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Edited by P. B. Garland and R. Williamson

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A Biochemical Society Symposium held in London in July 1978

The Biochemical Society's Forty-Fourth Symposium held at University College London in July 1978 reviewed in a two day meeting the exciting and rapidly expanding area of Genetic Engineering. Leaders in the field gave general introductions to the biochemical basis, practice and aims of many aspects of the subject, illustrated with accounts of current research. Subjects included ranged from the enzymology of restriction nucleases, ligases and polymerases, proceeded through vectors and hosts for recombinant DNA, considered in depth selected plant and animal systems, and concluded with industrial prospects and social perspectives. These excellent and well-received presentations form the basis of this publication, which will serve not only as a readable introduction to the biochemistry of genetic engineering but also as a valuable account of the activities of a number of leading laboratories as of summer 1978.

List of contents and authors:

Preface.

Restriction Nucleases, Ligases and Polymerases in Genetic Manipulation by A. D. B. Malcolm.

Safe and Useful Vector Systems by W. J. Brammar.

Plasmid Vectors for Genetic Manipulation in vitro by D. J. Sherratt.

Analysis of Restriction-Fragment Patterns from Complex Deoxyribonucleic Acid Species by E. M. Southern.


Primary-Sequence Changes in the Differentiation of Immunoglobulin Genes by T. H. Rabbitts.


SV40 and Polyoma Viruses: their Analysis by Deoxyribonucleic Acid Recombination in vitro and their Use as Vectors in Eukaryotic Systems by P. W. J. Rigby.


Genetic Manipulation Advisory Group (GMAG) and the Environment for Genetic Engineering in Britain by R. Williamson.

Genetic Engineering: Do We Need It? How Would We Do It? by A. J. Hale.


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The Ames Test for Mutagenicity

There is increasing evidence that some human cancers may be caused by both natural and man-made chemicals in the environment, through damage to DNA. Thus, identification of carcinogenic agents is clearly a major step in reducing human exposure.

Animal testing, mainly in rats and mice, still remains a key method for detection of carcinogens. However, these tests are long-term, very expensive, and require much manpower. Also, such tests do not lend themselves to the complex chemical mixtures around us, such as impurities in air and water and cigarette smoke.

Thus, there is a need for short-term tests which would allow, for example, a chemical company to test a new synthetic chemical rapidly and adequately, and make an early economic decision before large-scale production is undertaken.

For some fifteen years Bruce N. Ames and co-workers have been developing a simple test for detecting chemical mutagens, and have shown that a large percentage of chemical carcinogens are mutagens. They have described the test in detail.

This rapid and simple test, now well known as the *Salmonella* microsome test or "Ames test," has been validated by assaying about 300 chemicals known, by animal testing, to be carcinogens or noncarcinogens, and the results have been discussed.

The "Ames test" is carried out on petri plates, and employs several specially prepared mutants of *Salmonella typhimurium* exhibiting different kinds of histidine mutations. Rat liver homogenates are added directly to the petri plates as a source of activating enzymes, providing an important aspect of mammalian metabolism to the *in vitro* test. Thus, carcinogens requiring metabolic activation can be detected easily. Mutagenicity is determined by counting the number of revertants per plate.

Positive and negative controls are run with each experiment as a control for liver homogenate (S9) sterility. Aldrich offers a number of products which are used as strain-specific controls in the test.

Other compounds useful as positive controls in the presence of S9 are 2-acetamidofluorene, benzo[a]pyrene and 2-aminoanthracene (which serves as a positive control for all strains in the presence of S9). We also offer the very potent mutagen N-methyl-N-nitro-N-nitroguanidine (MNNG).

It has been demonstrated that, generally, carcinogens are mutagens, and since this test is becoming widely accepted as a simple and rapid means of detecting chemical mutagens, individual laboratories continue their efforts to modify and optimize the test. These efforts result in published recommendations from time to time, which help establish criteria for the usefulness of the test.

References:

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4-Nitro-α-phenylenediamine: 100g $13.20  
Methyl methanesulfonate: 25g $29.00  
Sodium azide: 250g $22.90  
Nitrofurantoin: 25g $49.50  
2-Acetamidofluorene [CAS 53-96-3, N-(2-fluoreny)acetamide]: 5g $27.00  
9-Aminofluorene hydrochloride monohydrate: 25g $115.55  
2-Aminoanthracene: 5g $17.20  
2-Nitrofluorene: 25g $18.00  
MNNG: 10g $15.00  
3-Methylcholanthrene: in preparation

*This carcinogen is regulated by Title 29, Part 1910, Code of Federal Regulations.*