ence in this field. ... It is industry that should play the principal role in the commercial applications of space."

Aside from the discussions of ESA's future role in nurturing industry, the Council also made two important decisions on future programs. It declined to back a project called Euromoon 2000, proposed by former ESA astronaut Wubbo Ockels, to send a small orbiter and lander to the moon in the early years of next century. Development work on the project had already begun at ESA's technology center ESTEC in the Netherlands. Brachet pointed to two reasons why the Council killed Euromoon: It had been developed without first gathering the support of the scientific community and ESA's Science Program Committee; and, although it would have been a scientific mission, Ockels was proposing to fund it through $135 million of industrial sponsorship in addition to $45 million from ESA. "Such a project goes counter to the aims of the agency, which is that the funding of [science missions] be by its own means," Brachet says. The ESTEC team was very disappointed by the decision, Ockels says: "We had only asked for approval of the first phase. ... Nobody expected that there would be a problem."

The second decision was to approve the creation of a single ESA astronaut corps. This will involve the dismantling of the separate astronaut programs currently run by France, Germany, and Italy, and their integration with the existing small ESA astronaut corps at a new astronaut center based in Cologne. "This is a very laudable decision. ... We are convinced that this will contribute to increased activity and an increased role for European astronauts, especially with the advent of the international space station," says Council member Jean-Pierre Ruder of the Swiss Federal Office for Education and Science. The ESA astronaut center will be based at DLR headquarters in Cologne and could be up and running by next year, reports Kröll. "DLR will carry out a number of training functions on behalf of ESA. ... This decision clearly reduces costs and is a concrete example of increasing efficiency," he says.

With much of Rodotà's reform program still in its early stages, several Council delegates called for the June meeting of the Council, at which government ministers will be present, to be postponed. Germany also wants a delay until after its general election later this year. "We should have a ministerial meeting which takes decisions sufficiently well prepared," says Kröll. The Belgian Minister for Science Policy, Yvan Ylieff, who will chair the meeting, will decide on its date later this month.

–Alexander Hellemans

Alexander Hellemans is a science writer in Naples.

MICROBIOLOGY

New Hunt for the Roots of Resistance

As bacteria worldwide acquire resistance to the drugs meant to kill them, public health experts have stepped up surveillance of antibiotic resistance in human pathogens. Now a grassroots network of scientists is taking aim at what they see as the root of the problem: resistance genes in harmless bacteria that live in humans, animals, plants, even soil and water. By keeping tabs on when and where specific antibiotic-resistance genes appear, the group hopes to predict—and one day help block—the spread of resistance.

Efforts to track resistance in clinical pathogens have "too narrow a focus," argues Abigail Salyers, a microbiologist at the University of Illinois, Urbana-Champaign, who helped organize a meeting in Boston last week to plot the new strategy. She explains that antibiotic resistance can hide undetected in harmless bacteria well before it shows up in patients. "Clinical isolates are the tip of the iceberg compared to what's out there in the environment," agrees microbiologist Stuart Levy of Tufts University School of Medicine, who is president-elect of the American Society for Microbiology (ASM) and president of the Alliance for the Prudent Use of Antibiotics (APUA), an international group that hosted the Boston meeting.

Seemingly harmless bugs are worth watching, Levy says, because widespread dosing of both humans and animals with antibiotics selects for drug resistance in benign bacteria that normally thrive in such places as the large intestine. The resistance genes can then jump species lines into disease-causing bacteria. When that happens, the genes from harmless bugs are anything but. For example, ampicillin has lost its potency against infections caused by *Haemophilus influenzae* because the bacterium picked up an ampicillin-resistance gene from *Escherichia coli* in the 1970s. The ASM estimates that drug-resistant pathogens cost more than $4 billion per year in extra medical costs in the United States alone.

By using sequence similarities in resistance genes from different bacteria as an indicator, scientists have already identified a handful of such trans-species leaps, although they can't prove which way the genes jumped (see table).

To provide early warnings of such gene transfers, the new network will catalog resistance gene sequences and data on specific strains in a searchable Internet database. The 19-member working group hopes to enlist scientists, physicians, and public health workers worldwide, reaching them through the existing networks of the 7000-member APUA and the 40,000-member ASM, as well as with editorials in scientific journals. Funded by a $100,000 National Institutes of Health grant, the group will also launch two pilot studies. One study will compare drug resistance in harmless gut bacteria from rural Mexican children, who have not been exposed to antibiotics, with bacteria from children in Mexican cities, where antibiotics are sold over the counter. The other study will compare resistance in gut bacteria from antibiotic-fed cattle with those from antibiotic-free bison.

SUSPECTED RESISTANCE GENE TRANSFERS

Drug resistance	Benign Bacteria	Location	Disease-Causing Bacteria	Disease
Tetracycline	*Enterococcus* species	Human intestine	*Streptococcus pneumoniae* *Neisseria gonorrhoeae*	Pneumonia Gonorrhea
Erythromycin	*Bacillus sphaericus*	Soil	*Bacteroides fragilis*	Blood infections
Tetracycline	*Prevotella ruminicola*	Pig, sheep intestine	*Bacteroides fragilis*	Blood infections
Tetracycline	*Lactococcus lactis*	Cheese	*Listeria monocytogenes*	Food poisoning

SOURCE: A. SALYERS

Not everyone agrees that these efforts are on the right track. The link between resistance in harmless bacteria in animals and in human pathogens is "pretty tenuous," says Richard Carnevale, director of regulatory affairs at the Animal Health Institute, a group that represents producers of animal antibiotics. "I'm not sure it's worth doing." But other experts support the undertaking. "Their approach is the correct one," says microbiologist Mark E. Jones of MRL Reference Laboratories, who directs resistance surveillance efforts in Europe.

As drug-resistant pathogens continue to emerge from the shadows, researchers are eager to start their hunt. Says Salyers: "We need the answers yesterday."

–Dan Ferber

Dan Ferber is a science writer in Urbana, Illinois.