Ringworm Roundup 2: Outbreak Management
Video Transcript
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[Beginning of Audio]

Dr. Newbury: How many of you have experienced what you think is a ringworm outbreak? Cool. You're still here. You live to tell, right? *[Laughter]* These are our two – this is my two-headed foster kitten. *[Laughter]* Got adopted in less than twenty-four hours just the other day. Here's Ken again, thanking the ASPCA. I just wanted to tell you because I neglected to say this earlier and I was talking with Ken in the front row about this that one of the things that I love when I see this picture of Ken is really remembering what it was like. We got everything all set up, we had this whole space, and then we waited to see who would come in and who would be our first customer. It was really funny.

There were several days went by and no ringworm-infected animals showed up, and then here comes Ken and he was just the crustiest kitten you could possibly imagine. *[Laughter]* We put him out in the treatment center and he was the only one out there. He just had so much love of all

these volunteers who were so geared up for this whole thing. It was so funny. Then when he graduated, it was such an amazing feeling to have him go through the program. In my mind, of course, he's still this size, even though, obviously, he's a big handsome boy at this point.

The other thing that I didn't say earlier that I want to make sure that I do say is that it's really important – I'm giving out a lot of medical information today. Some of you are veterinarians, some of you are not. It's very important to be aware of what things you really need a veterinarian to help you with and what things you can go on your own, especially when we start talking about outbreaks. We're talking about large numbers sometimes of animals involved. We might be talking about many people involved or public health risks. Don't go it alone. Don't take the information from this presentation and then just try to manage outbreaks on your own.

Find a veterinarian who can help. You can always contact us at UC Davis and University of Wisconsin, UF to help. There's always help out there for you if you think you're really having an outbreak. We want you to get the help that you need. We can work with veterinarians. Sometimes we'll actually make you get a veterinarian so that we can help you *[laughter]* with what you're doing. Please, please be aware of that. Sometimes it seems like having a veterinarian would be too expensive or too many

resources, but having a veterinarian will probably save you resources and help you save lives better than you can possibly imagine.

What I'm going to talk about today is a ringworm outbreak, but I also want – or a couple of ringworm outbreaks, actually, and how to respond, but I want you to know that many of the principles that we're going to talk about today involving ringworm and outbreaks they really apply in the same kind of systematic way that I've been talking about to many other infectious diseases as well that I actually use almost this exact same system. It's sort of a system of steps to manage almost any outbreak that I'm managing or trying to manage.

As a kind of preview to how we do that, the first thing we want to start with is identification or diagnosis of the primary agent. Is that always possible? No. I wish it was because that would make things really easy. You would always know what you were responding against kind of, right? Sometimes you don't know, but you always want to at least try. Especially with ringworm, as I talked about earlier this morning, you really, really want to make sure that if you think you have ringworm, that ringworm is actually really involved. Because that's one of the things that we see of all the things that take the most life in terms of ringworm outbreaks, it's panic and misunderstanding.

The next thing to really think about when we're thinking about kind of an overview, how are we going to think about this problem is what kind of capacity is there for response? Earlier from over here we had a question about I'm at a large animal control facility, we don't have anywhere we can treat for ringworm. That's good to know upfront when you start to manage an outbreak because that may mean that, really, you can't treat ringworm or it may mean that you need to get pretty creative about doing it, and it sounds like they are getting pretty creative about doing it so that they can make some of the choices that they want to make.

Trying to make the choice to respond in a particular way when you don't actually have the ability or the capacity to pull it off that's going to bring nothing, but heartache and sorrow. It's good to know that because it kind of sets the rules. We're going to talk a lot about what are the rules today when we talk about outbreaks. It sets the rules that you need to work within. I don't particularly like working within rules a lot of the time, but I like to know what they are *[laughter]*, right? I want to know what they are so I know what wriggle room I have or what I need to do to create something to go around it. Does that make sense? You got to know, what are the rules? Where are we?

Assess the impact of possible response plans. We'll come back to this one and talk a lot about it. What's going to happen? What if we made this

choice versus what if we made this choice? To really trace those all the way down those pathways because sometimes a shelter will think oh, I'm going to depopulate because if I depopulate now, then I'll be clean of this and I can move on. Maybe that's going to be a really large loss of life. Maybe that's going to be such a harsh impact from your community perception. Maybe there are all sorts of reasons not to do that. In some cases, very, very rare cases, the flipside might be true too. I'm not really talking about ringworm here. I'm talking about just in general.

It's really important to think. Sometimes it may be that what you want to do is treat them all, but you got to think about what the impact of that is too, right? That as you follow that all the way down the pathway, what's that going to do for all the other animals that were going to come to you who needed care and you spent all your resources already? I'm in the midst of a project with my son where we made a budget or our household. He's twelve. *[Laughter]* I'm making him run the budget. Of course, we ate out every night for the first week of October. *[Laughter]* Now we're not going to eat out too much for the rest of the month. He's got to figure that out, right? That's the same thing we've got to figure out when we're looking at what impacts are there, really, in the grand scheme of things?

Now let's think more specifically about outbreak response. What kinds of steps are we going to take in terms of responding to an outbreak? Here's

where we start to think about let's talk about the history and the clinical signs. This is at an organizational level. Now if I'm a veterinarian, which I happen to be, it's that organization who's my patient. Almost like starting out my interaction with my patient by looking at what's the history? What's going on? Why do you think you have an outbreak? When did it start? How many animals are affected? Questions like that.

The next thing, and this I'm going to talk about this throughout this whole presentation, is the idea of making a clean break. The idea with a clean break is what you're doing is stopping the cycle of transmission. You're not going to put any more fuel on your fire, whatever analogy you want to use to do it. You want to figure out how not to add any more animals to the exposed group of animals. We call this a clean break because sometimes we can think metaphorically, again, of the animals as being kind of clean or dirty, right? If they're exposed, it's not that we really think the animals are dirty. It's just a way to keep it clear in your mind that we're going to make this break.

Sometimes what that means is cleaning out a room of the shelter, moving all those animals to a different place and having one separate place where new animals can come in. Just so you're kind of saying you know what? It stops here. Whatever it is that's going on, we are not totally sure what it is yet, we're not sure how we're going to respond yet, whatever it is, we

don't like it, and we're going to have it stop here. *[Laughter]* We'll come back around and talk a little bit about a clean break. When you really think something bad is going on, the sooner you can get that clean break put in place, the better. That's a real lifesaving measure.

The next thing is now we move down to the individual animal level, right? Now we're going to start you told me it started here, and there's how many animals were affected and stuff, but I want to start looking at the individual animals and see if that really – does that all really make sense? Does this cat really have ringworm? Does this cat really have ringworm? How many of these cats really have ringworm? What does it look like? Is it unusual? Is it usual? Is there something else I need to know here?

After that we start to categorize the animals based on risk. We'll come back and talk a little bit more about that, but think about what I was talking about earlier about that whole system for pathogen scoring using your diagnostic tools. Then after that we're going to quarantine or treat or somehow remove those animals from the population of high-risk animals. That's kind of the next piece that has to happen. Sometimes what removal from the population means is put them in the treatment center, the treatment area. Sometimes it might mean putting them in a foster home. Hopefully, there is some alternative for any outbreak. Hopefully, there's some good solution for where those animals can go, but we need to think

always – and this is the hardest part is we always need to think not only of those individual animals, but about the group as a whole and all the other individual animals. We need to try to balance the risk. Usually, it can be done. We'll come back and talk a little bit more about that too.

When I talk about the rules *[laughter]*, ringworm is also dermatophytosis. There are rules surrounding how it behaves. We talked about that this morning, right? You guys should kind of know what all the rules are. I was quizzing Dr. Serono at lunch. It wasn't me. It was actually somebody else who was quizzing you. Keep in mind all those things we talked about earlier like it turns the media red, but other things turn the media red too. It doesn't grow in a colored colony. It affects cats more than dogs. We need to think about what things fluoresce and what things don't. That *M. canis* is the most common. We know that lesions may not be obvious, but they are actually present. You can find them. We know that Wood's Lamp exam highlights fluorescence. We know that fungal culture is the gold standard for diagnosis, but we also know there are other diagnostic steps that can give us really pretty clear early information about infection.

Other rules we know is that the DTM (dermatophyte test medium) is the standard growth media. Red color change and whitish fluffy growth indicates a need for a microscopic exam. *[Laughter]* Positive ID is required for diagnosis. When I was in vet school, we had one professor

who kept saying there was one thing that they wanted us to learn by the time we left, and he put that question on every single exam. *[Laughter]* By the time we were done, we knew. We know a direct exam of Wood's-positive hair is likely – is just like a snap test, so that gives us our early diagnostics. We know that healthy adult cats are difficult to infect in a research setting and probably in other settings as well.

Here comes our first case. I'm going to take you through a couple of case studies. "Hello." This is the first email that I got. I was out of town when this one came, of course. *[Laughter]* "Hello, Doctor. I'm in the tail end, I hope and pray, of a ringworm outbreak in the shelter. I have some specific questions, and I would greatly appreciate any input that you can offer. We have old-style plastic-covered wood cages that are used in some of the rooms here, unfortunately. They're not up to standard, but funds are limited. The unfortunate thing is that the ringworm was first brought in with a cat that was housed in the rooms with these bad cages. We have triple cleaned, bleach, Virkon, et cetera, and a few times I have Swiffered and cultured the rooms. So far no growth. Been five days only, though. I recommended to management to purchase stainless steel cages, but at $10,000.00, it takes some convincing. *[Laughter]* Unfortunately, we also don't use stainless steel litter boxes and bowels. We also don't have an isolation room."

"We house over 400 cats at any given time. We don't turn away any animals, and we are understaffed, undertrained, so there are many flaws in the system in place. These cages are even falling apart with the plastic coming off. My question, what would you recommend in this case? Ideally, yes, new cages, but I fear we have to work with what we got. Any suggestions on cleaning? Is there any hope? Any input or even more ammo as to why we should buy new cages? My other question, up in the Adoption Center, we have metal walkways. They provide environmental enrichment in the group housing areas, but I feel they are a sponge for hair, dust, and ringworm. Unfortunately, the second outbreak occurred in a large room with these walkways. They apparently cannot come off the walls, even though our maintenance staff tried. We've soaked, scrubbed the areas as best we can."

They sent pictures. "As you can see, there are hairs still stuck in between the bars and the walls. I'm also concerned that on a regular, non-ringworm outbreak when staff aren't cleaning as vigorous, that these areas will be overlooked. I'm sure other shelters have this setup. What can we do? Any tips would be greatly appreciated. I also Swiffer cultured this room. We'll see the results."

Second email two days later. Now I'm back in town. *[Laughter]* "Hi, Doctor. Once again, I just wanted to email you again so that maybe I

could be top of the list with my concern since you've been away from the clinic. I have an update on my ringworm struggles. Unfortunately, we've had a few cultures come back positive. I randomly chose one cat per room. I'm sending out those cultures to be ID'd by a lab, which will take at least seven days, if not longer. Unfortunately, the CEO, Director, et cetera, are now leaning towards depopulation. We have just under 400 animals. Decision will be finalized this afternoon. I'm mortified, but understand. Please see if you can answer my questions."

What did I think? I'll repeat what you say. Are there any red flags in that email? She's saying she doesn't send them out for ID. Why can't she ID them? What did she say about them? Someone's saying she said they were positive, but what does that mean? What question do I want to ask her? Was it really ringworm? Was it a contaminant? It either is positive or it isn't positive, right? It can't be positive and a need to be ID'd, right? Because if it was positive, it would have already been ID'd, right ? I know I'm a broken record. This is why. *[Laughter]*

It's not just an accident that this happened. This is what veterinarians learn in veterinary school often or at least it's the impression that they leave with often that if the media turns red, that's positive. It's not true. It's also the way in Canada where this was cultures were marketed. They were marketed as saying that they grow real fast in three days and you

don't need to microscopically identify them because that's just how good their media is. *[Laughter]* It doesn't make any sense whatsoever.

Don't think – don't have no sympathy in this case because this was a terrible situation, right? How did I feel when I read this email having just returned from out of town? Frantic, right? Completely frantic, right? Four hundred cats. Good job for you guys. I'm happy. That makes my day that you've learned that from the day. It's important to really keep track of that. Here it is, right? This is what I see. I see this. I'm picking this case study because I've got it all put together. I could show you so many of these. *[Laughter]* Here's the line that I read and my heart sinks.

"Unfortunately, we've had a few cultures come back positive. I am sending out those cultures to be ID'd." Right? Either it is or it isn't. In this case, it wasn't. Adding things up, you need to use your fungal culture, you need to take a sample, use your Hello Kitty microscope. *[Laughter]* You need to find canoes, right? All of that before you freak out. That's what equals positive. All of that.

This comes from the ASV guidelines for standards of care. This, I think, does a better job because we put a lot of thought into writing it. Actually, this is actually also from the position statement from the ASV on depopulation. "When considering depopulation, many factors, including

transmission, morbidity, mortality, and public health should be taken into account. Along with shelter administration, board members, and staff, community veterinarians, it is recommended that shelter medicine experts or related professionals be contacted for opinions and advice before making a final decision. All other avenues should be fully examined and depopulation be as a last resort."

That's also what's really wrong with the picture, right? Not only are we not really sure it's even ringworm, but we want to make sure that when we're considering depopulation like that, that we have looked at every other possible avenue for approaching things. This is community reaction. This was actually in Ontario. Since when do we need to save our animals from the SPCA? Then they got together a panel of experts after it stopped. What happened, in this case, was I did actually get in touch with them, but I got in touch with them after they had sent out a press release saying they were going to depopulate the shelter. They hadn't actually depopulated the shelter. They never depopulated the shelter. It was almost impossible. I think still to this day no one believes that they didn't depopulate the shelter. They had pictures of shelter workers walking around in Tyvek suites that the news took. The shelter was not depopulated. They got death threats. They had their route home from work posted on the Internet. It was horrible.

They had people staking out the shelter. I was supposed to go to the shelter and help them sort out what the heck was going on, and I had a ticket to leave and the police said I couldn't come because it was too dangerous. *[Laughter]* They thought that would just fan the flames, so I couldn't go. When I did go, which was not very much longer after that, once things actually settled down, all the in-house cultures that they had, all the ones that were called positive, were ID's as various contaminates. I ID'd them myself. There was not a single positive ID that came back from any of the samples that were sent out to diagnostic labs, yet all the animals who were reported to be Wood's positive – and this is not only animals in the shelter – what happened is as soon as they sent the press release out, people from private practice, all the veterinarians from private practice who had seen animals who had been adopted from the shelter were reporting all these Wood's-positive animals all over the community *[Laughter]*.

I saw the parade of all these animals that had been declared Wood's positive by veterinarians in the community and none of them were. They all had yellow sebum glowing on their skin and various patches of hair loss for one thing or another. All cultures and reports of positives from private practice were based on red color change alone. Once we got a hold of them and were identified by the diagnostic labs or us as contaminates.

Reported human cases. There were numerous of people who had adopted animals and then contracted ringworm from the nonexistent ringworm outbreak, were based on history and exposure to the outbreak. This is real. No evidence of fungal infection was found in any species. We found one spore. *[Laughter]* We laugh, but it wasn't funny. This is all the culturing that we did and red is when we see a positive. There was no ringworm there. This was horrible. Can you imagine? It was unspeakably damaging to their reputation. It brought huge amounts of increased scrutiny to that organization. The truth is no matter how many times they told people that they didn't depopulate – and then they had an internal committee and the internal – I mean an external committee, external review of the whole incident and everyone was so uncomfortable with actually just saying you know what? There really never was any ringworm there. *[Laughter]*

Because not only did they say that they had ringworm in the press release that they put out, but they also put out that it was a particularly virulent strain of ringworm in the press release. Not only – then nobody was totally comfortable saying oh, actually, there really was no ringworm at all. In truth, nobody really, I think, ever believed them that they didn't depopulate. Then when you went back through their records, you could see oh, well, they euthanized twenty animals that month. That wasn't a

particularly high number of animals for them to have euthanized that month anyway. Some animals were euthanized that month, but they never depopulated the shelter.

What's interesting is this was horrible, I was so worried that this would just demolish this organization. It was the Ontario SPCA if you want to look it up. It's all online. I talk about it. They know I talk about it. Because of it, they really changed the way they do things. They had this external review. They have enormous amounts of internal review and they have dramatically improved operations. There's a silver lining. It was really, really big storm cloud.

It's helpful because it really is the don't-go-there story. Hopefully, it's enough that it'll help people remember, but it's so important to be careful. Sometimes you can't diagnose what you're doing. Respiratory disease, this is the vein of our existence is we really wonder is it distemper, is it not distemper? Is it some other new pathogen? Is it something else happening?

The good news with respiratory disease is a lot of the time it doesn't matter that much. *[Laughter]* You still respond kind of the same way. It's really important with things where it may or may not actually be an

outbreak. We don't – we've got enough to do already. We don't want to waste our time with things that aren't really a serious problem.

Case two. Any questions about that one? I just want to make sure that everybody understands kind of what happened and how we knew. Yes?

Audience: So just personally, how did you respond to all the vets in the area diagnosing it as ringworm?

Dr. Newbury: That's a great question.

Audience: How to deal with this?

Dr. Newbury: It's a great question. She's asking, "Hhow did I respond personally to all the vets in the area who were diagnosing it as ringworm?" I'm not licensed to practice in Canada. I don't practice in Canada, so all I was doing was reviewing to see if I believed there was a ringworm outbreak there, and I did not believe there was. I was giving diagnostic information, but not treating individual animals. I did not go back to individual veterinarians and say hey, I think this is a problem. I did suggest that more training might be good for that area so people understood.

This is not, in any way, a slight on Ontario. This is true lots of places that you go. Again, I don't mean it as a slight on veterinarians. I mean it as we all need to learn how to – what these tests mean. Sometimes it can be confusing and hard. When things get marketed in particular ways, if somebody tells you – they've even got – they did research on specificity. When you look at all of that and someone says yes, you can do this and you don't need to do a microscopic exam, then you believe it, but you have to be careful. Does that make sense? Oh, yeah. Back there.

*Audience:*What made them think they had an outbreak?

Dr. Newbury: What made them think they had an outbreak? Excellent question. What made them think they had an outbreak is that they started with a cat who had funny lesions, and there may have been, at some point, a cat who had ringworm. By the time I got there, that wasn't there anymore. Then they started having – they wanted to investigate whether it was spreading, whether it had spread. So they started culturing. If we go back to that original email that I read to you, remember what she said was we took some random cultures, right? They went into their adoption rooms and they took a culture form this cat and they took a culture from this cat because they wanted to just sort of do surveillance testing, right?

They did surveillance testing and then the media turned red. It looked like – if your criteria for a positive was red media, it looked like it was everywhere. It looked like it was everywhere even in cats that didn't seem like they would have ringworm. *[Laughter]* Then that built and built into a panic. Hopefully, that makes sense to everybody. I'm not trying to pick on them, but I am trying to have you all learn from that mistake, really, because that's the best thing we can do out of what happened is to learn from it and not let it happen again. This is not, by any means, the only shelter where this ever happened. It's just the one that was the most publically accessible and where a whole report came out and it's all public and so I can talk about it in a way that doesn't make me feel uncomfortable because you can read about it on the Internet if you want to. *[Laughter]* Does that make sense?

It happens all the time. I probably get a call a month from a shelter that thinks they have a ringworm outbreak and it isn't an outbreak. Maybe more, especially during October, but more of those are actually really ringworm.

Case two. "Today we spent six hours at the shelter culturing, briefly examining, medicating, and dipping 65 cats in 5 upstairs rooms. Many of the cats have ear mites. Many of the cats also have nasal discharge, gingivitis, and ocular discharge consistent with upper respiratory viral

infection. A few have horrific stomatitis. I need to make a correction on the previous email I sent. The cats from the laundry room went into the yellow and brown rooms, not the blue room. As a reminder, five of the cats on the sheet were adopted out before the results came in." My head hurts now. *[Laughter]* So here are the diagnostic results for this shelter. Here are more. Here are more. This one was real.

This took us, though, some time to get to these diagnostic results because these are all fungal cultures. Hopefully, you can appreciate all of these are pathogen scores in the twos and threes and too many to count. There was more ringworm in this shelter than I've ever seen in an outbreak ever. The reason that we started with this, and hopefully it's not too small for you to see, is this was the layout of the shelter. The way this shelter worked was they had cats just kind of free roaming all over the place up here. They had quite a number of cats in their building. They had all these different rooms, but the doors between the rooms were all open. Excuse me. This was the public area and then downstairs was the non-public area, more rooms, more cats, more ringworm down there as well.

The reason that I like to go through this case is because we were able to clean this up. *[Laughter]* It was pretty phenomenal. I think that if you – it makes a great argument, to me, for approaching things in a systematic way. This was really overwhelming even for me and Moriello. It was

Moriello's idea that we get involved in this one. *[Laughter]* Over time, now I think we're really glad we did it because we can see that even in kind of the worst possible situation, if you follow what you know, you stick to the systematic approach that we're talking about, it works. You can get out of this situation.

I'm going to use that case study and kind of weave through. How do we approach an outbreak? We start with the initial contact. Somebody thinks there's an outbreak. Who? In this case, it happened to be two dermatologists who lived in this community, veterinary dermatologists who kept seeing animals from that shelter that seemed like they had ringworm infections. When we talked to them, it seemed like, they're dermatologists, they were doing really solid diagnostics. They could tell us what species they were seeing. It was almost *M. canis*. The who and the why were pretty clear.

Which animals are involved? They were seeing all sorts of cats, but large numbers of cats who'd been adopted were coming to them. Then they were also seeing cats from the shelter. Those, again, are kind of getting our attention. This leads to step one, collecting the history and clinical signs. At this point, a lot of the time on initial contact, we get enough information that we're kind of like hmm, I wonder if we really even need to go further? On this one, we definitely were like we need to go further.

When we look at this initial evaluation step, the first thing we want to know is what's already been done. By the time we're called, often a lot has already been done. For you, as veterinarians working in a shelter, sometimes you'll be the first one to notice it. For you, as shelter managers, it may be nothing else has been done yet. You just – you'll all be in different positions, but you definitely want to find out if something has been done yet, what has?

We want to collect the history and the clinical signs. Again, this is at that organization kind of level. Is the disease present at all? That's got to always be the first question. Is it an outbreak? What's the severity of the disease? Other clinical signs. In this case, we knew that we – it really sounded like there was ringworm present, but it also sounded like there was all sorts of other physical problems present in the kitties. We started to get a picture of what was going on in the shelter. Not only did we really need to respond to the ringworm outbreak, but we needed to pull things together from a managerial standpoint as well because there's no way we would have been able to implement a systematic plan understanding the whole picture of what was going on in the shelter at the time.

We knew that if we were signing up to do this, it wasn't just about ringworm. That's really important to be aware of as you're heading into it. What species and ages are affected? Is it all through the shelter? It did

not seem that any of the dogs in this shelter were affected, but the cats and the dogs really didn't interact, so again, that wasn't so surprising. Number affected. We got a picture very early on in this particular case that huge numbers were affected. If you get a picture very early on that only a few animals are affected, you may approach things really differently. It may be that just removing those three animals from the population and either quarantine or isolating them, putting them in a treatment center may be effectively what you need to do to create your clean break, right? It really depends on the numbers affected.

Husbandry practices are really, really important to find out about at this point. How are they cleaning? What are they cleaning with? Where do the animals live? The fact that all of the cats in this shelter were all intermingled with each other let us know we had a pretty big challenge on our hands for how we were going to do that, but we started to ask a lot of questions. We asked them to draw a sketch of the shelter for us. We started really thinking about gosh, what could we do? What can we – how can we start to approach this? That's that piece I was talking about earlier about really assessing what the capacity is to respond. As you're getting the information about what's happening, you also want to be collecting the information about what the capacity is for response.

All the time while you're collecting all this information, you want to be thinking about both the individual illness and making sure that animals are individually getting the care and response that they need, as well as the kind of group signs or what's happening. In most cases, from there, you need a little bit further evaluation.

The next step is usually some kind of diagnostic testing or checking to see what kind of diagnostic testing has already been done. So what testing has already been done? Is there a red color? Did we look at the microscopic exam? Was it a veterinarian who's examining the lesions or was it somebody who's less experienced at looking at what a lesion is? Were Wood's Lamp exams done? Were fluorescing hairs seen? All of those questions that you guys all learned about this morning.

As I said, the key concept here in terms of responding is to institute a clean break. That's stopping the thing in its tracks. The problems that we need to be aware of here, in terms of moving forward, is that there is this long diagnostic period for doing a fungal culture. There is ease of transmission once we know there's lots of it around. Clinical science can overlap with many other skin conditions, so it could be that there are other things going on. There are other things that cause inflammatory lesions besides ringworm. Then we can have environmental contamination that really interferes with our ability to clarify which animals are of concern or

at risk and which animals are not so at risk. Those are the things that we really need to think about, again, as we head into it.

Ringworm is commonly sort of taught as being highly contagious. I put a question mark at the end of that because I think we've really been able to show – this is my other two-headed cat, actually. *[Laughter]* We've really been able to show that under some circumstances, ringworm can be highly contagious. The circumstance, the primary circumstance where ringworm is highly contagious is when it's undiagnosed. If it's unrecognized and undiagnosed, ringworm can really spread in a shelter. We've seen that happen. You can just imagine if you have a kitty who's sick and they've got a ringworm lesion on their cheek and you go in to give it meds and you grab its mouth and you give it its medication and then you go to the next kitty and you grab that one's face, you've caused just a little bit of micro trauma that you need to pass that on.

Whereas if you know that kitty has ringworm and you wear gloves and you change your gloves or you change your top before you go on to another animal or/and you've used topical treatment on that animal, it really becomes not so highly contagious. This is in that kind of don't-freak-out category where, yes, it can be highly contagious, but happily, it really can be very contained. We want to really think about all of that. It's usually direct transmission, and so this is true, again, with any outbreak

you're approaching, you want to think about how does it get transmitted? It's usually animal to animal. It also can be what we call fomite where one thing can carry it from one animal to another because spores are very hearty. They can live through almost anything. They can also just be dropped in the environment and then another animal can go through the environment and pick them up. It can actually be from a human to an animal, can also be transmitted from a human to an animal. That's all just important to kind of keep in mind.

It's got about a two- to three-week incubation period from exposure to infection, and most common onset is somewhere around two and a half weeks of age. This doesn't seem to be massively clinically significant in our experience, which is very interesting to me. It's taken us about ten years to sort of think about how this is not particularly clinically significant, which is very different than understanding the incubation period for things like Parvovirus or for distemper virus. That what we find is if we actually kind of look at a snapshot in time at the point that we go in to look at animals, if they are not lesional, don't fluoresce and are Wood's Lamp – sorry – and are culture negative, we don't see that then two and a half weeks later they pop up with ringworm. I don't know why, but we don't. That's great *[laughter]* so far. We're able to do that.

That's a real difference when we're talking about outbreak management. That's not true with parvo. That's not true with distemper. What's nice about parvo and distemper is we can do other things to assess risk a little later. We won't talk about that today, but that's really nice. With ringworm, we seem to be able to sort of interfere somehow. If we look at that snapshot in time, the animal is not infected at the time that we're looking at them, seems to be that we can kind of move them on their way with a fair amount of safety.

The next step is kind of planning, and this is really important. This is my little poster child for planning. This is in a shelter that I was in, and I can show you. This kitty spent his entire day planning how he was going to *[laughter]* eat this bird. It was great because it really occupied all this time. No, I am not recommending that you house prey species near predator species *[laughter]*, but what was so interesting to me – my video isn't loading for some reason. Sorry. I was going to show you the video because what's so interesting is the bird – every time the kitty puts his paw out, the bird goes to the other side of the cage. The bird could completely choose to just be on the other side of the cage, but the bird keeps coming back. *[Laughter]* I think there was some cross socialization going on here, cross enrichment. Anyway. That's my poster for planning.

You need to think about what needs to be included in the plan, and I really – I know everybody talks about planning, but in this case, really, you need to plan before you move forward, and especially in a case like this case that I'm talking about. The more overwhelming it seems, the more you need a plan. Having that – diving into something without a plan later on will make you miserable and unhappy. You try to constantly come up with your assessment and your plan. Sometimes, like everything else, you need to change your plan, but working from the plan is really the best way to go.

What needs to be included in the plan? Number one, how are you going to establish a clean break? I follow this when I'm working with shelters. One of the first things I'm going to ask is what could you do to establish a clean break? Is there any way you can do it? Then we talk through all the different ways that possibly they could do it. Evaluate clinical signs. Do the – how are we going to get the diagnostics done? Who's going to evaluate the clinical signs? Often we'll really push and say you need to have a veterinarian come in and do this, depending on what we perceive as the severity of the outbreak.

Then we use those diagnostics and the clinical signs to make an initial risk assessment about which animals are really at risk and we think they're infected or we think they're at risk of being infected and which animals we

can send on their way. Then we use all of that when we finally get our final diagnostic results, then we really know who's infected and who's not. As I said, that can sometimes take about seven days to do that.

One of the things that's so important in the system of sort of systematically going through and defining risk to the animals is if you think about it and you say – this is a really overwhelming case that I 'm showing you. That's what often comes to us, again, with parvo or distemper too. It seems really overwhelming. It's a shelter full of animals. We know we've had a couple cases of parvo.

What we've seen is that by doing this sort of systematic risk evaluation, it turns it from a situation that feels completely impossible where the only solution must be depopulation because there's no other way we could ever get out of this to oh, wow, there are really only a handful of animals who are really truly at risk. The rest we can move on our way. It turns what seems like a completely unmanageable situation into an actual manageable problem. It doesn't usually get you to where oh, there's no problem, but it really turns it into a manageable problem where then you can apply the systematic processes and get yourself out of it.

Here is kind of how I graphically represent this idea of a clean break. We make the clean break. The idea behind it is that new incoming cats go this

way and the exposed population goes this way. Ideally, never the 'tween shall meet. *[Laughter]* That's what we really want. What we want, if we can, is to have separate staff, separate equipment, and both areas treated as isolation. This last one is often the hardest one for people to understand. Why do I need to treat it as isolation? Those are the clean cats. Those are the new cats. Those are the unexposed cats. Sometimes we treat things as isolation as a means of protecting. We make sure if both areas are treated as isolation, that you're not carrying anything back and forth.

The thing you want to be really, really careful of is making sure that you don't get bitten while you're establishing your clean break. So you need to be sure that you're screening your incoming cats as well. Because if you're not, you can end up with a sick animal or an infected or affected animal going into your clean-break area and now you have two dirty populations, right? Two exposed populations. You always want to have a step of screening as you're establishing this clean break so that you're protecting yourselves from any unexpected thing.

One thing that was really cool about this shelter that I was talking about is that the first thing that they did was establish a whole new system of intake. Even though that might seem kind of counterintuitive like here the outbreak is creaming outbreak, outbreak, ringworm, ringworm, right, that I think when I first – my first recommendation was wow, you guys really

need an intake system. When I first said that, all the other vets on the call with me are like what's she talking about? We've got ringworm. Because to me, it's part of the whole planning process. That I knew there was just no way, there's no way they were ever going to get anywhere, unless they had a reasonable intake system just even to start out with.

We started with that. They cleaned out what had been an office and they made that whole room clean. That effectively also created their clean break for them because new animals that were coming in they just didn't feel comfortable closing to intake. That may be what have been ideal for them, but they just couldn't do it. They set up a whole clean area. Those animals were cared for by different staff who came in, took care of those animals, and went home.

Alternatively, they could have come in, take care of those animals, then take care of the other animals and then go home. Lots of shelters do that. If you have two shifts, you can even do that, and you have the same staff, but they're acting like separate staff.

The next thing we do is kind of evaluate for clinical signs within this population. You've done – you've talked about your history, you start to look at the diagnostics or whatever else was already done, you try to establish your clean break, you make a plan, and now you are going to

start evaluating the clinical signs yourself. We've talked about these kinds of clinical signs before. We want to make sure that we're getting things right. Here's my screening slide. Sorry.

This is the thing that you really want to make sure of because if you're not screening and moving animals into the exposed population if they're coming in already exposed, it's really going to throw a wrench in your works. *[Laughter]* We went through this protocol earlier. This is just a different graphic showing basically the same idea. What's nice is you learned about that protocol as an admitting procedure, right, into your shelter. You want to always be doing this. It's the exact same protocol applied in the outbreak. Now we're going to go through. We decide what we think is the exposed group, and we're going to go through and do this exact same protocol again. We just apply it at a different time in their shelter stay.

Now we're going to go through each animal, we're going to look at them. Does he have lesions? No. Is he Wood's Lamp positive? No. Great. He's going to go this way. No lesions, move on. Does he have a lesion and it's Wood's positive? You're in that affected group. No lesions – or lesions, Wood's negative, you're in the now you need to wait for a culture group. There is some waiting, but not too much because you won't have too many that have lesions and don't fluoresce. Yes?

Audience: What about the incubation period?

Dr. Newbury: What about the incubation period? That's what I was just talking about. I say the same thing. What about the incubation period? Why does this work? I'm not wholly sure. *[Laughter]* I'll be honest about it. In our experience, we have not needed to quarantine for the incubation period. What we generally do is we make a decision based on the level of disease that we're seeing in the shelter and how much exposure we think there was. Sometimes while we're waiting for culture results, we'll tell the shelter to just go ahead and dip all the exposed cats.

In some cases, that may be what's happening, but it does seem like, for whatever reason, the incubation period just isn't as important in managing ringworm outbreaks. I don't have a good reason for that. It's just ten years of doing this and it doesn't seem to be. We don't quarantine. Instead we test and culture. We screen. Sorry. Screen and culture. That seems to be the thing. The safest possible thing , but listen to this part, from a ringworm perspective *[laughter]*, would be to quarantine them for a little bit, but that's only from a ringworm perspective because if we quarantine them, they're way more likely to get URI, the shelter's way more likely to get crowded, the shelter's likely to use resources in a way that may not be necessarily beneficial, and we haven't seen problems with it from a ringworm perspective.

Because sheltering is an imperfect world *[laughter]*, in case you hadn't noticed, we're always making choices, right? What we do here is I think that what we found is that the greater good is served by moving them on based on that snapshot in time for ringworm. Not so for other things, necessarily. That's what we see and that seems to serve us very, very well. In some cases where there is only one cat who was affected – somebody was asking earlier about a community room and there's a cat who had ringworm who slipped into that community room. Do you need to dip every cat in that room? You probably don't. Is it the safest thing to do? Yeah . Safest thing to do.

Do you need to quarantine that room for two weeks? No. That's probably not the safest thing to do from the perspective of the whole holistic picture of what's going on. Does that make sense? You do need to screen everybody in that room and then that screening that's all – this whole process kind of builds on itself. The more you screen, the more you're like ugh, we thought it was just this one and then we went into the room to screen and it turns out there were four others who were affected to. Then all of that starts to build into changing what was your original plan.

Just want to remind you, again, this is a really important piece of the puzzle. Somebody came up earlier and asked me we do the screening

exam and we do the Wood's Lamp exam, but we don't always do the direct exam. Is that okay? It's okay if you're really, really good with the Wood's Lamp and you're really pretty sure about your Wood's Lamp exams. What I've seen is lots of places who think something's Wood's positive and don't really, really understand what Wood's positive looks like. We are – we keep trying to come up with a way to do more training on what Wood's Lamp exams – like what a positive Wood's Lamp looks like. It's just difficult to do. We've wanted to schedule a wet lab in Wisconsin. You just never know when you're going to have a bunch of Wood's Lamp positive cats so you could schedule a wet lab and then there's no infected cats who are glowing.

We can show what's positive hairs. We just recently did a video that we're just editing where I'm doing an exam on a Wood's Lamp-positive cat because I think in a video, it makes it easier to kind of appreciate what it really looks like. Doing this direct exam steps gives you that extra sort of security that your Wood's Lamp exam was real; it does take a little more time. If you feel really confident with your Wood's Lamp exams, sometimes people are going to just go from here and make choices. We're already kind of varying from the gold standard, which is to say to do a fungal culture. For me, adding this little extra step, which is all it needs is a microscope and a couple of minutes, is worth it to me.

Audience: Question *[inaudible]*.

Dr. Newbury: Yes.

Audience: *[inaudible]*

Dr. Newbury: I do it just to back it up and so that I can see what the pathogen score is. I'm not particularly systematic about a lot of things in my life. *[Laughter]* I'm really systematic about ringworm because I like to have all those pieces of information. I like to know when I put that cat out for treatment, it was a P3 and now a week later it's a P1 and then a week later it's negative. Does that make sense? I like to see all of that because I know then everything's working the way it's supposed to work. I don't need to, but I like it. I like to have that piece of information. For me, when we do a fungal culture, it costs two dollars. That piece of information is so worth two dollars to me. For some shelters it costs more. It's about doing it in house and getting a good deal and buying your plates and all of that. You have to balance that.

Again, the other thing is this is meant to be a model program, the program that we built in Wisconsin. We want to do things in the right way. This is a grand deviation to say you can diagnose by a Wood's Lamp and a microscopic exam. It's not the gold standard. We're trying to be respectful of that by sort of saying take these extra steps. Do we start

treatment on cats where there's just a Wood's positive in the hands of someone we knew was good at diagnosing that? Sometimes we do. We actually have a veterinarian on staff for this program who actually now really screens every single animal and makes a choice about whether they're going to go out for treatment. Does she do it sometimes without doing a micro exam? I'm sure she does. *[Laughter]*

The next one is – this next step. We've gone through our diagnostics, we've made a plan, and we've done all these things. The next step is kind of what I call shuffle one. We've taken samples from the cats, we've screened, we've seen who has lesions, who doesn't have lesions, who's positive, who's Wood's positive, who's not, and now we shuffle the cats. *[Laughter]* Basically, what we're doing is shuffling them based on how likely we think they are to be infected. It's based on all the results that we got in step four. We remove identified positive animals from the general population. I'm not suggesting that we're euthanizing all of those animals. We're just taking them out of the general population. We're either sending them for care somewhere else, we have a treatment area somewhere, but we're pulling them out of the pool of animals because we know, yes, we have an answer on you. You go to treatment, ideally.

Isolate and separate suspect animals who are lesional. An animal who we found a lesion, but we couldn't say they went into this treatment group yet.

We need to wait. They need to be separated somewhere. The reason I say isolation/separation is there's lots of ways to separate those animals from the rest of your general population. It can be that you put them in a room somewhere. It can be they go in cages in a room. It may even be that they go in cages in the same room with other cats, but you hang tags on their cages, and they're all cleaned last. That's what they do now in Dane County with suspect animals. Animals who come in who have a lesion, but the lesion doesn't fluoresce, they put them in a regular old cage, they put a sign on the cage, volunteers aren't allowed to clean those cages. Staff clean them and they clean them last. They wear gowns and gloves when they clean those animals. They wait for fungal culture results.

When the fungal culture results come back, which is only about a week, then they know and the animal either moves to treatment or it stays where it is. Most of the time those animals are negative because there's really a very few number of animals who go through the shelter – who come through shelters who have lesions that don't fluoresce that are actually ringworm. It happens, but it's not very common. Does that make sense to everybody?

Non-lesional, Wood's-negative cats, base intervention on your clinical assessment. This is at the organizational level. Is this a giant outbreak and everybody's suspect no matter what because all your – you just think

it's going to be a huge disaster? Or does it really sound like maybe one or two cats had ringworm? You have to – here's where the art comes in of really trying to decide what's the thing to do based on resource investment, potential risk, and potential benefits? You can either do dip and go, that's what we talked about. Anybody who's exposed, but they don't have lesions, you can give him a single lime sulfur dip and send them on their way. That's what we usually recommend if we really believe there was exposure and the number of animals seems doable. *[Laughter]* The other step would be to dip and go and follow up with a culture result. That's where you want to dip and go and send them on their way, send them home, but just take some cultures just in case so that if you get a positive, you can call people and say hey, we sent your animal home and we've got a positive culture. We want to have you bring him back in for us to look at them.

Lots of shelters take that route as well because they just want to be a little bit extra safe. Again, the vast majority of the time those follow-up cultures will be negative, but it gives you a little bit of added security. Again, that's kind of one of those clinical judgment things. Step six is to go back and evaluate the risk again. How high is the risk of the initial results of the first clinical assessment? This is where you're kind of putting all this information in to decide can I dip and go? Can I send them on their way? Again, looking at all these different pieces.

The next – after you've got all the animals taken care of, the next thing you want to do is think about your environment so that you're really assessing what's going on in the environment. This is the same exact slide I showed earlier in the day, but, again, you want to use Swiffers, you want to target particular areas that are difficult to clean or areas where you think there's bee exposure. One of the places we've found to be positive are these kind of nubbly ceiling tiles. We've found stuff up in there, which, again, may not be such a big deal because cats aren't spending lots of time walking on the ceiling, even though they'd like to *[laughter]*, but we want to just think about areas that we really want to check. You want to do it room by room in the areas where you suspect there's been exposure.

Then those cultures go to what we call cook for a week as well while the other cultures are coming back. Now you got you culture results back. Again, you do your microscopic identification. Now, again, we use this same pathogen-scoring system that we talked about earlier, and we figure out who's high risk and needs treatment or needs to be treated as truly infected and who's low risk and who can just go home. Does that make sense? We use this same exact system.

Culture results should include environmental samples, and so here is an example for us. This was actually well into the outbreak, and this was a

room where we knew we still had infected cases. This was a shelter that was mostly cage free. We had to treat the kitties in large groups, in groups of ten or more by room. We couldn't clear the room until everybody in the room was cleaned up. You can see here although there was heavy growth in this one, all of these are suspect growth. This was just week one. By week two, those were all positive. They had ringworm everywhere in this shelter. *[Laughter]*

Now you got your culture results back. It's a week later. Now you're going to go again and remove the positives from the general population. Now you've got your finished answers, really, so now you're really going to go in and clean like heck and make sure. You should have also your environmental cultures back as well, and so you want to go back and clean and clean and make sure that the environment is clean partly because the environmental can cause infection, but partly because if your environment is dirty, it becomes more and more difficult to get good culture results from the cats because they'll be picking things up.

This is my kitty after she fell in the bathtub. She turned into a demon. *[Laughter]* This is a question. We talked about this a little bit this morning, but this is a question that we get all the time. Can we safely send them somewhere else? What is safe? We don't really know. This is a zoonotic disease. Humans can get it. It's safest when we use effective

treatments. It's safest when we include topical treatment. It's safest when we can keep animals away from other pets, children, and immune-compromised humans. Too, an easily-disinfected area, if the foster people can keep them in an easily-disinfected area, it's best with both resilient and compliant humans. *[Laughter]* If you have humans who get frustrated easily and are not very likely to do what you're asking them to do, you'll end up frustrated to.

No uninformed adopters for sure, but it can be perfectly fine to send animals on their way. Again, in a private practice setting, this is treated at home so we want to really be careful about that, but also, we can send animals home, especially animals that we've screened and cleared or in an in-shelter isolation area. Here's our isolation area that we created. This is – the trailer was a separate building. It didn't need to be a separate building. It could easily just be a ward. The treatment area in San Francisco is just a ward, and there's lots of other shelters that I work with who have just a ward where they're treating animals for ringworm.

Step ten, this one, please don't forget this one *[laughter]*, is the long-term response plan because, really, outbreaks happen because there wasn't a good systematic plan in place in the first place, especially for ringworm. That's not as true when we talk about some of the other diseases that we might be talking about when we're talking about outbreaks. For

ringworm, if you have that systematic plan in place right from the beginning, the biggest way to eliminate risk factors is to screen on intake, so that's why I had that shelter start with intake. Intake is the control point for infectious disease, so we always want to really think about that, that if we stop it – recognize it at the door, we can really keep it under control.

That's so important because if we keep it under control, it goes kind of hand in hand with what I was saying before about having an unmanageable problem or a manageable problem. That sometimes if you don't take the time to recognize it at the door and you end up with ten cats with ringworm, maybe that's an unmanageable situation. If you recognized it at the door and it was just one, maybe that's something you could have found a solution for. It's really worth doing.

Screen on intake. I've been over all that. Screen before re-housing. This is a really important one. If you're going to move an animal from a caged area into a community room, just check them with a Wood's Lamp. It just takes a few minutes to do it. If you're going to send an animal to foster, check them with a Wood's Lamp. I have a Wood's Lamp at home and when I get foster kittens, the first thing I do is *[laughter]* run a Wood's Lamp over them. Always screen before re-housing.

Protect the kittens because if anybody's going to get ringworm, that's who's going to get it first. They're not good at taking care of themselves, they don't keep themselves particularly clean. *[Laughter]* Especially orphan kittens, who really need somebody to look at after them, they're the ones to watch the most and to keep safe as best you can. The great news is, again, protecting them from ringworm will also help you protect them from panleuk because it's the same kind of things that you want to put in place to keep them safe.

Isolate or separate suspect or affected cats and recognize them. Once they're recognized, keep them separate. Treat with an effective topical. I can't say it enough. Monitor, monitor, monitor. That's the other big thing that was a huge learning lesson for us. Part of it, I'm sure, was compliance when there was a recognize and euthanize policy at the shelter, it was only there for a little bit. When I first got there, nobody ever pointed out ringworm lesions to me. *[Laughter]* As soon as there was an option even to treat some cats – when we started, we didn't treat all the cats, but even to treat some, all of a sudden people were noticing lesions all the time and reporting them. At this point, you'll have happy volunteers coming down the hall, "Hey, look, I found a ringworm lesion because they know it's the lush life if they got to move out to the treatment area." The treatment improves reporting for sure.

We've talked a lot about itra (itraconozole) and lime sulfur. That's what we usually use. The shelter that is our second case, we actually ended up using terbinafine to fairly good results. When we're using lime sulfur and itraconozole, again, we define cure with that protocol as two cultures, each taken a week apart. The first culture held for three weeks, the second culture held for two weeks. The reason we do that, again, is the gold standard was always three cultures, each taken a week apart, each held for three weeks, all negative. The reason we felt we could come back from that is that we saw a pattern in this ten years of doing these studies that once an animal got to that three weeks and two weeks, they never looked back. We redefined for us how we define cure.

This kind of goes to that question about intake quarantine. Is there a two- to three-week requirement? We don't really think that's beneficial. What if one develops clinical signs? We just don't see that to be a huge problem. Our recommendation is to use excellent monitoring as an alternative to quarantine. If you really have animals coming in that you think may have been exposed, check them every day, check them every couple of days and see if lesions are developing. That that would be a much better plan than quarantining because quarantining causes so many other problems in animal shelters.

Balance the risks with the population dynamics, consider the impact on your capacity for care and your crowding, and consider the maintenance of health and emotional wellbeing for such a long time period. It's really, really difficult to do.

In summary, exam screening is an unbelievable, powerful tool for prevention. What's great about it is as people get more and more experienced at doing it, they're going to get better at just doing physical exams, in general, which is a major boon to animal welfare and wellbeing from a behavioral and a health aspect. It is cheap, fun, and easy. There's not that many things you can say that are like that in sheltering. *[Laughter]* Outbreak response can be unbelievably devastating and costly, but outbreaks can be managed and ended and sometimes without even a huge resource investment, again, if you approach them really systematically. Lives can be used if you use that systematic approach. Ken says thanks.

[Laughter]

[End of Audio]