Ecologists Wary About Environmental Releases

They say field tests should proceed with caution, but suggest that many of the assertions about the inherent safety of genetically engineered organisms are not true

MOST GENETICALLY ENGINEERED ORGANISMS will probably pose minimal ecological risk when released to the environment, but there are important exceptions. So concludes a committee of prominent ecologists in a report released in mid-February.* It will be published in the April issue of *Ecology*.

While endorsing the "timely development of environmentally sound [biotech] products," such as improved crop varieties and pest control agents, the committee says such development must take place within the context of "scientifically based regulatory policy" that will identify the rare exceptions that do pose some risk.

The report, produced under the auspices of the Ecological Society of America (ESA) and reviewed by nearly 100 of its members, is close to a consensus document for the ecological community. It thus adds a voice long missing from the debate on the release of transgenic organisms. It should also lend support to the embattled Environmental Protection Agency, whose biotech regulations have been held up at the Office of Management and Budget for 10 months, allegedly because they are too burdensome.

Not enough is known yet about the possible ecological effects of novel organisms to warrant exempting particular traits or classes or organisms, says the committee. It is possible, however, to devise a strategy that will balance the level of regulatory scrutiny with the true risk an organism poses, thereby minimizing the regulatory burden. This report is a first cut at crafting such a policy.

Echoing a 1987 report by the National Academy of Sciences, the committee says that evaluation and regulation should be based on the product—the phenotype, or biological characteristics of the modified organism—not the process by which it was created. But, the committee adds, because many novel combinations of properties can only be achieved by the new cellular and molecular techniques, "products of these techniques may often be subjected to greater scrutiny than the products of traditional techniques," such as plant breeding.

In making their case, the ecologists challenge many of the arguments put forth by industry and many academic scientists about the "generic safety" of engineered organisms. An oft-heard argument, espoused by Winston Brill, vice president of Agracetus and others, is that the long experience with traditional crop breeding, in which genetic traits are recombined, albeit more crudely than with molecular techniques, demonstrates the safety of genetic engineering.

"The absence of an immediate effect does not ensure that no effect will ever occur."

Not so, says the ESA committee, because molecular techniques provide the ability to transfer traits among very different species, creating combinations that could not arise from traditional breeding.

Another argument for the safety of engineered organisms is the 15 years of laboratory experience with recombinant DNA. During this time, countless altered microorganisms have doubtlessly escaped from the lab on the unsuspecting sole of a Hush Puppy with no documented untoward health or environmental effects. The analogy is not apt, responds the ESA committee, since the "escapees" probably arrived in incompatible habitats in too low a number to establish themselves. In addition, much of this laboratory work has been performed on organisms that were designed to be less fit than their counterparts in nature.

Nor are introductions safe just because the modified organism is a native species rather than a non-native from a distant area. Both native and non-native species can become pests, says the committee.

Much of the report focuses on exceptions to the scientific generalizations that can be made about transgenic organisms, for it is these rare possibilities that must be considered in risk assessments. In general, the a transgenic organism poses depend whether it survives and reproduces, its tential for spread, its interactions with organisms, and its effects on the phy environment.

Adding a gene or genes will ten reduce the fitness of an organism. C quently, it is often assumed that mod organisms will perform their desig tasks in the environment and then die While this may generally be true, ther important exceptions, says the ESA com tee, citing one recent study that showe difference in the size of the control po tion and the modified population for 30 weeks. Even if fitness is reduced, sa 1% per generation, according to the mittee, it might take hundreds of thous of generations before the trait is elimin Meanwhile, natural selection will ten increase the fitness of the organism. A the organism passes on its new gene to organisms in the field, through wh known as lateral transfer, that trait persist even after the modified organism died out.

Given these and other uncertainties, the committee, case-by-case review of ronmental releases is still needed, th eventually it should be possible to d categories of organisms requiring mi screening and review and those requ intensive review. Meanwhile, they prop method to scale the level of scrutiny t actual risk the organism poses. To date, James Tiedje of Michigan State Unive the lead author on the report, "the sy has been a bit out of balance. There has more scrutiny than the true risk of organism would warrant."

The committee has created a table essentially asks a series of questions a key genetic, phenotypic, and environm criteria, allowing regulators to screen the safe organisms while identifying few legitimate cases that do present risk," says Tiedje.

Many of the safety questions about t genic organisms, however, can only b swered by small-scale field tests, say committee, which calls for such tests, regulatory oversight, before moving commercial uses.

The committee also notes that many of ecological effects are indirect, taking time to appear. "Unlike the effects of r ing chemicals to the environment, the effects of self-replicating introduced o isms may not necessarily decrease with or with distance from the point of intr tion. The absence of an immediate neg effect does not ensure that no effect wil occur." ■ LESLIE ROB

*J. M. Tiedje, R. K. Colwell, Y. L. Grossman, R. E. Hodson, R. E. Lenski, R. N. Mack, P. J. Regal, "The planned introduction of genetically engineered organisms: Ecological considerations and recommendations."