Introducing mouse teratomas

Teratomas and Differentiation. (A Symposium held at the Roche Institute of Molecular Biology, Nutley, New Jersey, May 19–21, 1975.) Edited by M. I. Sherman and D. Solter. Pp. xv+324. Academic: New York and London, November 1975.) $16.50; £8.60.

ALTHOUGH mouse teratomas have been available as an experimental system for more than a decade, it is only over the past few years that the application of immunological, cell culture and embryo micromanipulation techniques has begun to realise their enormous potential for studying regulatory mechanisms in mammalian development. It was in this climate of optimism (not without an element of elite evangelism) that a meeting was held at the Roche Institute of Molecular Biology in May, 1975 to consolidate and assess recent gains.

This book consists of the papers presented at the meeting, and is by far the best introduction to the subject at present available. It is a pity that the book does not also include discussion following the papers, along the lines of the CIBA symposia, so that the reader can enjoy the frisson of dissention and the benefits of a wider range of opinion. This would have been particularly useful following the papers by Barry Pierce and Beatrice Mintz in which, *inter alia*, it is argued that mouse teratocarcinomas are an important model for the study of cancer since they provide a case in which malignant stem cells give rise to benign progeny by differentiation. It is implied that many other cancers arise by a disruption in normal cellular interactions which reduce the probability that the progeny of stem cells will differentiate, and that this non-genetic malignant change should be reversible if only the correct environmental signals could be imposed. 'Malignant', however, is never clearly defined and the relevance of mouse teratocarcinomas, which seem rarely to metastasise or invade, to the corresponding human tumour, to non-malignant hyperplasia or to chemical carcinogenesis, is not discussed.

Murine terato(carcino)mas arise spontaneously either in the gonads or from early embryos implanted into extrauterine sites. The comparative development of these tumours is clearly described by Leroy Stevens, who argues that the pluripotent stem cells are equivalent to the cells of the inner cell mass of the normal blastocyst. Evidence in favour of this view comes from the pioneering work of the laboratories of Dorothea Bennett and Francois Jacob, which has shown that teratoma cells, sperm, morulae and blastocysts have in common a surface antigen which is probably coded for by one of the genes of the T locus. This work is the first step towards understanding the way in which early embryo cells may recognise each other by their surface properties.

Other exciting contributions are those of Gail Martin and Martin Evans on an *in vitro* method for obtaining relatively rapid and synchronous differentiation of homogeneous stem cells into endoderm, which in turn seems to trigger the next stages of embryogenesis, and the highlight of the meeting, which was the report by Beatrice Mintz that teratoma cells injected into normal embryos are able to participate in the formation of a normal, chimaeric mouse. The evidence for integration of teratoma cells into a wide variety of tissues, including germ cells of the testis, is impressive and the finding rich in biological implications. The book is worth reading for this paper alone.

Brigid Hogan

Iron transport and storage

Proteins of Iron Storage and Transport in Biochemistry and Medicine. (Proceedings of EMBO Workshop Conference on Proteins of Iron Storage and Transport.) Edited by R. R. Crichton. Pp. x+454. (North Holland: Amsterdam and Oxford; American Elsevier: New York, 1975.) Dfl.88; $36.75.

THIS book contains the proceedings of the Workshop Conference on Proteins of Iron Storage and Transport held by the European Molecular Biology Organisation in Louvain-la-Neuve in April, 1975. The main themes presented in the book are the molecular biology of transferrin and ferritin, iron transport and storage proteins, respectively, and the subcellular transfer of iron by the intestinal mucosal cell during iron absorption. There is a total of 56 communications by contributors from Europe, the US and Australia.

In the section of the book devoted to transferrin all the outstanding problems related to its structure and function are brought to light and discussed. Two independent groups of workers presented almost the entire amino acid sequence of transferrin. Several papers deal with the interaction of the metal and anion at the binding site, and demonstrate how iron and a ligand (with a carboxylic group) fit snugly into the receptor pocket on the protein surface. In addition, the distances between the iron, carbon and nitrogen (or the nitroxyl group) within the binding site have been measured using nuclear magnetic resonance and found to be about 1 nm. I find, however, that the most interesting investigations are not related to transferrin but to its specific receptor site on the surface of the immature red cell. The isolation and analysis of the transferrin receptor, a protein patch on the reticulocyte surface, initiated by Jack Fielding and Barbara Speyer, are bound to provide a solution to the biochemical basis of transferrin uptake and release by reticulocytes.

The contributions on the iron storage protein, ferritin, can be roughly divided according to their aim into the following groups. First, there are reports on the primary structure of this large molecule (molecular weight 450,000) composed of 24 subunits which form a shell enclosing a core of iron hyroxide and phosphate. In these reports the structure of subunits and their amino acid sequence are also described. Second, investigations on apoferritin subunit–subunit ineraction and assembly are presented. These are followed by communications on identification of isoferritin in normal man and animals. The significance of isoferritins in malignant diseases is then discussed. Also, an atempt to determine the intracellular site of apoferritin synthesis and its turnover is described. Finally, but not least impressive, there is the work on iron uptake and release by ferritin carried out independently by Pauline Harrison *et al.* and by two groups of investigators led by Robert Crichton and S. Stefanini.

In the last section of the book several communications on the mechanism of iron handling by the intestinal mucosal cell during iron absorption are presented. The picture of subcellular iron pathways is not yet complete but intensive investigation under way in this field will no doubt bear fruitful results.

This book represents a faithful picture of the currents of research on iron metabolism carried out by investigators in many laboratories all over the world. The book is published within a few months of the Conference and thus it has a rare quality of freshness. The editor's skill in balancing finely the material presented makes it an exciting book to read. The reader with only a superficial interest in iron metabolism cannot easily appreciate the value of many hints so useful for bench work and may find many arguments too difficult to follow. For the iron enthusiast, however, this book is a 'must' and it certainly deserves space on a shelf of every reference library.

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