

Critical Research Issues

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Dean A. Danilson

My task today, as I understand the charge of the session, is to discuss critical research issues from the perspective of the fresh red meat industry. My approach will be to focus on general issues and perhaps stimulate some discussions and thoughts that may evolve into specific research ideas or projects that would prove beneficial.

Value-Based Marketing is the buzz word of the industry recently. Value differences are in a continuous flux. What created "value" five years ago may not be delivering value today. For example, poultry protein replacement continues to force red meats into new frontiers of pricing and usage. Fat pork trimmings and fat beef trimmings will continue to experience downward value pressures.

What are we going to do with the fat? Our challenge is to further develop systems that efficiently recover the valuable proteins from the carcass and maintain competitive economic, functional and quality attributes to further processed meat products. We face several obstacles in these pursuits. The most critical are the regulatory aspects of meat versus poultry final-product usages. Also of great importance are the functional characteristics of the recovered proteins and how they affect both further processed products and fresh ground products. In order for the red meats to regain competitive positions with poultry and other alternate protein sources, these issues must be addressed and resolved.

Rapid changes in the industry to closely trimmed, boneless subprimals are going to put even greater demands on our lean recovery systems. Also, alternate or improved usage for the tallow and lard end products are needed.

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Another area of importance to the fresh meat industry is the retail display life of our fresh meat products. The industry has achieved excellent performance in improving distribution shelf life over the past 10 years. Distribution shelf life of 30 to 60 days for domestic products is now not uncommon. Export product shelf life of 60 to 80 days is consistently achieved with some additional packaging and handling modifications. We also know how to achieve 100-day shelf life if the need is there; however, this does not appear to be a critical need currently. On the other hand, the retail case life of products is gaining greater attention as retailers strive to increase the marketing flexibility of their fresh meat products. Improving ground beef case life by 6 hours and whole muscle cut case life by 24 hours would add tremendous value to the marketing and value of fresh meat products. Two basic factors affect this: (1) color stability, and (2) micro stability.

Improvements in packaging technology will continue to address this issue. Further basic research however, is needed to discover methods of physiologically changing the muscle itself to allow for extended retail display characteristics. The recent vitamin E supplementation work is an example of this concept. The potential improvement shown by slowing the oxidative process is one that needs further evaluation.

Along the same lines, PSE pork and dark cutting beef continue to be unsolved problems. Further discovery of processing, chilling and packaging methods are needed to reduce these problems. As important, however, is to re-emphasize the root problem of prevention and control before they get to the packing house. Animal genetics must continue to receive focus to gain control on these incidents. Also, management and feeding systems may also contribute significantly to reducing these problems.

Microbiological interactions of fresh meat systems are of great interest. Recent works with organic acid sprays are revealing interesting interactions of microorganisms as we change the micro-environment of the meat, and even the micro-environment of the physical plant. More clearly, what are these interactions, and how do they affect the microbiological conditions of the carcass, vacuum-packaged subprimals, fresh ground beef systems, retail overwrap products and the cooked and processed products? We don't as yet know the answers to these questions, and how best to take full advantage of these altered conditions.

Automation in the slaughter and fresh meat processing industry is continuing as a major priority. Methods and systems that serve to reduce costs, improve quality and ad-

dress the safety and ergonomic concerns of the industry will continue to result in new opportunities and new problems as they relate to the technical and scientific concerns of the industry.

W. C. Schwartz

Research Priorities from a Further Processing View

Establishing the appropriate animal food research priorities is extremely important for the future of the meat food industry. Importantly, choosing the correct research priorities is paramount in providing food for the future. Seldom do we reflect upon the impact our daily decisions make toward the future. The results of our activities each day not only impact the next year or the next five years, but also the next generation, or the next five generations.

Yogi Berra, the hero of us ex-baseball players, is credited with the quote "If you don't know where you're going, you might wind up someplace else." None of us would start a cross-country trip without a road map and some schedule for arriving at a defined destination. However, as I look at our daily activities, we usually focus on the "getting started," rather than on the "where we expect to end."

It is very appropriate that we pause here today to reflect on the circumstances of our daily research and how it coincides with the larger industry perspective. None of us here would disagree with the global research priorities including:

- clean water
- clean air
- clean environment
- safe and wholesome food

What is important to this audience is not our agreement with this list of global goals, but rather how we, in our industry, our companies, our universities, address these goals in our daily research activities.

It is important to me in Butterball, and to my counterparts in the other parts of Armour Swift-Eckrich, and Conagra, that we not lose sight of our responsibility to long-range goals as we develop new processes, new products, new businesses in the meat food arena. It is wrong for me, for us, to focus only on the short-term perspective of a research project without considering the longer view.

An example could be my recent role in the Butterball Fresh Tray Pack introduction. Although my specific responsibility was to define the products and processes of manufacture, I knew my role extended into the construction aspects of an efficient operation, the equipment selection for low energy and manpower utilization, the sanitation aspects of clean equipment without mechanical damage and disruption to the waste water treatment system. There were no "breakthrough" discoveries in this process, no revolutionary developments that attracted reporters, but rather a combined disciplinary effort by engineers and scientists to be good citizens of the world as well as good businessmen. This is not basic research, in the classical sense, but renewed applications of known information to protect and conserve the environment.

Our goal was not just to provide poultry products in today's marketplace, but to establish a sustained business for the future with safe, wholesome nutritious turkey products that fit today's lifestyle and culture. Considerations were given to minimize packaging, use recyclable materials, assure wholesomeness and provide nutritious products that our customers find simple and easy to prepare...and eat. Nothing is accomplished if the products are not consumed.

Did we achieve complete recyclability, complete wholesomeness, complete nutrition? No, but we have chosen the best, appropriate materials available in today's market. Will we discontinue our search for better materials, better processes, better food safety, and better nutrition? No, we will always seek to improve what we have done to make it better for our consumers. Is this research? I'm not sure, but it is a continuous process for improvement through research.

What does this mean to defining research goals? As I see it, any of the typical research subjects discussed by meat scientists have inherent as part of their research the requirements that the research address the global goals regarding the environment, food safety and efficient production. No matter what the shorter-range goals, including such key areas as food safety, health and nutrition, growth and development, animal welfare, processing technologies or whatever, there is always the longer view of the implementation for the next generation or generations.

It is important for me to point out, as a representative of the further processing membership, the need for animal agriculture to focus on the interdisciplinary application where engineers, environmentalists and scientists can collectively structure a research plan that makes sense in the world our children and grandchildren will inherit. This is not a world where meat scientists will garner the final decision. It is a world where the matrix of research disciplines must be managed to collectively focus on the combination of events that will sustain the world of the future.

As my hero Yogi Berra is also credited with saying, about the popularity of a local restaurant, "that place is so popular, nobody goes there." As we focus on meat science research priorities, let us join the efforts by other scientists so we make certain we are planning a road map that takes us where we want to go. If we don't do this we may end up, as Yogi says, "someplace else" and "nobody" will be there with us.

Clifton A. Baile

Biotechnology as a Growth Industry

The discoveries of biotechnology will soon be approaching 20 years of age. Several of the key discoveries, restriction enzymes (Kelly and Smith, 1970), DNA ligases (Weiss, et al., 1968), etc. led to the first transformed microbe in 1973 (Cohn et al.). The first biotechnology-based "boutique," Genentech, was soon formed. Genentech's success led the way to the creation of hundreds of other small companies specializing in applications of an emerging technology, genetic engineering. This excitement, dreams and speculation attracted billions of dollars of venture capital primarily for human medical interests. By January 1, 1992,

Amgen, one company of these origins, joined the Standard & Poor's 500 and was given a \$10 billion market evaluation.

The growing market of biotechnology-based protein drugs is now well over \$2 billion annually. Late in the 1970's, interest in animal applications of biotechnology started to attract investments. Bovine somatotropin product development was the first direct spinoff of this early drug research activity. Many other applications of biotechnology for animals and plants have subsequently been the basis of the formation of small companies. Close to \$4 billion in 1992 is directed by federal agencies to support biotechnology research. Even more than that is being spent by hundreds of companies to develop further the science and applications of biotechnology. Of tremendous potential for broadening the horizons for many aspects of biological research is the 15-year, \$3 billion federal support of the Human Genome Project.

Biotechnology Advances in Human Medicine and Spinoff to Animal Agriculture

In Figure 1 is a list of protein drugs approved by the FDA since 1982, starting with Humulin® (biosynthetic insulin). Momentum in protein drugs is growing: 5 of the 30 products approved by the FDA in 1991 were of this type. This rate may be duplicated in 1992 and possibly 100 more biotechnology-based drugs are in clinical trials now.

All of this activity is bound to lead to applications of identical or similar products for animals. In many cases, a major advantage is that human drug development leads to initial reagents and test probes for studies both *in vitro* and *in vivo* in other animals. Of longer-term consequence is the development of a large number of products resulting in significant production process developments and associated discoveries which lead to reduced costs of drug production. In many cases, this alone permits consideration of new animal product concepts. Finally, some of these biosynthetic proteins are likely to have desirable effects during certain physiological states of animals not predicted from their names or the initial basis for their discovery.

The rapid development of genetic engineering has made it possible for a soaring rate of new discoveries. Proteins present in minute quantities but sometimes of immense importance to animal physiology can be predicted from messenger RNA. Thus, the existence of previously unknown proteins can be demonstrated by isolation and multiplication of very specific genetic codes. This has led to the discovery of numerous important proteins (i.e., hormones, receptors, enzymes) that otherwise would have been impossible to discover by classical endocrinology-based techniques, even before knowing the function of these proteins.

Figure 1
Biotechnology-Based Drugs Approved by FDA

	<i>Company</i>	<i>Indication</i>	<i>Year</i>
Actimmune	Genentech	management of chronic granulomatous disease	1990
Activase	Genentech	acute myocardial infarction acute pulmonary embolism	1987 1990
Alferon	Interferon Sciences	genital warts	1989
Engenix	SmithKline Beecham	hepatitis B	1989
Epogen	Amgen	treatment of anemia associated with chronic renal failure, including patients on dialysis and not on dialysis, and anemia in Retrovir-treated HIV-infected patients	1989
Procrit	Ortho Biotech	treatment of anemia associated with chronic renal failure, including patients on dialysis and not on dialysis, and anemia in Retrovir-treated HIV-Infected patients	1990
Humatrope	Eli Lilly	human growth hormone deficiency in children	1987
Humulin	Eli Lilly	diabetes	1982
Intron	Schering- Plough	hairy cell leukemia genital warts AIDS-related Kaposi's sarcoma non-A, non-B hepatitis	1986 1988 1988 1991
Leukin	Immunex	autologous bone marrow transplantation	1991
Prokine	Hoechst-Roussel	autologous bone marrow transplantation	1991
Neupogen	Amgen	chemotherapy-induced neutropenia	1991
Orthoclone OKT3	Ortho Biotech	reversal of acute kidney transplant rejection	1986
Protropin	Genentech	human growth hormone deficiency in children	1985
Recombovax HB	Merck	hepatitis B prevention	1986
Roferon-A	Hoffman- LaRoche	hairy cell leukemia AIDS-related Kaposi's sarcoma	1986 1988

Reference: Genetic Engineering News, Jan., 1992

Within many of our life times, the understanding of receptors on cells have evolved from essentially a concept to a specific protein or a family of proteins. These advances have in many cases replaced the need for pharmacological classifications for receptor types, such as the adrenergic receptors which are subdivided according to their pharmacological response to epinephrine and non-epinephrine (Ahlquist, 1948). Now the genetic expression of a hormone receptor and binding characteristics of each of a family of receptor proteins can be studied for cell type specificity, etc. (Laird et al., 1991). The diversity of protein receptors has led to new strategies for drug design utilizing very powerful chemical tertiary structure software for predicting specific drug analogs with highly selective activity. In some cases, production of quantities of a specific receptor protein allows screening for specific binding by peptides or other chemicals to develop specific blockers.

Summary

Human health-related research is leading the way to new technological breakthroughs, reagents, probes, and general understanding of biological systems at a molecular level.

An additional benefit will be the generation of many opportunities for enhancing animal production. In many cases, species specificities may be engineered into the developing strategies to ensure that human health concerns are met even at a molecular level. At the present time, there are more opportunities for improving the efficiency and end product quality, e.g., nutritional value, than can be funded by most major companies. The many exciting advances in biotechnology are steadily making the discovery process cheaper. Thus, the backlog of opportunities will continue to build. Recognition and acceptance of how to safely apply biotechnologically based productivity enhancers and health aids will surely result in much greater investment in animal drug development in the near future. All of this activity and advancement in animal science will assure the world new methods of increasing the abundance, quality and variety of foods for the potential 10 billion people predicted to be on earth within the first half of the 21st century. These future products will be cheaper and safer to produce and will lead to superior, safer and environmentally friendly management options for animal agriculture. All of these qualities should make these innovations available to more of the world's food producers including those in developing countries.

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Discussion

Session One

T. Grandin: I am with Colorado State University and have been involved with working on developing animal handling systems for the last 15 years and one of the problems that I see is the industry does not roll enough money into research and development. I developed a system called Center Track Restrainer System for handling cattle at meat plants. It is now in 10 of the large plants. Over a quarter of all the cattle in this country go through a system that I developed. But I want to tell you about the funding I had for this system. It was over \$200,000 worth of grants from "would you believe it"—animal welfare associations and the humane society? That is where the money came from. You know nobody in the industry wanted to fund this thing. But then once it got built, then every plant was bashing down the door wanting to buy one but nobody wanted to pay for the development of it and it was only \$260,000. I mean that is cheap compared to what we just saw on the screen. We have to put more money in research. People have said to me, "Why don't you develop some other pieces of equip-

ment?" Well, if someone gives me a \$300,000 grant, I will develop automatic stunning. I will be real happy to do it.

D. Danilson: I don't directly control the funding that IBP puts out for research projects like you just described. You are right, there hasn't been a lot of funding from the packing industry and probably the common argument is that with the margins that are associated with the type of business it is, there is not a great deal of loose dollars available for the types of research that are out there and then priorities are assigned to them. I don't have an answer for that. You should have asked that question this morning of Mr. Fielding who is in upper-level management. That's something that we are going to have to work at.

C. Baile: I don't have anything to do with this, but I think it is an example of where it does take some shrewd business. I think the same thing could have been said about the first genetically engineered microbe. There were some people that really saw an investment in that. I think that if you really have a good idea, it is okay. But it takes another activity to really learn how to get the investment, at least in our system.

If you've really got something that can be developed for market, then there are venture capitalists available that will invest in that. But I think that it takes a real sales job and you have to have a solid business to do it. Sometimes it happens and sometimes people make money out of it.

D. Schafer: I don't know if it is even a question, but to follow up a little on what Grandin has raised here and places where money might be available for that sort of thing would probably be from government, which is the public at large. But research funding from that source has tended to diminish. There used to be an organization (the American Meat Institute Foundation) that would fund research where monies came from many packing companies and that has gone by the wayside pretty much; and then you get to the individual companies. So I don't know. I think it has a wider societal impact here of where should things like this be funded from. And maybe these gentlemen aren't really in a position as Dean has already indicated to answer that, but it's the question that FAIR '95 might be addressing—is where should things like this that have wide benefit—where should they be funded from?

T. Kotula: Just one comment on this. The CSRS competitive grants program is going to be growing, it is estimated, to \$500 million dollars annually. The meat industry right now exceeds 48 billion dollars. It is the largest industry we have in the country. Yet there is no line item. There is nobody going to USDA and to Congress saying that scientists and meat research should be getting some of this money. The production scientists have line items, the plant scientists have line items. We can't even have our scientists compete for the money because the industry and other representatives are not going forward and telling Congress that they want the meat industry to be represented adequately. Yet the money is there. All you have to do is make sure that your scientists can ask for it. Right now they are excluded.

R. Field: Cliff, I was interested in your article from *Science* that you quoted which indicated that over half of the research that people want is medical research. Then you went down and listed the others and commented that there was *nothing on food*. The thought crossed my mind that many people when they think of food lump it into the area of medical research. I can't believe that if their main concerns are food safety and food composition and cholesterol and whatever, and if they understood what we were doing, that there wouldn't be some people say we could use some research in that area. My question is to any of you "How do we educate people as to what we are doing?" "What are we all about?" It seems to me that is a critical issue if we are going to be in existence in the future.

B. Schwartz: Ray, the way I see a number of things and the way research comes to me from my company quite often comes through the popular press, *USA Today*, *Chicago Tribune*. When a new technology or something hits the popular press, it is more likely to catch our guys with the dollars. They don't read the *Journal of Animal Science*, *Meat Science*. Sorry folks, they don't do that. And I'm the one that is going in there saying, "Here's a good article, we ought to be following this." Yea, what are you going to get for it? But when they see it coming back down through the

popular press, it is more likely to come to me about what's happening in that. So that's what my direction to you is. Let's work with some of the ways of getting it out to the popular press, truthfully and accurately, so we can get more people to understand what is going on.

Allen: I would just add that watching what happens within our university in terms of getting out research from the whole cross-section of areas of the university, there is nothing that is equal to the health science area. And I think that it is related to the general human interest in what's going on in the health-related area. The other thing I would comment about that I think is correct, is I believe that this was a structured questionnaire, in terms of these science data. And in the beginning of the structure, people were not free to say what it was, they had to respond, as I understand, to a semi-structured questionnaire—among these, which would you rank the highest? But I think your point is very well taken, that many of the issues that we deal with in food are by the consumer lumped under health or a medical area.

B. Zimbleman: Perhaps a way to phrase the question that covers some of Temple's comments and some others is "Do you believe that animal agriculture has an assured future unless we do work on some of these issues affecting the public?"

Baile: First of all, I don't think we do have an assured future. We do have to address the public needs. I think society really does have a very big impact on what we should be thinking about and what we are trying to do. So, I think we very much will have to make sure we are in sync with society. Society can change, too. I don't think we have population increase under control in any way and that's going to create bigger and bigger food needs, and technology is going to be really stressed to keep up with it in any way. I do think we will be the ones that will suffer first as an industry, but also from a diversity of food if we don't keep in a competitive position on how to make food available.

Allen: Do we have some more specific questions relative to some of the points that the individual speakers made in the context of some of the technology that Dean mentioned, concepts that Bill dealt with and Cliff dealt with?

S. Goll: Dean, I have a question for you. Do you have a read on how the consumer perceives the term or the title "fat-reduced beef" or "fat-reduced pork", whatever the species might be?

Danilson: Well, anything that's concrete, no, other than the preliminary and gut feel it is not negative. We haven't received negative indications. Now we haven't been gushed over with positive either, so it is more of a neutral type of deal from what we have seen so far. I got one call from somebody in New York that was from the State Health Department that was just wanting details on it, and they kept calling it a rendered product so we got into the actual process itself. But, no, it has been very neutral.

B. Cassens: When I think about critical research issues, I always come back to the fact of looking at new people coming into the end of the stream, new well-trained researchers who have the ability to think. And frankly, I have some concern today, that we are losing ground when you talk about money not being available and I see sort of a lack

of focus in areas of research. I would like to have the panel comment what they think the situation is with new well-trained people coming into the research stream. I have heard conflicting reports—some people think there is a good supply and some people think there is a very poor supply coming up in the next ten years.

Danilson: You know Bob, from my standpoint, and what I deal with day to day and with the activities that we're involved with, the people that we have recruited pretty heavily and brought in the undergraduate level that you guys have trained, are coming in and doing a very good job. They have leadership qualities. They have some educational skills that let them think on their feet. And, we are very pleased with them. From IBP's standpoint, whether most of you realize it or not, we are not a heavy R & D company. We don't have a very real strong technical base. We rely on the universities, but we don't have that many processes that require it other than our equipment and engineering aspects. Now if you get into equipment and engineering and automation, those are the strong growth areas in our company, and in a lot of the things that we are doing. Many of the meat science things—there are some critical issues out there. We discussed several of them. As far as from IBP's standpoint, we don't have a great draw or need for technical people coming in. We just don't have the staff nor the corporate philosophy to have a strong R & D program. The Excel organization has recently put together that type of effort, very commendable, one of the first strong ones. It is a very strong program that is coming together. I think Gerry himself could comment. He has hired more technical people in the meat industry probably in the last few months than most groups. So, maybe these guys can be more specific. But IBP is not a real R & D organization.

Schwartz: Bob, I might just respond a little bit differently and that is because I have developed a perspective over the last couple of years, and it was dwelt on this morning in a conversation, that those of us in the processing industry don't have those large research staffs that we had 10, 15 or 20 years ago. The people that we bring into our organization, few as there have been recently, are very well qualified to do the kinds of jobs that we are asking them to do. Quite often they are very over-qualified from the point of view that most of our people in the business take these days. For instance, many of your graduate students are heavy into the instrumentation of all kinds of ways of identifying specific items and doing very specific kinds of tests. When you walk into most any meat processor, similar to ours right now, your first assignment is probably going to be something like "develop a new product and reduce the sodium content." All of those skills and training that you are doing right now won't come to bear immediately. Over some time and the experience and understanding what the company's philosophy is and understanding how you might apply some of those, will they come to bear. So as I have said, we have no problem with the way young people come to the industry. It is that the industry is probably not prepared for the young people.

Grandin: I just want to mention that I think this is a really good point. Young people are going to go places where there seems to be a future. Looking back at the R & D thing

and at equipment—in the pork industry, for example, Niehaus and Holland, that's a Dutch company, get a lot of government-supported research on equipment. They are coming over here and building whole entire hog slaughter plants. And sometimes the packers will say to our equipment companies here "Why aren't you designing this stuff?" Well, an equipment company cannot afford a \$500,000 or a million dollar research project. They just simply can't do it. But the better equipment saves money. I mean, going back to a center track restrainer compared to a V restrainer, you can pay it off in six months just on reduced downtime and line stoppages. So it pays to make new things, but somewhere somebody has to pay for it and you were saying how Excel puts the money back in. Well, Excel is a family-owned corporation. I think that part of the fundamental problem in America today is this leverage buyout garbage and wanting those quick returns on Wall Street and we are eating our seed corn. It is going to damage a lot of things in American industry, not just the meat industry.

Schwartz: Temple, I can't agree with you more. Provide me the alternative.

Grandin: No, you can't do anything about it but I would love to...

Schwartz: What's the alternative to the MBA mentality that runs today's American business?

Grandin: Put them on a ten-hour shift in a packing plant and see what it is like. I did a ten-hour shift at a plant the first week in December just last year. I know what it is like to get so sore and so cold that you can't stand it.

Schwartz: It's terrible, isn't it? What can I say? That's the business that we live in and that is part of what we are talking about—is understanding the change and what we can do to impact it. Okay?

Grandin: I'll do my research in Holland, I guess.

Schwartz: If you would like, I suppose you can. But you are absolutely correct. Doing equipment research is the most expensive kind of research that interfaces with this industry.

Grandin: The thing that is so disgusting is when I went to the American Meat Institute Trade Show in 1974, about 60 to 70% of all the equipment on the floor was American. Now you go to the AMI Trade Show today, and even the machines with American companies have Japanese nameplates on the back of them and the only companies that are really innovative in equipment in America today are companies like Jarvis, companies like Townsend Frankomatic, family-owned businesses that are plowing the money back in. Jarvis and Frankomatic are still selling equipment all over the world. Some of our other equipment—I mean we have just gone right down the tubes. We own all the gloves and boots and things like—all the little bits and pieces. But the Dutch have stomped all over us in hog kill floor equipment and part of that is due to the government which put a pile of money into some of that research. But you know, if we would take a little bit of this leverage buy-out money that is wasted and put it back into our industry...I don't know, I can tell you that me and the bean counters don't get along.

Schwartz: Well I think that is very obvious, Temple. Bob, might you want to explain a little bit more about what FAIR '95 might be able to do to help equalize some of that and

provide some federal funds for research. I think you are probably in a position to talk a little bit about that, aren't you?

Zimbleman: I don't know Bill, you caught me cold so let me ramble a little bit.

Schwartz: I know I caught you cold, but the point that I am trying to get at, is in one of the slides that we saw about the animal research versus the plant research and how the agricultural research dollars are being allocated and what we would want to do about that.

Zimbleman: I think the plant agricultural industry was ahead of animal agriculture. Gene, you may agree or disagree, but I think they had a few research priorities in the mid-70's that set the pace that has led to better funding of federal research till today. Animal agriculture has never been together with a concerted consolidated animal agricultural research agenda and that is what FAIR '95 is supposed to do. I think the other thing is a point that I didn't make earlier very well—if you believe that animal agriculture has an assured future and people are going to buy animal products regardless, then I think that gives you a set of critical research issues that's different than if you feel that we are in jeopardy and we have to meet certain needs of the public, including more esoteric needs now like animal well-being versus what the product looks like. We have always met consumer needs in terms of what they bought based on how they looked at it as something. But now they are concerned about animal well-being, environmental well-being and these issues. So if you believe that those are going to drive the future and if we don't meet those needs we don't have a future, then I think you have a different research agenda. And I think Aberle and his program committee have recognized that in FAIR '95. I think the other thing is that most of the federal dollars in this day and age go for reductionist kind of science—molecular, cellular, biochemical—and while that's very good, I think we have lost the whole animal or some other kinds of traditional research we have had. I think by focusing on issues and through what's called integrated resource management, I think those will bring back some more federal dollars into more holistic research which includes not only the reductionist but whole animal and system kind of things. So I feel optimistic that if FAIR '95 is a success that it will bring back a lot more traditional disciplines and integrate them into the whole process. I don't know if that answers your question.

Schwartz: Yes Bob it does, and I would be very surprised if, out of FAIR '95, animal handling and animal welfare is not an issue that needs to be researched. And if that is an issue, then we expect to have some federal dollars available for the kinds of things that Temple is talking about.

Grandin: You mentioned something about check-off funds. I have read the check-off law really carefully and you are not supposed to put it into feed trials and things like that but animal welfare research probably could and we need to increase our check-off. The Danes pay \$2 for every pig in check-off money, Australians are paying about \$5 for every cattle in check-off money. That's another way to get more money for research. For industry, you get farsighted enough to do it.

Schwartz: And everybody in here could put a \$5 bill in the pot and we could go down the road too. The other point

I would like to make is that I don't necessarily have a problem in dealing with a Danish piece of equipment or something from Japan, because I deal in a world economy. Now that may not sit well with some of you folks here, but if they have, in fact, identified me as a customer, and are providing me with the product that I would like to have, at a cost that I can find reasonable and return a profit for me, I am really not that concerned about which particular country it comes from. That I don't think sits too well with some of the people in this room when it talks about I'm a beef man, I'm a pork man, I'm a turkey guy, because we are all food.

B. Terrill: That's the whole problem. The problem I have seen over the last 25 years is that we are continuing to perpetuate an agricultural policy on campus that's commodity driven. You are either a beef man, a pork man, a this or a that and you go through life and we never put it together and we never become a food processor. One thing that Bill Fielding didn't say this morning when we addressed over capacity in plants is that the way you solve it is you close them. And that is what's happening. I don't know if you know this, but business ain't growing, boys as to what we are used to. Who cares where the capital comes from. The good American companies that diversified and went international are doing okay. Globalization has already taken place, friends. You don't have to wake up tomorrow and say "gee, let's have a talk on globalization." It's here, it's paying our checks right now.

Zimbleman: Thank you, Bob. Temple, on the issue of check-off funds, I too am disappointed how little of those go for research but I think having participated with some of those groups, they are concerned about who is supporting what. I would hope that if we get FAIR '95, we would have an agenda which says this is most appropriate for federal funding, these are more appropriate for state or regional funding and this is more for check-off funding. So perhaps if we can work this out and give some assurance to the groups that we have a clear picture of what animal agriculture needs, perhaps we can improve it. I can't promise that, but I think that will be the first time hopefully that we have an agenda where they might look at it with some optimism because I know they have concern. Is this something we are funding that somebody else either is or should be and they don't always know. I don't know if Eric would agree that that is a reasonable concern they have or not.

Allen: Another question or comment?

E. Aberle: I thought I just might make one additional comment relative to FAIR '95 and it's a follow-up to what Bob has indicated as well as Bill Schwartz. The year 1995 is an important date. The idea is to have this statement available in early 1993 to get ahead of the curve that the federal government uses in setting priorities, in initiating new funding initiatives, etc., and this works through the experiment station committees, it works through the land grant university setting as well. But that is all done in 1993 for the budget that is finally passed in late 1994 for fiscal year 1995. So I think it is extremely important to get ahead of that curve with animal agriculture and thus, we are in a better shape to compete with the other commodity or the other areas. I would like to respond as well to the comment that Tony Kotula made just a minute ago. I am not as familiar as

I should be, I think, with the competitive grants and the national research initiative, but I believe a fair amount of the increases this year have gone into some of the value-added processing areas, a major increase in human nutrition and some other areas in which meat science and meat scientists can apply and compete. They are not mentioning specific commodities and probably shouldn't but they are mentioning the food industry and food safety and some of those important things.

L. Miller: First off, just a comment on all this funding business and where funding should come from—I think funding for research should certainly come from the people that benefit from it, and I hate to see government pegged as the people that have to pay for all the funding in the world. I think, secondly, we have an interesting contrast in industrial representatives here with regard to margin and return on invested capital into research in the different companies, and I would like to explore that contrast a bit more with the question associated with Bill's talk on applications. Bill and Cliff, what do you find as effective vehicles for justifying projects within your research organizations and how do you communicate and interleaf with your business people to provide the funding necessary to start up a new project?

Baile: I am sure each company must operate differently on these kinds of issues. In the case of ours, it is a very integrated decision-making process so that there may be an idea and I have been involved with the ideas, but you really have to work with commercial people from the very beginning to make sure that there is a potential market and then eventually you get that scoped out. Then you can develop the research dollars it would take to move to different milestones for a project and with some of these, of course, you are talking ten or hundred million dollar-type activities. So quite a bit of time is put in planning that out. Over a period of time, it gets more solid because most things start with ideas, with very limited survey. So as far as my experience, that is the way it works within a Monsanto setting. I don't know if that is of much help to anybody here because each company, I think, will be very different.

Schwartz: You are absolutely right, Cliff. Each company is very different and even within Armour Swift Ekrich it changes. Last year it was a little bit different than it is for me today. That's because when you get as close to the business sometimes as you need to be as a researcher you have to help precipitate some of the questions or with the help of the business person they come to you just like "I don't know how I am going to make my margin dollars this month—Louis Rich is eating my lunch and breast roast. They are in the streets for a dime a pound less." What does that do? We have to go and investigate our process and our system so that we know where we are relative to a competitor. Or another kind of a way that these situations would happen would be where I have seen a pork product, a six-ounce patty or whatever else, can't I do that with turkey but I need to meet all the nutrition claims in our case of maybe a healthy choice or we want to be able to serve it to a Wendy's or whoever, and they have these kind of guidelines with restrictions on ingredients, so a lot of different ways. Our operating guys will come to me, "We seem to be having a lot of blood spots," or "We have a lot of wing bruises or

we are having difficulty getting the cook house yields." Those are the kinds of things that we have to deal with every day but it's the research that I am able to pick up reading through journal articles and trying these ingredients or looking for these opportunities that help me answer those kinds of questions. Where that research comes from? Yeah, from check-off dollars, federal funds. But on the other hand, we have our own staff that researches specific items for ourselves that doesn't show on some of these kinds of numbers of the amount of research dollars spent at a private level, at a corporation level, that does meet research. Does that answer your question?

Miller: The only follow-up comment to that that I might make is that I expect that the margin differences in the industry drive it, but in one case I can foresee the business group coming to you all the time in your case, Bill; and in the other case, it is an idea-oriented initiation for project. The only thing that I was more interested in is specific vehicles perhaps, but as was indicated previously, it is an integrated process sometimes.

A. Booren: This might be too long a question, I am not sure. This seems to be a decade where I perceive we are seeing a trend of loss of consumer confidence. The three speakers that we have here say they are consumers of research results. What type of confidence do you have in the research results that are coming out of this group today? Could you evaluate us?

Baile: I would guess that we are your best customers of those that you have. I think we do tend to depend on each other a great deal. I think it is really unfortunate when you realize how little credibility any of us have, and I am going to include all of you, although I probably have the worst credibility because I represent a chemical company and you can't get lower than that. So I think between us, at least, I don't see that as really an issue but I don't think that the customers we have to worry about are in this room.

Danilson: Bill made a comment as it related to how we evaluate the research that we need and the critical need that comes to us on a daily basis and the staffing that we have, or the experience that we have internally that we draw upon to manage critical issues. Our day to day lives and management of those lives overwhelm us rather than being able to sit back and think about where we want to be ten years from now. At least in my particular case, Bill, I am hearing the same thing as you are saying. But when we get into a bind and in the evaluation of you and your groups out here, when there is a technical issue and we can call and we have been through the same hoops as most of you have many times, the response from the groups out here, from the individuals that we can call for consultation. And then the other thing that I guess really gets at us when we evaluate funding and research projects is the administrative overhead that is tagged onto them that really inflates the cost of what the value of those dollars are. I guess that's two things that I throw back at, but other than we need you guys for the feedback and the information, I mean it is a good relationship. But those are two things—the delayed time and that administrative overhead. I try to sell whatever that number is to Bob Petersen or anybody else, and that's kind of a tough one to swallow.

Schwartz: Let me add just one more point to what Dean is speaking to and be a little bit more narrow in my approach at looking at processing types of information with ingredients or temperature controls or shelf life for those kinds of things. I think we do a real good job, but let me remind you that sometimes when you are designing those projects, you ought to understand what some of the industry requirements are. Let me use a simple example, if you terminate shelf life on a processed meat product less than 60 days, you might as well not do the research because the minimum we can sell on a cured meat item is 60 days on the market. So a two- or three-week shelf life study sometimes is rather meaningless. As an example, understand your customer and what his requirements are and you will do a better job of designing and giving us what we need to have.

M. Westendorf: Not a question, just more of a challenge. I am a sausage maker with an MBA and I guess a unique perspective that I carry would challenge you, as Temple said, she would like to bring a bean counter down into the plant. Well, I would like to take the sausage makers up and teach them a little bean counting in marketing. We need to be marketers and we need to be accountants. We need to understand a little bit about what drives and who we are serving and look for creative financing sources and I don't think we are always doing that. Maybe it is because we lack ability in the business area and maybe we have some contempt for the business area, but I think we could all be strengthened by broadening our knowledge.

Session Two

C. Kastner: Relative to research priorities, things that we should be looking at as far as the industry is concerned, as we interface meat science and the kinds of activities that we traditionally do with some of the needs for the future, how do you see us interfacing with the engineering needs in the industry to improve processing efficiencies? Let me give you an example, I just returned from a meeting where they said their objective was (I don't know if they will be able to achieve this or not) they would like to have nobody on the slaughter floor, everything would be mechanized. How do you see that as far as research objectives in the future?

Danilson: Have you been down in Australia? I didn't throw it out either time I talked, but one of the things that I did have written down is automation in the raw food processing industry is something that we're really active in. We have got to sustain the quality, we've got to automate the process, we've got to make it more cost effective. It's going to happen, we're going to do it one way or another, and you're going to be involved in it one way or another. If you, through your research activities or travel activities or consulting activities, come across or think and design automation systems that are of benefit, they will be welcomed with open arms for further evaluation and use if they can contribute from a cost benefit standpoint. Automation is the key to the future and it is going to hit us real strong. And you're going to see it. That slaughter floor concept is a very interesting concept if we can take it from 50 to 100 head per hour and then design multiple systems into our large scale plants. I think it will happen some day, several years down

the road. And then tying all that into the health and safety aspects of how it impacts the product. Whenever you automate, you are likely going to get some negative impacts on the product, some of the traditional things we are used to thinking about and looking at. So how do you interact? In the small pilot situations that you deal with? That is kind of tough until you can really get the engineering companies and the big equipment manufacturing companies that have to go into the design and process of that. But your thoughts and ideas as you come with them are things that we have got to get on the move with because the industry is behind in doing that.

J. Regenstein: I guess I would like to ask a somewhat broader question. Sort of listening through this morning's talks, coming as I am as the resident fishmonger for the group, are we thinking too small? And probably Bill has touched on it, though the biotechnology also touches on it, we have got animal agriculture, we've got muscle foods. We have seen those words floating around. But what we have in this room is a lot of red meats people with some poultry and Al Burn is not here so I guess I'm it on fish. We in the research community are still thinking too disciplinary and what we have in a sense is AMSA and the equivalent poultry organizations, etc.. The way to get us into the future or do we really need to think of even some drastic reorganization of some of our organizations as we are also being told to become interdisciplinary to think in these broader terms. Get some comments or discussion on those?

Baile: Maybe one thought on that. You are talking about our organizations that are disciplinary or maybe divided at certain points, but I wonder if you are once you get back to your institution or when we go back that, if anything, it's become much more multidisciplinary. Even as an animal nutritionist, every once in a while I have to think quite a bit about fish any more. And I think that's crossing lines that I didn't expect to ever have to. So I would have to wonder if it isn't just how we're organized. For instance, I am a member of the American Physiological Society but I don't think that keeps me from working and thinking about a lot of other areas and maybe it's just the type of meetings that we need to have organized outside of the specific animal science or the meat science meetings.

Danilson: I don't fit the mold that I think you have seen today perhaps. I am very narrow in fresh meat. If you look at ConAgra and what has happened there in the last two or three years and you hear those people talk, you look at Excel and the Cargill family and the broad scope of what those people with lysine and with Fielding crossing the poultry and the pork and the beef and the grains, I think that it is expanding a lot faster out there with those two organizations and with others probably a heck of a lot more than any of us are aware.

Regenstein: But the thing is it's expanding out there but somehow at least we are not expanding, we are still working in disciplines at our universities. Yes, we are occasionally working on teams and we are working on programs, but we are still really staying fairly narrow and the question here is do we need to restructure the research. We are still being evaluated, promoted and judged as individuals. If you cooperate too much, you may not have done original work

and you won't get tenure. If you work by yourself, you may or may not get in trouble. But still the research is over a fairly narrow range. It's still not gearing up the way the companies are. We are not training people. We are training meat scientists, food scientists, animal scientists or geneticists and the companies really aren't doing this.

Danilson: But if you as an individual go to a company, you are also a specialist. You're a specialist, I'm a specialist. The group as a whole comes together but I don't think you have enough time or hours in the day to cover all subjects here. We really have to concentrate on specialties. I don't know. You look at the group and this is a red meat dominated activity. But go to the poultry meetings and you'll have a poultry meeting but somewhere they'll come together. I don't know.

Allen: Joe, I need to respond to this. I can't restrain myself. I think that we in academic institutions need to look very carefully at what has happened in the evolution of our different meat species. The example I would like for us to think about is what has happened in turkey and poultry versus what is happening currently in pork and what is about to kick off in even a bigger way in beef? And where does that leave us as meat scientists? I can tell you that there are major poultry producers in this country who are looking at where is something going to be done on poultry work in the United States in an academic institution. As we focus and undergo cuts in budget and things of this nature, ten years from now your institutions will not look the same as they do today with regard to who is doing meat research and what kind they are doing. I think the question that Curtis asked, it seems to me that an example right now of a window of opportunity is what school is going to come together with a significant engineering and meat science program? What school is going to give some special focus to poultry or fish? And finally, which schools ten years from now will still have a meat science program? I am being very blunt about this but we are in an era when regional cooperation and focusing of our institutions is very real and we will not have as broad a distribution of general work going on contributing to meat science in the beginning of the next century as what we have now. At least that is what I believe is going to happen.

R. Kaufman: I would like to change the focus of this just a moment and center on another concern that I have at least, and perhaps if it is a concern of yours you can comment; if you don't, we can go to the next comment. And that is applied versus basic research. It seems to be more and more within our meat science research programs that they are much more applied than basic. I think that was mentioned this morning. Maybe Roger mentioned that, I am not sure. But anyway, I hear the industry saying that they need to have lots of answers to a lot of questions and they want them yesterday and they'll do anything to get them and they don't seem to really care why. They just want to know the answer to that problem and I liken it to putting out a fire rather than finding out how to prevent the fire or to what caused the fire. I guess that I see the problem of funding from this standpoint because generally there's "beaucoup" funding for projects in which it will solve your problem yesterday, but there is very little funding for answering the

question why. And I think this is really an important part of our college training which is to teach students not just how things work and what happens when you do something, but why it happens. Yet it is very difficult to obtain funding in this area. Would you like to comment on it?

Schwartz: No comment. Now, you know better than that. That's what you expected. You absolutely made a valid point. And that's part of what I see happening a lot and I don't need to use the word "change" because it's been used a lot already today but it is a matter of fact and you can see it all around us. I believe that the proper place for basic research to take place still is at the academic level and I believe that if we identify the right issues of environment, of food health safety and in a certain sense the economics of raising livestock for feeding humans, that the federal funds will come to bear to provide those kinds of funds in order to do what I'll call the unbiased kind of research, the basic kind of research. I had a discussion with a young gentleman after the last session regarding this topic. The industries from the tax base way that most of us look at it believe that we have something coming back because research dollars are being spent. And that's one of the reasons that I've participated and wish to participate in the FAIR '95 and help to understand what the real issues are in developing programs to identify, not by discipline, because that's going to get us in trouble. We identify what the issues are and find the right discipline and the right ways to answer the questions and explain why. Okay?

D. Kropf: Just a very quick comment about our program this year. I don't want to spend a lot of time on this because I think we have better issues to deal with here or more important with this panel. But I see in the Reciprocal Meat Conference program things that apply to my interest in red meat, poultry and fish through the whole program and support that. And I don't think that we're meaning to cut out any of those. Dean Danilson, my comment to you or question is, "I am aware that IBP perhaps has 800 different ways that you can cut a beef carcass, and how do you determine value when that's true?" And I agree with you. We have different values depending on how we cut that carcass and value it, but don't we really have to choose some center way of determining value so that we can come closer to this issue of paying for value?

Danilson: Yes we do and that defined way is changing, at least from an IBP standpoint. From an overall view, can we come to grips? Can we all come to one grip and say okay "let's have a set point" and then compare against this? You look at the cards program and as you look at that, you look at the retailers that are using that. If they are buying products from several different suppliers and each different supplier has a slightly different way that they fabricate their cuts, you have to have a different set of yield standards, a different set of standards that they use to evaluate that all the way back. It would have to be a very structured system to where they would have to test every supplier's product and do a full range test to come back to their values. So is there one out there to come to it? Yes, there is. The one in standard is going to go by the wayside. What is the next standard that we go to or is it a standard or level of com-

parison? I think we will all come to grips with that in the near future, but everybody does it a little bit differently, and as we change our ability, our knowledge of the values of the animals that we are searching for or sorting or striving for also changes. We have been in the traditional business for a long time so we've got to rethink a lot of things from our perspective.

Kropf: We hear concern about environmental issues. I am very interested in packaging and how we can extend shelf life and we're going to have to give up maybe some product life to meet these environmental issues. Bill Schwartz, how far do we go to do this? Are you an optimist enough to believe there is an answer that will meet the environmental needs and really our best packaging needs? How's your crystal ball?

Schwartz: Well I'm no different than Roger Mandigo, I don't have the crystal ball either. Probably the package that we need to consider is the one that we started with which is just a paper wrap with a string tied around it. Most of you don't know that kind of packaging, do you? That's the kind of packaging that used to happen when I went to the butcher shop—that's when we went to the butcher shop and didn't do it at home. Don, you are absolutely right. We have a two-edged sword in dealing with the environment and packaging and the biodegradability of packaging materials. I suspect there's probably some representatives of packaging companies here in the audience that may be in a better position to answer some of this than I am and how their particular organization might want to approach this subject. The difficult part that I have as a business person and a food technologist in dealing with shelf life is "How long do you have to hold a product" because my sole intent is to create a product that somebody eats and enjoys and comes back and buys another one. So I have got that as a personal dilemma that adds to the frustration of most of the packaging materials we have that are put together with barrier type materials that will not biodegrade. Yet on the other hand, we want to have a biodegradable material. The multilayer approach that most of the packaging companies are forced into using by the requirements that we establish for flexibility and durability and shelf life all create those kinds of problems. Will our packaging representative want to say anything? Mac?

M. Orcutt: I think colleagues at the other packaging companies will agree that society as a whole is going to have to decide on the best means of disposing of anything and that's what we're going to be talking about, water, solids, etc.. Also regarding plastics, I think if you look at plastics as a whole, since we are talking about packaging materials now, they actually represent the least amount of material going into a landfill at the present time. And if you want to talk about biodegradability—paper and carrots and meat that we have put in a landfill 20 years ago (our traditional landfills that we still think are good) are still there. They aren't degrading. They aren't disappearing. So, is the landfill the issue? No. I think, and again this is probably biased from the packaging standpoint, some sort of incineration is going to have to be the target way of disposing of most of our materials that are either biodegradable or flammable. Now I realize I am opening a can of worms here.

There are no simple solutions at this time, but going back to a simpler package that doesn't extend shelf life is really a step backwards, I think.

Regenstein: I guess I would like to comment, and I think it fits. In terms of this FAIR '95 and the agenda, is the importance of the integration. That may be one of the most important messages we can go to Congress with is that these issues of environment have to be tied in with the shelf life of the product, the cost to transport the product, the cost of disposing of the product, the package, the energy value to the consumer, the energy value as a feedstuff to an animal. It may be that one of the keys is to try to educate Congress about the whole interaction. I think last year I was sort of enjoying the discussion of the simplistic view of styrofoam cups versus plain paper around the time that McDonalds made what appears now to be somewhat of an idiotic decision, because in fact it is not clear. There have been plenty of letters back and forth in *Science* so that I have lost track of whose winning on this one. But the fact is that the obvious solution of going to paper from styrofoam is not that simple, and I think maybe one of the messages we really need to get to Congress, and it's not the animal industry even against the plant industry, is that this is all one system. What we need to do is to pick some of these pieces and integrate them and work together with this pot of money to be available as a contrast to the well-organized plant groups that seem to have dominated some of the funding. And certainly at 13% to 8%, they seem to be a little better than us. Maybe that's the message we really need to try to organize.

T. Carr: One of the comments that was made this morning which I think has a tremendous impact on biotechnology and some of those areas is the Jeremy Rifkin's that we have to deal with. I don't know how many of you have had the opportunity to read *Beyond Beef* but I highly encourage you to do that. Don't buy it; go to your library so you don't support Jeremy Rifkin. But we have "Prime Time" that was shown several weeks ago and some of our packers, and I don't blame them, have kind of shut their doors to that type of publicity. But how do we go about dealing with the perceptions of the consuming public, the ethics of biotechnology, the moral impacts that some people feel that might have as we try to improve our products? What can we do in the academic setting to help industry to provide the right education as far as our consumers are concerned, that what we are trying to do is actually improve our products and not create something that is unwholesome as such?

Danilson: I don't have any answers on this as no one else does but I mean this is the dialogue that I guess we have. The industry as a whole, not just IBP, but the industry as a whole takes a very conservative approach and we are on the defensive. The advertisements that have been on TV, the recent ones I think are very good. It's disturbing I think to all of us, Tom, what is the answer and I wish that we had an answer. I wish we had a multi-multi-million dollar war chest for advertising to go on the Super Bowl with advertising dollars just on the wholesomeness of what we do and the lifestyles just to support that. It's not there. About the only thing in this day and age is to spend zillions of dollars on advertising and try to sway public opin-

ion. Other than what each of us as individuals do on a day to day basis and getting out, but that's not a real strong public appearance. But then also when we do do something, we do it right. I think all of us are more comfortable today than we would have been 50 years ago with our food processing and food packaging systems. We know that we are doing a good job. We're all comfortable with that. I think you are. Aren't you, Bill? We're doing a good job. We're putting a good product out there and to do that and to support that, if we stub our toes or if the industry backslides and the economics makes us produce poor products and inferior products, then we would really be in trouble. But we have got to continue producing quality products and generating quality products. We won't spend zillions on advertising, but we do actively get involved with our customers down at the one-on-one consumer level. But from your standpoint, I don't know. I mean other people need to jump in on this. There are no answers. The Meat Board and the AMI groups serve as our public voice and will continue to serve as our public voice. I don't see any of the big companies coming out with a big publicity campaign saying how great the food industry is as a broad general type of deal. I don't see that happening. But we will continue to produce good products and spend the monies needed or finance whatever is needed internally to provide the safe products and attempt to avoid the negatives out there and hopefully there are sane people that realize the falsity of the Prime Time type of deals and the goofy types of things that are going on out there. It doesn't give you a lot of confidence but when you've got those negatives floating around out there, it is pretty hard to combat them. And it is discouraging too.

Baile: I'd have to speak from a different perspective because I don't know the background on some of these issues. We've had threats of various types like we spent some time with the producers of 60 Minutes and in my experience we spent a lot of time with the facts and in direct confrontation with Jeremy, Samuel Epstein and Margaret Mullin. Know your facts and stick with them. That's the most effective thing we've found. There are times with drug development that you can't speak and that's the hardest time because it's not allowed, it doesn't seem constitutional but all you can do is sit there and take it. But where the forum is right, I think you really know why you have a good product and if it is dealing with animal rightists, I don't see that there is any reason we can't have a code of ethics for the use of animals as we see them that is just as defensible as an animal rightist, but we need to be able to express it in the right language,

and use it. I think it represents the majority of the population but it can sound like it's a minority if you don't know how to express it or deal with the terms.

Allen: Dean, I would like for you to expand upon the good pork that's going to Japan and the PSE pork that we are eating here in the United States. How did this come about and what kind of a premium are they paying for this?

Danilson: I can't give you premium dollar. I don't know that and I didn't say good or bad. I think I said color differences. Bob you probably know more about the pork color issue than I do so jump in here and help me. They vary on the loins and on the fresh meats that they purchase, as they have very rigid color requirements on a color scale that the meat has to be selected by. What is the Japanese color scale? Seven or a five? Five. And it's got to be four or better. The three is a good piece of meat and the twos and the ones are pretty pale. We have got to go through them pretty hard to find the 4's or better.

Allen: Do they pay a premium?

Danilson: Yes. Now is that premium related to any other type of Japanese or export product? They are the customer, they are defining the specs, they pay for what they get.

Zimbleman: Not a question, but what can we do about this information? It is a very challenging job to try to counter the information but I do want you to know that we do have FASFAS which is the four professional societies who have organized response teams and they have also had a committee. Max Judge has been on it, looking into senior scientists in the classroom to try to provide some opportunities for senior scientists to go into classrooms, particularly for elementary school kids, because people are so far from the source of food this day and age that they don't understand where food comes from. So I think that FASFAS-sponsored senior scientists in the classroom program will start with about three locations this year on a trial basis to see how it works. So, I think it is a little like FAIR '95. We're always reacting late and we are trying to do something to get ahead of the system and be proactive. So any thoughts you have on that I think are good. We have limited resources as somebody said. You know the animal rights groups spend something like 50 million dollars a year. I do think perhaps some of the check-off funds, instead of promoting specific commodities, could spend a little more effort on saying where does food come from, where does animal food come from, instead of so much focus on their own commodities. If we could get them to get together, that might be a good investment.