

Animal Health Institute
Making Food Safer: Examining the Role of Animal Medicines
November 3, 2011

Panel Discussion and Audience Q&A, Moderated by Philip Brasher, Gannett News Service

Phil Brasher: The FDA, as many of you know, a year ago proposed to phase out the use of antibiotics in livestock production. As – for purposes of growth promotion. This is where low doses of antibiotics, some of them which are used – are similar to those used in human medicine are given to I think hogs in particular in order to reduce their – slightly, a few percentage [INAUDIBLE]. Reduce their use of corn, which is of course a very expensive cost of producing. Or – the biggest cost of producing hogs. The administration says this is not a judicious use of antibiotics. And of course that is a conclusion that the public health – the U.S. Public Health Agencies have reached as well. My question, Hilary, is – and I've explained this issue to readers. I assume there is a number of folks here who are working for congressional staffs. You have constituents, they may ask you this question. How do you – how would you explain to someone across a kitchen table, who's – we're not talking about a foodie, or somebody who maybe buys organic. But it's somebody who's – who is wondering, why should antibiotics – antibiotics that are used in human medicine, be used to reduce the cost of feeding a hog? Or another animal? How would you – how do you explain that?

Dr. Hilary Thesmar, Food Marketing Institute: *Let me give a caveat here. FMI (Food Marketing Institute) does not have policy on this issue, so I'm going to speak as myself. Is that OK? Is that acceptable?*

And I have had this as dinner conversation with neighbors and friends. And I'll go back to science-based. I think we need to look at the science on this issue. All of the drugs that are being used in the animal – in the animal agriculture right now have been thoroughly evaluated and scientifically evaluated and approved by the FDA for use. There are multiple guidelines in place by the industry and by organizations that oversee the industry. I know AVMA has judicious use guidelines, multiple other animal agriculture groups have judicious use guidelines in place. So I think we need to take a look at that system that's in place. We need to look at the science. We need to look at, you know, what are the unintended consequences if we change the current system and the policies around those systems? In terms of explaining why the industry uses growth promoters, the claims are actually for rate of weight gain. So I'll speak to that. There are multiple beneficial reasons why the industry uses approved medications. For the vast majority – I won't say 100%. But the vast majority under the oversight of veterinarians, there are many benefits, but medically and also – I'll throw in the environmental and sustainability issue for discussion too. It – for the feed efficiency. And there's medical benefits. And I have two veterinarians sitting at the table, so I'm not – why don't you ask them the same question? But there are benefits that I think we need to quantify and evaluate scientifically before we make drastic changes to the current system. And I think we need to look at – re-look at the reasons why these drugs were approved in the first place. And consider that, that they have gone through very thorough evaluations. And put some credence on that in the first place.

Let somebody else respond.

Mr. Brasher: *Thank you, Hilary. I think what gets lost in this public perception is that the underlying mechanism for why those antibiotics allow poultry or pork, swine, to be – to grow faster, to put on more weight in a certain period of time, or a defined period of time – the underlying mechanism for that is that it prevents disease. For poultry, I can specifically state that we have – commonly poultry, birds in general, are infected with one-celled parasite – parasitic organisms in the intestinal tract. Similar to GREF. Anyone*

is a hiker or been the Rocky Mountains, they call it beaver fever. It invades the intestinal tract. It sets up housekeeping in those cells. When it replicates, it bursts out, and it causes damage to the tissue. The animals are unable to absorb nutrients, because their GI tract has been disrupted. But they also become colonized with secondary bacteria such as clostridium. Clostridium causes a disease known as necrotic enteritis. Necrotic enteritis is extremely painful, causes gas production, swelling of the intestines. If any of you have ever had gas, particularly disease – you know, maybe like some kind of infection that's caused distention and bloating, it's very painful. The lining of the intestinal tract sloughs. The birds are sick. Many of them die. Growth-promoting antibiotics work by controlling the secondary bacterial outgrowth after coccidial infection. We also use [INAUDIBLE] and some chemical, other chemicals, to control that coccidial infection in the first place. If we do not have access to those drugs here in the United States, or in other countries, we're going to inflict a tremendous amount of bird pain, injury, suffering, and death. And that's a fact. My concern about withdrawing antibiotics from animal agriculture in general is that it is not a humane thing to do. You would no more withhold antibiotics from your child with an ear infection, a baby with an ear infection, or from your cat or dog with a bacterial infection. Maybe an abscess. Something like that. So why would you do it to food animals?

Sarah, if you want to go.

Sarah Klein, Center for Science in the Public Interest: *If I may. So, as the consumer representative here, the identified consumer representative, I am going to say that the – one of the issues that I take with the threshold question is your assertion that you have to be a foodie to know – to be interested in these issues, or to even know that there is an issue of antibiotic use on the farm. I think the point that I was trying to get at before is, thanks to the omnivore's dilemma and fast food nation, we're all becoming foodies. It's no longer something that's reserved for the kind of upper middle class consumers who can afford to buy organic. Now everybody's aware. And Chipotle is a good example of that. This is a fast food establishment. They are not catering to a, you know, kind of an upper echelon of only, you know, the organic Whole Foods consumer. And they're using this no-antibiotics in meat as a very effective marketing tool to reach the mass market consumers. And so that, I think, is an issue that the industry is going to have to face. And that is that, regardless of the perceived benefits or of the pervasiveness of antibiotic use in animal agriculture, the customers are no longer going to be comfortable with that. It's the old adage of, if you put glass doors on the slaughterhouse, would you change slaughter methods? You know, that's essentially what's happening to animal production in the last several years, is that suddenly we've got glass up, and now consumers are going – wait a second. Animals live on these industrial farms in a constant state of pain and disease if they don't have medicines?*

There's got to be a different way to be raising them so that they won't need the medicines that prevent the constant state of pain and disease. You know? The discussion that you made, I think, is absolutely accurate in terms of the medical and veterinary issues that exist on the farm. And I don't think it's compelling for consumers. I think their response will be, well, there's got to be a way that they would not be existing in a state of pain without being medicated. I think it's also a little bit risky to say whether you should withhold antibiotics – to compare withholding antibiotics from a single child and household to withholding antibiotics to an entire herd or flock. Because what – one of the things that we're concerned about is the use across the herd and across the flock, rather than treating actually sick animals. And that's very different, you know. You don't treat your entire household with an antibiotic because one child has an ear infection. And, you know, interestingly, you may actually avoid the antibiotics for your child's ear infection because you don't want to develop antibiotic resistance in that child. And that's not a dramatic, you know, kind of no-vaccine approach. That's just the state of the science around human use of antibiotics as well.

Phil Brasher: *Guy, she raises – Sarah raises the question. She says the consumers are going to demand change, or are demanding changes. Whether farmers see a benefit to it or not. I actually think that's a detriment in some cases. Is there – is there a, is there a middle ground? You know, farmers have told me that it's much more – far more labor.*

Dr. Guy Loneragan, Professor of Food Safety and Public Health, Texas Tech University: *I think the answer is yes. And it's a series of trade-offs at this stage. So the system that we have at the moment is complex. And I'll speak more to the cattle production, and Andrew can as well. But it's complex, but it's designed to provide a consistent product that has been in demand over time. If that demand changes, the industry will change to supply what the consumer demands. So in a very simplistic response, the industry is perfectly able to be flexible and change as it is needed. But let's say we take ionophores for example. Ionophores are used in livestock production that have increased the rate of weight gain, but they certainly make livestock production more efficient. It requires less feed, less fuel, less water, less land to produce a product for the consumer. So, can we do it without ion fours? The answer is yes.*

The ion fours are not medically important, though. I mean, they're not used in humans.

No, they're not used in human medicine. At the moment, there is some research on a few other things. But in general, no. So this is an easy discussion. But, so, can we produce livestock without ion fours? The answer is yes. Clearly. But it's a trade-off now that the livestock per unit of production will have a larger carbon footprint. We have to accept that and understand that. So it's a trade-off. Some of the other antibiotics that are used in livestock production – tylosin is used to help us gain efficiencies by using a certain type of ration. Do we need to use it, the answer is no. We can use a different type of ration, which is, again, less efficient. Requires more fuel, more water, more land, more labor. But it can be done. But it's a series of trade-offs. So it's not that it can't be done, it can be done. But I think we ought to weigh the trade-offs and the benefits of doing so.

Well, I'm not going to go into the science, but that's because I'm well outgunned here on this one. But as far as the production model goes, you know, what I would say is, the simple answer is that most of the industries that we're talking about on the protein side of things have not done as good of a job of understanding what the consumers really want in the first place. And, you know, if that is something that they'd want. You know, there will be an economic cost of it, and there will be those – as Dr. Loneragan mentioned. But if they're willing to pay for it on the other end of it, then absolutely we will respond to that. I mean, that's what we try to do here. I mean, the point is is that we try to do all the best production practices. And again, contrary to what, you know, YouTube shows, we do work on the best production practices to hit those. If that is something that needs to change, then that's something that obviously the industry will change. And we'll effect that change, and we'll do it as rapidly as we possibly can. I think that's the point that can be made here. As far as efficiencies and those kind of things, I mean, you know – what we're lacking here is a bit of communication between the segments, in my opinion. You know, we sit out here and do this job every day, and we get very blinded by that. And we forget, you know, where people are consuming our product. We forget all those things as we go down the road. And at the same point, you have people that are in the cities that don't have access to that. And there's a great story to be told about what we do. I mean, we live and breathe this every single day. And I have had dirt. I don't today, underneath my fingernails. But I have had it. And that's the point, is that we get so fixated in our own little world that we don't communicate that story of what are the positive messages that we do in this industry. That, you know – that reflect that. And have that direct communication. Because I have had these conversations about antibiotic use, about – with different people that don't believe in it, or don't believe it should be used. And that's great, and – you know. But again, Hilary's point was that it is approved, and that's where we're at today. And as long as it is, then I

have to remain cost-competitive as a businessperson. And I think that's something that is also missed in it. But to have that coordination between the two segments, and saying, you know, why do you do this? And then – and have that conversation on the farm, would be a pretty powerful message. Because then they can see why. And at the same time, we can explain why. And there's where I think the disconnect has been throughout the process. But absolutely. I mean, again, Dr. Loneragan is right. If the public demands it, that is our customer. That is what we need to do. That they say no more, then guess what? No more. That's what we have to do. We'll have to figure out a way to do it.

I'd like to open it up for questions.

Question: *I'll start. Andrew, you mentioned the lack of communication between the sectors, and I think that's a really good point. Along with that, I think, is a lack of understanding or difference of opinion on interpreting the science. Which makes it hard for the consumer, because they're hearing one thing from one sector and one thing from another. And they don't know what to believe. So they definitely have a perception, but that isn't necessarily what the science says. And so, how do we, as a group, better come to a common understanding of the science so we can make the decisions and make the policies based on sound science? And help the consumer understand what the science really says? I don't know who wants to take it, but that's –*

Answer (Andrew Murphy, CEO, Innovative Livestock Services): *I'm just doing – partly, isn't the role of the government, ideally?*

Well, I don't know if it's always the role of the government. But certainly the question of perception and science I think is interesting, because from where we stand and where we view the system and where we from our own experiential perceptions, we can view science as either good or bad based on our viewpoint. And I think that is the challenge, is that there is a tremendous amount of science and tremendous amount of good science on animal health, on food safety, on public health, and on antibiotic use. On medical use. But we tend to gravitate to the science that we feel more confident about or closely matches our perception. And generally so that the other science isn't as good as our science. And I think that is the problem, is that there is good science out there to support a variety of different units. So, just saying something should be science-based generally says that it should be our science-based. And I think that becomes somewhat problematic. I think that the bottom line is, though – I work with a lot of producers. I work with them every week. So every Monday, I go out to feed lots and I take samples, because – and the producers then let me come on and take samples and look at salmonella and E. coli and antimicrobial drug resistance, because they want to understand that they're doing the best thing they can.

Are they doing practices that they – maybe they shouldn't be doing? And so, I think from the whole complex system, all the way to producers that I can talk most to, is that they are keen to learn and to continually improve their process. So that if there's something that they are doing that they shouldn't be, they want to stop it. And if there's something that they can be doing that they can implement on their place, they want to know how to do it. So I think there's a variety of different sciences, but what encourages me is that, on the Mondays when I'm out in the middle of pens of 1,350-pound steers that may or may not be the safest place to be at the time. But they're willing, they're able to letting us come on so that they can make informed decisions on science as well.

I just have a quick comment. I think that part of the problem we have is that the public, the greater public, in general, is grossly misinformed about our production systems.

Answer 2: *There's no agreement on the state of the science. And that's unfortunate, but also it seems to be the kind of reality. It's not – we're not quite as polarized as, you know, as the political system. But it's – it's also, it's not easy. But, you know, I worry a little bit about this sense that it's the consumer's responsibility to be an expert on food production, that somehow the consumer needs to be educated on the intricacies of animal food production. And that if only the consumer were educated about how difficult it is to meet the demand, and how difficult it is to deal with the – with animals of this size, and all of the intricacies of the system. If only they knew, then they'd say, oh, what you're doing is fine. We're cool with it. And I'm not sure that that's accurate. In fact, I'm pretty sure that it's not.*

On two fronts. I'm sure that it's not the consumer's responsibility to become an expert on every production system for every item that they're going to purchase and that they expect to be safe. It's not a consumer's responsibility to learn how a six-cylinder engine fires to be sure that, when they drive that car down the road, it's not going to explode. Just as it's not a consumer's responsibility to understand the intricacies of the food system to know that they're not going to get an outbreak of antibiotic-resistant salmonella from eating that product. But I also think that it's not – even if they understood the intricacies, I'm not sure the consumers would be accepting of the methods. And I think that that's something that we really need to look at.

I think that there are probably ways in which there's a middle ground, and frankly that's where CSPI is trying to be, is in this middle ground. We're not saying, you know, that we shouldn't use antibiotics to treat diseased animals. We're not saying that there is no situation which pharmaceuticals are – can be used effectively and judiciously on a farm. We're just saying that it's entirely possible that we're not operating under that system today. And that we'd like to see more of the universal agreement on, for example, rather than, you know, voluntary agreements on – in different industry sectors about what is judicious use? You know, we'd like to see that to be more standardized. It – harmonized with the international community. You know, one of the things that troubles us a lot is, we look at seafood imports for example. Seafood is not an enormous American commodity. 80% of our seafood is imported. And we see routinely import alerts on seafood coming from other countries because of antibiotic residues. Now, some of these antibiotics legitimately are not approved for use by the FDA. And so, let's take those out. But it does seem a little bit disingenuous that we are so concerned about antibiotic residues in seafood which is coming from abroad, and yet we're not as concerned about antibiotic residues, whether approved – approved antibiotic residues – in products that are produced domestically. And that's a question that we struggle with, and that consumers who are informed about the issues also struggle with.

Question – can I respond to that also? I'm sorry. I know we're dragging out here, but –

Of course.

The main thing that I want to say – and, you know, I approach this in my life the same way, every way. We – are we really asking the right question here? And it's not whether or not, in my opinion, that there happens to be a residue on antibiotic said in the production system. As much as it is, does it truly affect human health? Are those residues directly related to resisting bacteria in the human body? Where, if I get sick, I can't go take some antibiotic to get rid of it. And I don't think anybody has fully answered that question, because what we deal in is biased science. And I think Dr. Loneragan alluded to that. And it's just because it's my science and not your science.

I don't know that that question has ever truly been answered. I think that there's a big difference in how we view things, and I just want to make this last comment. Is that, you know, Sarah – in reference to

what you guys do, I – we both have the same goal, and that is 100% safest food supply in the world. It's just the methodology by which we go there is where the big disconnect is. And that's where I think that if we can sit down and figure out what the right question to ask is – science is science. I mean, there will be more science produced, and there's being papers submitted today. And they're done in the Journal of Animal Science and American Medical Association. All the things that are out there. But are they really the right questions? I mean, and that's where I really have my biggest thought process goes in. Is just sit down and figure out what that question really is. So.

Question: *Regarding food security. I was just wondering, from the consumer perspective, and then also from the scientific perspective, thoughts on food security if antibiotics are taken out of animal agriculture. And what your thoughts are on that.*

Answer: *So, meaning – if we take antibiotics out of animal agriculture, will we be able to make enough food to feed the country? It's an interesting question. I think that consumers – I think that consumers are more interested in producing, in eating food that is produced from healthy animals than they are in producing the quantities of food that are currently being produced. And by that I mean I think the consumers will, as the issues become more crystallized, be willing to make changes to their consumption if it means that they won't be facing these other issues. Antibiotic residues, or the rise of antibiotic-resistant pathogens.*

And so I'm not sure that it's a, well, this is just a consequence of being able to feed the world. We have to use all of these, you know – every technology that we have at our disposal. Let's just throw them all at it, because otherwise we won't be able to feed the world. I think there are probably concessions to be made. Just as we were talking about before, that things might cost more. Or it might become less efficient. Or we might have to deal with a balancing of environmental issues. But I think consumers are becoming more interested in a – and I hate to use the word, because it's got such a kind of airy-fairy feeling. But in a holistic approach to food production. You know, one of the things that we're hearing a lot about is that consumers are interested in not just safe food, but also food that's been produced ethically in terms of environmental stewardship, farm worker justice – you know, our labor issues. And animal health issues. And so I think consumers are becoming more informed and more interested in these issues, and they're I think willing to make some of the concessions that are needed to ensure that they're getting the safest products.

Any responses to this?

I think there's a – I think part of that is true. In the United States and in the developed world, where we have excess income, we spend 10% of our income on food. We have a lot of money. We are facing a doubling of the world's population by 2050. We do not have the food production to support all those people. People, if given a choice, prefer to eat meat protein than to eat grains. And once they achieve some level of middle class and some expendable income in Asia, in India, in the developing world, that's coming into a more economically productive era, they choose to eat meat. That's a fact. We do not have the ability to produce the food for the population, the expansion expected by 2050, which is forty years from now. We do not have any more arable farmland. We're pretty much using – all the farmland that's available is currently in production. There might be a few acres here we'd set aside, or some other marginal lands that could come in, but not very many. So I don't know what the future is going to hold. But if we don't embrace technology, we don't improve yield, and both grain, crops, and animal agriculture, we're going to have people that will be starving. And there are people starving today. We live in a very rarified bubble here. Only 20% of the world's population lives this lifestyle. You know, that's one out of five people. The other four out of five live on \$2 to \$3 a day, and that's a fact. So, I don't know

where we're going. Where we are with poultry production today, we have so few antibiotics available to treat sick animals that we're almost going back to the pre-antibiotic era. I feel we look at – listened to a report with USDA AIS. Their research plans for the next five years. And we were talking about in the car on the way up. They're investigating cinnamon, and, you know, vinegar, and if the lemon juice will help.

And, you know, we – I don't know. We remember the 1920s and 30s, when that – and before that, the turn of the century, where we used to bleed people and use leeches. I mean, is that what we're going back to? So I think we do need to embrace technology, and we do need to be aware of the issues, the environmental issues, and animal welfare, and ethical treatment. We all agree. But the reality is, we've got a lot of people on this planet we're going to need to feed. And we have made huge, huge advances in the 50s and 60s with the green revolution. Huge advances. And it's – I feel like today's population doesn't remember any of that. Hasn't been educated about this. Completely forgotten about the advances in agriculture that allowed us to become the powerhouse, economic powerhouse in the United States that we are today. So, I don't know where we're going. I feel like I'm, you know, kind of getting one of those sages that's in their seventies and saying, no, when I was a kid, it used to be like this. But, I mean, it is almost like we're going backwards instead of forward. Thank you.

Question: *Guy, I did want to ask you a question on this. To get back to the real world. You talked about the trade-offs. What – and cattle is a little bit different issue than it is with some of the other species, because we talked about ionic board, [INAUDIBLE] the – you know, don't have the human use. But what is the trade-off, what does a cattle producer do to reduce the chances of antimicrobial resistance in their cattle? In the beef?*

Answer: *Thank you for the question. I think if you look at cattle production – and mostly what we've been talking about today is the feeding side, which is the right-in part before they go into harvest. But in terms of cattle production, there's been tremendous effort led by the grass-roots organization, particularly the National Cattleman's Beef Association and the state associations. And twenty to thirty years ago, they started a program called beef safety assurance, which transitioned into beef quality assurance. But it was originally set about what could producers do to address the chemical, physical, and biological hazards? And traditionally, it had started on the chemical for the residue hazards, as well as the physical hazards. And in beef production, per se, that program has been wholly successful. If you look where the biologic residues in – come from, they're not coming from the traditional beef production systems that we have in place today. If there is a problem, it's going to be on the dairy side. So, those systems that have been adopted and are now considered the norm, or they're almost the entry point for entering into this. If you want to participate in this system, you really have to achieve these minimums. And they've been tremendously successful. At the same time, the bio-pharma companies have been developing and improving the vaccines. So we've got a variety of vaccines against our traditional challenges, such as respiratory disease in cattle. But the innovation of vaccines to food safety to production animal medicine is increasing dramatically now that we have an E. coli O157 vaccine that's conditionally licensed. There's another one that's licensed in Canada. We're looking at salmonella vaccines that are available. So, what we're seeing is a gravitation towards these technologies that can help improve safety so that ultimately fewer animals will get sick and require therapeutic intervention. So it's not necessarily one producer at one point in time. This is an industry that has been working together over a long period of time to try and produce healthy animals. And I think they're succeeding.*

Question: *Andrew, you mentioned briefly third-party audits. And my question is – this is open for anyone. But just basically, you know, there were parts of the food safety modernization act that, you know, is allowing third-party audits to become, you know, more relevant. And then we saw with the*

listeria, maybe, you know, there was some third-party auditing there that didn't go well. So, like, what do you think is the place for that? And do you think it would become more relevant or not?

Well, I personally believe it's going to become more and more relevant. I mean, as we – and again, the thing that we've tried to develop is, again, develop your own internal standards within the industry. Which is – is going to be the most important thing that you can do, I think, to really kind of offset a lot of the concerns that people have. You know, realizing that the third-party audit process is only auditing what you said you did. You know, I mean, they're not going in there, and if you said that you did this, you know, it's no different than an IRS audit. I mean, if I did this, and that's what it is. If it's not, then it's not. I mean, it doesn't necessarily say that you made the right intervention in our production system. That just says that you verified that you had completed that process. And – but at the same time, you know, the level of accountability that it creates – and not only in our own segment of business. And again, you know, I attribute a lot of things to – you know, I cuss at her a lot, because she's kind of the – well, she's the compliance guru. And she holds everybody – doesn't matter what your status is – to the same standard. And expects that. And, you know, again, we cuss her and do it is what we do. Because we're all a little bit afraid of her. But quite frankly, what it amounts to is that, you know, once you're really in this deep process of it, you discover that, you know – you become a better manager. You become a better production person. You become – you become better at everything that you do. And you're allowing yourself to take on new and more complex programs that tie into this. And, you know, we were involved in a natural beef program for quite awhile. We would not have been prepared to do that without having this program in place. But, you know, that's kind of me, and I don't know if that answers your question or not. But really, it – I mean, again, you just – the audit is simply the same. You know, and finding groups, quite frankly, to come in and do this has been difficult for us. You know, IMI is one of those groups. And there's some other groups that we've been working with that, you know – people that just haven't tackled. But we're looking at new people every day, so.

Question: *Just to the panel. Do you all – getting back to the issue of food safety and technologies, probably the pre-harvest level in particular. Looking across the spectrum, do you guys see things going in the right direction in terms of innovation? To provide – you know, typically stop bacteria at the source? Or, you know, making it to the plant in the first place. Or, I mean, what do you think are the – maybe the medicines, or whatever that are coming out that could help food safety?*

Answer: *So, is the innovation on track? I think the answer is yes. And we – we're right now just [INAUDIBLE] of where we have effective pre-harvest interventions available to us. At least in the beef side, though we can address the E. coli O157 salmonella. Potentially the non-O157 shiga toxin-producing E. coli. I think that the challenge is not on the innovation. There's a lot of very very talented people in government, in industry, that are working on these questions. I think the challenge we have right now is getting these products approved. In that we're asking the regulatory agencies, whether that's FDA or USDA, to approve something that they're not necessarily used to approving. These tools would not be for animal health, they would be for public health. And it's taking them a period of time to get to that point. And it's taking the companies that take to them – to the regulators to get to that point. And so the dangers I see is not with the innovation. But unless we approve or license these products, it's going to send a negative message back to the innovators that there's not a pathway to get these to market. So I think there's good things going on, I just worry about the negative feedback that we may get.*

I mean, is that some common ground that people across this – the groups that are represented here would work on? In terms of helping spur innovation, that –

We've – we had a big push for pre-harvest food safety in the poultry industry about ten years ago. I trialed and Don had trialed a lot in our industry. A lot of different water treatments, litter treatments, competitive exclusion products at the hatchery, a variety of things. And two things – two outcomes happened. One, items or interventions that would work, we could not get licensed in the United States. Such as the undefined competitive exclusion products. Cannot get them licensed. They're used in Europe, can't get them licensed here. The other thing that happened is none of those interventions actually panned out once you upscaled to commercial production practice – or into the field. Like it would be great in a pair house trial or a pen trial or something like that. But when you scale it up to commercial size production, you couldn't see any advantage. So water treatments prior to movement don't really have any benefit. My concern now is there's – again, ten years later, we're circling back for a big push on pre-harvest. We don't have any tools. We need tools. We don't have any tools that are effective. Very very very few. Might be able to vaccinate or one, or maybe three or four strains of salmonella. You can't vaccinate for all of the potential salmonellas that could be present. That doesn't eliminate the disease. So as soon as chicks are placed in a hatchery or placed on the farm, all you need is one out of ten infected, and about two weeks later everybody's contracted it. You know, it's just a – it's a very difficult organism to control. We know very little about campylobacter control on the farm. So, I think that we definitely need tools. The pre-harvest sounds great from the 20,000-foot level. But there's nothing that we have today that we could be using that we're not. We have nothing. I don't know, Don, do you have any input?

Well, I mean, I think vaccinology maybe is becoming [INAUDIBLE] specific – specific pathogens that may help. But, you know, there hasn't been a new drug or [INAUDIBLE] that improved the poultry in twenty years, probably. And we're not going to get any, which is what you're saying. You know, that's not going to be the model going forward. So we're going to need new technologies to make this work. And, you know, fortunately in poultry, it is controlled a lot more than some of the other industries. And in the industries where the control is not as closely managed, I really feel for those folks. You know, to get their own directly.

From what kind of point of view of the end-user of the product right before it goes to the consumer, preventing contamination in the first place has to be done. I mean, we have to prevent these pathogens from contaminating the products in the first place. And every tool that we can use to keep that from happening is what we have to do. So innovation of new products, I would completely agree with Dr. Loneragan, that the approval process is cumbersome and it's too slow. And we need to make that more efficient and doable. I mean, I think it's in hindrance to innovation that companies doesn't even want to go down the R&D route because they know it's going to be years or decades before products can get in the pipeline. From our point of view, recalls – we've been inundated with recalls lately. And at that point, it's way too late. We just have to stop – we have to catch the products. We – first of all, prevent contaminations so that we don't have anything in the pipeline that's contaminated. And if there is something contaminated, we have to catch it way before it would turn into a recall at the consumer level. We're completely losing the trust of the consumers in our food supply with all of these recalls right now. And it's way too late once it gets into the supply chain.

Question: Hilary, on the consumer, we had a very similar issue. What are your members saying, in terms of consumer interest and consumer demands? What – their purchasing decisions? Not what they say in polls, but their actual purchasing decisions. Because if you ask consumers, well, they want X, Y, B, and they want something horrible. They always say yes. But they don't necessarily buy the more expensive product that has what they say they want. But what are you seeing in terms of trends? In terms of food safety or antibiotic resistance?

Answer: *In meat purchasing, poultry purchasing? I can tell you the traditional products are the majority of what consumers purchase in the grocery store. What we find – this is anecdotal. What we find is that when asked, a lot of consumers will say I like this, I like this, I like this. But then when it comes down to that moment where they're buying it in the store, they're going to buy based on price. There's a percentage probably less than 10% of consumers will make that purchase based on what I would call the value decisions. Organic, antibiotic-free. Those specialty products that are available. And they are a growing market, I won't deny that. They are definitely a growing market. And some stores have a very high percentage of those products in the stores, and some stores are meeting the demands of their customers. And they will continue to do that as that demand changes over time. But the vast majority of the product in the stores and that consumers are purchasing is traditional.*

Question: *Hi. I'm with the National Institute of Food and Agriculture. And we provide extra [INAUDIBLE] for grants on USDA. And I'm hearing two different stories in my area of veterinary science, and I always see a lot of portfolio, research portfolio and research education extension. And I'm hearing sort of two different stories. One for you, Guy, was that we got all – kind of the innovation you need to sort of get that translated into practice. And then I've heard you've got an empty pipeline from Beth, that we don't have the kinds of R&D, especially basic R&D, needed to fill that pipeline, to have something for the future. And then that brings you to the issue of who does that? Can the federal government – that should be doing that? Or is it industry that should be doing that? Industry is probably a little bit scared off by the regulatory issues and whether they can get something approved. And we at the National Institute of Food and Agriculture do not have a medicinal development emphasis. There is some of that [INAUDIBLE] – I mean, if you support good ideas in vaccinology. But not too much in the way of drug development. I oversee the [INAUDIBLE] program and the minor use of animal drugs program, but those are smaller programs. I personally was seeing a gap in terms of – well, that pipeline from basic R&D all the way up into translational sorts of activities. But I'm hearing different stories, and I'm wondering if anyone has a viewpoint about what – where that partnership is. Where that baton gets handed off maybe from a basic science national effort to corporate America, who – and pharmaceutical companies, who would then take the rest away. That baton keeps dropping, it seems to me, but I'd be interested in your opinions.*

Answer: *Some – I think what my experience has been is the people who bring innovations to the table are really entrepreneurial companies. Maybe they've got some kind of investor funding. And the most common categories of the last ten years have been probiotic. Something – some kind of probiotic, some kind of organic acid, citric acid, something like that. And they try to roll them out, but unfortunately they're not very effective interventions. And so there are small, you know, privately capitalized little companies trying to roll something out. And I don't – none of them have panned out. I don't think we have anything that's new that I can think of. So I'm not sure that it's – I don't know how, where the connection is. I know that NIFA does a lot of work. ARS tries to have technology transfer, things that they're developing. And so they're – we're trying some of the same old things. And when we're circling back and looking at spices and things like that, I'm thinking we're in trouble. We need a little more – we need somebody out of the box, something different.*

... And it's a good thing you continue to get funds. So, I think the beef industry is slightly different. We haven't been through this iteration ten years ago. But we are now at a stage where we have in the pipeline, if you will, a sodium chlorite product which is an ARS-discovered technology. Well, ARS application-discovered technology. We have a vaccine that's conditionally licensed which originally came from the turkey industry. And we've got another vaccine in Canada which was from basic scientists at the University of British Columbia. And there's probiotics that have worked – came out of the collaborator I worked with as well. And those vaccine companies are working on – and ideas for their second, third, and fourth generation products. So I'm not too concerned that the innovators are thinking the right

things. I think they're working on them to make the next generation products better. But I do know, for those two vaccine companies, that if – it can go beyond the conditional license, then they shut down all of their innovation. And then I become very concerned that we won't have any products in the pipeline. So in terms of data that's in – but if you go beyond that into pharmaceutical animal health, so new antibiotics for treatment of bovine respiratory disease, I think that the [INAUDIBLE] is still there in terms of new products coming along. So it depends where you look and which pipeline you're making into industry with why the story is different.

Question: I had a question back to the original discussion of education on food safety. Maybe somebody – this is a question in that area. Some work done looking at the reduction in food safety issues that result from the use of antibiotics, antimicrobial things. And if that is sort of out there, you know, how do we compensate if we take away some of those antibiotics? And you think we're talking about kind of two different issues here. We're talking about a marketing issue for consumers based on preferences of what – you know, we'll produce, but they won't buy what they want to pay for. But then there's this safety issue. And can you compensate for all of that, if in fact it is a safety issue?

Answer: The – I think, though, there's – it's pretty well established that sick animals are stressed. And stress animals shed more pathogens if they're present. Part of what keeps the pathogen under control – and they're only pathogens to us, they're not pathogens to – some of them can't go back there, for the most part, are not pathogens for poultry. What keeps that replication under control is – partly is the bird's immune system. And when the bird is sick, not only is the GI tract potentially disrupted – even with airsacculitis, there's – papers have shown that you end up having an impact on the integrity of the intestinal wall. But the bird's immune system is also compromised, and they shed more bacteria. They put – you know, they get released from that immunological control and they replicate. Which is what they're programmed to do. So not treating birds, sick birds, with antibiotics for bacterial infections has a twofold consequence in my mind. One is that it affects the welfare of the animal itself, and the second is that it also increases the likelihood of a negative outcome from a food safety standpoint. That said, we don't have very many antibiotics available to use any longer. We do control – try to control disease through best management practices. And through vaccination. A lot of the – for chicken in particular, a lot of the diseases are viral in nature with secondary bacterial overgrowth. So, we've come a long way in managing the process because we don't have the tools in the arsenal any longer. My concern is that we're pointing to the point where we have no tools in the arsenal. And it is a problem. I mean, I think it's a problem on multiple fronts. I also want to just put on the record that antibiotic residues in poultry meat is a non-issue in the United States. We test all of our birds. Our – every flock is tested prior to harvest. We send samples off for a whole panel using analytical chemistry. We have zero residues. We follow FDA withdrawal for both dosage requirements and withdrawal requirements. And we do not have an issue with antibiotic residues in meat.

And we're talking about antibiotic-resistant bacteria. It's not an issue?

No. Because – there's another issue that's kind of garbled. Antibiotic resistance is a natural, inherent trait in bacteria to defend against other bacteria. Penicillin comes from mold. Penicillin is – the reason it uses it is to fend off other bacteria, other molds, and keep them out of their territory. They – I think someone just recently reported a glacial ice core, like 10,000 years – you know, depth into core. It was 10,000 years ago. And there were resistance factors in the bacteria recovered. This is a natural process, antibiotic resistance. Antibiotics are naturally produced to defend against other bacteria. So – and this is nothing new that we create. We may manipulate the particular resistance factor that's present, but we don't – this is a natural process that's been going on forever and ever and ever.

Sarah, we'll give you the last word.

Sarah Klein, CSPI: *Thanks, if I may. I just – I want to reiterate that – and I know it's complex, and I know that it's not always the most popular thing to think about. But to accept as the threshold that animals have to be produced in the way that they're being produced currently, to accept that as the basis, is an error. They don't have to be produced in the way that they are. They don't have to be living in conditions that stress them so much that they need to be treated with antibiotics so that they don't shed additional amounts of naturally occurring pathogens. That's an incorrect assumption. We need to be looking deeper. That's why I'm talking about the paradigm shift in the way that we raise animals for commercial production. We don't need to accept that animals are going to be stressed because of their living conditions, ergo they have to be treated with antibiotics. Antibiotics should be used to treat disease and not to treat the symptoms of structure that is overcrowded, unpleasant, and otherwise difficult for the animals to behave normally. I also would like to note that the rise in antibiotic-resistant pathogens is – at least – and here you go, a perfect example of your science, my science. You know, both good science. Antibiotic resistance – the rise in antibiotic-resistant pathogens we believe is a direct result of the overuse of low levels of antibiotics in all different production systems. Antibiotics are naturally occurring, you know, defense mechanisms. But the overuse of them, whether it's in your home or in animal production, is what causes the development of these antibiotic-resistant pathogens. And one of the things that we have been experiencing lately since we've seen the rise in these pathogens – and well up into this year, when we saw the ground turkey outbreak from antibiotic resistance out in Heidelberg, is that the only thing worse than telling the consumer that they're sick from something they ate is telling them that no antibiotics exist to treat that illness.*

There are antibiotics that exist. But not any of the main antibiotics that would ordinarily be used. And then they have to go way down the list.

[END]