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PERSPECTIVE ON SCIENCE; Think Twice Before Trying to Outwit Nature; EA worldwide moratorium should be declared on genetically engineered food crops

By Jeremy Rifkin

On May 20, the term "genetic pollution" officially entered the public lexicon. Scientists at Cornell University reported in the journal *Nature* that the pollen from genetically engineered corn containing a toxin gene called Bt killed 44% of the monarch butterfly caterpillars who fed on milkweed leaves dusted with it. By contrast, caterpillars fed with conventional pollen all survived. The results are all the more shocking given the fact that nearly 25% of the U.S. corn crop now contains the Bt transgene and the Corn Belt states of the Midwest are where half of the monarch butterflies are produced each year.

In the wake of the monarch butterfly study, a growing number of scientists now say they wonder about the potential environmental effects of scores of other genetically engineered crops being introduced into the agricultural fields. Indeed, some critics are asking, why weren't these and other studies done before introducing genetically engineered corn, soy, cotton and other crops over millions of acres of farm land?

The fact is, genetically engineered crops are radically different from conventional crops because they contain genes in their biological makeup from completely unrelated species. For example, scientists have introduced an anti-freeze gene from flounder fish into the genetic code of a tomato plant to protect the plant from cold spells. While scientists have long been able to cross close relatives in the plant kingdom, the new genetic tools allow them to cross all of the biological boundaries, adding genes from viruses, bacteria, other animals and plants into the genetic code of traditional food crops.

Ecologists are unsure of the impacts of bypassing natural species boundaries. Consider, for example, the ambitious plans to engineer transgenic plants to serve as pharmaceutical factories for the production of chemicals and drugs. Foraging animals, seed-eating birds and soil insects, will be exposed to a range of genetically engineered drugs, vaccines, industrial enzymes, plastics and hundreds of other foreign substances, for the first time, with untold consequences.

Over the next 10 years, life science companies plan on introducing thousands of laboratory-conceived transgenic plants over millions of acres of farmland around the world. Ecologists tell us that the risks in releasing these novel crops into the biosphere are similar to those we've encountered in introducing exotic organisms into North America. While many of these nonnative creatures have adapted to the North American ecosystems without severe dislocations, a small percentage of them have wreaked havoc on the flora and fauna of the continent.

Whenever a genetically engineered organism is released, there is always a small chance that it too will run amok because, like non-indigenous species, it has been artificially introduced into a complex environment that has developed a web of highly integrated relationships over long periods of evolutionary history.

Much of the current effort in agricultural biotechnology is centered on the creation of herbicide-tolerant plants. To increase their share of the growing global market for herbicides, life-science companies like Monsanto and Novartis have created transgenic crops that tolerate their own herbicides. Monsanto's new herbicide-resistant patented seeds, for example, are resistant to its best-selling chemical herbicide, Roundup.

The companies hope to convince farmers that the new herbicide-tolerant crops will allow for a more efficient eradication of weeds. Farmers will be able to spray at any time during the growing season, killing weeds without killing their crops. Critics warn that with new herbicide-tolerant crops planted in the fields, farmers are likely to use even greater quantities of herbicides to control weeds, as there will be less fear of damaging their crops in the process of spraying. The increased use of herbicides, in turn, raises the possibility of weeds developing resistance, forcing an even greater use of herbicides to control the more resistant strains.

New pest-resistant transgenic crops, like Bt corn, are also being introduced for the first time. Monsanto and Novartis are marketing transgenic crops that produce insecticide in every cell of each plant. A growing body of scientific evidence points to the likelihood of creating "super bugs" resistant to the effects of the new pesticide-producing genetic crops.

Some ecologists warn of the danger of what they call "gene flow"--the transfer of transgenic genes from crops to weedy relatives by way of cross-pollination. New studies have shown that transgenic genes for herbicide tolerance and pest and viral resistance can spread by way of pollen and insert themselves into the genomes of relatives, creating weeds that are resistant to herbicides, pests and viruses.

The insurance industry has quietly let it be known that while it will provide coverage for negligence and short-term damage resulting from the introduction of genetically engineered crops into the environment, it will not offer liability coverage for long-term catastrophic environmental damage because the industry lacks a risk assessment science--a predictive ecology--with which to judge the risks.

The industry understands the Kafkaesque implications of a government regime claiming to regulate the new field of biotechnology in the absence of clear scientific knowledge of how genetically modified organisms interact once introduced into the environment. Who, then, will be held liable for losses if a transgenic plant introduction were to trigger genetic pollution over an extended terrain for an indefinite period of time? The life science companies? The government?

The introduction of novel genetically engineered organisms also raises a number of serious human health issues that have yet to be resolved. Most of these new crops contain genes from nonfood-source organisms. With 2% of adults and 8% of children having allergic responses to commonly eaten foods, consumer advocates argue that all novel gene-spliced foods need to be properly labeled so that consumers can avoid health risks.

The British Medical Assn. has become so concerned about the potential health effects of consuming genetically modified foods that it has just called for an open-ended moratorium on the commercial planting of genetically engineered food crops until a scientific consensus emerges on their safety. And, last month, the European Commission announced a freeze on licenses for genetically engineered plants after learning about the monarch butterfly study.

A worldwide moratorium should be declared now on releasing genetically engineered food crops and other gene-spliced organisms into the environment pending further study of the potential environmental and health risks and liability issues at stake. It would be irresponsible and foolish to continue seeding farmland with genetically engineered food crops when we have yet to develop even a rudimentary risk assessment science by which to regulate these new agricultural products.