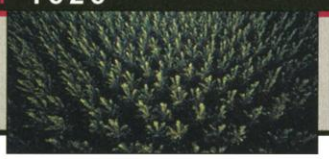
1624
The mammography wars

LEAD STORY 1626
The future for transgenic trees



1634
DNA and the search for roots

who wrote a commentary in the 24 January issue of *Nature* that criticized NIH and the Department of Defense for planning "duplicative" trials of the vaccine, says NIH has "shown excellent judgment after reviewing the scientific data." Douglas Richman, a virologist at the University of California, San Diego, who sits on NIH's AIDS Vaccine Advisory Committee, says many of his colleagues on that panel had similar qualms. "I was very uncomfortable with the two trials," says Richman. "I can live with the one." He says he "remains skeptical" that the vaccine will work, but adds, "I'd be delighted if I were wrong." **–JON COHEN**

BIOTECHNOLOGY

Has GM Corn 'Invaded' Mexico?

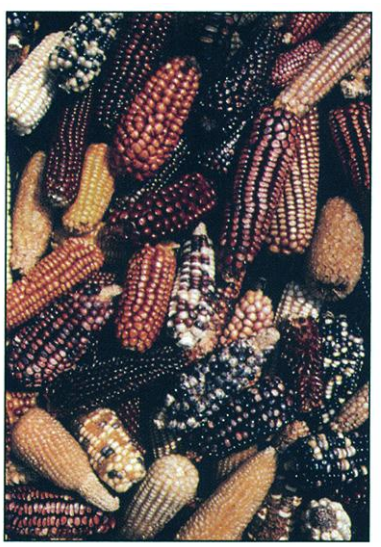
On Thursday, 21 February, the gene wars took a stunning new twist, or so it seemed. Mexican newspapers reported that two teams of government researchers had confirmed University of California (UC), Berkeley, biologist Ignacio Chapela's explosive findings: that transgenic corn was growing in Mexico, the heartland of maize diversity.

Yet even as Chapela was proclaiming this news at a Mexico City press conference, a scathing editorial in the February issue of *Transgenic Research* was crisscrossing the globe by e-mail. In it, editor Paul Christou charged that Chapela and his coauthor, UC Berkeley graduate student David Quist, had presented "no credible evidence ... to justify any of [their] conclusions." Meanwhile, *Nature*, which published the Quist-Chapela paper last November, was weighing the publication of no fewer than four biting critiques of the article. Adding to the muddle, Elena Alvarez-Buylla Roces, a biologist at the National Autonomous University of Mexico who appeared with Chapela at the press conference, insisted in a later e-mail to *Science* that Mexican investigators "still do not have definite answers towards corroborating or not [corroborating] Chapela's results."

Welcome to the "maize scandal," which is driving the battle over genetically modified (GM) crops to new heights of acrimony and confusion. Widely circulating anonymous e-mails accuse Chapela and Quist of conflicts of interest and other misdeeds. Meanwhile, 144 civil-society groups have leapt to the authors' defense, asserting in a joint statement on 19 February that the biotech industry is using "intimidatory" techniques to "silence" dissident scientists. "I've never seen anything like it," says Peggy Lemaux, a UC Berkeley molecular biologist who is one of the most public critics of the Quist-Chapela paper. "There's been a lot of fighting about transgenics, but this is something else."

Still unclear, say many scientists, is whether transgenic corn has indeed invaded Mexico—and if so, whether it poses a threat to one of the world's most important foodstuffs.

The furor began on 29 November, when Quist and Chapela reported that transgenic maize genes had introgressed—skipped from one gene pool to another—with traditional strains (landraces) of maize in remote areas of Oaxaca. The highlands of Oaxaca, Chiapas, and adjacent Guatemala are one of seven "centers of genetic diversity" that spawned most of today's crops. To protect this diversity, an invaluable resource for crop breeders, the Mexican government declared a moratorium in 1998 on planting transgenic maize anywhere in the nation. Now the *Nature* paper was claiming "a high level of gene flow" from illegally planted transgenic maize to local landraces—a process that Quist and Chapela argued could exert "a major influence on the future genetics of the global food system."



At risk? Traditional strains of maize could be threatened by GM corn.

Greenpeace and others opposed to biotechnology immediately called on the Mexican government to ban transgenic U.S. maize, the presumed source of the foreign genes. (Free-trade rules let transgenic maize be shipped into Mexico but not grown there.) "World food security depends on the availability of this diversity," Chapela told *Newsweek* in January. "Having it contaminated is something humanity should worry about."

Adding to the alarm, Quist and Chapela suggested that the transgenes were unstable. The foreign genes, they wrote, often "seemed to have become re-assorted and introduced into different genomic backgrounds." In other words, when transgenic maize hybridized with landrace maize, the novel genetic material broke up into chunks that jumped around the genome. The implications were profound: Because a gene's behavior depends on its place in the genome, the displaced DNA could be creating utterly unpredictable effects.

Activists' fears centered on the promoter sequence—usually CaMV 35S, which originates in the cauliflower mosaic virus—used to drive the activity of newly inserted genes for, say, herbicide resistance. If the promoter broke off during hybridization, it could conceivably take over other genes, with unknown consequences. "The spread of the promoter could prove to be worse than the spread of the genes for herbicide and insect resistance," says Peter Rosset, co-director of the Institute for Food and Development Policy (Food First), a research group that advocates on behalf of small farmers. "If true, this would be a red flag that would call into question every other GM crop on the market."

But Lemaux and other critics aren't buying it. "They're saying that the [hybrid and introgressed] genomes were completely unstable all the time," she says. "I've worked with transgenic corn for 10 years, and I've never seen anything like that."

To search for transgenic DNA, Quist and Chapela took sample ears of maize from two locations in Oaxaca in October and November 2000 and tested them using the polymerase chain reaction. PCR amplification detects particular snippets of DNA by multiplying them to observable levels. Unfortunately, notes molecular biologist Marilyn Warburton of the Mexico-based International Maize and Wheat Improvement Center (CIMMYT), PCR is so sensitive that minute traces of laboratory contaminants can create false-positive results. "If you get a positive result, you have to check it repeatedly," Warburton says. "And even then you need to confirm it by another method to be completely sure you're not fooling your-

CREDIT: CIMMYT

self." Chapela and Quist did not report performing such additional tests.

Motivated by these sorts of concerns, at least four groups of researchers—from the University of Washington, the University of Georgia, and two from Quist and Chapela's home base of UC Berkeley—sent sharply critical letters to *Nature* in December. Three referees reviewed the letters and recommended publication of one or more, accompanied by a rebuttal from Quist and Chapela. "The PCR and iPCR [inverse PCR, a variant] data presented is simply not sufficient data to warrant ANY of the conclusions of the authors," including both the presence of transgenic DNA in Mexican maize and its instability, declared the first reviewer. "*Nature* should demand that the authors retract their manuscript if they cannot demonstrate well-controlled DNA blot analyses [a common confirmatory test] documenting transgene integration events."

"*Nature* is coming under pressure to use secondary technical criticisms to discredit our main findings," responds Quist. Regarding doubts about the instability he reported, he believes that "the critique is coming from expectations" created by lab experiments "that aren't necessarily reflected in what you see when you go out in nature." To respond to criticisms, "we're discussing with *Nature* the possibility of publishing [in a reply] some new information that substantiates our findings."

(*Science* obtained three of the letters, the initial Quist-Chapela response, and some of the anonymous referee reports from sources other than their authors, who are blocked by *Nature* from discussing their critiques before publication. *Nature* editor Philip Campbell says the journal acts "as promptly as possible" on criticisms, publishing them when "appropriate.")

Surprisingly, even Quist and Chapela's most strident critics agree with one of their central points: Illicit transgenic maize may well be growing in Mexico. In May 2001 Chapela shared his initial results with the National Institute of Ecology (INE, the research arm of the Mexican Ministry of the Environment and Natural Resources) and the interagency National Biodiversity Council (CONABIO). Concerned, INE and CONABIO took maize samples from 20 random locations in Oaxaca and two in the adjacent state of Puebla. The samples were divided into two groups and independently analyzed by researchers at the National Autonomous University of Mexico and the Center for Investigation and Advanced Studies (CINVESTAV) at the National Polytechnic Institute. At a 23 January meeting in Mexico City, CINVESTAV official Elleli Huerta presented preliminary PCR findings indicating that transgenic promoters, mostly CaMV 35S, were present in about 12% of the plants. In some areas, up to 35.8% of the grain contained foreign sequences, INE scientific adviser Sol Ortiz Garcia told *Science* last week.

According to Ortiz, both the INE lab and the National Autonomous University of Mexico labs are still "double-checking" the findings. The possible corroboration, Alvarez-Buylla Roces says, is "only based on PCR tests and [is] preliminary." Indeed, says Timothy Reeves, director-general of CIMMYT, which is working with the Mexican government, the two Mexican teams are now responding to the criticism of PCR methodology by revamping their analyses to include bigger samples and more reliable tests.

Meanwhile, CIMMYT, which develops improved crops for Third World farmers, has been searching its vast storehouse of maize varieties for transgenic "contamination." By 22 February, the lab had found none, and the organization has adopted measures that it believes will prevent GM maize from entering its gene bank, preserving at least some of Mexico's maize diversity. But given the amount of transgenic maize in the United States, Reeves believes it is "very likely" that some will eventually end up growing in Mexico. For now, however, "transgenic maize in Mexico is still hypothetical."

—CHARLES C. MANN

AGRICULTURAL BIOTECH

NAS Asks for More Scrutiny of GM Crops

The U.S. Department of Agriculture (USDA) needs to strengthen its procedures for approving field tests and commercialization of transgenic plants, a National Research Council committee concluded in a report released last week. Although transgenic crops don't pose a greater risk than that of products of conventional breeding, the committee said, traits introduced by either technique can pose risks to the environment. Ultimately, it added, the potential environmental impact of conventionally bred crops should also be assessed. But for now, to bolster its regulation

CREDIT: KEITH WELLER/USDA

Look closely. An NRC panel says USDA should regulate biotech crops more rigorously.

ScienceScope

Debate Down Under Australian researchers were astonished this week by press reports that the government was considering new limits on stem cell research. The Melbourne broadsheet *The Age* reported on 26 February that senior ministers had agreed "in principle" to bar scientists from harvesting stem cells from embryos destined to be destroyed by in vitro fertilization clinics—prompting howls of protest from researchers and a hasty retreat by government officials.

Researchers said the reversal would imperil Australia's position as world leader in stem cell studies. Its scientists were among the first to isolate human embryonic stem cells, and they have produced 10 of the 73 cell lines approved by the National Institutes of Health for use by taxpayer-funded researchers in the United States. Prospects looked bright after the government spent heavily on a new tissue research center and a parliamentary panel last year recommended against restrictions.

So there was an instant uproar upon reports that the head of that panel, Minister of Ageing Kevin Andrews, had broken ranks and convinced a majority of ministers to support embryo restrictions. Andrews quickly issued a statement denying that the government had reached a decision. Still, researchers are wary. Says Martin Pera of Melbourne's Monash University: "We hope there's less to this than meets the eye."

Fish Fight South African ichthyologists are protesting a government decision to strip the name of a famous fish scientist from a prominent research center. The J. L. B. Smith Institute of Ichthyology in Grahamstown was named after the scientist who described the rediscovered coelacanth in 1938. But last year, government officials rechristened it the South African Institute for Aquatic Biodiversity, saying the new name would better reflect the institute's broader future mission.

Several institute scientists, however, are challenging what they call the "undemocratic" erasure of Smith's legacy. The name change is a "political ploy of dubious worth," ichthyologists Eric Anderson and Phil Heemstra charge in a recent open letter to members of the American Society of Ichthyologists and Herpetologists—if only because budget constraints mean the institute will remain focused on fish for the foreseeable future. Institute officials weren't available for comment, but Anderson is hoping that international pressure will convince them to restore Smith's name to prominence, perhaps as part of the titles of journals published by the institute.