BY RUSS HOYLE

"STREETLIGHTING" THE ALASKA OIL SPILL

Earlier this year in Washington, the outspoken humorist, Burt Ensley of Envirogen (Lawrenceville, NJ), made an interesting observation. Although an enzyme that eats dioxins would be a wonderful thing, said Ensley, an enzyme that eats dioxins at the rate of "picamoles per fortnight" would be a virtually useless technology. The hypothetical anecdote barely concealed Ensley's pointed message to scientific colleagues whose business it is to formulate basic research that translates into useful products. When making fundamental decisions about research, Ensley declared, scientists must relentlessly ask themselves (and be asked): Is it practical? Will it work under real field conditions? Will it be competitive? To do otherwise, he said, was an exercise in "streetlighting," *i.e.*, choosing conditions convenient for analysis that may look good in the lab, but will be next to useless in the real world.

Streetlighting—now there's a wonderful metaphor. In the business of biotechnology, especially, the temptation to streetlight is all too common among the diverse network of scientists, bureaucrats, engineers, regulators, and consumers necessary to market effective products. Unfortunately, the Alaska oil-spill bioremediation project, conducted though it was on the beaches of Prince William Sound, looks like a piquant case in point.

Institutionalized streetlighting

As part of more than $2 billion Exxon (New York) spent cleaning up the Exxon-Valdez oil spill, the oil giant and the U.S. Environmental Protection Agency (EPA, Washington, DC) undertook to spend $3.2 million on some very basic bioremediation research. EPA and Exxon scientists ran months-long studies during the summers of 1989 and 1990 using fertilizer products to speed up the natural bacterial biodegradation of oil at selected sites on Prince William Sound. Reading the EPA science advisory board's draft report on the Alaska project, which is now being circulated for peer review, it is hard to avoid the conclusion that the oil-spill project was an instance of streetlighting at its most institutionalized, so mincingly cautious and circumscribed are its stated purposes. Among them: to examine the rate and extent of natural biodegregation of oil on beaches; to examine whether those rates could be enhanced by the addition of nutrients; to develop methods for long-term application of nutrients; and to monitor ecological effects that adding nutrients might cause.

There is no question that Exxon-Valdez was the spill that could have launched a thousand bugs, and not just on Alaska shorelines. Thanks in part to EPA Administrator William Reilly, the historic accident at Bligh Reef at least marks the dawn of an era in which bioremediation technologies began to be taken seriously in the U.S. and elsewhere. From a scientific perspective, too, the study will provide important, if not always definitive, baseline data on the efficacy and environmental impact of various applications and types of microbe-enhancing fertilizers.

Yet from the outset, the project was hip deep in problems. "If you tried to design the experiment yourself," remarked one observer, "you couldn't have hamstrung yourself worse." Some Alaskan officials wanted nothing to do with microbes at all, much less to enhance them. The institutional bias of the EPA itself, burned after several incidents in the mid-1980s involving the possible release of microbes into the environment, certainly favored extreme caution. Logistical nightmares abounded, from a short summer experimentation season to difficulties transporting personnel and equipment to the oil-covered Alaskan beaches. All of these factors may have helped whittle down the scope of the project.

Little significance

Nonetheless, the upshot is a sneaking suspicion that we will learn very little of significance from the Alaska oil spill report that we did not know well before the ill-starred Exxon tanker ran aground. Yes, the addition of phosphorus and nitrogen nutrients seems to have aided biodegradation. No, surrounding ecosystems did not seem to be affected by the bioremediation process.

No surprises, nothing particularly new. It is doubtful, for example, that any new commerical bioremediation applications will emerge from the Alaska experiments. We will learn nothing about the behavior or efficacy of biologically modified or genetically engineered enzymes or bacteria that might form the backbone of new oil spill clean-up technologies, since none were used. (And this despite the fact the Bush Administration only recently has given its blessing to recombinant technologies.) We will learn nothing about the effects that adding enriched indigenous microbes might have had in the beach clean up. Reason? Because, according to the draft report, any introduction of these naturally occurring bugs was "considered inappropriate as an initial approach." Nor will we learn anything at all about how to control the behavior of microorganisms in the open sea, or other chaotic natural environments. This factor has convinced many industry executives that the oil-spill bioremediation business is a non-starter.

Purely scientific intentions

EPA officials, however, will be able to say they have completed the first baseline study of bioremediation under field conditions in the aftermath of a real oil spill. The agency's data banks will reflect that enlarged body of confirmed knowledge. But it still remains for EPA officials to explain how this benchmark study was more than an internal exercise limited to conditions that lent themselves to convenient analysis—and what practical use it could possibly serve in the real world of commerce where environmental problems will be solved, if they are going to be solved at all.

The official answer, of course, is no doubt that the EPA-Exxon bioremediation project was never intended to serve any other than a purely scientific purpose. That is no longer good enough, and it is where Ensley's Corrective comes in. Such a rationale is rapidly losing its punch, given the seriousness of our environmental problems and the imperatives of the marketplace. With all eyes on the potential of biotechnology, EPA is going to come under increasing pressure to do more than ascertain, with painful and crippling caution, how to reduce the risk of environmental damage to zero.

Instead, Reilly and his successors must find practical ways to reorient EPA to help industry—in this instance, the biotechnology sector—develop solutions to environmental problems that are efficient, competitive, and timely. This year tens of millions of gallons of oil will be spilled in an estimated 16,000 incidents on U.S. waterways alone. Statistically speaking, another Exxon-Valdez-sized spill is only a matter of time. The market is there. New cost-minimizing clean-up technologies are not.