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References

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Section:
THE FUTURE OF MEDICINE

BRAVE NEW FARM

The first commercial products bred by genetic engineering incur a backlash in Europe, where "Frankenstein" fears run deep

You may drive out Nature with a pitchfork, yet she will always hasten back.

--Horace, Epistles

Pitchforks? Nowadays we use guns. A so-called gene gun using gold bullets has become one of the standard methods for rewriting nature's codes. Pellets coated with DNA are fired into the chromosomes of a plant that biotech engineers wish to alter in some amazing way. Then, after patient cultivation to bring out the inserted trait, a prodigy is born. The transformed crop may be corn or cotton with a built-in insecticide, tomatoes that retain their fresh-picked texture on the shelf, or wheat with extra gluten, making for lighter, bouncier bread. The new crop of doctors has been so busy re-enacting the Creation in the past few years that Americans, at least, no longer pay much notice. If genetic engineers had envisioned a quick conquest of the world, however, they have experienced a sharp comeuppance in Europe, where fears about the unknown consequences of "Frankenstein foods" are rampant. So suspicious are Europeans that they are virtually ready to take up pitchforks on behalf of Mother Nature's return.

From a global standpoint Europe's resistance to genetically modified crops is a peculiar case: a complex amalgam of bad timing, conspiracy theories and allegiance to traditions, with perhaps a dash of economic protectionism thrown in. Yet the Continental food fight that continues to pitch up scare headlines in Europe may herald what genetic engineering can expect to encounter as it

moves more broadly into pharmaceuticals and medical procedures. It's not just a matter of consumers' smelling something very fishy in the idea of tomatoes given an antifreeze-producing gene from the winter flounder. More broadly, society--at least European society--is beginning to view genetic science as a market-impelled juggernaut out of control and wearing moral blinders.

The notion of science as a Faustian enterprise is deeply embedded in the popular psyche, even in the relatively optimistic U.S. Technologies that tinker with the fundamentals of life can inspire anxieties enough; when increasingly wedded to the profits of Big Business, the exercise can begin to look downright alarming. Author Jeremy Rifkin, America's most persistent critic of bioengineering, wonders what is in store for a world in which evolution is treated as a plaything and life as an "invention." A case in point: the announcement in November by Advanced Cell Technology of Worcester, Mass., that it had hybridized human DNA with a cow egg. Says David Magnus, director of graduate studies at the University of Pennsylvania's Bioethics Center: "It's an example of an issue that requires deep, careful thought. Instead, there was a race to get it done as fast as possible, because there were commercial benefits."

That race has produced some truly remarkable things. In one lab researchers are developing food plants fortified with a scrap of DNA that codes for a natural pesticide, eliminating the need to spray clouds of toxin over acres of crops. At another they're developing beans and grains with much higher levels of protein--no small thing for parts of the world where beef and other meats are scarce. At still others they're making potatoes with more starch and less water, coffee beans that grow caffeine-free right on the vine, tomatoes with more solid flesh and less pulp, and strawberries with less natural sugar. Better still, possibly, such Uber-plants, passing their clever new traits on to succeeding generations, could yield more bountiful harvests on marginal land in poor, overpopulated countries.

Europe's reticence mixes some good arguments with some ill-informed rhetoric. Does a modified form of wheat grown in France by the Swiss-owned giant Novartis contain a resistance to antibiotics, posing a risk of imparting that resistance to consumers? The company insists the buzz is nonsense, yet a French citizens conference last year solemnly accepted the rumor as fact. Do genetically altered crops "outbreed" with wild relatives and other plants? Yes, but so do hybrid farm crops produced by classical breeding since time immemorial. The prospect of unwittingly breeding "superweeds" and "superpests" is a justified concern, demanding caution. Yet studies to date suggest herbicide-resistant genes die out in the wild. And when eco-saboteurs raid a test field to uproot plants, as in a highly publicized spectacle on a British farm last July, they seem to be defeating their own calls for further trials of the crops.

At the same time, biotech firms like Novartis, America's Monsanto and Britain's Zeneca are somewhat disingenuous when they imply that nothing could go wrong with their products. Science has moved at such a dizzying pace that neither politics nor the law, let alone research into unforeseen consequences, can keep up with it. Britain's pre-eminent champion of organic farming, Prince Charles, weighed in on the debate in mid-1998 with a newspaper commentary arguing that transferring genes between utterly unrelated species--fish to tomatoes, for instance--"takes us into realms that belong to God, and to God alone."

What rings the loudest alarm bells, of course, is the specter of cloning humans. No sooner had Dolly the sheep emerged from a Scottish lab than authorities scrambled to build legal pinfolds. Fourteen U.S. states introduced bills to regulate cloning, and President Clinton outlawed the use of federal funds for the purpose--although much of bioengineering has long since slipped that leash. Bioethicist Glenn McGee, Magnus' associate at the University of Pennsylvania, notes that with so much research now financed privately, less and less of it "receives any federal scrutiny."

The difficulty for legislatures lies in striking the right balance, weighing public concerns against the principles of free inquiry and market liberties. In fact, genetic modification is very big business today for the U.S., both domestically and as an export earner. That does not necessarily entail greater dangers than usual, but it can--and does--result in confusion between commercial rights and what properly belongs to the personal or public domain.

While society is torn between benefits and risks, commercial scientists have done a bad job of regulating themselves, in Magnus' view. "Testing with breast-cancer genes was offered far too early," he says. "It wasn't even clear what the tests meant." He adds, "We could literally have had women getting double mastectomies because of a positive result on a genetic test, where in fact the test does not mean that they are at increased risk."

Perhaps because of Europe's deeper suspicions of Big Business, the food fight has prompted a regulatory go-slow on the Continent. One factor is the scare that erupted in 1996 over "mad cow" disease in British beef. Though the disease was caused by feeding animal parts to cows, rather than by genetic meddling, the panic left consumers extremely wary about what goes onto the family dinner table. Herbert Krach of the Swiss Small Farmers Union notes, "For years scientists assured us that feeding animal-based feeds to cattle was harmless." But the cautions also owe something to romantic--and perhaps outdated--notions about agriculture. Says population geneticist Brian Johnson of Britain's conservation watchdog English Nature: "Conventional intensive agriculture has done more damage to wildlife than anything else." Anyone who thinks that pesticide spraying is safer than biotech crops, he says, "must be nuts."

Still, critics contend that consumers should at least have the option of refusing bioengineered foods. The European Union recently introduced mildly restrictive labeling requirements, but no such regime exists in the U.S., Canada or the other countries with rapidly expanding fields of modified crops. Tricky ownership questions also arise: Is a bioengineered potato, or any gene sequence mapped in the lab, a patentable property? These threads are increasingly tightly coiled by nature and science, and not easily unraveled.

WHAT PEOPLE THINK

Should genetically engineered food be labeled as such?
Yes 81% No 14%

If food were labeled as genetically engineered, would you buy it for yourself or your family?
Yes 28% No 58%

PHOTO (COLOR): ECO-SABOTAGE Last November demonstrators uprooted a field of genetically altered plants in Oxfordshire, England

PHOTO (COLOR): ANTI-CLONER American critic Jeremy Rifkin protests that evolution is not a toy and life is not an invention to be patented

ILLUSTRATION

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