Mycotoxin Matters - episode #28 transcript

**SPEAKERS**

Announcer, Martin Minchin, Dr. Alexandra Weaver

**Announcer** 00:02

Welcome to the mycotoxin matters podcast from Alltech mycotoxin management. As mycotoxins present an ever-increasing threat to livestock production, join us as we discuss these impacts and potential solutions, sustainable farming, and our vision for a Planet of Plenty.

**Martin Minchin** 00:23

Hello, everyone, and welcome to this month's episode of Mycotoxin Matters. On today's episode, we'll be looking at the various options that feed and livestock producers have when it comes to detecting and identifying mycotoxins in animal feeds. To discuss today's topic, we're once again delighted to be joined by Dr. Alexandra Weaver from Alltech's mycotoxin management programme. Dr. Weaver will be familiar to many of you from previous episodes of Mycotoxin Matters and is a well recognised name in the mycotoxin category. Alexandra, thank you for taking the time to join us here, again, today.

**Dr. Alexandra Weaver** 00:55

Yes, thank you. It's good to be here.

**Martin Minchin** 00:57

So I said Alexandra, we're going to talk about mycotoxin testing today. So maybe we'll start with just giving a bit of a context to the overall topic. Despite the best efforts of the industry to control and manage the challenge, we continue to see that mycotoxins are unfortunately not going away and they're ever present in the animal feed chain. But I'd ask you, why do we test for mycotoxins? Why do we need this specialist equipment? Can I not just see that grain or forage is mouldy and then decide what to do with that?

**Dr. Alexandra Weaver** 01:28

Yeah, so that's a great way to start. It is very important to test for mycotoxins because they have toxic properties that can impact the performance and health and overall profitability of a farm. So there can be some reduction in that animal's growth performance, there can be damages to the intestinal tract, increases in diseases occurring, reduction in vaccination efficiency, reduction in reproductive capacity. And again, all of these things relate to that overall profitability and economic status of that farm. So we want to have healthy animals, we don't want these toxins to be another piece of the puzzle that's trying to pull away that performance out of all the things that are out there. So testing is very important. Now these mycotoxins are very tiny, invisible chemical compounds, we don't know that they're there without testing for them with some type of method. Now they are produced by moulds, and the moulds are visible, they're the living organism. But just because there's moulds, we don't know how much mycotoxin is there, we don't know the type of mycotoxin that is there, or if there is even any toxin, so the mould itself does not give us the indication of the toxin concentration or type. Sometimes we get a very clean looking material without the moulds visible. And actually, those could have very high mycotoxin levels. So again, it gets back to not just visibly looking, but actually testing with some type of method that gives us the details of that mycotoxin type and concentration.

**Martin Minchin** 03:04

Alexandra, when talking to our teams both internally and then speaking with customers and partners externally, we often get the question, what's different between the different mycotoxin testing methods? And I know there are a lot of acronyms being used when we talk about the various methods that are in use across the industry. Maybe just explain to us, I guess, what are the key differences within some of the key methods that are being used?

**Dr. Alexandra Weaver** 03:35

Yes, so there are a lot of testing methods and typically we can put them into two categories, either what we call on site testing, or lab based analysis. The on site testing really refers to technologies that can be used directly at a feed mill or on a farm. They have relatively simple methods, they're quick, they're easy to follow, and you can get these basic results on mycotoxins usually individual single mycotoxins at a time. Now one of the main types, a group of these most used on farm testing methods are either what they call lateral flow devices or LFDs or enzyme linked immunosorbent essays or Eliza. Both the LFDs and Eliza function in fairly similar ways in that they allow for mycotoxin analysis through a reaction with antibodies that then recognise and bind to that specific mycotoxin and then are read with a specific reader that measures a colour change intensity of an antibody conjugate reaction that's occurring here. So, the mycotoxins are binding, there's a reaction that's occurring, you use a specialised reader, it measures that colour intensity change and then quantification, that specific level of toxin can be assessed with that reader. So now you know the mycotoxin that's present, you've tested for that, and you know the amount that's present. On the other hand, we have the lab based methods, these are going to be a bit more advanced in their detection capacity. Usually they have lower limit of quantifications, they do require a bit more training in the use of these techniques. Some of these are liquid chromatography. Usually, it's either high performance liquid chromatography or HPLC. Or it might be liquid chromatography with tandem mass spectrometry added on, coupled on here. So that's known as LC-MS-MS. And these methods are much more sensitive. They actually allow for the separation of the mycotoxins or the identification of the mycotoxins by basically separating that compound that chemical structure under pressure. And then if we have the mass spectrometry added on to that liquid chromatography, it actually further breaks down that compound, and you can analyse it based on the mass of the fragments of that mycotoxin. So that actually gives you much more specificity and selectivity and sensitivity for assessing those mycotoxins knowing the compound you have and actually detecting much lower concentrations than you might be able to detect with your more basic on site testing methods.

**Martin Minchin** 06:23

So, Alexandra, now that we've essentially defined the difference between what you're referring to as on site, or our lab based methods, you know, if I'm a feed or livestock producer, I'll put two questions in here potentially, what are the key factors when choosing what type of testing method I should use within my business? And then, you know, what are the pros and cons, I guess, attached to each of those, those methods that you've talked about as well?

**Dr. Alexandra Weaver** 06:53

Yep. So I think the first thing you'd want to ask or the first question to ask is, what material is being tested? Are you looking at raw ingredients, because those can be tested by most of the methods that I've mentioned. Whereas, if you're looking at testing finished feeds or complete rations, these need to be tested with more complete, or advanced laboratory methods, because those have very complex matrixes with all of the different ingredients and the vitamins and minerals, and that can change how a mycotoxin test, is running. So really, first, what are you testing? Then next, thinking about maybe how often are you planning to test for mycotoxins so if you need to test every load of incoming grain, you would want something that's inexpensive, and very quick and very easy to use, like a lateral flow device that we can use right there at the mill or right there at the farm. However, if you're testing maybe once a quarter or once a year, then I would say put more effort into using that more extensive lab based analysis, so that you can get more information on the number or a larger number of mycotoxins more detailed information. And that really will overall give you more value. What I'd also say is, how many mycotoxins do you want to test for? If you're going to focus on maybe just one or two toxins, then again, that rapid test might be sufficient. If you want to get a more complete mycotoxin analysis, looking at your common ones like aflatoxin or DON, but maybe also some emerging toxins or some storage toxins, then you're gonna go towards that lab based testing as well. And then finally, I guess just a critical point here is, is there someone, if you want to do a rapid test, is there someone actually that's trained to use that equipment at your, farm or your mill? Or is there no one that can run this test? Then you need to just send it off to a lab and maybe that is a lot easier for your situation. So, those are a few things to think about, you know, again, what are you testing? How often are you testing? Do you have someone there? All of these things can really play a role in the process that you decide to use for your mycotoxin management programme.

**Martin Minchin** 09:10

Alexandra, you've not talked specifically about NIR yet, but it is an analytical tool that is being I guess, used and talked about more within the agricultural industry, when it comes to mycotoxins, where does NIR sit in terms of on site or lab based methods? And then secondly, you know, what are your thoughts around it as a detection tool?

**Dr. Alexandra Weaver** 09:33

Yes. So, NIR, or near infrared spectrometry is really a technology that again, it doesn't really fit into either of these categories I've mentioned, although it may go more on that on site testing. It basically is working by detecting interactions with the different chemical bonds in the sample of what mycotoxins are present. But what I would say is that really it's still in the initial stages of being developed for mycotoxin analysis. Currently, it's more utilised for kind of a quality control type situation. And there is research being done to try to understand how this can be used for mycotoxin analysis. At the moment, it does show that there can be some, some situations where it is very accurate, but some situations where it might have a lot of very high standard error. And so you might get an inaccurate quantification of some of these mycotoxins. It can also be quite costly, so, again, that's something to think about in your situation, if you can use that or not. But overall, I'd say that potentially at this initial stage, it could be used as a way to understand maybe just generally, if you have low mycotoxin concentration or high concentration, but I would still suggest further mycotoxin testing, until we really know a lot more about this technology as it applies to mycotoxins.

**Martin Minchin** 11:00

Great. Alexandra, going back briefly, again to I guess, selecting what method to use within my business, you know, is it an either or decision? Are they mutually exclusive? Can they work in tandem from both an on site and a lab based method? You know, is it something that I could use in a wider programme? Or have I to choose, you know, one of those within my control programme?

**Dr. Alexandra Weaver** 11:28

Yeah, that's a great question. So, actually, I believe that really a combination of both testing methods is actually ideal if you can do that. So having your on site testing for your key mycotoxins, maybe DON and zearalenone are the two that are most problematic in your region, and you're going to test for those more frequently. So having that quick test on your site to know what your key mycotoxins are doing is very important. But I think it's also good to link that in with your more advanced laboratory based method like LC-MS-MS. So you can actually learn about that mycotoxin mixture on a more complex level. So you can look at things like again, those key toxins, but maybe emerging toxins or the masked mycotoxins or the storage mycotoxins these need to be analysed through that more advanced method. So if you maybe once a quarter, once a month, or even once a year, depending on your farm setup. If you can send that sample to this more advanced method, then you can actually get more details on your mycotoxin mixture. And then maybe you can use that to then say, am I testing the right mycotoxins with my rapid test on site? Or should I be looking at something different, that you really can learn a lot from both methods and see how they kind of go together and fill in the pieces, using both of them to put towards your whole mycotoxin management programme.

**Martin Minchin** 12:56

Let's move I guess, Alexandra, toward the data that has been generated with these various testing methods, and it's probably fair to say that there are millions of data points being being generated each year with the testing programmes across the globe. At Alltech, for example, I think, you know, between our rapid test methods and the lab based Alltech 37 plus service, we'd maybe assess up to 30,000 tests each year. What are we doing with all the data that we're generating? How connected is it? And I guess, where the opportunities lie around making better use of all that information that we have that's for, you know, for a long time now, what are we able to do with that?

**Dr. Alexandra Weaver** 13:43

Yeah, so I think data is very important for understanding, you know, not just in your immediate mycotoxin risk, but kind of your long term and your historic even looking back, you know, what your mycotoxin risk is. If we look at the analysis, we're actually able to track where mycotoxins are coming from geographically, which commodities can have more risk over time? How is your mycotoxin risk changing? And if you're looking at these samples, say at a feed mill and seeing how is my mycotoxin risk changing over time, maybe there's some different procedures you can put in place, whether it's from not buying from a certain region or not buying from a certain provider, maybe certain suppliers have higher mycotoxin risk because of where they're coming from. And so over time, you can learn these pieces of information about your system. And with that, then try to minimise your mycotoxin risk and reduce the mycotoxin risk coming from certain areas and that helps you put together a better mycotoxin management programme. I will also say that, no matter you know what mycotoxin test you're using, it is very important to actually not just look at the levels, but link that to the risk of the mycotoxins to the animal that helps you understand what your animal might be dealing with the challenge that they might be undergoing with these mycotoxins and again, that links back into making the best decisions for your mycotoxin management programme. If you don't know that full mycotoxin profile and the risk of what happens when all the mycotoxins come together, you really are missing a piece of the puzzle. So that's actually why, back in 2012, the Alltech mycotoxin management programme developed our risk assessment programme, where we could look at the total mycotoxin mixture and the concentrations that are there and we developed what we call the REQ or the risk equivalent quantity. So this actually lets us get all of the mycotoxin risk from whichever mycotoxins are present and the concentrations that they're at, and compare them to our guideline limits. That could be at lower, moderate or higher, for a particular species or that particular status of that species. So now, with knowing what is our mycotoxin risk over time, what is our total risk or REQ, we can actually get a better picture of how mycotoxins relate to performance and health in the animal. And again, make better decisions on what is that risk? How do we want to lower it? Where's the risk coming from? And overall put together a better mycotoxin management programme.

**Martin Minchin** 16:24

Staying on the data theme, Alexandra, the methods we've talked about today, they're post harvest testing methods, you know, with advances in machine learning, AI, connect data in general, do you continue to see a role for these post harvest testing methods? Or is there a, could you see a scenario where actually, we're able to predict what the mycotoxin risk is, before harvest? Make better control decisions around that then?

**Dr. Alexandra Weaver** 16:53

Yeah, so research is certainly starting to look at that prediction type way of analysing for mycotoxins, you know, looking at climate, looking at location, looking at the crop type, and trying to predict how mycotoxin contamination could be, or what could be happening for this mycotoxin contamination. And I think we'll learn more in the future about how these, to build these prediction models and how accurate they can be. And it is certainly an interesting area that I look forward to, to seeing what happens here, and how accurate these predictions can be. But I think there will always be some aspect of actual post-harvest testing because we do still need to know what the mycotoxin risk is. We want to validate that and you know, maybe things could change, there could be some weather event that has a drastic change towards the end of the crop season that maybe could greatly influence mycotoxin levels. So I think actually, in the future, putting together that prediction modelling, but then also still testing could be quite helpful.

**Martin Minchin** 18:02

Alexandra, it's crystal ball time with our final question today. And you've a vast amount of experience with mycotoxins. What, in your opinion, maybe do you see as the next frontiers when it comes to mycotoxin testing and I'd ask you specifically on maybe you know, stuff like emerging mycotoxins, you know, what are we saying, there's about 5-600 mycotoxins identified. How many of those can we we currently actually test for in a in a feed sample? So maybe touching on a few areas like that to understand, you know, in 5,10 years time, what breakthroughs do you foresee there?

**Dr. Alexandra Weaver** 18:41

Yeah, so certainly, you know, more and more research is being done on emerging mycotoxins as you gave that example. These are toxins that, really, they've been around a long time, but we're now able to detect them and know that they're there and that they can be harming the animal. But that can be a huge category and many mycotoxins can always be added into this. So that is certainly one area just tracking new mycotoxins, you know, the detection of new toxins being able to analyse them and know what they do. I'd also say that there's climate change that's going to have a shift in which mycotoxins are present. So we might always think, okay, DON, or aflatoxin is our biggest problem. But we're going to have to keep ahead of that, I think, and realise that, you know, under certain conditions with elevated co2 or changing temperatures, that the moulds are going to react as well. And they're going to produce maybe different toxins or different levels of toxins than we previously have observed. So I know there's research that has been conducted in Europe looking at T-2 for example, and when there's elevated co2 levels, there's higher levels of T-2 in some of the grains. And so that is an example where, again, there's a shift in what's happening. So, research and just the general user of these mycotoxin tests and agricultural producers, whether you're on the feed side or the animal side, I think you're gonna have to realise that the mycotoxin landscape is going to change over time. And so we need to be just ready to be or be open minded to the fact that there might be new toxins out there that we don't know about or that we need to do more research on. But something can be out there influencing the animal.

**Martin Minchin** 20:33

Alexandra, as always, thank you for sharing such fantastic insights. It does feel like we're only really at the tip of the iceberg. When it comes to the opportunities we have to understand more about the presence of these toxins and how we can see to control them in the feed and food chain. And as these technologies continue to advance, I'm pretty sure we'll have you on again in the future to share some of those updates. To our listeners, we hope you enjoyed today's conversation, and we'll be back next month with another episode of Mycotoxin Matters. Thank you.

**Announcer** 21:05

We hope you enjoyed listening today and look forward to you joining us next time on the Mycotoxin Matters podcast. For more information on the topics discussed please visit knowmycotoxins.com That's k n o w mycotoxins.com.