

Q & A on pharmaceutical crops

Q: What is a “pharm” crop?

Genetic engineering (GE) corporations are creating crops that produce proteins that are pharmaceuticals, vaccines, industrial enzymes or reagents for biochemical laboratories. Genetically engineered (GE) “pharm” crops are mostly grown in open fields, then after harvest the novel protein is purified for use. Most pharm crops are in pre-commercial field trials, but at least two proteins used in biochemical and diagnostic procedures are already being grown in corn for commercial use – avidin and beta-glucuronidase. Other proteins from pharm crops are already in clinical trials. Open field trials of pharmaceutical crops have been taking place every growing season in the US since 1992. If these altered crops were released into the environment they could never be recalled and could enter the food chain.

None of the companies have a commercial permit for the cultivation of these crops. In the case of avidin and beta-glucuronidase, the companies are selling the chemical in commercial channels, but hiding their actions behind a “research” permit provided by the USDA. With this type of permit, the chemicals and field locations can be kept secret.

Q: What kind of products are companies developing in gene altered plants?

About 20 companies worldwide are developing plants for the production of pharmaceutical or industrial proteins using rice, wheat, corn, barley, tomatoes and other plants. Companies have already conducted open field trials of plants that produce Hepatitis B vaccine, human antibodies against herpes and other diseases, and human blood proteins. One company is developing an animal drug in corn, and suggests that the corn would be grown only for feed. Field trials have taken place at least in the US, France, and Canada.

Q: What is Greenpeace protesting today?

A California company called Applied Phytologics, Inc. (API) is conducting field experiments of genetically engineered rice that is altered to produce human proteins for use as drugs or other non-food uses. We know there are drugs in these rice fields because of the type of permits issued by the USDA for these particular field trials. These “test fields” mean release of genetically engineered organisms into the environment – in this particular case the GE fields are even located close to a conventional rice fields. The GE varieties are likely to contaminate also their wild relatives as well as their whole environment. This environmental risk is unnecessary as these chemicals can be produced in other ways.

Q: What drugs is this rice actually producing?

According to the information submitted by the company to the USDA, there are nine different compounds being produced in the Applied Phytologics fields. Eight of the nine compounds come from humans, that is, there are eight different human genes engineered into the rice plants. API is producing human lysozyme, human lactoferrin, human alpha-1-antitrypsin, and an unidentified human trefoil factor, among other compounds that the company claims as secret “confidential business information.”

Human lactoferrin and human lysozyme are commonly found in breast milk, as well as in human bile and tears. They both possess antimicrobial properties, that is, they have been shown to kill certain bacteria. Lactoferrin binds to iron and kills bacterial cells by depriving them of this essential mineral. It has also been shown to promote cell growth and has immune-modulating effects. Lysozyme breaks apart bacterial cells and is a common reagent in molecular biology laboratories. Alpha-1-antitrypsin is used to treat symptoms of cystic fibrosis, emphysema, and liver disease. All these compounds can be produced by other less risky means.

Q: Why is Applied Phytologics producing these drugs in a plant?

All the companies experimenting with pharmaceutical and industrial enzyme crops (see attached table) claim that the method has lower costs than production within a pharmaceutical facility. One company says that just 200 acres of corn would produce the same amount of drugs that would otherwise require building a \$400-million factory. Moreover, by making the compounds in crop plants, rather than non-food plants, they can take advantage of all the cultivation, harvest, and processing machinery already designed. Rice or corn fields producing pharmaceuticals provide a high yield of the material that can be harvested and processed on a very large scale in regular food crop facilities before being sent to the pharmaceutical factory for further purification.

This means, of course, that there is a great risk for pharmaceutical crops to mix with crops destined for human or animal food. Applied Phytologics has formed partnerships with two different companies that have malting capabilities – Coors Brewing Company (US) and Maltagen Forschung GmbH (Germany) – as the pharm rice or barley needs to be malted before the proteins can be isolated. Beer-making facilities could also become contaminated.

Q: Could this rice contaminate other plants?

According to Norman Ellstrand, professor of botany at the University of California at Riverside, cultivated rice can easily transfer its genes to wild and weedy relatives, such as red rice, a common weed in California rice fields. If pharm rice pollinates nearby food rice, or red rice, the pharmaceutical protein would be produced in the resulting rice grains, thereby contaminating human and/or animal food sources. Scientists do not know exactly how far rice pollen can travel.

Q: How is this crop dangerous to me?

There have been no peer reviewed scientific studies published on the safety of pharmaceutical-producing rice. No one knows whether this rice is safe to eat. We do know from experience that companies have failed to segregate GE from non-GE crops, even when directed by the government to ensure segregation, such as in last year's StarLink fiasco. Because there are numerous ways that rice for human consumption could become contaminated with pharm rice, use of rice or any other food crop for pharmaceutical production should be stopped in open fields.

Q: Does this crop pose an environmental risk?

Yes. There are many other organisms in the environment that consume rice or rice plants. The most well-known are the millions of ducks that visit California's Central Valley every winter and eat the rice seed remaining in the fields.

Q. Is Greenpeace opposed to all pharmaceutical crops?

We are opposed to the introduction into the environment of all engineered crops. We are not opposed to contained greenhouse cultivation.

Q: What does Greenpeace want?

Crops engineered to produce pharmaceutical or industrial proteins should not be grown in open fields. Greenpeace is calling for a ban on the release of genetically engineered crops, since these plants will irreversibly alter the natural environment, with potentially devastating consequences for food production and biodiversity.