perhaps assemble living cells from their component parts, but that undertaking is not yet tractable.

In terms of safety and ethics, some researchers see these results as “falling along a continuum,” says Jeffrey Miller of the University of California, Los Angeles, who cochaired the colloquium. “We crossed this Rubicon in the 1970s,” he adds, referring to other developments in microbiology and molecular biology that enabled, for example, the full synthesis of viral genomes and the ever-widening use of recombinant-DNA techniques to modify the genetics and physiologic properties of many different types of microorganisms (as well as plants and animals).

In terms of safety, there are “two classes of issues,” one involving inadvertent risks that develop despite “good intent” and the other is deliberate misuse, Hutchison says. In terms of the former, “there is no difference from traditional genetic engineering.” As for the latter, “aside from toxins, we don’t know how to design something really novel, but there are people thinking about this problem,” he adds, alluding to the National Science Advisory Board for Biosecurity, whose mandate is to safeguard potential dual-use research of this sort.

Scientists working in this field as well as ethicists who follow it closely are weighing in with an array of opinions about reaching this milestone. For instance, some critics complain about the Venter Institute seeking patents to cover commercial rights for this research, saying they could impair progress in the field. Meanwhile, some ethicists express enthusiasm for the progress being made, while others, including Vatican representatives, urge caution. Amid these responses, President Obama asked the members of his recently revamped Presidential Commission for the Study of Bioethical Issues to put synthetic biology at the top of its agenda item. The commission report on this subject is due sometime before the end of this year.

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Microbiology Meets, Might Succumb to, Analytic Nanotechnology

Microfluidics, lithographic fabrication processes, and nanotechnology are major new analytical components that are helping to change how scientists study microorganisms, sometimes enabling the study of individual cells instead of massive numbers of cells, according to Steven Quake of Stanford University in Palo Alto, Calif. These analytic tools, in turn, are enabling researchers to address questions that were beyond the scope of conventional microbiology and already are illuminating the “dark matter” of microbiology, namely those species that so far cannot be grown in culture, he says. Quake spoke during the opening session, “Technology and Revolutions in Microbiology,” of the 110th ASM General Meeting last May in San Diego.

One striking trait is Quake’s pride in boasting about how small his work scale, and that of others in the field, is becoming. For instance, he says, “nanoliter performs better than microliter” for those analyzing single copies of microbial genomes, explaining that the smaller scale of the analytic vessels “lowers contamination and restricts side reactions.” Even so, in some cases that shrunken framework is considered too voluminous, leading some researchers to resort to “using a laser trap to isolate single cells,” he continues. Once trapped, individual cells can be “moved into a clean part of a microfluidic device, where there is no ‘background’ DNA.” The cells remain undamaged during this procedure through use of a trapping laser that works in the infrared range.

FDA Urged To Consolidate Food Safety Efforts and Make them Risk-based

In dealing with its food safety responsibilities, the U.S. Food and Drug Administration “should implement a risk-based approach,” and also should move away from a long-established “piecemeal approach to gathering and using information on risks,” according to a report issued last June by the Institute of Medicine (IOM) and National Research Council (NRC) in Washington, D.C. The report also calls on the federal government to “establish a centralized food safety data center to . . . conduct rapid, sophisticated assessments of food safety risks and appropriate policy interventions.” Further, FDA should consider delegating food inspection responsibilities to the states while setting national standards for such activities, according to the report. “Our report’s recommendations aim to help FDA achieve a comprehensive vision for proactively protecting against threats to the nation’s food supply,” says IOM-NRC committee chair Robert Wallace of the College of Public Health at the University of Iowa, Iowa City. “Foodborne diseases cause significant suffering, so it’s imperative that our food safety system functions effectively at all levels.” The report, “Enhancing Food Safety: The Role of the Food and Drug Administration,” is available at http://www.nap.edu.
Another noteworthy example of microbiology analysis on this shrunken scale points to some of the unusual challenges that may arise. Thus, adapting a chemostat to work on the microfluidic scale forced investigators to confront the impact of biofilms that formed along the walls of these tiny vessels, Quake says. In a traditional chemostat, the bulk cell population generally overshadows biofilm effects. On a nanoscale, however, the biofilm effects can dominate. Overcoming this challenge took a “plumbing solution,” he says. The overall device is designed to permit periodic scrubbing of biofilm-laden chambers with lysing buffers, while moving the planktonic growers elsewhere. Such relatively mundane maneuvers “extend the active lifetime of the device.”

Jeffrey L. Fox

Role for Microbes in Coping with Gulf Oil Spill

Amid anguish and anger over the massive oil spill in the Gulf of Mexico—particularly its destructive impact on that ecosystem—indigenous microorganisms will slowly but relentlessly play a major role in degrading much of that oil and helping to restore the equilibrium of that region, according to Jay Grimes of the University of Southern Mississippi in Hattiesburg and Ronald Atlas of the University of Louisville in Louisville, Kentucky, who spoke during a special session about the oil spill during the 110th ASM General Meeting last May in San Diego.

“Microorganisms consume many but not all the components in crude oil, but it’s not an instantaneous process,” Atlas says. “However, we’re better off to clean it up physically than waiting for the microbes.” In general, the hydrocarbon fractions in oil are degraded to carbon dioxide and water, while producing proteins and other macromolecules for the organisms. Less in the way of microbial decomposition happens to the more polar fractions in crude oil. And the tars in oils tend to deposit, much like asphalt, along the ocean floor or on beaches.

One proven way to accelerate microbial action is to add fertilizer to provide oil-decomposing species and consortia with a better balance of nutrients, Atlas says. For the Gulf spill, he recommends adding fertilizers when oil comes onshore and “sooner, rather than later.” Typically, there is a “burst” in activity and a sharp rise in populations of hydrocarbon-degrading microorganisms, temporarily reducing the local diversity of microbial populations.

Dispersants can help speed these degradative processes by making the crude oil more accessible to the microorganisms, according to Atlas. However, those dispersants, whose use is generally limited to oil floating on open waters, can damage other species, including fish and birds. Thus, he calls dispersants a “two-edged sword.” Not a great deal is known about the toxicology of oil-dispersant mixtures, Grimes says, noting that a colleague of his recently began to look systematically at the chronic effects of this combination on several representative species of fish and shellfish. “There soon may be serious federal money available for more studies,” he notes.

Despite interest in inoculating microorganisms, including those specially selected or genetically engineered to degrade crude oil, there is little to suggest that they could outperform indigenous microbes, Grimes says. Adds Atlas, “I gave up looking for such miracle ‘bugs’ years ago.”

Jeffrey L. Fox

Shift in Fungal Pathogen Could Be Key to Bee Colony Collapse

Bee colony collapse disorder could be due to the impact of two very different pathogens—one a fungus, the other several similar types of RNA viruses—coinfecting and thus weakening bees during a vulnerable stage as they move from winter to spring, according to Jay Evans of the U.S. Department of Agriculture (USDA) research labs in Beltsville, Md. He spoke during the colloquium “Microbes in Extinction Events.”

Separately, Arturo Casadevall of Albert Einstein College of Medicine in Bronx, N.Y., speculates that global warming could lead to the emergence of novel fungal diseases as fungi adapt to higher ambient temperatures, making them better suited to survive in mammalian hosts. He outlined that hypothesis, which is detailed in the inaugural (April 2010) issue of mBio. The new journal, the first open-access publication from ASM, was rolled out during the 110th ASM General Meeting in San Diego last May.

“Global warming means narrowing of the thermal gradient between ambient and mammalian temperatures,” Casadevall says. “As thermotolerance is more commonly found within the basidiomycetes, this group may be the major contributor of new fungal pathogens.” Moreover, he points out, “The risk from newly emerged fungal pathogens could be magnified by the fact that there are few antifungal drugs available and no licensed vaccines.”

Meanwhile, Evans of USDA does not argue that the emergent fungus Nosema ceranae—now often associated with honeybee colonies in North America and elsewhere in the Northern Hemisphere—is a sign of global warming, but he does say that it could be “interacting” with other factors such as pesticides or that affect the food supply of bees. More importantly, this newer fungus may be “displacing fungal species in the United States,” while also interacting with RNA viruses from the family Dicistroviridae. Indeed the presence of both that fungus and those viruses is “a