Infection risk small in some DNA experiments

Studies by the National Institutes of Health to assess the risk of infection from working with recombinant DNA find that risk very small.

Virologists Malcolm A. Martin, Wallace P. Rowe, and associates at the National Institute of Allergy & Infectious Diseases find that highly infectious polyoma virus is not transmitted to mice when the mice are fed or injected bacteria infected with polyoma DNA in recombinant DNA molecules.

However, two of five mice that were injected with purified recombinant DNA having more than one copy of the polyoma DNA became infected with the virus.

The scientists conclude that polyoma DNA contained in recombinant DNA molecules is between 10 million and 1 billion times less infectious than free polyoma virus. When administered by mouth or in live bacteria, it was never observed to cause infection. And free virus growth was not observed in bacteria carrying the recombinant DNA molecules.

Rowe says these findings show "our intuitive fears over the safety of these experiments were greatly exaggerated."

Rowe cautions that the experiments so far have examined the safety of only one host system—that of the bacterium *Escherichia coli* K-12. Similar experiments must be done with each host to establish its safety. But speaking only for experiments in *E. coli* K-12, Rowe says, "I personally believe that any recombinant DNA research is safe except that involving toxin genes, which should not be transferred willy-nilly." *E. coli* K-12 has been the host for nearly all recombinant DNA experiments performed so far.

Rowe and Martin's experiments use DNA from polyoma virus—a small, well-characterized DNA that replicates readily in its natural host, the mouse, but is not infectious in humans.

Using recombinant DNA techniques, polyoma DNA was spliced into DNA from either *E. coli* plasmids or bacteriophage lambda, a virus that infects *E. coli*. Then the recombinant DNA was introduced into *E. coli*, propagated there, and either the infected bacteria fed to or injected into mice, or the recombinant DNA isolated from the bacteria and injected into mice.

Polyoma antibodies were never observed when mice or mouse cells in culture were exposed to bacteria carrying the recombinant molecules, the researchers say. When the recombinant DNA molecules isolated from bacteria were injected into mice, the systems in which a single copy of the polyoma DNA was contained in the recombinant molecule also did not cause infection.

The only cases of infection that occurred came when recombinant DNA carrying double copies of the polyoma segment was injected directly into mice. Such double-copy DNA is not likely to be produced in recombinant DNA experiments, the scientists say. When it is produced, it frequently will revert to a single-copy form in the bacteria as it propagates. And, when part of the whole bacterium, even this double-copy DNA is not infectious, according to Martin and Rowe. □