of Brazil's universities. The Federal University of Rio de Janeiro, the second largest public university in the country, cannot pay its telephone and electricity bills. And other public universities report similar straits.

Especially galling to many scientists was a directive, issued on 16 October by CNPq's president, José Galizia Tundisi, freezing funds for most new research and postgraduate fellowships and requiring the return of airline tickets that had already been issued. The agency also canceled funding for about 30 scientific meetings planned for the coming months. These measures drew sharp protests from the scientific community, prompting the science ministry to issue a statement on 5 November to try to calm things down. "We guarantee the same number of fellowships in 1999 as we had this year, and grant payments will continue to be made on time," promised Lindolpho de Carvalho Dias, interim minister for science and technology. (Science minister Israel Vargas was out of the country.)

While researchers throughout most of Brazil are tightening their belts, they are casting envious glances at their colleagues in the state of São Paulo. The richest state in Brazil, São Paulo gives 1% of its state tax receipts to the Foundation for Support of Research of the State of São Paulo (known as Fapesp). As a result, from 1998 to 1999, Fapesp's budget will increase $16.8 million to about $295 million—the equivalent of 45% of the federal science ministry's entire 1999 budget. This has led some researchers to argue for a sharp reduction in São Paulo's share of federal postgraduate and research fellowship funds. But Carvalho Dias promised last week that São Paulo's fellowship funds will not be raided.

Carvalho Dias also offered some solace to scientists working in un–air-conditioned offices. Unpaid utility bills at the nation's premier research institutes and their libraries will be covered by the end of the year, he said. If so, the group that meets at CBPF each Tuesday to discuss the financial crisis afflicting the country's science may at least get some relief from Brazil's summer heat. **–CÁSSIO LEITE VIEIRA**

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MICROBIOLOGY

Training a Molecular Gun On Killer *E. coli*

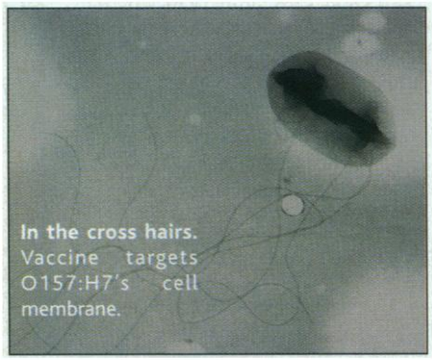
Scientists are hoping to add a vaccine to a thin arsenal against O157:H7, a bacterium that kills scores of people every year in the United States

Researchers at the National Institutes of Health (NIH) are closing in on the development of the first vaccine against *Escherichia coli* O157:H7, a pathogenic version of the common gut bacterium. Tests of an experimental vaccine showed promise in adults earlier this year, and the researchers are about to apply for approval to test it in young children. If the trial gets the go-ahead and the preparation passes further tests, experts say, a vaccine for people and one for livestock could be available early next century.

First identified in 1982, O157:H7 made headlines 5 years ago when contaminated hamburger meat sickened more than 500 people, triggering symptoms such as bloody diarrhea and kidney failure. Since then, the bacterium has turned up sporadically in everything from raw milk and apple juice to daikon radishes and drinking water. Some 20,000 cases occur each year in the United States, resulting in about 250 deaths; young children are the main victims. Moreover, O157:H7 shrugs off antibiotics with ease.

To tackle this daunting public health threat, a team led by NIH immunologist Shousun Szu is combining cutting-edge molecular biology with a method that dates back to Louis Pasteur. They homed in on O-specific polysaccharide, a molecule that studs the bacterium's cell membrane "like hair on the scalp," Szu says. Its structure is unique to O157:H7, she says, and thus serves as a good vaccine target.

The polysaccharide alone would make a poor vaccine, partly because it is too small for the body's immune system to notice. To solve this problem, Szu's group followed an approach developed 20 years ago by NIH pediatricians John Robbins and Rachel Schneerson. Szu bonded the polysaccharide to a carrier protein, which flags it for the immune system. In the future, Szu says, it may be possible to use a carrier similar to the O157:H7 toxin that triggers hemolytic uremia syndrome; this would create a powerful one-two punch against the organism.



In the cross hairs. Vaccine targets O157:H7's cell membrane.

CREDIT: CDC

The team tested the conjugate vaccine in adults. Within 4 weeks, all 87 volunteers had substantial blood levels of antibodies to the O157:H7 polysaccharide, with no observed side effects. More importantly, the subjects' blood serum contained enough antibodies to kill O157:H7 bacteria, even after being diluted at least 1000-fold. For the next step, Szu's group is preparing to submit to an NIH safety panel a protocol for a similar study in 60 children aged 2 to 4.

While clinical trials press ahead, Szu's team is hoping to design and test an O157:H7 vaccine in cattle—up to 2% carry the bacterium in the United States. In cattle, however, O157:H7 doesn't attach to the gut lining like it does in people, where it is easily reached by antibodies. It's unclear whether cow antibodies can reach the free-swimming bacteria in the intestines and stomach, says Mike Doyle, director of the University of Georgia's Center for Food Safety and Quality Enhancement in Athens. He's pursuing an alternative approach that involves feeding animals several harmless *E. coli* varieties believed to inhibit the growth of O157:H7. On another tack, Cornell researchers have found that in animals fed hay rather than grain for a few days before slaughter, gut conditions favor nonlethal *E. coli* (*Science*, 11 September, pp. 1578 and 1666). "The more control points we can develop, the better," Doyle says.

If researchers manage to create a working livestock vaccine, industry officials say they are keen to give it a try. "Assuming that the vaccination program would be no more expensive than some of the vaccinations they give cattle today, I believe people would use it," says David Theno, a vice president at the fast-food chain Jack in the Box. Restaurant groups, he adds, may insist that their meat come from vaccinated animals.

Scientists are trying not to raise public expectations too high, however. "No single intervention is going to get rid of this problem," says Phillip Tarr, a pediatrician at Seattle's Children's Hospital and Regional Medical Center who has treated hundreds of O157:H7 infections. "None are magic bullets. It's not going to be easy to eradicate: We don't have a sterile food supply and never will."

–RICHARD A. LOVETT

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