Media Treatment of Plant Biotechnology

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The relationship between plant biotechnology and the mass media has vacillated during the past two decades. At times it has seemed as if proponents of plant biotechnology have used media outlets as advertisement of the novel and outstanding claims of biotechnology, and at other times the same biotechnology proponents have felt unfairly treated by the media; that risks of the technology are blown out of proportion. This situation is not much different from other fields of science, especially those known for controversy (e.g., global warming and stem cell research). This article examines the role of media in science reporting, the role of scientists, and a brief history of plant biotechnology interactions with the media. Included here are a few case studies, and what we might expect in future media coverage.

Question: What is the role of the media in science coverage in general and plant biotechnology in particular?

Answer: In general, media outlets report on news stories that are of interest to the general populace or a specialized subset of people. Their duty is to report facts in an interesting way and give the opportunity for reasonable opinions to be aired. Plant biotechnology and, in fact, all the sciences are highly technical in nature, and there is often a tradeoff between absolute accuracy in reporting and the understandability of the material for people who are not trained or educated in the particular science. Typically, the story must be told in a few words or minutes, which also makes it difficult communicating details.

The more specialized the writer and reader, the easier it is to convey the fine points and limitations of the science story. For example, there are a number of journals that cover science research for scientists and many pertinent details can be included in arcane technical language and mathematics that would not be appropriate for a general readership. Thus, in reporting science for the general public, without the precision of mathematics and technical vocabulary, pertinent facts risk being lost or glossed over, and scientists often complain that the media "doesn't get the science right."

However, most scientists have no training in media relations and many are uncomfortable talking with reporters about their work. Therefore, media reporters complain that some scientists cannot

explain science so that it can be understood by non-scientists. In this backdrop, it must be noted that responsible journalists rely on original scientific peer-reviewed publications as a primary source of science reporting. This issue will be discussed further.

Genetic engineering has been of interest to many people for a variety of reasons, and the media have taken a variety of approaches and perspectives in communications over the years. Since most processed food in the U.S. contains genetically engineered ingredients (corn and soybean), consumers are interested in nutrition and food safety (Is it safe to eat?). Since a majority of U.S. cropland is used to grow genetically engineered foods, people interested in environmental issues are also concerned (Will it harm the environment?). Some people wonder about the ethics of corporations seeming to control the food supply and agriculture in general (Is it fair to farmers and consumers?). There are people whose interests tilt toward global areas (Will it help feed the world?), business (Will there be economic benefits?), or competitiveness (Will it help U.S. trade or science?).

All of the above issues are valid and worthy of news stories and, indeed, all these angles have been covered in plant biotechnology. Although diverse fields (e.g., economics, business, ethics, and sociology) have stakes in the outcome of how genetic engineering is perceived, the science behind biotechnology and how it has been reported has often been the point of contention between groups who hold different philosophies and worldviews. Therefore, it is important to also examine the roles of scientists and the groups whose livelihoods (agricultural industry) and ideals (activists) rest with scientific outcomes.

Q: What is the role of scientists, industry, and non-governmental and activist groups in interaction with media?

A: The role of scientists is to create new knowledge using sound scientific principles and communicate it in peer-reviewed journals. The chief role of scientists is to do good science and report it accurately, and the main reporting outlets are journal articles that have been reviewed for accuracy by their peers. Scientists are assumed to be objective and competent in experimental design, data collection and analysis, and its interpretation. In addition the primary source of scientific knowledge — the scientific canon — is the primary peer-reviewed literature in which data and results are displayed. Of course, the conditions of competency and objectivity are not always met in science, so it is the job of peer reviewers and editors to assure that scientific publications closely meet stringent requirements. Peer-reviewed journal publications are not the only acceptable means of communications with other scientists, media outlets and the public, but journal articles are considered to be the "gold standard" of science dissemination because of these built-in checks and balances. Thus, scientists are the people who should be most objective in biotechnological debates, especially when it comes to safety and risk assessments, which are at the heart of many controversies that have been played out in public.

Industry and activists are not expected to be neutral. They are assumed to carry some sort of premeditated agenda, which would shade the credibility of their scientific pronouncements. This situation is complicated somewhat because the biotechnology industry employs scientists who have dual allegiance: to their employer and also to the ideals of science. Activist groups generally have few practicing scientists in the midst. Often, therefore, university and government

scientists who are not affiliated with industry or activist groups are assumed by the media to be the least biased.

News stories in the popular media are primarily triggered by peer-reviewed publications, which are then the subject of press releases by companies, universities and even scientific journals. However, scientists, and in some instances universities, have inappropriately communicated their results prematurely (prior to or instead of in peer-reviewed publications) and the media have partnered in allowing non-reviewed information to be communicated to the public in ways that have not only misrepresented the facts of the science, but that have also damaged the credibility of plant biotechnology in present and future contributions to society.

Q: What is the history of plant biotechnology and the media?

A: Media relations with biotechnology can be divided into three stages: early, middle, and late.

The early stages of biotechnology (1975–1994) could be characterized by optimism that genetic engineering could revolutionize the pharmaceutical and agricultural industries. Much of the science originated from companies and the reporting emphasized benefits. New regulatory structures were being erected by governments and groups of scientists met to discuss how biotechnology should be regulated, beginning with the 1975 meeting in Asilomar, California. The middle stage (1995–2002) was characterized by negative reporting stemming mainly from preliminary or flawed scientific studies. The first commercial genetically modified plants were grown in 1995 and more university scientists were performing biotechnology risk-related research. In hindsight, the results of this chain of events are not surprising. A few examples are briefly discussed below. The period from 2003 to the present has been largely quiet in reporting on food biotechnology, indicating a certain maturity of both the science and the media. There have also been overshadowing issues looming in environmental science, especially global warming.

The most interesting period with regard to controversial reporting comes from the middle period of 1995–2002. In 1998, after completion of genetically modified (GM) potato feeding studies in lab rats, Arpad Pusztai announced on British television rather than in a peer-reviewed journal that the rats had intestinal problems. His announcement focused negative media attention on GM food and scared the public. Pusztai published his data the next year, 1999, and it was promptly trounced by myriad scientists and scientific organizations including the Royal Society, which concluded that no scientific conclusions could be drawn from Pusztai's study.

In 1999, the most spectacular negative GM plant story emerged from a small, lab study of questionable design at Cornell University in which researchers force-fed monarch butterfly caterpillars pollen from GM corn plants transgenic for a Bt insect resistance gene. The caterpillars died, which was not surprising given that this species is closely related to corn pests, which are the target insects that the Bt protein was deployed to control. However, monarch caterpillars feed on milkweed, not corn. The question that really needed to be answered was the potential exposure of these insects to Bt corn pollen.

Unfortunately, it took a host of researchers two years to deliver those data, which conclusively showed that monarch butterflies were not at risk from biotechnology crops. After the Cornell scientists'1999 paper, published in the prestigious journal *Nature*, the *New York Times* headline was "A warning from the butterflies" (May 21, 1999), and from the *Washington Post*, "Gene altered corn may kill monarchs" (May 20, 1999). After the suite of papers refuting the Cornell scientists' results, the headlines were, respectively, "Data on genetically modified corn reports say threat to monarch butterflies is 'negligible'" (NYT, August 20, 2001) and "Biotech corn appears safe for monarchs" (WP, July 24, 2001). Note that the initial tone of the headlines is more alarmist in 1999 than in 2001. That the initial research came from an Ivy League school and was published in *Nature* likely fueled the fire of the media. In this case the reported science and coverage was not representative of the facts about the agricultural system and a course correction of sorts was made by the media two years later *(also see the paper on monarchs by Hellmich on this website).*

The final example also involves a prestigious university (University of California-Berkeley) and, again, the journal *Nature*. In this instance, a group of researchers published a paper in which they claimed that transgenes from corn had crossed the border from the U.S. into Mexico where they had introgressed (i.e., stable integration of a transgene into a related plant genome-see article on gene flow on this website) into Mexican landrace corn. In this case, the *New York Times* announced "Genetic modification taints corn in Mexico" (October 2, 2001). This study was severely criticized by the scientific community almost immediately and *Nature*'s editor distanced his journal from the paper. The follow-up paper came four years later and found (as was suspected by most scientists) that no transgene flow could be found in Mexican landrace corn. No headlines in large newspapers announced these findings.

Of course, highly sensationalist headlines abound in tabloid journalism, which also upsets the scientific community because the alarmist Frankensteinian nature of tabloid writing strays far from scientific facts. "Lifting the lid on the horror of GM foods" (*The Express*, May 20, 1999), "Mutant porkies on the menu" (*News of the World*, May 23, 1999), and "GM food threatens the planet" (*Observer*, June 20, 1999) might be more amusement than news to most people, but they apparently do play a role in shaping public opinion.

Even in the middle period of biotechnology alarmism, there seems to be an attempt at balanced coverage by the major media. Invariably, when the media went astray, most of the blame could ultimately be placed on individual scientists, peer reviewers and editors, since they did not assure that the science was of high quality to warrant publication in journals such as *Nature*.

Q: What can we expect in the future?

A: Perhaps it is reasonable to expect that most media leaders have learned from past mistakes of over-reporting potential benefits or risks of biotechnology. The science has grown up as well in the past decade and scientists have gotten a bit more sophisticated in science communication and media relations. In addition, millions of people have eaten GM-derived foods grown on millions of acres of land in the past dozen years with no documented ill effects. These factors tend to remove the shrillness from potential alarmist media treatments.

Perhaps even more important, the push-pull dynamics of the GM controversy has changed in recent years in two ways. First, the agbiotech industry has moderated its aggressive push of GM products. The industry seems much more reasonable and thoughtful than it was a decade ago. Not that they engender any more trust among environmental activists, but scientifically their scientists are operating more as scientists and less as biotechnology cheerleaders. Second, Katrina, the worst hurricane to hit the U.S. in decades, brought to the forefront global warming as *the* cause for environmentalists to fight. Momentum on this front continued by *An Inconvenient Truth* in 2006, which led to Al Gore winning the Nobel Peace Prize in 2007. GM plants pale by comparison to global warming as a cause for environmental concern.

Two recent examples demonstrate the lack of mainline media overreaction in biotechnology. In 2005, Irina Ermakova gave a presentation at a scientific conference in which she claimed that GM soybeans in chow fed to mother rats caused their pups to be small and die at a higher rate compared with the control groups. There has been no follow-up peer-reviewed paper published. Very recently, a study was published in the *Proceedings of the National Academy of Sciences USA* that indicates that pollen and plant debris from Bt corn can get into waterways and kill caddisfly larvae, an important insect in aquatic ecosystems.

Yet, there has been a noted absence of sensationalist reporting in the media in these two instances, which would likely not have been the case just a few years ago. It is as if the news media is saying, "Been there, done that." Science is a self-correcting process in which real facts about nature are eventually learned and reported. When science works at its best, there is a normal refractory period between when a scientific paper is published and when it is discussed and replication and follow-up studies are performed. Have the media or scientists experienced that ideal frequently enough in response to controversial science? No. But are we progressing? It seems as if we might be. The internet now seems to have filled the bottom feeder niche in controversial areas. In science, at least, mainline news seems to more often play a respectable role in reporting. There are exceptions, of course, but it does give hope that biotechnology will continue to receive mature treatment.

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