus antigens, acted as strongly as all other red cells tested, however, except Rh_{null}. Adult cells reacted as strongly as cord cells; the specificity of the *Clerodendron trichotomum* agglutinin is therefore not related to the Ii system.

Thus it seems that the specificity of the agglutinin is directed towards the Rhesus blood group system. We believe that this is the first seed agglutinin to be described which shows specificity within this system, although human auto-agglutinins with similar specificity are known[5].

Because there is now evidence that a seed agglutinin "recognizes" the Rhesus system, it is hoped that a further search will provide seed reagents with the more common specificities, for example anti-D, anti-c. Further studies of the *Clerodendron trichotomum* agglutinins, serological and chemical, are in progress.

G. W. G. BIRD
JUNE WINGHAM

Regional Blood Transfusion Service,
Birmingham.

Received May 29, 1968.

[1] Bird, G. W. G., *Brit. Med. Bull.*, **15**, 165 (1959).
[2] Boyd, W. C., *Vox Sang.*, **8**, 1 (1963).
[3] Bird, G. W. G., *Nature*, **187**, 415 (1960).
[4] Landsteiner, K., *The Specificity of Serological Reactions* (Harvard University Press, **5**, 1947).
[5] Weiner, W., and Vos, G. H., *Blood*, **22**, 606 (1963).

GENERAL

Entropy, Evolution and Living Systems

IT has been suggested that a statistical distribution of entropy among a large number of entities will lead to a small percentage of them possessing a lower entropy than the mean value for the group as a whole[1]. To illustrate this point Campbell considered the example of the codfish laying a million eggs. This, however, is not a representative example of the entire biological world, for birds and mammals produce a very small number of eggs and the higher mammals produce only one egg at a time. Furthermore, if such a statistical distribution of entropy were possible in the biological world, a similar statistical distribution should also exist in non-living systems; and for every spontaneous reaction, a small number of products with decreased entropy should result. This is contrary to all known facts.

It is not necessary to believe, as Popper[2] and Woolhouse[3] suggest, that living systems are beyond the second law of thermodynamics—which states that spontaneous reactions lead to an increase in entropy of the system and its surroundings combined. Any reaction can cause decrease in entropy of the system—which here is the living organism—provided this decrease is compensated by a large enough increase in the entropy of the surroundings so that the combined system and surroundings acquire an increased entropy. This is precisely what is happening during biological evolution. It is not only living organisms which undergo reactions leading to a decrease in entropy. Such reactions also take place in the non-living world—for example, the photochemical decomposition of ammonia and the ozonization of oxygen require a negentropy which the surrounding sunlight can provide. Living organisms also obtain negentropy from sunlight from metabolites such as carbohydrates and proteins.

The information in the DNA molecules can be used in development only if the DNA is in contact with the other contents of the egg. The reactions within the egg leading to the development of the organism can take place properly only if the environment of the egg and the phenotype is suitable for such development. Normal development depends on a congenial environment—environment being taken to include features such as temperature, humidity, radiation, air, water, food and other living beings which can affect development. It will not therefore be possible, despite Woolhouse's[3] suggestion, to define living systems by the information content of their DNA molecules alone. There is, however, no evidence to suggest that the laws which apply to chemical and physical changes in the non-living world do not apply to living systems or cannot be used to study and predict their behaviour. An earlier discussion[4–6] of the use of quantum mechanics in the study of living systems failed to produce such evidence. Because living systems are very complex and involve a huge network of linked reactions, it is difficult to study them and tools and techniques more sophisticated than those applied so far may be needed.

C. R. VISWANADHAM

57 Mehdipatnam,
Hyderabad-28,
India.

Received May 15; revised July 9, 1968.

[1] Campbell, B., *Nature*, **215**, 1308 (1967).
[2] Popper, K. R., *Nature*, **213**, 320 (1967).
[3] Woolhouse, H. W., *Nature*, **216**, 200 (1967).
[4] Landsberg, P. T., *Nature*, **203**, 928 (1964).
[5] Ageno, M., *Nature*, **205**, 1306 (1965).
[6] Wigner, E. P., and Landsberg, P. T., *Nature*, **205**, 137 (1965).

Apparent Sizes of Different Shapes and the Facility with which they can be identified

EACH of the shapes illustrated in Fig. 1 has the same surface area but when comparing them most people agree that they appear to differ appreciably in size. From a study in which visual stimuli were presented within