Ringworm Roundup 1: Overview
Video Transcript
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[Beginning of Audio]

Dr. Newbury: I love talking about ringworm. It's such a fun thing for me to talk about partly because I started a program, which I'm going to talk with you guys a little bit about. Hard to believe, but over ten years ago I started this program to treat ringworm at a shelter in Madison, Wisconsin at a time when really most shelters the solution was to euthanize a cat if they had ringworm. Everybody thought oh, my God. Ringworm. It's this horrible, nightmarish thing. In fact, it turns out it's one of the easiest things. There's hardly anything else that's treatable, curable, and it just goes away when you're done, which I could say the same thing for you or I, right *[Laughter]*?

It's super fun to talk about it. It has been just phenomenally fantastically fun to watch the change in what's happened over the last ten years in the way that shelters approach ringworm and our understanding of it, including my own. We'll get to that.

This is Ken *[Laughter]*. He was our very first customer *[Laughter]*. So I always start our – oh, and we have another Ken in the audience today too. He was our very first customer, and so I try to usually start my presentations with a picture of him just to remind me of how incredibly gratifying it was to be able to make the choice of treatment for this little guy.

I wanted to – also, I'd like to thank the ASPCA for the grant to UC Davis that makes my position possible and allows me to travel all over the place working with shelters, which is what I like to do best. It's also dedicated to volunteers everywhere. I started my life in sheltering as a volunteer at an animal shelter in Chicago. I've just been floored over and over again with the power of volunteering in shelters and what can happen.

You'll see, as I talk about it, the program in Madison in Dane County, Wisconsin is almost completely volunteer driven. So all of the changes that we've seen in the last ten years had something to do with me and Karen Moriello sort of driving those things forward, but it never could have happened without all of the volunteers who kind of put their money where their mouth is to really make it happen.

I've got quotes from two different shelter directors about the changes that were made at their shelter in terms of treating for ringworm I wanted to share with you. This first is from Jennifer Scarlett who's the Co-President of the San Francisco SPCA. "Taking on ringworm with a logical screening, diagnostic, and treatment program rather than just fretting about it is well worth the effort. Not only does it solve a lot – save" – sorry – "a lot of lives through screening and treatment, it can be a great way to develop and give confidence to your medical and adoption staff. We respect ringworm and the damage it can do to an adoption program, but we know how to handle it. For us, it only enhances our lifesaving efforts."

I hear things like that over and over again from shelters that are managing it successfully. "Is it worth it? Dane County Humane Society is proud and grateful to participate in operating a high-quality standards of care lifesaving ringworm treatment program for cats along with the compassion and expertise given by UC Davis and UW School of Veterinary Medicine. This partnership has truly impacted our shelter operations and has been an inspiration to staff, volunteers, our community and donors. We look forward to continuing to grow the program in the future to help save even more cats." That's from Pam McCloud-Smith from the Dane County Humane Society.

Now we're going to get into the nitty-gritty of it *[Laughter]*. Fungus is a lot like us. That's one of the big problems. I like to start out talking about this because I want you to understand why it's so complicated to find the right treatments for fungus. That it's hard. We have to find a treatment that'll kill fungus and not kill mammalian cells. The cells have certain similarities that make that hard to do.

There is a potential for human infection, and so whenever that's true, we should pick up our ears and really take notice because we want to make sure that we're not going to spread this infection all over. That being said, we also need to be really careful that we don't overestimate what's actually happening and that we don't leap to conclusions about what's happening. Yes, it can infect humans and sometimes it does. Sometimes it does in really awful ways. I know a vet student who got it all over her face. On the other hand, I've also seen lots of humans who've been diagnosed. In human medicine, I'm not knocking them, but this is what happens, usually, is they make the diagnoses presumptively. They know there's an animal involved, they see a rash on the skin. They don't tend to do fungal cultures. They don't tend to do further diagnostics. They do a treatment trial and if it goes away, it's assumed to have been ringworm.

In my experience, lots of the time it doesn't play out. This picture here is from a woman who was a student at UW who was fostering kittens, got

this rash, went to her doctor, and was told it was ringworm. You can see why *[Laughter]*. She brought the kittens in and we cultured them. They didn't have ringworm. Turns out she worked in a squid lab at UW and as soon as she stopped going to work for the squid lab because they didn't want her there because she had ringworm on her hand *[laughter]*, it all cleared up.

We see this really frequently. I'm not saying it's not zoonotic. I am saying be careful and make sure that you don't jump to conclusions based on presumption of human infection. We'll come back to that when we start talking about outbreaks after lunch.

We hear a lot about this question of are there carriers? There are carriers, but those are just mechanically carrying those spores on their coat. I'm going to talk about that in just a second. True infection happens when that spore somehow gains access to the skin. When some sort of, we call it micro trauma, allows the fungal spore to actually invade the skin and establish growth or the hair. There is no true carrier state where you're sort of a "Typhoid Mary" and you're ongoing infected and you're going to go around and give that to everyone else.

In fact, cats are a lot like dust mops, right? This is Sonoma. She's electrostatically charged *[Laughter]*. If she moves through an

environment, she's going to pick up just as much crud as that super static dust mop. If there's in the ringworm in the environment, which isn't normal, but if there is, she'll get it on her coat. If we culture her, she might be positive, but she might not be infected. We'll come back around and talk about what we do about that. That's really different than a carrier state. She's not going to be shedding spores into the environment, but she might be collecting them.

Now we want to talk about screening animals for ringworm. How do we do these diagnostics? How do we recognize when we have ringworm around us? We use screening exams, Wood's Lamp exams, something that I call a direct exam of the hair or a microscopic exam of the hair. We use that to define the case. We use all of those things together as a package to understand whether an animal is non-infected, a dust mop, actually infected, or even severely infected. Then we use those categories to help guide us what kind of response we need to have.

Here's our basic screening protocol. This is actually what we started with. I apologize. This is kind of a busy slide *[Laughter]*. We'll make these slides available for you. We start with a screening exam at admission, which includes a Wood's Lamp exam. I can't really say enough for this. Just finding the time to really look at animals as they come to you is important for every single thing you do. Not just ringworm. Everything.

Taking the time to look at the animals carefully, one thing we found is whenever we get shelters to start doing that, they start picking up on all sorts of other things too. Just having the staff do that careful exam looking for lesions, they end up noticing respiratory disease, they end up noticing behavior issues, they end up noticing all sorts of things where if respond early, we can get that animal what they need rather than missing it and all manner of things can break loose that way. I can't say enough for that.

The first pathway is green light go, right? No lesions, no positive Wood's Lamp. That animal goes home. I'm going to come back around and talk about Wood's Lamp exams, just so you know. This animal is just going to go home. We give him an exam, we look at him with a Wood's Lamp and we feel great. See you later. The next is the cautionary path. We look at the animal, they have a lesion, the lesion fluoresces, so it glows. Then we do a microscopic exam of the hair. If that's positive, we're going to treat that as true infection. I'm going to come and talk about each one of these steps, so don't be concerned if you don't know exactly what each step looks like.

If we do that direct exam and it's negative, which it's hardly ever going to be if the other two things were true, then we would do a culture. We'd wait for that culture. If it's negative, then we move the animal home. If

they have a lesion, but the lesion doesn't glow, then we've got to wait for a culture because it's not behaving the way we would expect. We'll come back to that.

Here's the flow-through for the first program at Dane County Humane Society. They do an intake, they check for lesions. If that's positive, they do a Wood's Lamp exam, either way, even if it isn't positive. If that's positive too, they're going to look at that hair under the microscope; they're going to treat that animal as truly infected. In the meantime, they'll also do a fungal culture just because that's the gold standard and they want to be doubly sure that they're getting it right. Then they're going to do a microscopic identification from their fungal culture. You're going to hear me say that in the next hour over and over and over again. If there's nothing else you remember from this lecture, remember that you need to do a microscopic ID of a culture that is suspicious.

Here's the other pathway. They do an intake exam, check for lesions. Wood's Lamp exam is negative, now they got to wait for the culture. They've got a positive fungal culture, microscopic ID; they're going to treat that animal as truly infected. Or if the animal is fungal culture negative, then they'd move the animal on and release them for adoption.

They could do an intake exam, no lesions, negative Wood's Lamp exam, no waiting, on your way, release for adoption. For Dane County, they would then get a fungal culture result in five to ten days just in case. This is a shelter that had some really bad experiences with ringworm about ten years ago, and they just haven't wanted to let go of culturing every animal. That's what they do *[Laughter]*. No matter how many times I kind of tell them – the last time I was there, last week, and I started making a joke about culturing every animal, and they started to think about it *[Laughter]*. Right now they even culture everyone. That's the reason I'm showing you two different versions here is that you don't need to do this for every single animal. That's what we thought you really needed to do when we started this program ten years ago. Now we think if you're really, really doing good physical exams and a good Wood's Lamp exam, you can release those animals for adoption, as long as you're being careful.

I can't promise you'll never have one sneak through on you, but probably the cost benefits or the resource investment versus the benefit, at this point, we tend to recommend that they are not doing that. That's what San Francisco is doing now. They've got no wait, and they skip those fungal cultures.

You want to choose the right location when you're doing this intake screening. You want to always look at non-lesional animals first. Doesn't

always work out because sometimes you find a lesion where you didn't know there was one. If that happens, always make sure you clean up after yourself and be careful before you move onto the next animal.

When we culture animal shelters, we do environmental culturing. Admitting areas consistently have the highest level of environmental contamination. Cleaning your admitting area is really important. Get into the habit when you're doing these screening exams to do it the same way every time. The way I say it is nose to toes and then the tail. I start at the nose, I go down, I look under the hood *[laughter]*, turn them back over, and then I do the tail. Document your lesions so that if somebody else wants to find what you saw, they can go back and find the same thing. Using a physical exam form like this really helps. As I said, a careful physical really helps.

What are we looking for? We're looking for an inflammatory abnormality of the skin. What does that look like? It doesn't look like smooth skin with hair loss. It doesn't look like where an animal's collar was and now the collar is missing. It doesn't look like a scar. It is true that many times – we used to say oh, ringworm can look like anything. Now what we realize is what we really mean is it can look like any inflammatory lesion. You want to make sure that there's nothing like that.

Here's a couple of lesions that we describe as kind of classic lesions, but I'll ask you to take a second and really think about how classic would this be if I weren't taking the picture, right? There's my gloved finger separating the hairs for you *[laughter]* so you can see this perfectly crusty, round lesion. If I wasn't doing that, that lesion would be really hard to find in the skin, unless you were doing a careful exam. That's one of the things that makes it classic *[laughter]*, that you have to look carefully to find it.

This one is hard, right? I don't know how many of you have seen a lesion like this. This is an inflammatory, crusty, icky lesion on the inside back hock of a kitty, which, again, unless you look under the hood, you're not going to see it. Even though this is really severe infection, you're going to miss it, unless you're looking – turning that kitty upside down.

Can everybody see the lesion in this picture over here? It's right here on the ear. Right there. Crusty, crusty. It's really easy to think that just because a kitty has ear mites, you don't need to look any further. Get out the Wood's Lamp *[Laughter]*. We've had – my favorite story about that is a whole crew of vet students who spent probably about an hour in an exam room treating a kitty for ear mites and cleaning its ears and all that stuff and they never got out the Wood's Lamp. Then they all left and one of my techs went in and turned on the Wood's Lamp and the kitten was glowing

from across the room *[Laughter]*. So we had to call them all to let them know they needed to change.

Inside the ears. The nose, the toes. Here's a toe, here's under the foot. Again, these are obvious lesions if you're looking. If you're not looking, not so obvious. What about this kitten? Does she have ringworm? What should we do? Wood's Lamp or *[laughter]* – I'm cheating because it's only a photograph. We could look at the back of her *[Laughter]*. Right? Can you guys appreciate, hopefully, that? This little kitty glows like a Christmas tree too. Here are her lesions on her ears.

The reason that I show you this is because I've seen so many instances where people see something like this and think oh, she's just got a runny eye. Right? Maybe she does, but she also has ringworm, so it's important to be careful and check through that. Here's what ringworm looks like when we put a fluorescing light on it. This picture is actually – the color is a little strange, but we do see this sometimes, so I want to make you aware of it.

What's different about it is that this has kind of a blue-white glow to it. We see this sometimes when what we think is very early on in infections. What I want you to appreciate here, which is sometimes hard, it's really hard because we're taking pictures in the dark when we're trying to show

you pictures with the Wood's Lamp, is that what you're seeing glowing here is actually the individual hairs themselves. It's not a big smear on the skin. It's that each individual hair is coated. I'm going to talk about that again with a little graphic in just a minute.

This is my all-time favorite Wood's Lamp. I don't get any money for telling you that or anything. It's actually made for fluorescing rocks for people who collect rocks. You usually can find it from scientific companies. If you Google Model UVL21, you'll find it. The old site that I used to give everybody where I used to buy mine, it seems like that company went out of business. These two I found this morning, and they're perfectly good. We also will have it on the UC Davis website as well if you're looking for one. One of these was $138.00 and the other one was $129.00 when I looked this morning. Just wanted to make sure that the price didn't change much.

What I like about them is you can hold it in your hand really easily and it doesn't get in your way. You can hold the cat or somebody can hold the cat with you, and you can look, and you can get really close if you need to and there's nothing in your way. Some people really like these big ones that have a magnifying glass built into them. I find them really cumbersome, and I find that the magnification lens gets really dirty. It's

really hard and frustrating for me to see through it. I found the same thing when I'm training people, that they get frustrated by this big thing.

If your eyes are not that great at looking at things close up, I would consider just getting a separate magnifying glass that you can hold when you need to. Again, lots of the time it's not so subtle that you really even need a magnifying glass. You need to do this in the dark. If you can't do it in the dark, don't just skip it. It works kind of when it's not really dark. It just doesn't work as well. Ideally, do it in the dark.

I worked through an outbreak with some veterinarians in Nevada, and they were like we can't find a dark place to do it. We just can't do it. They actually ended up buying – getting a refrigerator box and setting it up in the middle of the room and taking the cats into this refrigerator box *[laughter]* one at a time because that was the only way they could find to dark a place out.

A lot of the time you can see the fluorescence, even if it's not totally dark. Ideally, you want to give your eyes time to adjust to the dark and then the fluorescence will be even brighter. Previously people have said all sorts of things about how you have to give lamp time to warm up. Karen Moriello and I have talked about that over and over again for the last ten years because I was constantly confessing to her that I was always in a

hurry and I never really let it warm up and it seemed to work just fine. It seems like it works just fine *[laughter]*, even if you don't let it warm up. We've kind of taken that advice out. If you have time to let it warm up, it probably doesn't hurt anything.

The basics of ringworm. I showed you that blue-white glow. That's not normally what you see. I'll show what the apple green glow looks like soon. Really, more what you're going to expect is an apple green glow. The whole hair shaft should glow, especially at the base because the fungus is actually in the hair follicle. The fungal growth does not make the hairs stick together. We'll come back and talk about that. Here is my great – I was an artist before I was a veterinarian for real *[Laughter]*. Here's our hair follicle. Here's the hair coming out of the hair follicle. What I want you to appreciate is that it's the hair that's glowing because the fungus is living in the hair follicle and it's coating the hair with a metabolite. It is not the skin.

What we see all the time is people see that yellow, kind of funky glow on the skin, that's actually sebum. It's just secretion from the skin. It's like a waxy stuff. That glows a faint yellow. People get really excited about that. That's not what you're looking for. What you're looking for is a glow on the hair. Sometimes what happens is the hair breaks right here. Sometimes what happens is when you look, it's almost like looking at the

starry night or something because you see the skin and then all you see is these little tiny specks of glowing stuff. It's just because that's all you can see because the hair's broken off so far. That's what you want to think about.

Here's another picture. This is more the correct color, but you can see it's hard to take pictures in the dark. Hopefully, you can appreciate that we've got individual hairs glowing here. If I tried to flick this off or go like this, rub it off, I can't rub it off. It won't come off. What glows is *Microsporum canis*. It's one species of ringworm. When I was in vet school, what I learned was that only *Microsporum canis* glows and only 50% of *Microsporum canis* glows. There are three different primary species of ringworm. If I'm a vet and you tell me that, what do I do? I take my Wood's Lamp and throw it in the garbage, right? Because what's the point?

It's not true *[Laughter]*. So in cats in shelters, in our experience over the last ten years with thousands of cats, most ringworm is *Microsporum canis*. Probably 95% or more. Of that, almost all of it glows. Almost all clinically significant ringworm glows. Use your Wood's Lamp because what that does for you is it's like a beacon telling you. It's like the emergency lights going off that this is something that you need to deal with. There's just no – there's nothing else as great as something that will

light up and tell you it's there as it's coming into the shelter *[Laughter]*. Which parvo would do that, right *[Laughter]*? That's just a really important thing.

Tricky things that also glow are really good to be aware of. Does anybody know what's on that kitty's eye? Terramycin. Great. The difference is it's smeared. Sometimes you can rub it off if it's crusty. Doxycycline suspension does the same thing, but you can flick it off. The difference is it's really, really yellow. That's hard to just describe, but hopefully, you can even see it in this picture. It's very, very yellow, not very green, and it looks like something got smeared on their fur, which is very different. It'll glow on their skin as well because it's all smeared around.

What about this? What's going on here? It runs down the nasal lacrimal duct and comes out the nose. It's still Terramycin. This is not ringworm. This is Terramycin *[laughter]* that was on the eye and is now on the paw. It's really important to think through everything that's going on when you're trying to make these calls.

Once you find a glowing hair or some glowing hairs, this is the next step. These are the supplies that you need. I'm going to go through what the steps are for how you can examine the glowing hairs under the microscope. This kitty is waking up from spade-neuter surgery, just so

you know *[Laughter]*. I didn't anesthetize him just to do this. Usually, this is not something painful or a problem. It was just easier to get the picture. This over here is the Wood's Lamp. It's just the edge of the Wood's Lamp. The third and fourth hand here is somebody who's holding the kitty for me. I'm going to hold the Wood's Lamp and then I'm going to hold something that's good for plucking hairs. In this case, it's a hemostat. I'm going to hold the Wood's Lamp, find the hair that's glowing, and I'm going to use my hemostat, pluck it out, hold it up, hold up my Wood's Lamp and make sure that what I've got in my forceps is actually glowing. Then I'm going to have set up a microscope slide already with a drop of mineral oil on it. I'm going to take that little hair that's glowing and just drop it right onto that slide. Then I can even use my Wood's Lamp and see if the hair that's on my slide is actually glowing. It'll still glow right in that drop of mineral oil. Then I'm going to put the slide on the microscope, put my Wood's Lamp right next to the microscope, and I'm going to look through the eyepieces. I can move the slide around until I actually see the glowing hair right through the microscope eyepieces. I use the microscope with the microscope light off in order to do this.

Once I find the glowing hair through the eyepieces, you can also do this by just looking and putting the hair – you can actually see the hair on the microscope side and move the hair to the center. Then I'm going to turn on the microscope light. When I do, here's what I see. Here's the hair, this

dark line, and then hopefully, you can appreciate all these little tiny dots. This is all – it's called ectothrix, which you don't need to remember, but it's a cuff of spores that actually goes all the way around the hair. So one great thing about doing this is it really helps you appreciate how contagious this really could be, right? Because these are all spores. It makes me think of Pigpen from Peanuts *[Laughter]*. How many of these little spores could be shot around.

Here's where you can see the structure of the hair. This is a hair. Structure of the hair has just been demolished here. All around it from here out is just spores. Then the hair breaks, and spores go everywhere. Here's a closer shot where you can see this is not normal hair structure. The hair ends about here. From here out, each one of these little round bobbles is a spore. This microscopic exam is as close as you can possibly get to a snap test for ringworm. If you come in – if a cat comes in, you see a lesion, you put the Wood's Lamp on it, you pluck a hair, put it on the microscope, in ten minutes you can say this cat is ringworm infected.

It takes some practice. It is not a super complicated thing to do. I'll tell you when I was in vet school, Karen Moriello was actually my instructor and she went through this and I was like oh, yeah, I'll never do that. That is so complicated *[Laughter]*. I even got to work at the shelter and was working at the shelter and was like God, I remember learning that, but that

just seems so complicated. There were all these different substances that you need to put on the microscope slide before you put the hair. It was so intimidating to me. I didn't want to do it. Finally, she came one day and gave me a bottle of the clearing agent that you needed to put on the microscope, but she gave me all these warnings about how it can demolish your microscope lens. I used to keep it in my desk drawer locked because I knew if our microscope got ruined, we'd never get another one *[Laughter]*.

Then one day – I mean, I used to do it and I learned how to do it, and I was like this really isn't very hard. One day I just was lazy and didn't want to go get the stuff out of a locked drawer in my desk, and so I was like I wonder if this works with mineral oil? It does *[Laughter]*. Now I always use mineral oil. All the pictures that I'm going to show you are all using mineral oil because I wanted everybody to know that you don't need to have any weird corrosive substance and it can be incredibly simple to do this. You just do it and then you can see that an animal is ringworm infected.

Always back up your results with a culture. Culture is the gold standard. If you really, really want to know, and especially when you're learning, it's a great thing to do. To do that exam, look at the hair under the microscope, go ahead, start treatment, start a fungal culture. If your fungal culture is negative, you got it wrong and you want to go back and figure it

out. Every now and then you'll find a cat who had one positive hair, literally, one glowing hair. You plucked it out and that's *[laughter]* – but that's more with cats that are under treatment, not for a cat that's currently really infected.

Now we're going to move on to fungal cultures. We recommend using a toothbrush for sample for fungal culturing. It's an ideal means of collecting spores off the hair coat. Cats love it *[Laughter]*. In all our years of culturing cats, they lean into it, there's no problem collecting these kind of samples. You really want to remember to brush the whole cat from nose to toes and tail. You want to do the whole cat first and then go back if they have a lesion because if the lesion really is ringworm, you don't want to spread that all over them. If it isn't ringworm, but you might have missed ringworm somewhere else, you don't want to miss that. You want to make sure you do the whole cat. Like I said, kitties love it.

I put this resource on here just so you can see for shelters that are doing a lot of culturing, you can go to the dollar store and get five toothbrushes for a dollar, but you can go to a hotel supply company and get toothbrushes for about six cents each. They come in a big cardboard box because then you'll never run out of them *[Laughter]*. That's one of the things that Dane County does. Lots of other shelters we work with do that as well.

When you set up the cultures, we use gametophyte test media, and that's what we recommend everybody else use as well. It's just a fungal culture media. It contains an indicator so that when the fungus is growing, certain types of fungus will turn the culture media red as they're growing. We recommend, which is different than lots of people have said, incubating the cultures at about 78 to 80 degrees Fahrenheit. It used to be that people said oh, incubate them at room temperature. Room temperature has really changed over the last twenty years. What we find is that if you incubate the cultures too cold, you'll be really frustrated when it comes to interpreting them because they never sporulate. They never make the structures. They kind of never bloom. They never make the structures that help you identify the fungus. Or they make them, but after a long period of time. We want this to go kind of fast.

Not cooking them, 78 to 80 degrees. Lots of the time that's just going to be what room temperature is. In Karen Moriello's lab, you can't even go in there, unless you're just wearing a T-shirt. It's so hot. We incubate them at room temperature. In the shelters, we usually incubate in an incubator. I'll show you a picture of that.

When you're inoculating the culture media, you want to have the culture upside down and gently stab the toothbrush into the media. We always do it in a spiral pattern. We always do it exactly the same way so that we can

interpret our results and we can judge based on the things that we know already.

I always thought maybe I didn't need to include this slide in my presentations *[laughter]*, and I just did a case study with a shelter out on the West Coast where they were getting negative cultures for all these animals and then the animals were going out to foster, and it turns out they were actually positive. They couldn't figure out what was going on. Through this exhaustive questioning on my part with them, it turned out when the intake staff were inoculating the cultures, they were hardly touching them to the media. They really weren't inoculating them at all. I had the veterinarian go look and see if there were any marks in any of the culture plates and there was nothing.

Then we started tracking and they hardly ever grew anything. That was the problem. They changed the way they were inoculating and now they're picking up all their cases. It's good to have this here.

I hate these *[laughter]* so I make a point of showing you them. You can see, hopefully, how chewed up these ones are, in particular, on the inside. Not only is it impossible to get a toothbrush into them to inoculate them. Just imagine trying to get a piece of Scotch tape in there to pick up a little bit of that sample so that you can look at it. I tried for a long time before I

just declared that I hated them and we would never purchase them again. These were used when people used to think the best way to culture was to pluck a couple of hairs and then stick it into that media, but even then, it's impossible. Just don't get them *[Laughter]*.

We love to use these petri dish style plates. Derm-Duets is something kind of similar, but has two different culture medias on it that, in my experience, seem to confuse people a little bit. I tend to really push people towards just getting these kinds of plates.

Here it is. The thing that I'm going to say that I don't want you to forget, which is red. When the culture media turns red, all that means is hey, look at me. It means you need to do a microscopic exam, that that is a potentially suspicious growth. It does not mean it's positive. The reason I make such a big deal out of it, and I know I'm joking about it, but in my heart, I am not joking about it, is that I have seen so many animals die because the media turned red. I have seen shelters torn apart because the media turned red and then they call me and then I tell them that it wasn't really ringworm. It's horrible. Don't do that *[Laughter]*. You need to look and make sure that it really is a dermatophyte and even a pathogenic one would be good before you say that it's positive.

Here's what a contaminate looks like when a contaminate is growing on a plate. Pigmented colonies are never pathogenic, so you don't even have to

look at these. I'm going to go through and talk to you about how we manage a whole bunch of cultures, but this one I don't need to look at it. Ringworm is never normal flora. It requires some kind of assessment on our part about what we need to do to respond. The contaminates we never need to worry about.

This is what it looks like when it's growing on the culture. You can see early on the media is already changing colors. This is about four days, probably maybe five days of growth at 78 to 80 degrees. You can see it's starting to turn white. It's fairly clear-ish and has these kind of fingery growth. This is ringworm. This is not ringworm, right? Hopefully, we all get that. Here is the quiz. Do I need to look at this one under a microscope? Some brave soul. I do? Why? Because it turned it red. I am really busy and I have a ton of sick animals I need to deal with today. Right. This one is green in the middle. I don't need to look at it. I put it aside because it's green. Pathogenic colonies are not pigmented. It's a really nice little gift for us that lets us go do ten more vaccines *[Laughter]*. Right? We don't have to look at this one because it's green.

I just wanted to show you a picture. One of the things I hope you'll get out of this is you do not need to be fancy or glamorous to have a ringworm treatment program *[Laughter]*. This incubator I bought ten years ago for twenty bucks and it's still working. This is the incubator we use at the

Dane County Human Society. Again, we keep the cultures in bins inside. The incubator – this is the inside. It has three shelves for three weeks. What we do is we fill the top one all during the first week. Whoever's coming in, they get their cultures put in there. Then we look at them every day. All we do is, is it red? No. Is it red? No. Is it red? No. Oh, it's red. Then we look at it and then we decide do I need to look at it or not look at it? We put it in a separate pile.

Once we've looked at them, usually by the end of the first week, we've already seen all the positives. Week two and week three is really boring. There are some that come up between seven and ten days as positive. We've never had a positive that we didn't identify as a suspect before ten days be positive after ten days. That's important to realize. That's not true if you don't keep them warm, but it does seem to be true.

How long does it take to go through these bins? Hardly any time, even though they're culturing every single cat in the shelter because all we do is look through for the red. That's the first cut. The second cut is, is it white? Is it colored? That's the second cut. Usually, there's not so many. October, there tend to be more. Then we look and we define where does it fall? All we can say when we're grossly looking at the culture plate is does it have no growth? Excellent. Is it suspect? Is it a contaminate? Or is it a heavy contaminant? Sometimes if we get a really heavy

contaminate growing really fast, we'll re-culture to make sure that the contaminant didn't grow over something that was more important, but even that hasn't seemed to be so important lately. Again, we can't say positive without a microscope. Can you tell I think this is important? *[Laughter]*

Now, how do we look at them under a microscope? We use Scotch tape. This is my favorite, stain lactophenol cotton blue, but, again, it's sort of hard to find. I have it because I do it all the time, and so I keep it in my desk. If you don't have it, no big deal. Just use new methylene blue. Almost every clinic has some kind of stain. Even if you don't, just don't use stain and it works fine. I'll show you what that looks like. I think I have a picture without it. You need some microscope slides.

These are my fingers, and I do not have gloves on *[Laughter]*. I'm telling you that because I would challenge you to go home and try to use Scotch tape with gloves on. What you'll find is that you're more of an infectious risk than you could possibly imagine with gloves and Scotch tape. What I do, and I hope you can see, is that I'm protecting my finger with the Scotch tape. I use these two fingers to hold the Scotch tape and this finger to just gently press into the colony. When I'm done, I wash my hands. This has never been a problem for me. I really think it's more of a

problem with gloves because you end up just making a completely disaster *[Laughter]*. That's the reason I'm making a point of talking about it.

Basically, I start with a microscope slide, I put a little drop of stain on the microscope slide, gently press the clear Scotch tape onto the colony, and put the tape on top. You can sandwich this and put another drop of stain and another coverslip if you want to, but it really isn't necessary. These pictures are not with my favorite stain, again, because I always want to show you guys the low-rent version. This is just new methylene blue on a regular old microscope. What we say to look for is rowboats and canoes. Here is the canoe. Here are the rowboats. Canoes are much more common. Easier to paddle *[Laughter]*. Canoes are what you're going to see most of the time. Every now and then you'll see rowboats. The good news is you don't really need to know the difference, right? Because they look very, very similar. If it's a rowboat or a canoe. The rowboats should never be seen from an animal that didn't glow because that's a different species. That's *Microsporum gypseum*. It shouldn't glow. That's the kind of ringworm that cows usually get. Sometimes barn cats have it, but, again, not very often. I see this more in dogs.

We use a pathogen scoring system that sounds, again, like it's some kind of complicated system. The truth is it's really pretty simple. It's just based on the number of colonies that grew, so how many spores hit the plate. In

this case, we can see one, two, three colonies that grew, so we would call this a P1. Basically, P1 or P2 is anywhere from one to nine on the plate. What we're saying with that is not too many. The reason we divided between one and two when we got started is we thought there would be more of a difference. The only thing that we really found was that if it had nine colonies on the plate compared to one, it kind of increased our suspicion that somebody might have missed a lesion if they reported an animal with no lesions and it had nine spores on the plate.

Either way, what we do is if they get a positive culture and they didn't have any lesion, we say, "Well, okay." We go back and double check and make sure do you really not have any lesions or did somebody miss it? If they really don't have any lesions, we can call tem a fomite carrier. What they really are, right, is a dust mop. If they do have lesions, then that's a real infection. They've got a lesion; they've got a positive culture. That's a kitty who needs treatment.

P3 is ten or more. I don't care if they have lesions or not. We're going to at least start treatment and then we'll keep culturing and see what happens. A lot of the time when they don't have lesions, they cure very quickly because probably they were dust mops too. We're just in that level of how comfortable are you just saying that this animal can go?

One of the things that we did when we started this scoring system was that we had this big idea that what we would do is we would culture all the cats, and then we'd get these culture results back, and then for the ones who were dust mops, we'd go back to them and we'd see if we could just wipe them down. Then re-culture them and if they'd be negative. What happened was we would culture them, so we'd take the culture, wait a week, get the culture results back, go back to that cat, re-culture them, wipe them down, reculture them. Both cultures were always negative *[laughter]* because the cats had groomed themselves. Or maybe when we took our original sample with the toothbrush, maybe we took all the spores that were there. They never were positive afterwards.

We've come to really think dust mops just aren't that important. We used to do this thing called dip and go where if they had a positive culture, but no lesions, we would give them a lime sulfur bath and send them on their way. We do that still sometimes in an outbreak situation, but if it's not an outbreak situation and the animal has no lesions, they're probably okay. It's all a question of kind of margin of safety.

We always are kind of tormented. This is Shelly. Shelly's brother had ringworm and she didn't. What should we do with Shelly? She was a bonded pair with him. It's always a judgment call. Should you treat them both together? What should you do? The protocol that we wrote for our

program was really, really if they were bonded. We had to really make the call that they really were. We would leave them together, and we would treat the uninfected animal just topically. We'll come back and talk about treatment. That's just the decision that we made.

Again, this is what our fungal cultures look like in here. Here's a lab book that we keep. Every fungal culture that we take gets posted into this book. Then we record all the results into an Excel spreadsheet. Cleanliness is incredibly important for fungal culture lab management. It's very easy to do, though. It doesn't need to be a whole separate room or a whole separate space. Any time you take a culture out, before you put it on the counter, you put a paper towel down. Then when you're done, you clean up the paper towels and you throw it away and you clean the counter. We want everything to be really super clean. We don't want clutter or anything like that. Then cultures should always be disposed of as a biohazard, even if it wasn't a positive culture because it may be some other kind of fungus that's growing in there.

Screening the environment is also really an incredibly useful tool. We use this especially during outbreak situations. Use pretty much all the same tools, except for Swiffer. We've bought so many Swiffers that we even actually called the company that makes Swiffers at one point to see if we could get them to donate some Swiffers for a study that we wanted to do.

We love that we got a letter back informing us that Swiffers are not a veterinary medical supply *[Laughter]*. We went to Target and – Karen Moriello went to Target and bought all the Swiffers that we needed. As we were checking out, the woman at the checkout was like wow. You guys really love Swiffers, don't you *[Laughter]*?

When you use them, basically, what we do is we have people cut them into thirds or quarters. You want to do that in a place that you think is reasonably clean and put them into Ziploc bags and then go where you're going to go to sample. You really want to think about wherever dust might be. Where dust and hair collect are the places that you want to sample. You take the Swiffer and wipe it on the environment, if you think about it, a lot like you would use a toothbrush on a cat. You want the Swiffer to get visibly dirty. Put it in the plastic bag. Then when you're going to inoculate your culture, you would take it out of the plastic bag and just do the same thing that you did with the culture plate with the toothbrush, but you're going to use the Swiffer to do that now.

Then you can use the same kind of pathogen scoring system to try to kind of quantify how much contamination there is in the environment. It's really great to do that kind of in before and after settings to see how well people are cleaning. We did a whole little study with a student where she went to foster homes and that had accidentally had a ringworm-infected

cat sent to them and then removed to see how quickly those homes could get clean. Actually, they can get clean very nicely.

From here, I'm going to go into a couple of treatment programs for the rest of our time. I've got these two awesome shelter programs that I wanted to talk with you about. I like to start with this picture because, as I said, I want to show you the low-rent version. You definitely do not need to be glamorous to have a ringworm treatment program. This is the trailer at Dane County Humane Society, which I think so sadly does not exist anymore.

The City of Madison gave a permit for it originally, but then really didn't want it to stay there after a while. It's on wetlands, so it had started kind of sinking a little bit. It was really, really old *[Laughter]*. The way that the shelter got this trailer is somebody's sister had lived in it and she was moving. She was going to scrap it. Instead of scrapping it, she gave it to the shelter. We rebuilt the – or we kind of gutted the inside of it . This is what it used to look like. The red tape defined the difference between the clean area and the dirty area. There were nine cages in this area, which was general treatment. Then back here, there was another room back here, there were six more cages for kitties who had ringworm and URI.

What's amazing is because of the efficiency of this program, they were able to treat hundreds of cats a year with really, really excellent care through this little trailer *[Laughter]*. Everything was easy to clean. We used to culture the environment weekly. We never had environmental contamination. The only place we ever found spores was actually in the furnace filter. We found spores there once.

Now I'll show you kind of where they've gone from there. Here's San Francisco SPCA. Here's the Dane County Human Society. The program set up for Dane County, it's the first program of its kind. It was started in 2003, again, by this amazing group of volunteers. Though what was hysterical to me was that the volunteers had this idea that they would get Sally's sister's trailer and put it out back. They had heard that ringworm cats will self-cure. What they wanted to do was set it up as a real life room with couches and stuff. Then they were just going to take a bunch of ringworm-infected cats and put them in the trailer, and then people could go out and hang out with them, and eventually, they'd get cured *[Laughter]*.

They brought the idea to me, and I was like wow, that's a great idea, but let's do it a little differently *[Laughter]*. I can't believe how many times that year I was told that I was so clinical *[Laughter]*. The previous policy at the shelter had been to recognize and euthanize for ringworm, and so

there had developed this kind of black market kitty underground where people would take kittens that they knew had a ringworm infection, and they'd be like I'm going to foster this kitten. I'll see you later *[Laughter]*. People had ringworm in their houses. Then unexpectedly, you'd send another cat to foster at that house, and then all of those cats would come back with ringworm because you didn't know there was ringworm in that house. Nobody wanted to talk about it. This was an answer to that problem. It was so amazing. I think that was party why the volunteers really put up because they didn't want ringworm in their houses either, but they just didn't want to euthanize all those friendly cats.

San Francisco SPCA, as of more recent, they really followed the model from UC Davis and Dane County. They use staff veterinarians, staff technicians, and it's a staff-driven program. Program supervision for Dane County is UC Davis and University of Wisconsin. Karen Moriello and I still really drive that program. The staff veterinarians drive it on a daily basis. There's a clinic manager, there's a program supervisor, and there's a ringworm program coordinator who only has about five hours a week to organize the volunteers. That's what she does, primarily.

San Francisco SPCA, they call their program SPORE, Shelters Preventing Outbreaks of Ringworm through Education. They are doing a lot of really great outreach with their program teaching other shelters about ringworm

as well. They have staff veterinarians, a shelter director, a foster associate who's also the ringworm program coordinator, and they got advice from us.

DCHS, as I said, primarily volunteer staffing. Incredible volunteers, some who have been with the program the entire time. One amazing thing that happened at Dane County is that we got some volunteers from the Mycology Department at a local hospital who came and started becoming volunteer culture readers. They actually just train the new crop every time. That's been amazing. The one really funny thing about that is the hardest thing to teach them was not to care when they saw human pathogens or other kinds of things that just weren't a big deal for cats. When we first had them start reading the cultures, there were lots and lots of overtreatment for what they were reporting. It was really hard for me to get them to just not care about those. They thought I was being really irresponsible until I could sort of explain that they just weren't clinically significant in cats.

Treatment cultures for the UW Program are still run by Karen Moriello at UW and it's because she loves to do it and she loves to keep all the data and she publishes on that research all the time *[Laughter]*. San Francisco SPCA, it's almost all paid staff for t heir program.

Here's the treatment housing at Dane County Humane Society. Partly, I'm showing this, they know that I lay them open like a book all the time, is that these cages are really too small. They know that now. What's so funny is that ten years ago all I could get, even with all my foot stomping and hand banging and pouting and wining, this was the biggest cage I could convince anybody to buy. They actually bought these cages only with the understanding they came with these giant metal dividers that you could slide *[laughter]* in and turn it into two cages, which I promptly gave away *[Laughter]*. We're actually just getting ready in Dane County to redo these cages and cut portholes so that each cat's got two cages because just in that amount of time, we've come to understand that or what is usually about a month of treatment, those cages are just too small.

Here is the new Dane County Humane Society Isolation Facility, which is actually called the FIT Center. It's Maddie's Fund donated the money for it. It's Felines in Treatment. What cracks me up is it's still very often referred to as "the trailer" *[Laughter]*. Old phrases go down hard. It's very lovely. Inside it has two dedicated wards. Though we actually still have the same number of cages, because there is still the same number of volunteers and the same number of animals who need to be treated. They're just in the process, though, of considering a pretty major expansion because they're getting so many requests for help from shelters

in the surrounding area who want to bring their kitties in for treatment. We may be expanding pretty soon.

At San Francisco SPCA, they have three dedicated wards within their treatment area that are just dedicated for ringworm. Each ward has stainless steel, three dog runs, and then two large cages, so it looks like this. Like that. So kitties get these nice dog runs to live in. Then that's what – their cages are actually pretty similar to the Dane County cages. A little bit bigger.

Protection for humans is really important. We have never, again, knock on wood, had a volunteer contract ringworm from our treatment program. One of the reasons why is that when you use a topical treatment on the animals as they're coming into the program, there's very little environmental contamination. Even though we're very, very careful with the way we handle the animals, the truth is when we go through and just check the environment still, even in our fancy, glamorous FIT Center, we still find that the environment is negative because the animals are receiving effective treatment, I think.

This is Karen Moriello with Ken *[Laughter]*. This was our first day. You can use disposable gowns, and that's what we used to do. Now we use cloth gowns and wash them because there's less going into the landfill that way, and it doesn't seem to cause us any problem. Again, you can use

shoe covers or you can just have shoes that are dedicated to that area that don't leave the area. Now we use Crocs, and there's just a bunch of Crocs there that are all different sizes. Everybody wears socks, so everybody can share those Crocs. The Crocs stay in the treatment wards.

For our program, the attractive cap is optional, but lots of people wear them. The thing that's not optional is to at least have your hair up off your neck and shoulders so that you wouldn't end up getting spores in your hair. Here's Dr. Carsten, our third-year resident, modeling our new cloth gowns that we use. This is San Francisco SPCA. Everything is here and very easy to access for people who are coming in.

It all starts with intake, as I said. That intake exam is really, really important. Setting up for your treatment program to work right is really important. This is a picture of Dane County. This is where they keep the clipboard with all the animals that they're taking cultures from. One of the most important things is just making sure that it's really, really easy to do. I kept asking and asking and asking for every animal to get Wood's Lamped at intake and it just wasn't happening. It was happening, I don't know, maybe 70% of the time, maybe 50%. I think it probably depended on how busy they were.

One day I went into watch and they knew I was coming, so they were using the Wood's Lamp. I went in and I just started laughing. I was like no wonder you don't use the Wood's Lamp. The exam table was here. The outlet for the Wood's Lamp was back here. They had to plug in the lamp and then take the lamp over to the table. Meanwhile, nobody could get from the door to the refrigerator or to any of the area where the animals were housed while the cord was stretched across. It was such a pain in the neck that that's why they weren't doing it.

It's really important to try to figure out when they're not doing what you want them to, why. We moved the outlet. We actually had an electrician come. I asked, "Could I please move the outlet? It's really important we move the outlet." Then they started using it. That was really important.

They do these intake cultures. This is if we're going into the treatment area now. Not just into the shelter. Once we've decided, yes, you're an animal who's going to come into our treatment program. We do an intake culture. Why? We want to just be sure that the animal that we're treating really has ringworm *[Laughter]*. Even if we did that diagnostics before, we just want to – that gives us our baseline. We always, always dip animals before they go in. We'll come back and talk about topical treatment, but we use a lime sulfur dip. We always do it before they come in because then that's why we don't have any environmental

contamination. They're leaving all their Pigpen mess behind. They're coming in clean into that treatment area.

One thing we'll talk about again, but I'll talk about it here for just a minute, is that when we think about treatment for ringworm, we're always kind of thinking about making a sandwich, is how I think about it . You've got fungus growing in the hair follicles, and then you've got all this fungus that came – all these spores that came from that fungus all over the hair and the skin. The topical treatment kind of cleans the cat of all those spores. If you culture a cat right after you've dipped them, usually they'll be pretty close to negative, if not negative. Over time, more spores are going to kind of come out. By dipping them, we dramatically reduce the environmental – the potential for environmental contamination and the potential for infection of humans. That's why we always do that.

We don't clip. The only time we would clip is if we had a Persian or a very, very long-haired cat going into our treatment program. Again, ten years ago everybody said you have to clip. We've seen some really gruesome things happen with thermal burns from shelters that are clipping every single cat. You have to be really, really careful when you're clipping to not let those clippers get hot because often you won't see those injuries until about two weeks later because that's how long it takes for

that thermal burn to come up through the skin for you to see those consequences.

The last one in is usually the last one cleaned. We always clean in order of infectious potential. Singles need more love. We know that's true *[Laughter]*. We want to balance the socialization with time to cure. We want to make sure that they're getting tons of socialization, but they're not getting cross contaminated. The volunteers in our program have totally understood that and they're great about it and they have different systems that they rotate through for how they make sure that they do that. Sometimes they say oh, just love one on your time there and then the next time you come, love somebody different. Or they say change your gown in between each one or only socialize in order of infectious potential.

I have to say that one of my biggest fears in doing this was to take animals and put them in a cage for a month and then see how they do at the end. Cats come out of this program better socialized than most animals I see in shelters. They get so much love in this program. It's really fantastic.

Again, we use these tags. Here's Ken when he was just about to graduate. We use these tags to say who's about to graduate. This is actually Sonoma too. She's just about ready to come out because she's number one. That means she's going to graduate and move on her way. Then he's next.

That's based on their weekly fungal culture. We do fungal cultures every week while they're in the treatment area.

This is the inside of the FIT Center, which will be changing soon. We're currently undergoing some research on what really needs to happen in a treatment area. How much cleaning do you really need to do? We are the lovers of spot cleaning. For ringworm, we never feel comfortable telling people they could spot clean. We wanted you to make sure you're getting all the spores out of there. This treatment program they've always cleaned every single day and taken everything out and put everything back. Right now we're kind of trying to figure out what's the minimum you can do? Does it really matter? Do you really need to do that? Because what we want to know is what we – if we can tell you, you don't need to do that, then you can spend your time playing with kittens, right? I'd much rather that your volunteers did that than spend their time pulling everything out of the cage and stressing the cats out and all of that.

We're actually looking at it right now. We already have changed the protocol to spot cleaning and we're trying to see how it affects the time to cure. The time to cure in our treatment programs right now is very, very short. It's about fourteen days. Then it just takes a couple of weeks to define that cure through a fungal culture. It's very fast. Cats are in there about a month when they go in. Important to think about that and

remember because whatever little kitten is going in there is going to come out a month later, and so that's important to remember.

Again, we want to try to check in on this minimum stuff and stress reduction for everybody, right? The volunteers or the staff, as well. Really try to control kicking up dust. When you're taking things out of ringworm treatment cages, you don't want to pick them up and shake them *[Laughter]*. You want to try to roll things into itself and try to put them right into bags. Keep the room really clean. You can see how this counter's really clutter free. Mechanical removal of the spores is probably the most important thing. We get a lot of questions about what's the most effective disinfectant? We know in a test tube, sure, bleach is fantastic. Ten minutes with bleach in a test tube and ringworm will die. How often can we really achieve that in a real shelter setting, that kind of contact time?

What we think and what we know is that it's really much more about elbow grease, getting in there and really cleaning things out is what – and also minimizing the contamination in the environment through effective treatment. Laundry, we bag it up as we pull it out of the cage, and it goes straight into a bag. Then that whole bag kind of goes into the wash. You can actually even use a cloth laundry bag and then just wash the laundry

bag as well. You can turn the whole thing inside out and put it in the wash.

Karen Moriello is currently *[laughter]* in the midst of – this is such a research project of her design where she is infecting various articles of fabric and then washing them in the washing machine with the washing machine overloaded or the washing machine only half loaded and different kinds of detergents in there to figure out what really gets rid of it. It seems like if you wash things in the washing machine and you don't overload the machine, as long as you put things in the dryer too, that that's really effective at getting rid of ringworm. Overloading the machine is bad, though. Then you can really end up with – overloading the machine and skipping the dryer, that wet laundry coming out of an overloaded machine can really be an issue.

Here's what I was saying about the sandwich. We really want to think about making that sandwich. We use an oral medication that collects and concentrates in the skin to treat the fungus within the skin. We use a topical treatment to treat the fungus on the outside of the cat, really, right? We're making that sandwich. The way we do this is we do topical lime sulfur twice weekly until graduation. We start that before they go in and we don't stop until we're taking the animal out of there. Part of that is preventative. Lime sulfur has a really nice residual activity. We put that

on the cat and we know that they won't get re-infected from somebody else.

Twenty-one days of itraconozole is what we do. We start twenty-one days and then we stop. If we're seeing some kind of problem where the animal isn't curing correctly or something like that, we might go back and restart, but I can't think of a time at the Dane County Human Society where we ever had to do that. Sometimes when programs are starting up and there's some other problem, we may have to go back and figure out what the other problems are.

Let's talk topical treatment. Lime sulfur is my favorite thing *[Laughter]*. We have published clinical research with shelter animals in conjunction with oral itraconozole. It's demonstrated incredibly rapid times to cure for P3 infections, so severe infections. It's demonstrated excellent control of environmental contamination even after just the first treatment. Demonstrated that adverse reactions are very rare, i.e., did not happen *[Laughter]*. No other product has yet been shown to have equivalent efficacy.

That I lay out there and say if you have a choice, use lime sulfur. It works great *[Laughter]*. People always want to use something different. I understand it smells bad. What's really funny to me is that I love the way

it smells. It's like Scrubbing Bubbles. I smell it and I know that it's working. Right *[Laughter]*? I am okay with that, but I know people want to use other things, so actually, we've done a few investigations and one was with a product that we thought was really going to be good. We did some treatment, some early trials with it. We did some in test tube trials with it. It looked really promising. We did the research we just published with *[inaudible]*. It's just not as good. It just didn't work as well. It's not that it doesn't work at all. It just doesn't work as well. For us, time is everything. Time in a shelter – if it takes you two weeks longer to treat a cat that might be one more cat you can't treat. We really strongly urge you to stick with lime sulfur.

This is really promising, and this is – we are just – we just got our first bottle of shampoo. The Pure Oxygen isn't actually going to be marketed anymore. It's got a new name. There is an accelerated hydrogen peroxide that we're just starting to test. Again, we did the lab testing and it looks really promising, but we know that the last time that happened, it wasn't as good, so we really are asking people to kind of wait and see. We're really hopeful. It doesn't smell. It actually smells really good and the cats get really nice and clean from it too. We'll let you know. We're just on the verge of getting started with that.

To do it, I don't know if you guys saw this picture in the trailer, we still have these lovely sinks, even in the fancy FIT Center. That we just use

these little portable laundry sinks. There's no plumbing involved. There's just a little drain that comes out and it drains into a bucket down below. What's great about these is you can move them around. You can move them right by the cat's cage if you need to, and no need for a plumber. Then you can just dump the solution that collects below.

We use these hand sprayers for applying the lime sulfur. We like the half-gallon sprayer better because the solution stays warm, it's easier to carry, it's easy to manipulate. That's what we use. We always use eight ounces of lime sulfur to one gallon of water. When we first started, we used the other dilution, which was four ounces to the gallon and we were really unhappy with the results. We switched to eight ounces and everything went the way we wanted it to.

Here's a picture of what it looks like. We want you to use gentle, but firm handling. The real key is to keep the spray close to the skin so that the cat is not being sprayed. It's more that the solution is cascading over the cat. You can really see the difference. There was a time where I came into the shelter, heard all this crazy screaming, and there was a kitten that had gotten oil all over it. The animal control officer was washing the kitten by sort of spraying the kitten. As soon as we took the spray and put it right next to the kitten so that the spray was just cascading and we made the water warm, no screaming, no struggling. It's really not hard. This guy he

named himself – his name is Tom and he named himself the dip *[Laughter]*. He could dip 40 cats in a day by just really gentle handling, but firm handling. We usually let them hold onto the side if they want to.

Here you can see you need to really soak them to the skin because, again, think about making that sandwich. You don't want to pre-wet the cat because all you're doing then is really diluting the solution. You want to get that treatment to the base of the hairs to be effective. You have to go back with a small sponge, some kind of raglet to go back and get their face. This was one of the great things that we did at Dane County is I would go in and Wood's Lamp the cats under treatment, and you could see all the places where they were missing with the lime sulfur because those places were persist in glowing. We could actually see they were missing around the eyes or they were missing the ears. I would have them come in and look. I'd say do you see? I know you're trying to be nice, but what you're doing is making it so they'll stay in here longer. They changed the way they were doing things, and it was really, really helpful.

We don't use Elizabethan collars or anything to prevent them from licking the solution off of themselves. When they're done getting dipped, we wrap them in a towel and then we put them back into their cage on a dry towel. Then we go back later and check and make sure and remove the wet towels and give them a dry towel. We just let them air dry. If they

want to groom themselves, they can. A lot of the time they don't want to because lime sulfur is probably not that yummy *[Laughter]*.

Again, remember this. We're going to talk about systemic treatment now. Everybody wants to use something different. Again, itraconozole is fantastic. We have this published research. It's so applicable to what we do. If I have my druthers, I will tell you just use itraconozole and lime sulfur. The way that we do it is we take 100-milligram capsules that are made for adult humans and we split them into four capsules that are the right size for cats. That's pretty easy to do. You can also buy liquid. The liquid is easier for dosing kittens.

What about post-treatment with itraconozole? Lots of people ask about that week on, week off. With week on, week off, you have to start with fourteen days on to load before you start the pulse. Actually, it's longer treatment because you would go fourteen days, then a week off, and then another seven days. For ours, we just do twenty-one and stop. It's actually more expensive, we think, to do the pulse treatment and possibly not as effective, so we don't recommend it. We have done and are just getting ready to publish some research using terbinafine and we saw pretty good results. Again, not quite as lovely as what we see when we use itra and lime sulfur, so I think that is still my combo of choice, though sometimes terbinafine can be found more inexpensively. Right now it can be really hard to find itraconozole.

Monitoring treatment. This is what we do. We create a spreadsheet. Here is where the kitty came in in July 19th with a P3. You can see even by the next week, just a P1. This is too many to count. Went down to three colonies. From there, it was just negative the rest of the way. What we do is we use this sort of staggered system. Here's the entry culture. P3 *M. canis* at week one. Treatment week one was P2 *M. canis*. This is a different count. Treatment week two was suspect at week one and only P1 by the end of the second week that that culture was sitting.

The reason I included this is to make sure that you know that once you start running cultures on animals that are under treatment, you're trying to grow sort of a plant that's sick, right? The fungus grows all funky. It doesn't look the same. It starts to look weird. It grows much more slowly. All that stuff I was saying about how fast the cultures come up, that's before you start treatment. After you start treatment, you need to wait. This is what we use for defining a cure. The first culture where there's no growth for three weeks and the second culture where there's no growth for two weeks. These two cultures are finalized on the same day. Hopefully, that makes sense because this culture was taken a week later. That is how we say the cat is cured. Hopefully, that makes sense.

What are the payoffs for all of this work *[Laughter]*? These are the payoffs, right? I mean, live in concert *[Laughter]*. Really, saving lives is a huge, important thing just from an individual animal perspective. Outbreak prevention from a resource perspective, from a lifesaving perspective. Having a treatment program, one of the things that we found – again, I told you about kind of the black market kitty underground at Dane County Humane Society. When that was happening, the regularity at which infected animals were adopted to the public was astonishing. There were horror stories that are really real where they adopted a kitten and the Girl Scout troop came over to meet the kitten and all of those kids got it and all the other kids' pets got it. Those kinds of things happen. I was joking earlier about why they don't want to give up culturing every animal. They lived a horror *[laughter]* before they started this program. They don't want to do it again. It's worth it to me them to do that from a public health perspective, from the perspective of community trust.

Just charting new territory. It's so exciting to just have something that's treatable, curable. We can fix it and send them on their way. It's really amazing how much I think we've learned in a veterinary field from shelters treatment ringworm. People really, I think, even dermatologists, had some kind of misunderstandings about how hard ringworm really is. It's not that hard if you follow the rules. Again, here are the resources and expenses involved. It's not that much. Again, it's not something you

should go into lightly. You should be organized and systematic about the way you approach it, but otherwise, I can't thank enough the shelters that have tried it and are willing to kind of be case studies for other shelters. Both of these shelters are happy to answer questions about their individual programs. I am totally happy to answer questions about any of this. I want to thank Karen Moriello who's been an amazing partner in this adventure that we've been on with ringworm. Thanks to all of you for all the work that you've done.

This was one of my favorite post-presentation emails that I ever got from a shelter. They said, "We've had a terrible year with ringworm in our shelter and in the community. We've participated in both of the recent ringworm webinars, and we're inspired to rent a trailer so we can start treating ringworm in our shelter." They did. That was really even better than a click and treat for me *[Laughter]*. Thanks you guys. Your enthusiasm is worth everything.

[Applause].

[End of Audio]