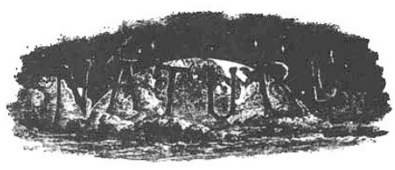
the 'interaction' between alkyl groups in water results primarily from repulsions between water and solute, and not from van der Waals attraction between solute molecules.

Most molecules for which hydrophobic effects are commonly invoked also possess one or more functional groups which contribute to the observed interactions in solution. In all cases such contributions of –CONH, CHOH, and so on to ΔG^E are negative, but only alkyl groups exhibit negative contributions to ΔS^E. Even more important, cross interactions between alkyl and polar groups are not equal to the mean of the interactions between like groups. This finding has a bearing on calculations of protein stability in terms of amino acid side chain contributions.

Any future progress in our understanding of hydrophobic effects is not likely to come from thermodynamics, although there is still much scope for high precision measurements of excess functions in the low concentration range. Techniques which are showing promise include electron spin exchange between hydrophobic spin probes and the enhancement of nuclear magnetic relaxation by such paramagnetic spin probes. Monte Carlo and molecular dynamics simulations have also shown some promise, but in the absence of reliable potential functions it is questionable how much confidence can be attached to the results of such calculations. The same question mark hangs over recent computer simulations of protein dynamics, in which solvation and hydrophobic contributions to the stability of the folded protein were not, and indeed, could not be included. However, in view of the progress that has been achieved over the past 10 years in our general understanding of molecular interactions in aqueous solutions, the prospects for such ambitious ventures look quite encouraging. □



A hundred years ago

THE chemists of Berlin have been occupied lately in analysing the wares of the wine merchants, and no little excitement has been caused by the discovery that the entire stock of one of the largest houses dealing in wines for medicinal purposes, consisted entirely of artificially prepared mixtures of spirit and sugar solutions, flavoured with various herbs.

From *Nature* **17**, 29 November, 1877.

Mechanisms of parasite immunity

from F. E. G. Cox

A meeting on Immunity in Parasitic Diseases: Antigens and Mechanisms of Immune Response was held under the auspicies of the Institut National de la Sante et de la Recherche Medicale and the Institut National de la Recherche Agronomique with Professor Andre Capron as Chairman, at Grignon, France on 5–9 September, 1977.

PARASITOLOGISTS and immunologists need to meet from time to time to share their rapidly accumulating knowledge and there can be few better places to do so than a Louis XIII chateau. Twenty review papers and four round tables, each with a dozen or more contributors, demonstrated the healthy state that the science of parasite immunology has reached and for the first time various pieces of information painstakingly obtained in different laboratories began to fall into place. The two themes that came over time and time again were first that in each infection there are probably several effector mechanisms involved in immunity and that under particular circumstances any or all of these might be involved and, second, that eosinophils, macrophages, antigen–antibody complexes and complement may be more important to parasitic infections than hitherto suspected. Against this background it was possible to look forward as well as backward.

The initiation of any immune response begins with the antigens of the parasite. Most parasite antigens studied so far have been relatively crude extracts and Ruth Arnon (Weizmann Institute of Science, Rehovot) discussed the possibilities of obtaining pure antigens which could be characterised and synthesised. For some microorganisms this possibility is a reality and for many parasites there are indications that the isolation and characterisation of functional antigens has progressed sufficiently far for the synthetic stage to be contemplated. The isolation of such antigens depends on the exploitation of their characteristics such as enzymatic activity and ability to bind to drugs and ligands and P. Pery (Grignon) showed that this was not difficult to achieve. In the case of *Schistosoma mansoni* over 60 antigens have been identified. D. Bout and his colleagues at Lille, using drugs as ligands, have found that malate dehydrogenase is a particularly important antigen in human *S. mansoni* infections and J. P. Rotmans (University of Leiden) has shown that only one isoenzyme of malate dehydrogenase is antigenic in mice. This antigen can be purified and used in microgram quantities in immunodiagnosis of schistosomiasis. An egg antigen described by J. Hamburger (Jerusalem) is the antigen responsible for granulomas in mice but also has considerable potential in immunodiagnosis as has a circulating polysacchoride antigen isolated by Y. Carlier and his coworkers at Lille. Other purified antigens also described include one from *Nippotrongylus brasiliensis* (A. Petit *et al.*, Grignon) and one from *Trypanosoma cruzi* which, as it is shared by both the blood and culture forms of this parasite, may be very useful as a potential vaccine (L. Hudson and D. Snary, Wellcome Laboratories, Beckenham).

The effector mechanisms attracted considerable attention particularly in the case of schistosomiasis. A. Capron (Lille) drew attention to the two main ways in which schistosomula are attacked ,IgG and eosinophils and IgE and macrophages. The IgG involved is IgG2a and the activity of the eosinophils is enhanced by the presence of mast cells (Monique Capron *et al.*, Lille). The importance of eosinophils in immunity to parasites was discussed in general terms by A. B. Kay (Edinburgh) and in much more detail as the cells that actually attach to schistosomula and penetrate the body wall by C. Mackenzie *et al.* (National Institute for Medical Research, London) who pointed out that these cells adhere to other helminths as well. B. M. Ogilvie (NIMR) also drew attention to the similarities in the immune responses to parasites as different as *Elmeria* and *Nippostrongylus* living in the gut.

Macrophages are obviously important in immunity to parasites and their role in the production of nonspecific mediators of immunity was discussed by A C Allison (Clincal Research Centre, Harrow). Nonspecific immunity to blood parasites following the administration of *Corynebacterium parvum* or BCG was also discussed by F. E. G. Cox (King's College, London), who postulated a common mechanism for homologous, heterologous and nonspecific immunity to malaria in rodents, and by B. Leblanc and J. C. Salmon (Villejuif). Another nonspecific mechanism, the activation of complement through the alternative pathway, was discussed by G. Huldt (Stockholm) in the context of *Entamoeba histolytica*.

Immunodiagnosis and vaccination are the two main objectives behind immunological studies and the prospects

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