PLENARY SESSION

83rd Annual Meeting
of The American Phytopathological Society
August 19, 1991, St. Louis, Missouri

Our Responsibilities in the Food Safety Debate

Will D. Carpenter

Monsanto Co., St. Louis, MO.

I would like you to think about the image and stand the scientific community needs to take in the public eye regarding the issue of food safety. By the very nature of your profession of plant pathology, you are engaged in the protection of the world's food supply. I also understand that particularly in the past two years, APS is challenging its membership to explore ways in which your perspective and expertise can be, according to past president Paul Williams, "brought to bear on matters of public policy and concern in the areas of plant protection and plant health."

As I was preparing my discussion, I decided to do an actuarial computation based on my dietary habits. Over the course of my life, I discovered, I have put myself at mortal risk by consuming substantial quantities of red meat, chicken, fish, apples, fruits, vegetables, coffee, moderate amounts of wine (sometimes from a lead-crystal decanter), and tap water (but only in extreme circumstances). After toting up the amount of these life-threatening substances and studying the statistics, I concluded that I must be dead.

Clearly, if everything I have been reading is correct, no one could have eaten food for this long and survived the experience. What did I die of? The choices I am offered by food extremists and the media are endless: a large assortment of terminal illnesses from pesticide residues, cardiovascular disease from steak or coffee, food poisoning from chicken and fish, and so on.

Or was it the steady diet of scare stories that killed me?

Obviously I am not dead. But I am dead serious. How many people have endangered their health because fear made them avoid foods that are unquestionably important to a long life? Foods such as apples and vegetables?

I acknowledge there are substantial risks in the food we eat. Over the last several years millions of people became ill—or indeed died—because of contaminated food and water. But virtually none of the documented illnesses was from the substances receiving media attention. They were caused by the same sources that have plagued humankind from the first time our ancestors ate a bad piece of mastodon meat or drank from a stream that had a dead cave bear 400 yards upstream. Coliform bacteria and salmonella in diseased food ranging from cole slaw to chicken are the sources of 99.9% of all food poisoning in this country.

I appreciate the advances in understanding health and nutrition that have come our way over the years. I want to be told of these advances. But if I want to be scared, I'll buy a Stephen King novel. I want to be informed; I don't want to be manipulated. I want facts, not headlines that sell papers. I don't want good science turned into bad advice.

The public debate about the safety of our food supply should not, and cannot, be a spectator sport. Good science is not enough to give the public the knowledge and assurances it needs. In fact, we all put our own freedom to operate at risk if we do not keep the public debate on an accurate course. If you think this is an issue that belongs to industry scientists and not academic professors, then you need to play catch-up, because your professionalism—your academic freedom—also is at stake.

For reasons that are clear to a scientist, we deal in terms of risk-benefit ratios. What are the benefits of using pesticides versus the risks of using them? The public doesn't realize what worldwide losses would be due to insects or diseases if pesticides weren't available, or what this would do to the price of any available food left after a severe epidemic. But the public doesn't like dealing with that sort of equation. It makes it sound as if we are institutionalizing risk, accepting it—telling them that a little more cancer is okay with us, because it is in a good cause. We are in a trap. When the EPA computes its ratios, is it not telling the public that the use of a certain insecticide or fungicide will cause x number of cancers in our population?

Of course, it isn't as simple as that. In this complex game of probabilities and risk computations, we are dealing with statistical derivations, not reality. And we are often dealing with probabilities that are themselves extrapolations from animal feeding studies—a highly questionable exercise. We have no evidence that the maximum tolerable dose for a rat has any relation to a minuscule quantity consumed by a human. We do know that a rat's biochemistry is a lot different from ours. However, until we have better ways, we must continue to use these model systems, albeit better than we do it now.

Risk-benefit ratios, far from being a willingness of the government to take chances with human lives, are just the opposite. What the risk-benefit ratios say to me is this: if the best science we can offer finds any more than the most remote risk in a product, based on evidence not all that relevant to people, we will not allow that product to be used, or we will set tough limits on human exposure or consumption. That, unfortunately, is a perception that entirely escapes the public, and one that either is beyond the ability of critics to see or something that they choose not to see.

Moreover, when tolerances to pesticides are set, I think the public has no idea how low those tolerances are. Just what is a part per million, or a part per billion? How can anyone visualize how small an amount that is? You have an instinct, a training to appreciate these ratios. Your audience does not. Next time you are talking to a layman, try these comparisons to put what you understand in terms they can understand. One part per million is equivalent to a credit card lying on a football field. One part per billion equals a pinhead on a football field, or one M & M on a football field covered with M & Ms one foot deep, or a 35-mm slide lying somewhere within the boundaries of the city of Cleveland.

The point is that our priorities can get seriously out of balance and even destroy our decision-making process. Instead of thinking about risk-benefit ratios, we should think about risk-risk ratios. That is, what are the risks of using pesticides versus the risks of not using them? For a truly objective assessment of risk, we must first compare risk with risk. If we determine the risk of a pesticide residue present in our food, why shouldn't we determine the risk of the presence of a wide range of toxins that will be present if the pesticide is not used? And if we determine the toxicity of a pesticide at higher concentrations than are found in food, and make judgments from that data, let's be consistent and have comparable studies run on the toxins found in untreated plants.

Yes, pesticides are a health issue—they protect plants from injury from insects and plant pathogens that can lead to toxin production in plants. It is axiomatic that the first line of defense

in keeping aflatoxins out of peanuts and grains is to protect the growing crops from insect and disease damage. In other words, pesticides make a great contribution to our health. It is our job to help make people understand that. In fact, I would think it is also the job of the EPA and the FDA to help people understand that it is our job. And I commend APS for your position statement on the use of fungicides as "medicines for plant health" that you made public last August.

Let us get the debate back in balance, while we proceed with science and technology to find ways to make food safer and safer. The chemical era in agriculture is making as much of a contribution as it is capable of making. The advent of chemicals generated a dramatic and vitally important jump in agricultural productivity in the last generation or so. There simply wouldn't be nearly as much healthy and healthful food on this planet were it not for chemicals. But I think we would all agree that we could use another tool to keep meeting the goal of a plentiful, safe, high-quality supply of food at a reasonable cost. Fortunately, another tool is on the horizon: biotechnology, or genetic engineering, or the new biology, or whatever term you choose. I think the best term is biology, pure and simple. We have been well served by the physics of mechanization and the chemistry of pesticides and fertilizers. Now, at last, we know enough about the agricultural life sciences, and about life's processes, that we can harness those closest to nature.

I won't give you a Monsanto commercial, and I won't give you a biology lesson—you hardly need that. But I do want to give you my spin on this technology: its virtues, its pace of development, and its role in protecting food and fiber crops and in protecting and serving us. As you know, the main lines of research concentrate on conveying inherent resistance to insects, viruses, and herbicides. This research is well along into the field-test stage, and about three years away from the market. Work on resistance to fungi, drought, cold, and acid or saline soils is also proceeding, but it is not as far along. And, as you know, work is progressing rapidly on improving the physical characteristics of foods (higher solids content, more protein, resistance to rotting, and even better taste).

On the economic scale, the goal of this research is a more reliable harvest of better-quality food with lower inputs. In other words, it is primarily about productivity. On the human scale, it is also about production. There is not much more good land to bring under cultivation, and we should not bring marginal lands and rain forests under cultivation because the environmental consequences are unacceptable. So the only way to produce enough food for a growing world population is to improve the productivity of existing lands in a sustainable way. And that means, in particular, the lands in food-short areas, where stresses are severe, skills and capital are low, and population growth the highest. That is a very poignant benefit of biotechnology. The only skill needed is the ability to plant a seed.

The first crop altered by biotechnology is likely to be our *Bacillus thuringiensis* (*B.t.*) cotton, which is performing at commercial levels in field tests. It naturally wards off all caterpillars that attack cotton—creatures that usually take four or five or even more sprayings to control. The benefits to productivity are dramatic. So are the environmental benefits: we can eliminate the annual need for major use of insecticides in the United States. In the pipeline behind cotton are insect- and virus-resistant tomatoes, potatoes, corn, and other vegetables. Herbicide-resistant commodity crops such as soybeans, canola, and cotton will reduce the cost and environmental consequences of herbicides and tilling.

But by the year 2000, I suspect that no more than five percent of the $2 billion spent yearly on crop protection will be spent on biotechnology-derived crops. It is a revolution in agriculture, but not an overnight revolution. We need good methods of integrated pest management (IPM), and I don't mean the way some people have corrupted IPM to mean no chemicals. We need to continue some Jeffersonian principles of agriculture such as crop rotation—accelerate techniques that fell into disuse when chemicals came along and did such a good job for us. And we need chemicals. Biotechnology, mechanization, and chemicals, used with modern IPM principles, are our arsenal for the foreseeable future. All of them will be working in concert and subjected to rigid regulation and standards.

Despite our plans for the future, damage is being done. Although our science can stand up to the test, you will find, if you ever get the opportunity to debate opponents, that facts won't win it for you. Scare stories sell to lay audiences much better than science. They may seem to be talking about the future, but they are using dark-age thinking, which was based on fear of knowledge and fear of altering the status quo. I want to alter the status quo, for the status quo is one billion chronically malnourished people whom we condemn to their current condition if we don't recognize that good science is not enough and that we have to stand up and be counted in this debate on food safety.

So, let me charge you with what I think are your responsibilities:

1. You must step up and participate in the public debate on food safety and continue in the mode of issuing position statements and exploring any initiatives or alliances with other agricultural professional societies to speak in unison. As a corollary, you must learn how to debate effectively. Become spokespersons. Be public. Don't be afraid to seek coaching from those experienced in dealing with the media. It's a different arena from the one you're participating in this week. You are not guaranteed to win just because you are correct. You must learn how to win in the rough-and-tumble arena—to use emotional statements that get attention while still maintaining your scientific integrity.

2. You must participate in the sustainable agriculture issue. Your research should be designed to meet the demands and opportunities posed by the issues being raised. There are many opportunities to improve disease control and, at the same time, improve food quality and meet sustainable agriculture criteria.

3. You must address the risk versus risk issue I've described regarding the pesticide issue, regarding biotechnology: the risk of not using pesticides versus the risk of pesticides. You, better than any other group, can bring skill and knowledge to this issue.

4. You must see that current practices and the new opportunities of biotechnology as well as new pesticide techniques are brought to bear in ways that improve agriculture. Do not pit biotechnology versus chemicals. Explore the integration of these tools.

5. Work together as colleagues in academia, industry, and government across all plant science/agriculturally related disciplines. Have a voice. Think partnership. Think teamwork.

The improved use of pesticides and the new science of biotechnology are only two of the weapons we have if we are to have the faintest chance of providing food to the people on this planet. It is our responsibility to take a stand, to realize that good science is not enough, and to fight subjective, inflammatory speculation.