Disease Du Jour Episode 54 Merck Respiratory Biosurveillance Program

Kim Brown: Welcome to this episode of Disease Du Jour on topic of the Merck Respiratory Biosurveillance Program with Dr. Duane Chappell. Dr. Chappell has spent his career bettering the health of horses through his work in the field, in the classroom, and in research projects. He joined Merck Animal Health equine veterinary professional services team in 2014, and currently serves as Associate Director Equine Pharmacovigilance and Professional Services. Dr. Chappell practiced at mixed animal clinics in the Midwest. He owned and managed solo and group practices and was the resident veterinarian at Richland Ranch Quarter Horse breeding farm for many years.

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Thank you, Dr. Chappell for joining us today to talk about the Equine Respiratory Biosurveillance Program.

Dr. Duane Chappell: Thank you, Kim. I look forward to our discussion and interaction today.

Kim Brown: Well, let's just jump right in and tell our audience a little bit about the background of how this program got started and how it evolved through the years.

Dr. Duane Chappell: Well, it started back in 2008, when we actively started collecting samples. And, and as you can imagine, the preparations occurred several years before that leading up to the initiation in 2008.

Merck Animal Health has a great collaborative situation with the University of California, Davis, veterinary school and in specifically with the PCR laboratory that is overseen by Dr. Nicola Pusterla. It's been an ongoing program since that time to study the prevalence and epidemiology of very relevant viral and bacterial respiratory, or specifically upper respiratory, pathogens.

Currently we have about 300 veterinary clinics nationwide enrolled in the program, and we're approaching a milestone of 10,000 samples that we'll probably hit sometime later this month or early in May.

They've been samples received from as you can imagine, various ages, genders, breeds, and they meet the qualifying requirements to be entered into the program. It is a value-added service to our customers that use the Merck Animal Health vaccine line. But the submissions for this study are not restricted to only horses vaccine with Merck products, but actually are received samples from horses that are cared for in many different ways. And some have no vaccine background. But as you can imagine, the clinics that participate, provide care for a lot of different scenarios of boarding facilities, training facilities, breeding farms, where they might not be the only one interacting in the care of those animals.

Kim Brown: And so why did you all start it? What are the goals of this program?

Dr. Duane Chappell: So the goals of this program are really fourfold and have been the pillars of the program from the very beginning. The first one would be to provide that participating veterinarian with a valuable diagnostic tool that helps them to identify and accurately diagnose and treat and manage that respiratory disease that they're encountering.

The second goal is to provide the equine industry with a better understanding of prevalence and epidemiology of the common upper respiratory pathogens.

Thirdly, to identify and monitor the current circulating strains that are occurring in our major equine respiratory pathogens.

And then finally, to evaluate the efficacy of current vaccination protocols.

Kim Brown: Well, and so what samples are you all taking? What diseases are you looking for in this program?

Dr. Duane Chappell: Well, the, we look at the primary upper respiratory diseases of equine herpesvirus type 1 and -4 equine influenza virus, *streptococcus equi* subspecies equi—as we would all refer to as strangles—equine rhinitis A and equine rhinitis B virus, and those were added to the panel in 2012. And then finally, we continue to survey samples that are submitted for equine herpesvirus type 2 and 5, but, currently do not report those results as they seem to be almost confusing at times how they may interact with a case and, and how we piece them all into what's going on.

Kim Brown: So, if veterinarians are interested in this program, what are the requirements to submit a sample?

Dr. Duane Chappell: So obviously the first would be that your clinic's approved to participate in the program. And with that approval comes a specific submission form that allows us to collect information, whether it be about the veterinary clinic, the horse, the vaccination history, was there recent travel involved or exposure of how many animals that were involved. And then in addition to that, there is some minimum qualification, which would be a temperature of at least 101.5 at the time of sample collection. And also one of the following clinical signs would need to be present, which would be either nasal discharge, cough, depression or lethargy and/or central nervous system signs.

The submission form is completed, and it is really, really important that all the lines can be filled in, if you will, when we go back to do retrospective studies. Leaving things blank leaves a lot of unanswered questions that we can't provide information for. And then also these samples are submitted for what we would call sentinel cases or kind of the first case, if you will, of an outbreak. It's not set up to be a screening tool, where you can go in and test 10 animals in a barn. It's set up to identify a couple of early disease individuals and then help and assist in trying to identify what's going on.

Kim Brown: And the veterinarians that are involved in the program, what kind of samples are they submitting?

Dr. Duane Chappell: WTheyre going to collect two nasal swabs and one, five ML purple top tube. The nasal swabs can be collected at the same time, so they can pass two swabs up one nostril and collect those samples. And, and we found that how those samples are handled and how that collection process occurs, it is very important to trying to identify a pathogen.

Kim Brown: So, do you have some tips about sample collection and handling that could help us help veterinarians give a good sample that can help identify what's going on?

Dr. Duane Chappell: We do. And, you know, we touched on this in one of our newsletters a few years back because we reached out to the technician that primarily oversees the PCR lab, Samantha, and she had some real helpful tips.

And so we'll pass these on, because I think whether we're talking about sample submission to our program, or just in general of respiratory samples, I think it can be helpful.

The first one is we kind of treat this like anything else that we were going to collect a sample and we need to clean the area. So just wiping out the nasal opening, removing organic debris, can be extremely helpful in collecting a clean sample, but also helpful when the lab receives the sample to not have that negative interaction from things other than what we're looking for in the nasal, nasal swab sample. The other things that have been noted is one to use a plastic shaft swab, or a synthetic swab to collect these samples. Wooden shaft swabs, or cotton swabs, typically have remnants of some of the herbicides or pesticides that were present when that cotton was grown. And then once it was harvested and then made into a swab can be interfering. Also the swab fibers of a cotton swab are a little more sticky. They're a little harder to extract that sample from. So the lab would much prefer a synthetic swab.

Just a reminder, make sure that swab's in there long enough to actually absorb and collect the sample—15 seconds is often preferred, but you know, there's times it's kind of challenging once you pass that swab the game's on and some horses don't really appreciate having that done.

And so we want to make sure that we can get an adequate sample size to be able for the lab to do what they want to do.

If we don't have viru transport media available, which we provide to some of our customers that are participating in the program, or they've ran out, they can just place that swab in red top tube.

But more importantly is after that sample is collected and placed in the tube is to keep it refrigerated because the clock starts ticking on the breakdown of that DNA/RNA material. And if it's warm, it just accelerates that time where it breaks down. So, keep the sample cold. And similarly with the purple top tube, keep it cold. And then through the shipping process, make sure we include ice packs on that sample.

And then finally, in our particular study, we don't want samples shipped on Fridays. And the reason being, there's no one there on Saturday to process that sample. So now that sample

is going to go through a time period where it could get warm. And that kind of defeats all of our efforts up to that point of a good sample care.

And finally, we collect samples from a febrile horse, because we have found that the likelihood of identifying that causative pathogen is a lot higher in an afebrile horse than maybe he's either been ill for a long time and already went through the disease process and/or is very early and at this point is not febrile and likely would not recover a pathogen.

Kim Brown: Well, those are great tips for sample collection, whether they're sending them into the Biosurveillance Program or not. So, yeah. Tell us a little, when you're talking about shipping the samples in and the lab, where are the samples processed?

Dr. Duane Chappell: So, the samples are shipped with an overnight shipping label. So, we want to make sure those samples move from the point of collection, the veterinary clinic, to that lab in as expedient fashion as we can. So, we provide that overnight label to get those to the PCR lab at the University of California, Davis.

And that partnership there with Dr. Pusterla and his laboratory team have been amazing. And has actually been a very, very vital component to the success of this program. They received these samples the next day after you collect them, and in most cases that afternoon that next day you're going to have results.

So, the turnaround time's quick, and that's really important when we're trying to manage these cases in the earliest situation.

Kim Brown: So veterinarians that send in samples is shipped overnight. What, what should the veterinarian expect back?

Dr. Duane Chappell: As we just discussed, a quick timely result,and it's going to be accurate.

And they run a tremendous ongoing control system with each sample. So we know that the information provided is accurate to what's going on. It allows that veterinarian the opportunity to have some early intervention and treatment, and also allows that veterinarian when they look back after the situation to evaluate, okay, was my vaccine program working well, or maybe it wasn't that particular clinic's program, but it was somebody else's and maybe they need to find out a little more information on what's been done in the past and help them to identify either different management changes that need to occur or maybe different biosecurity planning that needs to take place. So that in the future when respiratory illness occurs, which we know it will, they're better prepared to handle that. And then finally don't be, you know, you need to step back at times and say the vaccine I'm using and be critical: Is it working or not working?

And if it's not working, take the steps to make those changes so that the horse is the one that benefits the most out of this.

Kim Brown: And I know our listeners want to get the information from the data of what's going on with the program right now, but can you just go back and touch on some key points about the respiratory pathogens in generalor us?

Dr. Duane Chappell: Absolutely. And I appreciate that opportunity to share that Kim.

We're so often reminded as we look back at the data set we have the requirements of the need for a febrile situation, a horse with a 101.5 or greater fever. We asked for, does the horse have a nasal discharge or a cough? And when you assimilate all that, well, all the samples start looking the same because all the horses have the same presenting signs.

But what we're so often reminded is the pathogen that's identified can be quite different.

And so even though we have a snotty nose horse with a fever that doesn't feel well and it's not eating, it does not mean that that's a flu horse or it does not mean that's herpesvirus 4. And until we take the next steps to actually collect that swab, send that sample in, and get that laboratory information, we really are treating in general ways that long-term is probably not going to be the best management, not only that individual case but with the other horses that are impacted.

So, as we look at the pathogens in this program, the big reminder on herpesvirus 1 and 4 is these pathogens have in their—if you will—toolbox the ability to become latent. And they also have the ability to recrudesce or become reactivated later on through periods of stress. And that in itself makes that particular organism so challenging. When we talk about vaccination programs, when we talk about management and control or biosecurity.

periods of stress might be as simple things like weaning, or it might be hauling the horse from point A to point B, whether it's to a clinic for a referral exam, or whether it's to a show experience.

Pregnancy. Pregnancy in itself is a stressful event to that broodmare and can be the inciting stress factor that reinitiates or reactivates a herpesvirus 1 situation, and on and on. We can think of many stressful things that would contribute to reactivating those two viruses.

If we move on to influenza as a reminder, the H3N8 is the influenza virus that we're dealing with in the horse world today. And more specifically, the Florida Clade 1 is a sublineage of that. And I know if I look back to my veterinary education process and my time and practice, a lot of those specifics, I just call it flu. And in turn, those specifics are important when we start looking at vaccines and differences in products, and we start applying it to what's actually circulating in the industry today. And we pick up a research article to read, we've got to have a little background knowledge of what's actually going on.

So, when we look at that information, we're going to see things like key immunogenic sites talked about, and we're going to see things like antigen binding and neutralizing antibody locations, and all of that can become quite confusing when we're thinking about I've got a horse with flu and how am I going to treat it, but we need to assimilate that information to realize that that influenza virus is changing, and it changes on a regular basis just like it does in humans. And with that there are changing needs that occur in reference to our vaccine products and how we look at those and how we'd study those. And so, as a reminder, the current circulating strains are not well aligned when we look at genetic testing with what our organizing body, the OIE would make recommendations to manufacturers for vaccines.

And by that, I mean this, the last time they made a recommendation of change was 20 years ago. And that currently their recommendations are a vaccine that contains an Ohio 03-like strain and a Richmond 07-like Clade 2 strain. Well, the Clade 2, we don't worry much about in the United States because they don't occur here, but Clade 1s are the predominant strain that we see.

And we're thankful that through this program, we've been able to identify a strain that's much more aligned with what's circulating, and that being the Florida 13 strain that we'll talk about a little later.

Let's move on to *Strep equi* and just touch briefly on that. And one of the challenges that we see with sample submission is, Oh, that was a surprise. I got *Strep equi* back on this nasal swab. And that's to remind us that this disease has its challenges with silent carriers. And that contributes often to how we manage or try to prevent this disease.

And then lastly, equine rhinitis A and rhinitis B. And I think this is a place to put a caveat in that of the samples that have been submitted and evaluated since 2012, we find rhinitis A almost never, and almost never being likely because the nasal swab sample that's being submitted to qualify for this study may not be the best sample to identify this pathogen. And we acknowledged that, and we know that, but rhinitis B is becoming to be a little more prevalent, and we do find that from time to time. And oftentimes it's in that febrile horse that we think is probably flu or herpes and lo and behold comes back the primary pathogen is rhinitis B

Kim Brown: Well, let's get into some of the key findings from, from this Biosurveillance Program, and give us some facts and figures on that. Dr. Chappell.

Dr. Duane Chappell: Well, you know, we look into just very recently in the last four to six weeks and herpesvirus 1 continues to grab all of the press, grab all of the headlines, and, and rightfully so. The concerns and challenges with the neurologic form bring a lot of fear into our horse owners and even to veterinarians and the fear of managing a large outbreak that could occur.

But from our study, it's really much lower on the occurrence list of respiratory pathogens on a regular basis. We commonly see equine herpesvirus 4 as the leading pathogen.

If we look at the life of the study over 13 years, a third, if you will, of the cases submitted have come back herpesvirus 4, but right in behind that—almost as you'd say in a race running neck and neck, a furlough behind—would be equine influenza virus, and 29% of those samples over the last 13 years have come back flu positive.

Next in the list would be *Strep equi* as we look of how they fall on order at 22%. Rhinitis B is, is running a little farther behind that. Not as frequent. But even below rhinitis B is equine herpesvirus 1.

So, we want people to realize that really the, the pathogens that are causing more of the primary disease that we manage and treat through febrile experiences, nasal discharge,

cough are more than likely if we had to choose two would be either herpesvirus 4 or influenza.

If we break that dataset down a little closer to recent times, what we'll find is depending upon the time period selected, influenza will even jump ahead of herpesvirus 4 in its incidence.

And so, it is becoming a very prevalent, predominant disease. And as we all know, we've got vaccines for all but a couple—all, but one—of these viruses or bacteria we study, but we also know the challenges that vaccination can bring and the shortcomings that may be involved.

In addition to that, if we layer upon the expected outcome that we see from the study and layer seasonality upon that, it helps that practicing veterinarian step back and say, okay, it's it's now April, and I'm going out to, to look at a respiratory case, collect some nasal swabs. I'm going to maybe do an SAA test on it. And all that information assimilated, but I'm kind of waiting for that lab test to come back, so I gotta make a decision what I'm going to do for treatment. And we can layer seasonality on expectations of occurrence and give them a little bit of heads up, maybe, what to expect.

So, herpesvirus 4 seasonal incidents is typically the fall. It kind of starts rising in August. We see oftentimes in our weanlings and yearlings, weanlings going through a period of stress and also that challenge of in that young age of vaccinations are a lot of times not completed. And so, we've got a naive animal that's run out of maternal antibodies, but herpesvirus 4 commonly will run from August peaking usually in October to early November. And then we start seeing a decline of positive samples along about December to the first of the year.

And right behind that, we have influenza that's starting to run its peak of the year. And that usually starts in later in the fall and occurrence will start somewhere typically in November and start climbing and then kind of start tailing off in March.

So, we're falling into that time of the year that we don't have a pathogen that always is going to be the, the common one to find. And so, we have to continue to submit samples to know what's going on.

Strep equi is a little higher in occurrence in the early part of the year, January through May, as we look at the whole study, but remains steady throughout the year. And kind of reflective of, I think the disease and, and how it can just continually circulate in a population, sometimes undetected.

Herpesvirus 1 to be a little bit more prevalent in the winter time.

And then finally rhinitis B, we can identify at most months of the year, and it doesn't seem to have that seasonal bump that we see in some of the other diseases.

Kim Brown: So that's really interesting with the seasonal observations. So how does that impact when a veterinarian should be recommending and giving vaccinations?

Dr. Duane Chappell: You know, that question was posed by Dr. Valla at an AAEP presentation a couple years ago, because as we looked at our data set, and as we just talked

about seasonal occurrence of, for example, influenza, typically our vaccination cycle is March or April of each year, and then followed by a booster, if that's give, in August or September. And if we add to that the fact that the duration of immunity specifically in this case, influenza, is six months. And the occurrence is oftentimes in December-January, that kind of stretches us out, if you will, to the tail end of protection.

So maybe we need to slide those vaccinations when they're given a little bit later in the fall. To more closely align with periods of exposure when it's the highest or more closely aligned when animals are going to be stressed and would encourage these diseases to appear.

In addition to that, we need to keep in mind the importance of just semi-annual vaccinations.

And I know we've got a lot of pasture horses that don't have a job except to eat grass. They may be retired. They may be the twice a year trail horse. But they may live with other horses that do come and go. And it's important that we keep semi-annual vaccinations, especially for our viruses, because the protection is not going to last a year from one year the next, and it needs to be done more often to keep that if you will herd immunity at the, the proper level to protect all animals.

And then finally, as you know, modified live versus killed or inactivated products and all of our killed products are adjuvanted, are going to also impact planning. Some of our modified live products may last longer than our killed products or may overlap and provide protection in some of those holes or times a year when typically we wouldn't have animals in a good state of immunologic protection.

Kim Brown: While we're talking about equine influenza, tell us a little bit about what have you learned about equine flu during this viral surveillance and all this testing.

Dr. Duane Chappell: Well, as we mentioned earlier, Influenza as we look at one year to the next data sets, it's either going to be the number one or the number two pathogen that we identify.

And even in the years it's number two, it's, it's a percentage point or two different from herpesvirus 4. So, it's very prominent, very easily found if you will, out there in that equine population, even for the veterinarians that say, Oh, I never see flu cases was really one of the reasons that this program even started back in 2008 was until we actually swab that horse, we don't know.

Well, once that sample is received at the lab and the veterinarian gets the information to find out what's going on and they treat the horse, we as a company continue to look further with that sample to determine how's, that in this case, flu virus changing. And so we do genetic sequencing on a regular basis to evaluate if antigenic drift is occurring. And if antigenic drift is occurring, is our vaccine still aligning well with what's occurring out there in the field.

And we're fortunate to say that we found that Florida 13 continues to align well with what we see out in the field, but we also see some distancing, if you will, from vaccines that may

have older strains in those. And so, we want veterinarians to know if you're seeing scenarios where vaccines don't seem to be working as well as they used to—we're starting to see some more respiratory cases at a well-vaccinated barn—we want to remind them that we need to first evaluate what's going on, and then two, to take that information and be very critical to look at what's occurring and what am I doing to try to prevent it?

If we look at some of the research work that's been recently presented, Dr. Lee presented a piece in 2019 to AAEP Convention, through his graduate work with Dr. Pusterla at UC Davis. And they looked at this question of whether antigenic drift is occurring or was there a new strain of influenza that came to the U.S. that's causing current disease.

And he quickly determined through his molecular genetic work that it was not a new strain, but it was the regular strain that we deal with,-the Florida Clade 1. But it continues to drift a little bit and change at that genetic level. And those changes are enough to impact how well a vaccine is going to align with providing protection.

We specifically are thankful for this program because it allowed a sample to be submitted back in 2013 that were later isolated in named Florida 13 through an outbreak that occurred in Ocala. And that's one of the premises of this program is to be able to receive those samples. Then as our part in trying to support and encourage keeping up with, if you will, the pathogens as they change, we're doing our background work to identify organisms that we need to update vaccines.

And that's what we were able to do with this Florida 13 strain was update our vaccine and get it to a point where it's still effective in the field today.

And finally as a reminder, not only in that Ocala situation, but I've had several situations since that time. Flu Avert is still a wonderful product. And it's a product that can be effective during an outbreak.

And some people say, well, why give a flu vaccine after they're already getting sick? It's not the febrile, sick horses that we're vaccinating. It's the afebrile population that it hadn't got to that barn yet. It hasn't got to the neighbor's horses yet.

It's that putting that, if you will, a boundary around horses that have not been exposed, because Flu Avert is going to start providing protection much quicker than an injectable product and can build that fence, if you will, to keep some of those population, some of those horses in that population from becoming ill.

And if we look at the AAEP Guidelines, it continues to be displayed on those guidelines as a treatment, if you will, during an outbreak.

Kim Brown: In a recent discussion I had with Dr. Soboll Hussey about equine herpesvirus, which was on the previous Disease Du Jour. That was a really great discussion if anybody wants to go back and, and look at, or listen to that, but she mentioned something about, you know, different respiratory diseases happening with different ages of horses and what to expect.

So, what through this Biosurveillance, how does age impact the respiratory disease in horses?

Dr. Duane Chappell: You know, Kim, there was a, a pre-held thought, if you will, belief that most respiratory—infectious respiratory—situations were in our young population. And, you know, once they hit the golden age of three or four or five years old, if we vaccinated them correctly, they just weren't going to get sick from that. So, it had to be something else causing that problem.

And we, I hate to burst that bubble. But the truth is—and the data supports—that in the cases of influenza, it's not just our young horse population.

And actually, as we break down different ages and look at this data set, we find that it's commonly in horses one to nine years of age. And that's a little bit concerning to know that we've got a population of horses that—and oftentimes they're being well vaccinated—and we're hoping that the vaccine's working.

And I'm thankful that as I look at this data and I look at the vaccination history that's provided, we're not seeing positive cases coming out of our Florida 13 vaccinates. So, we know that the vaccine's working, if it's being given correctly—and by correctly meaning twice a year.

The age range for some of the other diseases, commonly the EHV 4 typically is 1- to 5-year-olds. So, it's not just the weanlings and yearlings, but we're seeing it even in a little bit older horses.

And then *Strep equi*, surprisingly in our study represents a different age group than you'd expect. And it's more of the 6- to 10-year-old horse that's more commonly found to have *Strep equi* positive.

Kim Brown: Yeah. Using this Biosurveillence data, what else have we learned from, gosh, has it been 13 years now that this has been going on? It's amazing.

Dr. Duane Chappell: It is. And we're finding some of the other information that we request on the submission form. One of them is travel. Has this horse recently traveled in the last 14 days. And we're finding that travel is a risk factor. And it's a risk factor more commonly with flu and herpes 4, as you'd expect. And it's oftentimes the horse that didn't travel, but was exposed to the horse that did travel, that we get submissions for and find to be positive.

Now that doesn't seem to play as much a part in *Strep equi*. And it seems to be less commonly reported as travel being associated with positive samples.

And then finally, we're just reminded that the vaccines we have today and the pathogens we're trying to prevent disease with, can only go so far. We still need good biosecurity plans. We still need just good daily care in trying to prevent disease spread. And we're often reminded about that. And jokingly, we may look at the COVID situation now and be reminded to wash her hands.

And I don't know how we would inflict social distancing in our horse population, but obviously if we can move those animals that are infected far enough away from those that are not, we are going to cut down the opportunities for exposure.

Other things we've found is that a high percentage of the influenza-positive horses—over half of those horses—have some vaccination history associated with a positive horse. And that may be an under-vaccination situation where maybe the horse had been greater than six months since its last vaccination. Or it may be that the product that was used if known and disclosed, maybe wasn't as effective as it was hoped for.

So, in any case, we want to make sure that people put the right expectations with vaccines and realize that there's more to do than just give that shot.

Kim Brown: So how can the outcomes from this program benefit veterinarians as well as horse owners?

Dr. Duane Chappell: Well, we try to get that information out to the public. Now, the participating veterinarians have been receiving a Biosurveillance newsletter twice a year, and we look at … we'll put a feature article about a particular topic in that.

We'll also look at data from the last six months in the total program and put those, we try to display those in graphs and maps in ways that a veterinarian can take a quick look, see where they are in the country, identify concerns they may have, and then support that information when they're talking to customers. We'll also take some of that information and put it into social media links, and also put that into means that can be shared out in the equine industry.

We've put together things like infographics about each of the diseases that veterinarians have available as tools to provide to their customers. And those can be back to the old print version, as opposed to digital, and you can hang them up in a barn and have them out there where the general public can see them.

In addition to that, we continue to try to reach out to larger and larger audiences. And so, we have increased the circulation of this information beyond just the participants, but to any other veterinarian that's opted in to receive information from Merck. And we have a university -type folks and other research-related, interested parties that are on our mailing list, too, because they want to get this information.

And then finally, continue to plug for the EDCC, and we're able to share information on a bi-weekly basis to them to get people a little more current information, as opposed to these twice-a-year newsletters. So, there's actually data that's shared with the EDCC every two weeks that they post on their site from the study.

Kim Brown: Equine Disease Communication Center, you can do a Google search and find that, but how would veterinarians find out more about becoming involved in the Biosurveillance Program that Merck has put so much time and effort in?

Dr. Duane Chappell: The simplest way would be to have that interested party reach out to myself or one of the other professional services veterinarians on our team. They can reach out to a sales member that is located in different regions around the country, or they could call our professional services number, and I'll give that to them right now. It may not be easy for somebody to write it down if you're in a truck driving down the road, but that number is 866-349-3497. Let me do that one more time. It's 866-349-3497. And we'd love to have that conversation and be able to visit with them if they're not involved in the program, how they could become involved in the program.

And if they just like to have information, we would be happy to share that with them, too, at any point in time.

Kim Brown: And we will make sure if you're listening to this podcast on iTunes or Stitcher or something—please do not take your hands off the wheel while you're driving—we will put this number in the article on EquiManagement. So, you can just go to EquiManagement.com and get it.

And we also have started doing complete transcripts of this. So, if you're the kind of person who likes to read, then you can go read the transcript for the most recent Disease Du Jour podcasts, but we encourage you to listen to them.

Well, thank you, Dr. Chappell. That was a lot of information, and we really appreciate all that Merck is doing and, and we thank our listeners for joining us today on Disease Du Jour. And we ask you to please listen to and rate previous and future episodes. We've had some really good information on these Disease Du Jours, and we've been very fortunate that Merck has been our partner on this for the last two years and, have really helped us bring some great information that you can listen to, whether you're in your office, your truck or your treadmill.

And if you have any questions or suggestions, you can send me an email to kbrown@equinenetwork.com.

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