international news

NAS ban on plasmid engineering

"RECENT advances in techniques for the isolation and rejoining of segments of DNA now permit construction of biologically active recombinant DNA molecules *in vitro*. For example, techniques employing DNA restriction endonucleases, which generate DNA fragments containing cohesive ends especially suitable for rejoining, have been used to create new types of biologically functional bacterial plasmids carrying antibiotic resistance markers (Cohen *et al.*, *Proc. natn. Acad. Sci.*, **70,** 3240; 1973; Chang *et al.*, *Proc. natn. Acad. Sci.*, **71,** 1030; 1974) and to link *X. laevis* rDNA to DNA from a bacterial plasmid. This latter recombinant plasmid has been shown to replicate stably in *E. coli* where it synthesises RNA complementary to *X. laevis* rDNA (Morrow *et al.*, *Proc. natn. Acad. Sci*; in the press). Similarly, segments of *Drosophila* chromosomal DNA have been incorporated into both plasmid and bacteriophage DNAs to yield hybrid molecules that can infect and replicate in *E. coli* (Hogness, unpublished; Davis, unpublished; Boyer, unpublished).

"Several groups of scientists are now planning to use this technology to create recombinant DNAs from a variety of other viral animal and bacterial sources. Although such experiments are likely to facilitate the solution of important theoretical and practical biological problems, they would also result in creation of novel types of infectious DNA elements whose biological properties cannot be completely predicted in advance.

"There is serious concern that some of these artificial recombinant DNA molecules could prove biologically hazardous. One potential hazard in current experiments derives from the need to use a bacterium like *E. coli* to clone the recombinant DNA molecules and to amplify their number. *E. coli* strains commonly reside in the human intestinal tract, and they are capable of exchanging genetic information with other types of bacteria, some of which are pathogenic to man. Thus, new DNA elements introduced into *E. coli* might possibly become widely disseminated among human, bacterial, plant or animal populations with unpredictable effects.

"Concern for these emerging capabilities was raised by scientists attending the 1973 Gordon Research Conference on nucleic acids (Singer and Soll, *Science*, **181,** 1114; 1973), who requested that the National Academy of Sciences give consideration to these matters.. The undersigned members of a committee, acting on behalf of and with the endorsement of the Assembly of Life Sciences of the National Research Council on this matter, propose the following recommendations:

"First, and most important, that until the potential hazards of such recombinant DNA molecules have been better evaluated or until adequate methods are developed for preventing their spread, scientists throughout the world join with the members of this committee in voluntarily deferring the following types of experiments:

"Type I: Autonomously replicating bacterial plasmids that might result in the introduction of genetic determinants far antibiotic resistance or bacterial toxin formation into bacterial strains that do not presently carry such determinants, or construction of new bacterial plasmids containing combinations of resistance to clinically useful antibiotics unless plasmids containing such combinations of antibiotic resistance determinants already exist in nature.

"Type II: Linkage of all or segments of DNA from oncogenic or other animal viruses to autonomically replicating DNA elements such as bacterial plasmids or other viral DNAS. Such recombinant DNA molecules might more easily be disseminated to bacterial populations in humans and other species, and thus possibly increase the incidence of cancer or other diseases.

"Second, plans to link fragments of animal DNAs to bacterial plasmid DNA or bacteriophage DNA should be carefully weighed in light of the fact that many types of animal cell DNAs contain sequences common to RNA tumour viruses. Since joining of any foreign DNA to a DNA replication system creates new recombinant DNA molecules whose biological properties cannot be predicted with certainty, such experiments should not be undertaken lightly.

"Third, the Director of the National Institutes of Health is requested to give immediate consideration to establishing an advisory committee charged with (*a*) overseeing an experimental program to evaluate the potential biological and ecological hazards of the above types of recombinant DNA molecules; (b) developing procedures which will minimise the spread of such molecules within human and other populations, and (*c*) devising guideliness to be followed by investigators working with potentially hazardous recombinant DNA molecules.

"Fourth, an international meeting of involved scientists from throughout the world should be convened early in the coming year to review scientific progress in this area and to further discuss appropriate ways to deal with the potential biohazards of recombinant DNA molecules."

IN an unprecedented move, the National Academy of Sciences has called for a voluntary worldwide moratorium to be placed on an area of scientific research because of potential and unpredictable hazards to human health. A statement drawn up by a committee of eminent biomedical scientists and released by the academy this week calls for a temporary halt on two types of genetic engineering research because of the risk of infecting man with bacteria containing hybrid DNA molecules whose biological properties cannot be predicted in advance.

The academy is concerned about experiments which combine fragments of DNA from different sources to form a hybrid molecule which can then replicate in bacteria such as *E. coli*, which is normally present in the human intestine. The Committee on Recombinant DNA Molecules, whose members* have all agreed individually to renounce two types of experiments involving such techniques until the potential hazards have been evaluated, has called for a committee to be established to define the hazards and to develop guidelines under which such research should be conducted. Part of the statement is given here.

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