

7. Do the other species now in the ecosystem to which the thylacine might be restored have any rights or interests that should be considered as the project moves forward?
8. Now that you have read this case, go back and reread the "true but twisted" version in the preface. Would it be professionally unethical for a journalist to write this case up along the lines of the paragraph in the preface? (For related issues about professional responsibility in journalism, see question 3 in Case 35: Bhopal and Case 38: Scientific Integrity at EPA.)

NOTES

1. Department of Primary Industries, Water and Environment, Government of Tasmania, *Tasmanian Tiger*, August 2002, available at www.dpiwe.tas.gov.au/inter.nsf/WebPages/BHAN-53777B?open.
2. James Meek, "Special Report: The Ethics of Genetics. Scientists Pledge to Clone Extinct Tasmanian Tiger," *Guardian*, May 29, 2002, available at www.guardian.co.uk/genes/article/0,2763,723868,00.html.
3. Meek, "Special Report."

SOURCES

- Australian Museum. "Australia's Thylacine: A Conversation with Professor Mike Archer, Director of the Australian Museum." *The Australian Museum Online*. 2002. Available at www.austmus.gov.au/thylacine/archer.htm.
- "Bringing Back the Tiger." *ABC News*. August 22, 2002. Available at http://more.abcnews.go.com/sections/science/dailynews/cloning_tasmaniantiger000822.html.
- Holloway, Grant. "Cloning to Revive Extinct Species." *CNN*. May 28, 2002. Available at www.cnn.com/2002/WORLD/asiapcf/auspac/05/28/aust.thylacines.
- Meek, James. "Scientists Pledge to Clone Extinct Tasmanian Tiger." *Guardian*, May 29, 2002. Available at www.guardian.co.uk/genes/article/0,2763,723868,00.html.
- Tasmanian Department of Primary Industries, Water and Environment. *Tasmanian Tiger*. August 2002. Available at www.dpiwe.tas.gov.au/inter.nsf/WebPages/BHAN-53777B?open.
- Weidensaul, Scott. "Raising the Dead." *Audubon*. May 2002. Available at <http://magazine.audubon.org/features0205/thylacine.html>.

GOLDEN RICE

Vitamin A deficiency is a serious and widespread problem in the developing world, leading to blindness and increased risk of infectious disease for approximately 400 million people worldwide. In the hopes of ameliorating the problem, researchers at the Swiss Federal Institute of Technology created a genetically engineered strain of rice: golden rice. To create golden rice, the researchers first added a daffodil gene to their rice's genome. Then to enhance iron absorption, the researchers removed the gene that codes for phytate.

The Swiss institute has turned the golden rice over to the International Rice Institute, which will employ traditional breeding techniques to produce rice varieties best adapted to particular geographic areas. These varieties will then be distributed to farmers on an ability-to-pay basis, with those most in need receiving the rice free of charge.

Golden rice will not eliminate vitamin A deficiency by itself. Consumed in normal quantities as a staple food, it contains less than a quarter the amount of vitamin A recommended by most authorities as a daily requirement. But there is no doubt that adding vitamin A to one of the world's most important staple crops will provide health benefits to millions of malnourished people whose vitamin A intake is on the margins.

DISCUSSION

The creators of golden rice hoped that their plant would be easily accepted because of its potential benefits to so many of the world's poorest persons. As one writer expressed the hope in 1999, "Because the potential benefits seem great and the potential health and environmental risks small, . . . the new rice strain may draw less opposition from the critics of genetically engineered foods than other modified crop plants now being marketed."¹ Both the scientists' and the writer's optimism has proven to be naive.

Critics of golden rice, including Greenpeace, contend that the rice is a cheap substitute for serious efforts to eliminate the causes of vitamin A deficiency: poverty and inadequate diet. According to Dr. Vandana Shiva, "The lower cost, [more] accessible and safer alternative to genetically engineered rice is to increase biodiversity in agriculture."² Vitamin A, the critics point out, can be found in a variety of food plants, including green leafy vegetables, eggs, milk, and meat. These alternative sources of vitamin A, the critics argue, are being threatened by genetically engineered foods. Proponents reply that the vitamin content of eggs, milk, and meat is irrelevant to the hundreds of millions of poor who cannot afford these foods.

Some part of the debate is clearly political and is being conducted with an eye on plants other than golden rice. To both proponents and opponents of genetically modified foodstuffs, golden rice is seen as the "gateway organism"—the plant that will give genetic engineering a kindly face. Widespread acceptance of golden rice, both groups believe, would establish a legal and psychological precedent that would open world marketplaces to a much broader range of genetically modified organisms (GMOs). Vandana Shiva writes, "Genetically engineered vitamin A rice is now being used as a Trojan horse to push genetically engineered crops and foods."³

Proponents of golden rice also frame their arguments in moral and political terms. In a particularly scathing article, Dr. Ingo Potrykus, the principal scientist behind the creation of golden rice, comes close to accusing GMO critics of crimes against humanity:

The GMO opposition often demands that scientists be held responsible for their actions. At the same time, however, they sidestep responsibility for the harm they cause to the disadvantaged and poor with their creation of a most hostile atmosphere against GMOs in Europe and elsewhere. In my judgment, hindering a person's access to life- or sight-saving food is criminal. To do this to millions of children is so criminal that it should not be tolerated by any society.⁴

Greenpeace's answer is just as blunt:

"Golden Rice" containing provitamin A will not solve the problem of malnutrition in developing countries. . . . A normal daily intake of 300 grams of rice would, at best, provide 8 percent of the vitamin A needed daily. . . . It is clear from these calculations that the GE [genetic engineering] industry is making false promises about "Golden Rice." . . . This whole project is actually based on what can only be characterized as intentional deception.⁵

Clearly, one's attitude toward golden rice might be affected by one's citizenship and nutritional status. The United Nations Development Program, in a report on genetically modified foods, offered this observation: "Western consumers naturally focus on potential allergic reactions and other food safety issues. People in developing countries, however, may be more interested in better crop yields, nutrition, or the reduced need to spray pesticides that can sicken farmers."⁶

But it is one thing to observe that the concerns of consumers in Europe and America may be different than the concerns of poor persons in developing countries. It is more difficult to decide how those different concerns should be balanced. Proponents of golden rice accuse critics of imposing Western priorities on malnourished Africans and Asians. Critics accuse the proponents of putting the lives and ecosystems of Third World peoples at risk to serve their own Western scientific hubris. Some African scientists believe that much of the present debate is misplaced. For example, while suggesting that "the millions of dollars being wasted each year by anti-biotech activists elsewhere could go a long way to help build badly needed capacity for agbiotech research in Africa," Jesse Machuka goes on to conclude that "biotechnology for Africa should mostly be done in Africa and mostly by Africans themselves."⁷

QUESTIONS

1. In terms of the moral and ecological issues it presents, does golden rice differ significantly from Bt corn, which has been genetically modified to render it immune to a commonly used synthetic pesticide?
2. Is it true, as Dr. Potrykus charges, that the environmental groups that oppose genetically engineered crops such as golden rice are responsible for denying life-prolonging or life-saving nutrition to millions of the world's poorest people?

3. Is it true, as Greenpeace charges, that the promotion of golden rice can only be characterized as intentional deception?
4. Like Case 26: Tasmanian Tigers, this case raises issues about the release of genetically engineered organisms into the environment. What principles should govern such releases?

NOTES

1. Trisha Gura, "New Genes Boost Rice Nutrients," *Science* 285 (August 13, 1999): 994.
2. Vandana Shiva, "Genetically Engineered Vitamin 'A' Rice: A Blind Approach to Blindness Prevention," February 14, 2000, available at www.biotech-info.net/blind_rice.html.
3. Shiva, "Genetically Engineered Vitamin 'A' Rice."
4. Ingo Potrykus, "Golden Rice and Beyond," *Plant Physiology* 125 (March 2001): 1160.
5. Greenpeace, "Genetically Engineered 'Golden Rice' Is Fool's Gold," Greenpeace Statement, February 9, 2001, available at www.biotech-info.net/fools_gold.html.
6. United Nations Development Program, "Press Release: Although Controversial, GMOs Could Be Breakthrough Technology for Developing Countries," Human Development Report, 2001, available at www.undp.org/hdr2001.
7. Jesse Machuka, "Agricultural Biotechnology for Africa: African Scientists and Farmers Must Feed Their Own People," *Plant Physiology* 126 (May 2001): 19, available at www.plantphysiol.org/cgi/content/full/126/1/16?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&searchid=QID_NOT_SET&stored_search=&FIRSTINDEX=0&volume=126&firstpage=16.

SOURCES

- American Society of Plant Biologists. *Genetically Modified Crops: What Do Scientists Say?* Rockville, Md.: American Society of Plant Biologists, 2001.
- Greenpeace. "Genetically Engineered 'Golden Rice' Is Fool's Gold." Greenpeace Statement. February 9, 2001. Available at www.biotech-info.net/fools_gold.html.
- Guerinot, Mary Lou. "The Green Revolution Strikes Gold." *Science* 287 (January 14, 2000): 241-43.
- Gura, Trisha. "New Genes Boost Rice Nutrients." *Science* 285 (August 13, 1999): 994-95.
- Machuka, Jesse. "Agricultural Biotechnology for Africa: African Scientists and Farmers Must Feed Their Own People." *Plant Physiology* 126 (May 2001):

- 16-19. Available at www.plantphysiol.org/cgi/content/full/126/1/16?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&searchid=QID_NOT_SET&stored_search=&FIRSTINDEX=0&volume=126&firstpage=16.
- Potrykus, Ingo. "Golden Rice and Beyond." *Plant Physiology* 125 (March 2001): 1157-61. Available at www.plantphysiol.org/cgi/content/full/125/3/1157?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&searchid=QID_NOT_SET&stored_search=&FIRSTINDEX=0&volume=125&firstpage=1157.
- Shiva, Vandana. "Genetically Engineered Vitamin 'A' Rice: A Blind Approach to Blindness Prevention," February 14, 2000. Available at www.biotech-info.net/blind_rice.html.
- United Nations Development Program. "Press Release: Although Controversial, GMOs Could Be Breakthrough Technology for Developing Countries." Human Development Report. 2001. Available at www.undp.org/hdr2001.
- Wambugu, Florence. "Why Africa Needs Agricultural Biotech." *Nature* 400 (1999): 15-16.
- "Zambia Affirms Rejection of Genetically Modified Food." CNN. September 3, 2002.