Uncontrolled Release of Harmful Microorganisms

At a recent colloquium held at the U.S. National Academy of Sciences in Washington, DC, there was intensive discussion of a wide range of applications of laboratory automation. These applications included methods for prevention and early detection of biological warfare agents, infectious diseases, and water and food supply contaminants. The main concern raised was the use of pathogens by terrorists or nations as a result of biological warfare. It is clear that U.S. Army authorities and the Federal Bureau of Investigation are able to predict the outcome of numerous scenarios regarding the hostile use of microorganisms. Also, it appears that we are well prepared to detect, respond to, and potentially prevent such threats.

Are there enough safeguards in place to protect the U.S. population from the release of harmful organisms from U.S. labs?

However, a different type of threat, the release, either intentionally or unintentionally, of laboratory strains and genetically modified organisms, is underestimated. These organisms include natural, highly antibiotic-resistant commercial strains, as well as bacteria that were created either by genetic manipulations such as rapid DNA shuffling or by rationally designed point mutations. Such organisms can interact with human pathogens and can easily change the microbial diversity and ecology that we know today. We have already experienced an example of such release in the case of the antibiotic-resistant human opportunistic pathogen *Burkholderia cepacia*. This plant pathogen is used in agriculture as a biocontrol agent and in the bioremediation of toxic chemicals (1). *Burkholderia cepacia* is still released into the environment as a bioremediation agent, despite the fact that it is now organnized to be a cause of devastating infections in patients with cystic fibrosis (1, 2) and in other vulnerable individuals(1, 3) and its use in agriculture is controlled by the Environmental Protection Agency (4).

It is evident, therefore, that we need to create guidelines and safety measures that will prevent the uncontrolled release of microorganisms into the environment. In addition to the necessary guidelines, those involved in biotechnology should direct their attention to creating laboratory host strains that will survive only in controlled laboratory conditions. Bacterial and viral genetic manipulations that may influence our environment need to be restricted to such laboratory strains. Such measures should reduce the threat of the accidental release of harmful species into our ecosystem.

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