Episode Title: Food Pesticide Residues -- A Conversation with Sheryl Dolan and Meibao Zhuang, Ph.D.

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Lynn L. Bergeson (LLB): Hello, and welcome to All Things Chemical, a podcast produced by Bergeson & Campbell, [P.C. (B&C®)], a Washington, D.C., law firm focusing on chemical law, business, and litigation matters. I'm Lynn Bergeson.

This week, I sat down with Sheryl Lindros Dolan, Senior Regulatory Consultant with B&C and our consulting affiliate, The Acta Group (Acta®), and Dr. Meibao Zhuang, Senior Scientist and Regulatory Consultant with B&C and Acta, to discuss pesticide tolerances. What are they? How does the United States Environmental Protection Agency (EPA) develop them? And how well do government and industry stakeholders communicate their utility in assuring a safe and reliable food supply? We also wander into the complex world of soil amendments and adjuvants. So if you don't know what these things are, listen up. Now, here is my conversation with Sheryl Dolan and Dr. Zhuang.

Sheryl and Meibao, it is so great to have you both in the studio today. Thank you for joining us.

Sheryl Lindros Dolan (SLD): Well, thank you, Lynn.

Meibao Zhuang (MZ): Thank you, Lynn. Great to be here.

LLB: We're here today to talk about food, pesticide residues, tolerances, and get into that very important subject. It probably comes as a shock to some people that agricultural products contain pesticides by design that the federal government has determined may be ingested without causing harm. The super fancy legal term for an allowable amount of a pesticide residue is called a tolerance. What exactly is a tolerance? Sheryl, you first.

SLD: It's pretty straightforward, Lynn. The tolerance is the maximum amount of a pesticide residue that legally may be present on human food or animal feed as determined in the United States by EPA. Elsewhere in the world, sometimes it's called a maximum residue level, or an MRL, which is a little more straightforward, a little bit more descriptive.

LLB: Right. Exactly. Pesticide detractors -- and there are no small number of them -- often express concern about people ingesting pesticides on food, both human and animal feedstocks, that are allowed to eat. What do you say to these concerns if you're counseling someone in this space? Do you think the government's response is effective? Meibao, do you want to take a shot at that one?

MZ: Well, before we get to that question, I just want to comment that pesticides, we all know that these are important agriculture tools to control weeds, insect infestation, and disease and are also important tools to control various paths with these carriers, such as mosquitoes, [ticks?], rats, and mice. And also pesticide is how farmers grow more food on less land by protecting crops from pests, disease, and weeds, as well as raising productivity per hectare. So we know that pesticides [are] important for farmers and also for people here.

But pesticides [are] a heavily regulated industry, so pesticide registration and use are regulated by -- under two laws. One is the Federal Insecticide, Fungicide, and Rodenticide Act (we call it FIFRA) and also the Federal Food, Drug, and Cosmetic Act, so-called FFDCA. So under these two laws, EPA registers individual pesticide products and allows use of these individual registered pesticide products on particular crops. To obtain a registration under FIFRA for use of a particular pesticide product on a food crop or a site that will leave pesticide residues in raw agricultural commodities or in processed food. A tolerance or tolerance exemption covering the pesticide residue is required and -- to make it a little bit longer.

LLB: Yes, that's an excellent explanation, Meibao. And we, the converted here at B&C and The Acta Group appreciate that the government's regulation of pesticides is strict, it's extensive, it's exceedingly data intensive. But at the end of the day, people are still chowing down on an established amount of a pesticide in the raw agricultural product and or processed foods that they eat.

SLD: Right, or in animals that have consumed treated feeds.

LLB: Exactly.

SLD: I feel perfectly safe eating foods grown in the United States. As Meibao has highlighted, right, this is a heavily regulated area. Before the pesticide's registered for food use, all the components must be approved for food use. And that's a decision that's based on a wide variety of -- a big data set -- and then subjected to a lot of analysis. So and tolerances that we're talking about and also tolerance exemptions, which we can talk about -- the rulemaking process undergoes our federal rulemaking process. It's effective, it's transparent, and then it's subject to periodic review. So I think those are all reasons for being confident.

LLB: Well, maybe we can drill down a little bit into that process. You said it was a rulemaking, Sheryl, which to -- we lawyer sorts recognize that that provides multiple opportunities for stakeholder engagement. So both users, manufacturers, and detractors may have an opportunity to comment on that process. Is it relatively frequent? Is it updated? I mean, what is the tolerance establishment or exemption from tolerance process like?

SLD: Well, again, as we said, it's a rulemaking process. It typically starts by an interested party submitting a petition to EPA to set the tolerance, to establish a tolerance, or to establish a tolerance exemption. I think we can note by quick detour that, if EPA makes a determination that any amount of a pesticide chemical left that would leave a residue -- I'm trying to get all the right terms. If any residue would not pose a dietary risk at any

anticipated level, then EPA can grant a tolerance exemption, which basically means, right, that there's no quantitative limits set, because any amount anticipated would be-- would not pose a risk. So in any case, when an interested party submits a petition, that's usually accompanied by a significant data set, whether solely to support this petition, maybe in the case of an inert ingredient or a lot of times that data set has already been submitted to support the registration of a new active ingredient or a new product. And then the petitioner proposes -- it has to provide a lot of information, but basically proposes the tolerance, and then EPA reviews that. And in setting a tolerance, establishing whether it's acceptable, EPA has to determine that -- and I'm going to quote from the statute -- "there's a reasonable certainty that no harm will result from aggregate exposure to the pesticide residue."

LLB: Got it. And Meibao, forgive me for not knowing this, but is the tolerance the same for every raw agricultural product that it's applied to? For example, if a fungicide can be used on multiple products, multiple types of vegetables, is it a different level per plant? Or is it generally thought a tolerance can be applied to all vegetables, regardless of what type of vegetable it is?

MZ: Yes, that's a great point, Lynn. Tolerance actually is a combination of the pesticide type or the chemical and the specific crop commodity. Though it could be very different from crop to crop, depending on the actual use pattern and then how the crops, how they metabolize those pesticides that they got exposed to, so that the resulting residue level may be different from crop to crop by a certain pesticide. But regardless what that is, like Sheryl referred to, EPA has to be able to determine that what that residue level left on a specific crop commodity is safe for humans, and especially for infants and children.

LLB: I'm guessing I know the answer to this question, but can states make a tolerance more restrictive, or has the federal government preempted the field entirely? Can California, for example, say, "Well, we really, really care about our people here. Can we make a tolerance more restrictive in the state of California?"

MZ: Yes, they can make the tolerance more restrictive, but not less restrictive than federal.

LLB: And I'm guessing because states don't actually dabble as much in this space as they perhaps may wish to, because of resource constraints or their deference to the federal tolerance establishment process, that it's probably the exception that makes the rule, right?

SLD: Yes, I would agree with that. Obviously, having a patchwork of any kind of regulatory program creates --.

LLB: Chaos.

SLD: Chaos. Right, right. Barriers to trade and so forth. And in fact, to flip that outside the United States, there are considerable international harmonization efforts, both to share resources, right? Because this is a lot of work. This is a lot of science. And also to reduce trade barriers so that the [United Nations] (UN) Food and Agriculture Organization (FAO), which is descriptive. I say, that is the actual name of the organization, so that's very descriptive.

LLB: It is very descriptive.

SLD: And also, I guess similarly, you could say the World Health Organization (WHO), although that's why we say WHO all the time. FAO and WHO work jointly to develop MRLs (maximum residue level) again for that reason, so we don't end up with as much, as many

trade barriers. And the United States also works with Canada and Mexico -- through NAFTA -- on doing the same.

LLB: Well, before we move into the, I think, very interesting and related topic of imported foods, Sheryl and Meibao, let me ask one further question about what tolerances apply to, because a pesticide product, if you go to the store and buy a product, it consists of a combination of components, right? The AI, or the active ingredient -- which is the pixie dust that makes the formulation do its pesticidal thing, right? -- and a mix of other chemicals, called inerts, among other things. And that resulting formulation is the product. Are tolerances or an exemption from a tolerance required for just the AI in a pesticide or for all of its components, either one of you? Who wants to answer that nerdy question?

MZ: Lynn, yes. EPA sets tolerances or tolerance exemptions for all pesticide chemicals. That includes the active ingredients and the inert ingredients that you referred to. Those are clearly defined in 40 C.F.R. Part 180, getting a little bit nerdy to the regulation.

LLB: Well, we have a very diverse listening audience, so that citation, Meibao, is very helpful. Thank you.

All right, why don't we push on to imported foods? I guess it's possible that if a pesticide product is used *outside* the United States for one reason or another, but not registered currently or perhaps ever *in* the United States, it would seem to follow that the residue of that not permitted pesticide product in the United States found on food or imported processed food could be a problem. If the food or a raw agricultural commodity or processed food is allowed entry into the United States, is it reflective of some permission to allow that small amount of residue of the banned or not registered product in the United States? How does that work?

SLD: Lynn, I'd start by noting that all pesticide residues found on a raw agricultural commodity or processed food are presumed to be unsafe under the law unless EPA has adopted either a tolerance or the exemption. So if something is being imported in the United States and it has a chemical residue on it, it's presumptively unsafe until, if that's determined, unless there's a reason for believing it has been safe. So, yes, there is a permission.

If a pesticide is not registered in the United States or, frankly, if a crop is not grown in the United States -- which I think is as often, if not more often the case, so there'd be no reason to register the product for use in the United States if the crop isn't grown there, grown *here* -- an *import* tolerance can be set. That's what we call that subcategory of tolerances for pesticide residues on imported foods. And that's a petition process also; it goes through -- has the same standards, same requirements as for a so-called regular tolerance. And yes, if and it's FDA that's charged with evaluating and sampling the foodstuffs. So if they determine that there's something there that doesn't have a tolerance or tolerance exemption or that it exceeds it, then that food could be subject to seizure.

LLB: Right. I was going to ask about that. Who is the entity? Is it the FDA that is the guardian at the border, as it were? If a food or crop is allowed in, who determines that there is a residue on it that may not have a tolerance and therefore is presumptively unlawful?

MZ: For the inspection and detection for the specific or general import of the food and feed items. So FDA has the jurisdiction on that, and also they have the responsibility on doing that. So they conduct regular inspections for the imports, import stuff, before they can be admitted into the States. So for example, if shipments of the food or feed items [are] found

to have pesticide residues without established tolerance or tolerance exemptions, then those shipments will be held up at the port, and then FDA will notify the importers and give them, basically, a warning letter. And then they would either need to file for a tolerance or tolerance exemption, or return the shipment to the country of origin, or destroy the shipment. So that [is the] enforcement action that FDA does to make sure that food and feed in the U.S. market are safe for human consumption, and also animal consumption, too.

LLB: Got it. Thank you, Meibao. Sheryl, let me ask you a question about a related and probably a little arcane subject matter area pertinent to adjuvants and soil amendments. A very simple question is, "Do tolerances apply to adjuvants and soil amendments?" And perhaps before answering that question, you can spend a minute just defining what an adjuvant and/or a soil amendment is.

SLD: There are a variety of chemical products that are used in agriculture. And how chemical residues from those products are regulated when they're on food, if they're not themselves part of a registered pesticide, is a good question and a bit of a gray area. So examples of those kind of agricultural chemicals, as you've mentioned, are adjuvants, which basically are substances that are separately added to pesticides to improve performance and typically are added at the point of application.

LLB: And these are chemical substances, right?

SLD: Right, right. So they, maybe, or stickers or something to help the pesticide stay --

LLB: They boost the pesticidal.

SLD: Right, or make it, improve performance, right, however, defined. Soil amendments typically are good products. You can have something added to the soil to improve the quality of the soil, or some aspect of the soil, for supporting plant growth. Now, particularly with regard to -- so EPA has authority-- I should back up.

EPA's authority is under the Food, Drug and Cosmetic Act and under -- as amended by [the Food Quality Protection Act] FQPA -- to set a tolerance or tolerance exemption for pesticide chemical residues. And again, a pesticide chemical includes all the components of a pesticide formulation, so the active and inert ingredients. But so that you get, and as we said, there's this gray area about these other products. Now, EPA has made statements and guidance documents. It's asserted that it has authority over residues of adjuvants in food and feed, or it *may* have authority, but those statements are a little light on citation.

LLB: So we don't know how EPA is supporting that guidance, in other words.

SLD: Right, right. And without getting too down in the weeds on that -- I think, though, for reassurance to the public, there is at minimum a safety net here. So either a tolerance or tolerance exemption will be in place because, for example, chemistries have multiple uses. So it may be that an adjuvant in one place also is an inert ingredient in a pesticide formulation. So there would be a tolerance or more likely a tolerance exemption that applies. I know, going back to our conversations, for the vast majority of inert ingredients, EPA approves inerts that, especially for food use, that meet the standard for tolerance exemption. So any amount EPA has determined to be safe, as such, those are not chemistries that are typically tested for, because any amount is considered to be safe. EPA sometimes puts restrictions on the amount that could be formulated into a product in an effort to maybe -- not exceed certain levels.

So there's that piece, right? There may well be a tolerance or tolerance exemption applicable to an adjuvant because it's in some cases used as an inert ingredient. But again there, I think there's a safety net here, because FDA has authority over food additives, which broadly defined and I'm going to read this now because it doesn't roll off the tongue, straight out of the statute.

"A food additive is any substance, the intended use of which results, or may reasonably be expected to result, directly or indirectly, in it becoming a component or otherwise affecting the characteristics of any food."

That's a pretty broad safety net.

LLB: Oh, yes.

SLD: And I -- my colleagues -- I personally think a petition for a tolerance or tolerance exemption may be a more predictable path in getting a new food additive approved.

LLB: It certainly would be, right.

SLD: So it may behoove one to go down the EPA path.

LLB: What do you think, Meibao?

MZ: I agree. For the pesticide and any ingredients used for the pesticide product, EPA has a set of guidelines determining what they -- that will be needed -- how the process by the applicant who participates -- who petitions! Sorry -- who petitions for a tolerance or tolerance exemption for the, not just the active ingredient, but also any other components. That goes a little bit beyond the pesticides go for any chemicals that may potentially [be] left on food and feed in the United States. FDA has more say on regulating that. And also the purpose is just to make sure that any chemicals, not just pesticides, left on the food and feed are safe for humans and animals in the United States.

LLB: Okay. No, I got it. I think both you, Meibao, and you, Sheryl, are being modest in articulating what I think would be a prudential matter to get a pesticide tolerance or exemption for tolerance for some of these other components that might be found in a pesticide formulation. I think your bottom line is that the rules in some cases are less than clear, and the need for expert help in this area is very much necessary, because not every EPA regional office or even people here at headquarters would agree, because the rules are sometimes a little bit fuzzy, right?

SLD: And don't we always remark with amazement that as such a mature regulatory program as this can still have gray areas, can still have questions of first impression.

LLB: Right! No, that's exactly right. And it does. It's like a client will come to you and say, "What about that adjuvant? Is that included in the need for a tolerance or tolerance exemption?" And it's like, "Well, let me take a peek." And then, lo and behold, you take a peek, and it's about as clear as pea soup. Always good to get expert counsel on these issues, because these are areas that can give rise to significant enforcement, reputational injury if a food crop is thought to be adulterated and therefore not amenable for commercial sale. And in that regard, Sheryl --.

SLD: And I was going to say expensive! If you have to destroy the crop or destroy the product.

LLB: I know. It's super expensive and commercially, very, very, very disruptive. But how does the federal government enforce the tolerance? We talked about import tolerances, and FDA is engaged there at the border. But what about tolerances for crops just grown here in the United States? Who takes care of that?

SLD: Again, principally, as Meibao was saying, it's FDA. They're charged with enforcing tolerances, both for imported and for domestic food shipped in interstate commerce, or the interstate commerce clause writ large, so very inclusive. And FDA manages that responsibility through multiple programs, as Meibao was saying, it selectively tests commodities in commerce for residues. It also may engage in testing programs that are very targeted toward specific commodities or specific pesticide residues if there's a reason to suspect that there's an issue. And then, it also monitors levels of pesticides in foods prepared for consumption. And I think --and I got to credit Meibao -- she did some of the digging on these statistics, because I'll confess to our podcast listeners, Lynn did share the questions with us yesterday, so we had a little time to think about it.

Meibao, I think in the data you dug up, it seems like, in almost half the samples, no detectable residues were detected at all, which makes me, again, circling back, feeling really good about what we eat in this country. And then a very high level, I think it was like 99% of domestic samples were compliant, maybe a somewhat lower rate of compliance. I think you said 90% for imported samples. So good reason to be vigilant at the border.

MZ: Yes, I agree. After looking at the latest report published by FDA for their food inspection and residues and other chemical analysis, I feel very comfortable and confident in consuming the food provided in the U.S. market. And I also want to add to that responsibility for the residue enforcement. So we talked about EPA, we talked about FDA. I don't want to leave out USDA [the U.S. Department of Agriculture]. The USDA also is responsible for enforcing tolerances in meat and poultry products, both imported and produced domestically. And similarly, actually, USDA maintains a pesticide data program, also called PDP, which is a national pesticide residue monitoring program. And its activities include the sampling, testing, and reporting of pesticide residues on agricultural commodities in the U.S. food supply, and with an emphasis on those commodities highly consumed by infants and children. Though similarly, looking at their most recent report, I feel very comfortable just looking at the numbers. I mean, greater than 90% of the commodities are in compliance. And if anything that's found is not in compliance, it will be destroyed at all, not allowed to get into the market.

LLB: Got it. No, I think that is a basis for a high degree of confidence in the system working as intended.

SLD: No, no, I agree.

LLB: Well, let's transition to a related but different subject, and that is kind of hazard communication. First you, Sheryl. But does the American public kind of *get* what a tolerance is conceptually? For example, I was reading not too long ago that it might be a more effective strategy to remind consumers that consuming a cup of coffee, which we all do with nauseating regularity, is likely ingesting more carcinogens than a year's consumption of fruit and vegetables. And the citation to that is Dr. Bruce Ames. And that many risk communicators believe that this is a better means of expressing toxicity than in the more traditional technical terms of an LD50, which people tend to not understand and believe to be too technical. I mean, do you agree? Or could both the industrial chemical

community and the pesticide world and EPA and FDA do a better job of communicating the concept of risk from pesticide residues in terms other than a tolerance, for example?

SLD: Well, first, clearly, Dr. Ames is not a spokesperson for Starbucks.

LLB: No, definitely not.

SLD: You know, it's funny. So last night I polled some people on this question, just because. Well, I figured, you know, I have, I guess, about what most people would think. But, you know, what I think isn't reflective. So I -- between friends and family and neighbors -- got kind of, I think, what we would say predictably. So one end was sort of, "Well, I don't think too much about it because there's nothing I can do about it" to the government -- and forgive me for podcast listeners, you can't see me doing air quotes -- "The government [unspecified] regulates these." Or maybe someone would guess it would be FDA, right? Which makes sense. It's food, food and drugs.

I think as a society, we absolutely could do a better job about communicating on science issues. Of course, we also -- that requires good, honest communicators, and that requires people who are willing to listen to something longer than a tweet, which I'm quite confident everyone on this podcast falls into that category. I think there's a disservice paid to the general public when someone points out that there are pesticide residues in food without putting that information into context.

LLB: Exactly.

SLD: Every toxicologist I've worked with in more than 30 years has always told me it's the dose that makes the poison. In other words, it's not just that a chemical may inherently have a hazard, but it matters how much you consume, how much you're exposed to. And EPA considers that dose, as well as the hazard, and includes safety factors in its calculation so that the dose you would receive from consuming your fruits and vegetables is nowhere close to the dose that would have an effect. And I think that was part of what Dr. Ames was getting at. We don't want to discourage people from having their fruits or vegetables because there's everything to gain there. And really, it's quite safe to do so.

LLB: Understood. Meibao, any thoughts on that subject? Risk communication? And are we getting it right?

MZ: That is a very tricky question. In my mind, it, of course, it's like, as Sheryl said, it is very important but critical to get it right, because when we talk about the dose, talk about toxicology, everything is about the dose and then the endpoint, right? So we have to make sure that those data, supporting what we are saying, [are] correct. But on the other hand, too, for communication, we need to find a way to use a common language to share that -- either that conclusion or that information based on the data. So that is a very difficult, yet very important thing for not just the regulators, not just the pesticide industry, but also for scientists, that they do find ways to communicate it accurately and also effectively and make sure that people can get it. I personally have experienced that as well. I recall in my earlier career that I took specific training classes just to try to learn how to communicate to a general audience on a scientific topic. So, yes, that is one thing that we think is an important area.

LLB: Absolutely. Absolutely. Given that there are new data being generated all the time with respect to chemicals and how they might interact with the crops on which they are applied,

in establishing tolerances, how does EPA accommodate new data? Are tolerances established and then updated? Do pesticide chemical manufacturers and/or users have obligations to report funky results that might dictate the need to reevaluate a tolerance? What's the trigger there? Sheryl, you want to take a shot at that?

SLD: I would say, that this is a regulatory program and a regulatory area that's dynamic, for multiple reasons. I mean, first of all, every time there's a -- clearly, every time there's a new active ingredient for food use, or you want to use an existing active ingredient on a new crop -- it hasn't been approved for use on that crop before because, as Meibao said, it's a combination of the chemistry and the crop-- or you have a new chemistry that you want to be able to sell into the pesticide formulation market as a food use ingredient. I mean, you're always having new tolerance petitions or new tolerance exemption petitions submitted to EPA. So there's that piece that's ongoing.

But then EPA also reevaluates the safety and the supporting data set for pesticide active ingredients on a 15-year cycle. We're approaching very close to the end of the first official -- well, we had wheat for FIFRA nerds, right? -- we had reregistration, and now we're having our first round of registration review. But as envisioned, these cycles will continue every 15 years, and EPA will continue to review the existing data set and the current scientific standards to make sure that they still support registration and that they still support the tolerances or the tolerance exemptions. And that still makes sense. So it is a ongoing process, which probably will evolve over each 15-year cycle, depending on the work that needs to be done.

And then, as you allude to, I think, in your question, Lynn, under FIFRA Section 6(a)(2), if you have new information that suggests that there's a risk, an adverse effect, that EPA may not be aware of that could factor into these assessments, there's an obligation to report that as well.

LLB: Mm-hmm, and I assume, but seek your confirmation, Meibao, that if a third party, independent third party, were to be of the view that a tolerance needed to be updated based on independent information, not part of a 6(a)(2) notice or information that EPA has, that that could invite a review of the adequacy of a current tolerance. Yes, no, maybe?

MZ: Yes. Though, with all those ongoing, those different pieces, including what you just talked about, the 6(a)(2), the new petition, and then also the registration review, and then also at the third party petitioned, EPA would incorporate that into their review process. And then an outcome of that review may require EPA to amend that established tolerance for certain pesticides. So this is an involving activity for pesticides.

LLB: To my ear, it sounds like we have a pretty good system in place, that there are multiple opportunities for pesticide manufacturers, for EPA, for third-party detractors or supporters of any sort to explore the adequacy of tolerances. They are reviewed and rereviewed by EPA over the passage of time.

SLD: And certainly with the advent of the Internet, and the dockets are online, it is so much easier to submit, to monitor, to track what's going on, to submit comments. Yes, that all factors in. It just adds to our transparent regulatory process.

LLB: Transparent indeed. And increasingly so, with each passing year, largely for the reason you note, Sheryl, that the Internet just is an extraordinary source of information. But given the public's focus on chemical exposures generally and on food, something near and dear to

everyone, where do you see the program, the tolerance program, say, five years from now, largely the same, different, or overhauled entirely?

SLD: I certainly don't think it will be overhauled entirely or there's any reason for it. It seems to me that there are predictable tensions. On the one side, you have market and regulatory pressures that cause stakeholders to regularly give scrutiny to the safety of our food supply. That includes the registration review process that we've just talked about, EPA periodically reviewing the safety and supporting data for pesticide active ingredients. There's industry interest in developing less hazardous chemistries. I mean, just from a competitive basis, that's something that many, many, many companies are engaged in.

And then there's the public's interest in organic produce as well. And we would emphasize, right, that organic -- contrary to maybe some popular belief -- does not mean pesticide free. But there are tighter limits on the pesticides that can be used on organic crops. So you've got that kind of multi-factor safety, greener kind of interest. And so that would put pressures on maybe some of the older legacy chemistries to deselect in the marketplace. On the other hand, we've got, always, that our world's population is not diminishing.

LLB: No, no.

SLD: Knock on wood.

LLB: And the available areas in which to grow crops is diminishing, thanks to our climate change.

SLD: -- I was just going to say climate change impacts as well. Absolutely. So that all increases our need for greater efficiency and production. And who knows? Maybe the growing interest in shifting to plant-based diets will factor into that, as well in terms of increased need for agriculture. So you've got those tensions. So ideally, we'd have less hazardous chemistries in combination with good agricultural practices that allow us to grow abundant food that's safe for humans and good, reasonable footprint, not adverse to the environment. So I think it's a dynamic area. So we're, I would say steady improvement, but no dramatic overhaul. But it's currently dynamic, so I wouldn't expect it to become less so.

LLB: Got it. What say you, Meibao?

MZ: I agree. I would say that there will be a steady improvement, like Sheryl referred to. Maybe some older chemicals will be gradually phased out, either by the EPA or the administrative action, or just by growers' preference to use greener chemicals in a more effective way, in combination with other agricultural practices to reduce hazardous chemical use, but maintain the productivity and effectiveness, and overall the result will be safer food for the market.

LLB: Well, great. Well, I'm going to end on that very optimistic, happy note. And thank you both for being with me today. This has been a fascinating conversation on a topic of interest to a great many people. So, Sheryl, Meibao, thank you so much for being here.

SLD: Thank you for inviting us, Lynn.

MZ: Thank you for inviting us, Lynn.

LLB: Thanks again to Sheryl Dolan and Meibao Zhuang for speaking with me today about tolerances and the essential role they play in ensuring food safety.

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