altogether unexpected, because presumably Benjamin's selection procedure selects for viruses which are defective in one or more functions which are expressed in transformed cells and are also required for the lytic replication of the virus. When mutants grow in 3T3-Py-3 cells they are presumably complemented by a viral gene product or the product of a cellular gene which is depressed by transformation. Because all the mutants fail to transform non-permissive cells there is a chance that the complementing function in 3T3-Py-3 cells, which the mutants lack, plays an integral role in maintaining transformation. In other words the host range mutants may well carry mutations in a transforming gene(s).

MEMBRANES

Miniproteins or Myth?

from our Biochemical Genetics Correspondent

AN analysis of the red blood cell membrane has become an almost statutory requirement of anyone professing the name membrane biologist. The ease with which material can be isolated and purified makes the erythrocyte the favoured test system for new techniques and the touchstone for any new theory of membrane structure.

About half of the red blood cell membrane is protein, the rest being lipid and carbohydrate (44 and 7 per cent, respectively, by weight). The protein fraction displays considerable heterogeneity: Rosenberg and Guidotti, for example (*J. Biol. Chem.*, **243**, 1985; 1968), have separated and characterized several components, some—but not all—of which Berg found to be located on the outside surface of the cell (*Biochim. Biophys. Acta*, **183**, 65; 1969). More recent reports (Phillips and Morrison, *Biochem. Biophys. Res. Commun.*, **40**, 284; 1970; Lenard, *Biochemistry* **9**, 1129; 1970; Rosenberg and Guidotti, *J. Biol. Chem.*, **244**, 5118; 1969) are consistent with a system in which there are two huge proteins of approximate molecular weight 200,000, one of intermediate size (100,000) and about six smaller components (40,000–80,000)—all present in large amounts. And there are also many minor components. Most of the identified fractions—with the exception of that with a molecular weight of 100,000—do not seem to reside on the outer surface of the cell.

In the many laboratories where work has led to this picture of the red cell membrane a cry of astonishment is likely to go up at the report from Dreyer's group at Caltech (Laico *et al.*, *Proc. US Nat. Acad. Sci.*, **67**, 120; 1970) which implies that they all missed the fundamental polypeptide subunits of biological membranes, and suggests that at least 50 per cent of the protein in red cell ghosts is present in this form. The first surprise is that the molecular weight of these subunits is only 5,000—that is, each peptide can only contain at most fifty amino-acids. Some of them are believed to be glycoproteins (for which no evidence, however, is presented). Clearly they must be very small indeed, and Dreyer and his colleagues call them "miniproteins". The second surprise is that they have no N-terminal amino-acids: Dreyer *et al.* suggest that they are cyclic peptides or have blocked N-terminals. The third surprise is the aggregation phenomenon. They surmise (but do not show) that the miniprotein can aggregate to give complexes which cannot be dissociated by any known method: many of the several proteins observed by other groups are, by implication, likely to be artefacts. The only real characterization of these miniproteins Dreyer and his colleagues have carried out is fingerprinting. Miniproteins from red blood cell membranes and mitochondrial membranes give very similar fingerprints.

Unfortunately, these fingerprints were made using subtilisin to digest the miniprotein: this gives no idea of the complexity of miniprotein because of the complete lack of specificity of subtilisin. The fingerprints, then, are not very helpful. Could these miniproteins be degradation products of larger proteins—the cleavage products of a latent membrane peptidase? Dreyer *et al.* must remove this possibility before the miniprotein can be regarded as a fundamental subunit.

ENVIRONMENT

Monitoring for Malformations

from a Correspondent

WHY should anybody monitor for congenital malformations? To detect the influence on the embryo of environmental indiscretions, said Dr E. A. Murphy (Johns Hopkins University) at a symposium on the subject held in Albany, New York, on October 19 and 20. The shorter the interval between insult and recognition of injury, the easier it will be to establish causality. For this reason Drs J. R. Miller (University of British Columbia) and T. H. Shepard (University of Washington) urged monitoring of spontaneous abortions for specific malformations. The history of environmental exposures would thus be obtainable while the mother's memory was still fresh, and an excess of teratogenic effects would be potentially recognizable six to seven months earlier than if observations were limited to the outcome of pregnancies that had gone to term. Unfortunately such surveillance is costly, biased in various ways, and limited in extent.

Epidemics of environmentally induced malformations have sometimes been long delayed in gaining world wide attention; for example cerebral palsy (congenital Minamata disease) among Japanese infants whose mothers, while pregnant, ate fish contaminated with organic mercury. Dr R. W. Miller (National Cancer Institute) suggested the establishment of an international unit to deal with the global implications of such episodes, whether they occur in man or beast.

Because specific major malformations are rare, surveillance for them must be wider than can readily be achieved at present. As an alternative measure, potentially more sensitive, Drs D. W. Smith (University of Washington) and E. B. Hook (Albany Medical College) recommended further study of the relevance of minor malformations (for example abnormal palmar creases) to environmental influences. In the discussion it was suggested that a test of this relationship could be made through the study of Japanese survivors exposed *in utero* to atomic radiation, which is a known teratogen.

Vital and health records contain many unused data that would greatly aid human teratology, especially if a system for automatic linking of records were developed on a large scale. Assignment of a unique number to each child at birth for use on medical and other records would greatly ease computer processing, while preserving the