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My view

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The question "Are weed scientists repeating the mistakes with genetically modified crops (GMCs) we made with pesticides?" was asked during the Western Society of Weed Science Meeting in March 2000. Weed scientists and business advocates of GMCs often say, "we need to educate the public" about this technology. Our view suggests that we might be ignoring a relevant science involving risk perception that resulted from trying to understand the pesticide controversy of the 1970s.

First, let's ask why professionals repeat the same mistakes. Petroski (1993) noticed a pattern associated with new bridge designs that failed every 30 yr. Analysis suggested that young engineers ignore basic design assumptions described in the "older" literature while continuing to cut costs by reducing construction materials. Eventually, the bridge fails, resulting in disaster. Are young weed scientists and genetic engineers searching the older literature? Do we require students to explore the social perceptions and associated sciences that include risk analysis and risk perception?

Second, scientists express a strong ethic of analysis and repeatability leading toward an understanding of our world as constructed through research. Risk analysis is based on mathematical models or empirical comparisons of actual risks. We assume that given factual information, consumers will draw similar conclusions. So, we "educate" more, but do consumers decide about risks based on analysis of probabilities and safety margins?

Evidence suggests that consumers construct knowledge about controversial issues from information presented by the media, personal beliefs, and perceptions of risk (Slovic 1987). Consumers may include risk analysis data if they are presented clearly by trusted, third-party professionals who are unlikely to benefit. Slovic concludes that people are more likely to engage in risky behavior when actions are voluntary, risks are known, and consequences are understood. Consumers become outraged when presented with potential exposure to a manufactured, unfamiliar product that they fear might have possible delayed health and environmental effects and is controlled by someone else (Grobe and Douthitt 1995). Ethical beliefs also contribute to perceptions and actions (Sparks et al. 1995). These include religious concerns about human intervention and genetic manipulation of living organisms.

Third, the science of risk perception says, "give consumers choice" of information and products. It is not about educating them about risk analysis or explaining the utility of the product or science (many researchers' implied moral view), but facilitating learning when the individual poses the question or desire to learn and to choose. It is not about including GMCs as if they are the same as crops improved by Mendelian genetics, but about honesty and developing trust with information and respect for the consumer's ability to make informed choices.

Hoban (2000) suggests that consumers are overwhelmed with information, including data on food labels (http://www4.ncsu.edu/~hobantj). When asked separately, neither consumers nor companies want to pay for labeling. But what might happen if GMC labeling were viewed or described as education instead of more data required on labels? For example, genetic selection procedures could be diagrammed to show similarities between plant selection 8,000 yr ago (Diamond 1999), breeders' selection of improved varieties using Mendelian genetics, and today's improvements using bioengineering of crops. Listing environmental and social benefits with concerns expressed by scientists and consumers would provide evidence for developing trust, reducing potential outrage, especially involving children, and improving the public's knowledge about science (Groth 1991).

As professional weed scientists, we are taught to judge the merits of an alternative or to reason why the idea won't work! For a moment, why not consider alternatives that use insights gained from multiple sciences while achieving a new or different approach toward educating the public for the 21st century? Let's fold the diagram and list of benefits and concerns mentioned above and attach it to food containers similar to labels on pharmaceutical products. Alternatively, the information could be placed throughout supermarkets or at checkout counters, on the Web, or sent for newscasts that include a wide array of views. The purpose would be to provide clarity and information or additional sources of data in a variety of media and messages to help consumers make informed choices.

Evidence suggests there are similarities between the pesticide controversy and public perception of GMCs. We know from experience that educating the public worked partially. There are numerous other possibilities to provide information for learning. As scientists, we ought to blend the social sciences, including risk perception with the sciences of learning, to craft approaches that might work with new technologies such as GMCs. We need not reinvent the wheel that failed to turn last time!

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