



# WINN FELINE FOUNDATION

For the Health and Well-being of All Cats

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## 2013 Winn Symposium Transcript Superficial Fungal Skin Diseases in Cats

June 27, 2013 (published)

[Karen Moriello, DVM, DACVD](#) 

**Steve Dale:** I have been a very bad MC person. I forgot to remind you about those cards on the table. They are I hope at every table (they are). Please feel free because after our second speaker I will or someone will. I think I will have helpers running around the room. It will be our version of a workout and we will grab your questions and ask the speakers to answer those questions. Please fill out the evaluation forms and folders and turn them in. For veterinarians you can pick up your RACE CE certificates on your way out at the table where you registered I believe is where they are.

Is anyone here from Oregon? That is it? Wow, how about Washington? How about Moscow? We do, we have a veterinarian here from Moscow. Welcome! Borsht, I do not know much to say. Is that, no I guess not.

I got involved with the Winn Feline Foundation, do any of you know about this cat? Or know of this cat? A couple of people say yes. We had a dog that did – are you familiar with animal assisted therapy where pets will go in to nursing homes or hospitals and in some cases help people not only to feel better but to get better. We had a dog that did that, a miniature Australian shepherd named Lucy. After, I don't know, several years and I would come up with new things for our dog to do. We went to the rehab institute of Chicago because Lucy was a pretty small dog we were often paired with a child who might have a spinal cord injury, burns...the stories go on and on as to why these kids or adults are there. My wife came to me one day and said you know we have got to come up with something else, I am just bored. I want something else to train Lucy to do. So lord knows why I went to Toys 'R Us and purchased a little kids piano and I thought I would train Lucy the dog to play the little kids piano. I would clicker train. I do not know how many of you are familiar with clicker training, operant conditioning, so I closed the door to the room Lucy the dog was in and I began the process of click and I would treat and click and treat and began to shape the behavior and the paw would come up a little bit and a little bit more close to the little kids piano key and a little closer. We were doing okay and I did not close the door all the way. In walked Ricky the cat.

Ricky looked at me and looked at the dog, looked at the piano and went ping, ping, ping, ping...and I thought what am I fooling around with this dog for? I had a prodigy! Ricky was a ready, in part because Ricky a devon rex cat and in part just because of the way Ricky's individual genetics were but in part because of the way we socialized him when he was young

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and before me Leslie Spiller the breeder socialized him is that he loved people, loved going out to places. He was not one of those cats that was terrified of going to the veterinarian. If the carrier came out he would hop in it voluntarily. I could take him out and walk down to the drycleaner down the block or the video store when they had video stores.

We would, he would be on my shoulder and I still had the harness and leash on but he was not going anywhere and we had this relationship that was amazing. We would go Petco and PetSmart and he would do recitals there and the TV crews came out. They could not believe, this was before Youtube otherwise forget about Nora the piano playing cat, this dude had it. We had this incredible relationship that I am not sure I will have with any other pet again and along the way we were in our veterinary clinic in Chicago and just doing an exam and the veterinarian said, 'You know I am really disappointed in you Steve.' Then I said why? He said well you do all these performances for all these other people but how about for my staff? So we went in and Ricky played the piano and then in this little small room you had all these technicians and I do not know who all the people were. I think people from down the block, I do not know, all these people were in this little room. She then began the exam and as people began to leave the room she put her stethoscope on the cat and I could tell by the look on her face something was wrong and she said go see, and she mentioned the name of a veterinary cardiologist where we lived. Ricky had hypertrophic cardiomyopathy. Now the good news is that for many years he did not know he was sick. Sometimes with this particular disease cats very much do know they are sick. They get quite sick. That was not the case with Ricky but at some point also with this disease, we treated him as we could but at some point with this disease sometimes these cats, this is what I am looking for here, these cats just drop and die as I am sure many of you are familiar with.

Have any of you ever had a cat with this yourself? Just one hand? There comes another, another and another. Yea, it is common. You know it might even be the most common cause of death of indoor cats who do not get hit by cars or chased by coyotes between the ages of about 3 or 6 or 7 when renal insufficiency and cancers and other things begin to happen. I thought this not right, so many cats die of this yet there is nothing really that can be done. That is when I went to the Winn Feline Foundation and said we need to make a difference. We need to do something about it. We have raised well over \$100,000 just for the Ricky fund but we need more, not only for the Ricky fund but in general to help cats. The researcher that you heard, the one that you are about to hear they cannot do what they do without dollars so it is a plea for dollars. But it is also look what those dollars have done. You just heard an example of what dollars can do and how that makes a difference. It is the same thing with cardiomyopathy. The good news is that if you are a ragdoll or Main coon breeder you know there is a test that is not a perfect test but it is a test that is something where you can determine, inexpensively which is nice, whether that cat is carrying the gene defect or not and then make a decision as you want to on whether you are going to breed those cats or not. Anecdotally breeders are telling me for

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those two breeds they are seeing a bit less cardiomyopathy and that is an amazing thing. But, that is not good enough. We want to do this for all cats. Pedigreed cats or not because this disease occurs in all cats so this is a plea from me to you to help us spread the word about what we do at the Winn Feline Foundation. All of you make a difference all the time. You're coming to this, you paid to come to this. The money that you paid goes to help cats. Most of you are with breed clubs, many of you are with breed clubs who have made a difference to help the Winn Feline Foundation. Some of your breed clubs that are here are listed in this little program that I have so thank you, thank you, thank you. The people who buy cats from you do they know about the Winn Feline Foundation? For those of you who are veterinarians or veterinary technicians, do those clients you have know about the Winn Feline Foundation and the difference we make. People need to know about us.

Thank you very much for allowing me to say that and it is an honor and a pleasure to introduce Dr. Karen Moriello. She is a clinical professor of Dermatology at the University of Wisconsin in Madison where there is the Henry Vilas Zoo which I love and of course she is at the school of veterinary medicine there. She is a 1982 graduate of the University of Illinois, College of Veterinary Medicine. Afterwards she was a small animal practitioner in Chicago for two years before starting her residency program in veterinary dermatology at the University of Florida in 1984. She joined the faculty of the School of Veterinary Medicine in 1986 and is a Diplomate of the American College of Veterinary Dermatology. She has over 25 research grants, has published over 30 scientific articles. In addition she has written over 20 review articles and 22 book chapters. That is a lot of book chapters. It is, that is a lot of work. I just did one, one so I know how much work it is! I could read to you the name of the books and what is really interesting and impressive to me, not that all of that is not, is that she worked with Dr. Sandra Newbury to co-develop a dermatology treatment and screening programs for shelters which I think is wonderful. She is the co-editor of the Journal of Veterinary Dermatology, a recipient of a lot of awards including the ACVD award for excellence, the author of three textbooks herself and she is here.

Help we welcome Dr. Karen Moriello.

**Dr. Karen Moriello:** Wonderful! Thank you!

Alright so just a couple seconds here while I try to figure out the computer here to get, oop there is my picture.

All of those papers were just on dermatophytosis, I have done a bunch of other things. My department chairman says I cannot just be solely focused on one topic and I say why?

Alright if it is not my computer, you know I cannot work it.

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Alright we are good. Off we go.

This evening I would like to thank everybody for bringing me here again. I spoke many, many years ago with my colleague Dr. Doug DeBoer. I would like to thank you all for inviting me.

You have been funding my work since 1986 when I joined the faculty at the University of Wisconsin and since that time, you want to talk about seed money. The Winn Foundation is responsible directly for taking dermatophytosis out of the dark corners of the feline world to the point now where this disease and not just by myself but with dozens of other collaborators, has actually literally changed the way this disease is seen in private practice, in clinical practices, in shelters and around the world. We have now developed not just treatments but we have actually along with Dr. Sandra Newbury who is, well I should say, this is Dr. DeBoer, he is my colleague and co-researcher, but Dr. Sandra Newbury about 10 years ago said get out of the lab we need you in shelter medicine and I said for what? She said we have a need. She and I developed the first dermatophyte treatment and screening program at the Dane County Humane Society and since then the program has now become quite national, has received worldwide recognition and I am really happy to say that she and I continue to work on things.

Another thing that I am really, really proud of with our work and I think it is important for everyone to know. It is important to know that when we have done research studies we use kittens and every kitten that comes in off the plane is usually pretty scared from liberty and they get their own veterinary student and they get to be cultivated as pets from the get go. The person hiding in the corner up over here in the front is Spouse. Spouse is directly responsible for helping me find permanent and loving homes for all of our cats. His practice before he retired made sure that all of the medical care and surgical care, necessary spaying and neutering, was done so that we could find cats and even when we ran out of money to board them their practice boarded all of our cats until they found the right perfect loving home. That is a big thing for us.

Alright, I was actually asked to speak on two topics. The first one is malassezia and the second one is ringworm. Malassezia if it could speak would say I am really tired of being second fiddle to ringworm because I am the most common superficial fungal skin disease of cats. It is true, it really is. It has pretty much been a neglected disease but it is very important. It is part of the normal fungal flora and it is under recognized and undertreated. Just like it was in dogs. Cats are always playing a little bit of catch up and I totally agree with that sentiment. What it is, is this particular disease is part of the normal flora so people ignored it and cats were itching and suffering tremendously but nobody paid attention to it and all they got were steroids. Once we got people to realize not everything that itches in cats should get a steroid we started getting diagnoses and we started getting diseases and we started getting syndromes.

What is malassezia, malassezia is a fungal organism. This is a skin cell here. These little guys here are bacteria and these big blue guys here are yeast. They look like purple circus peanuts.

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Normally you would think (I am very food oriented, very food oriented so you know) bacteria look like purple M&Ms and malassezia look like peanuts to me. Where they are is present all over the body but particularly in the oral cavity and in the other body orifices. You have to remember too that with the discovery of malassezia, or I am going to tell you anyway, came another little tiny discovery and that is that cats have got bacterial pyoderma or bacterial infections of the skin. It is in all of the literature and all of the textbooks until the most recent small animal dermatology book that cats do not have pyoderma. You know what that is a true statement. Cats do not have bacterial pyoderma like dogs do because cats are not dogs. Cats do it differently. Everything, you know, they take it from people, they put it on to dogs and they think cats should do the same thing. Well they do not, cats are subtle creatures and so are their diseases. In a cat some of the most common clinical signs of a bacterial pyoderma are just scaling or just sort of a smudgy dirtiness on the inside of their leg and you would just totally ignore this. Cats do not do it that way. One of the most common presentations that is overlooked on bacterial pyoderma in a cat and yeast overgrowth is scaling on the hair coat. Every time somebody sees or especially baby veterinary students see scaling on the hair coat of a cat they say 'Oh I have got a really scared cat in the exam room.' The cat is laying there purring, you know playing with his mouse and I am like I do not think so. This cat has got skin disease. It is pretty easy once you actually learn how cats do it to find out whether or not they have got a bacterial infection of the skin. Very simply if you look close at the hairs of these cats their hair is piercing the scale and so what happens is, is as that hair is growing up it pulls up the scale and then when you look at it microscopically you will see their version of bacterial pyoderma. This is what dogs do, dogs do the big thing, the peanut thing, not cats. Cats do what I call the earth and the moon so here you have got the earth which is round and these little guys are bacteria and for many years people just assumed if it was round and it was small it was a bacteria and until there was culturing done then we discovered that cats have got their own. They have their own way of doing it. They have 11 different species of malassezia and many of them are round so therefore it is easy to overlook. If you do not have the two of them in the same scope together you are going to miss it. It is really important to diagnose it because bacterial and yeast overgrowth complicate every itchy disease that cats get and many cats have been treated for diseases that are "idiopathic" when actually they have a treatable disease.

On the far left hand side you will see a cat with raised lesions which most of you recognize as what we might have called an eosinophilic plaque but now we know it to be one form of a combined bacterial and yeast infection in cats and it is intensely itchy. That cat had the disease due to flea control. You could give that cat all of the flea control in the world but that lesion is not going to go away even with steroids until you actually treat it appropriately with antibiotics. The cat on the right hand side is one that probably for many years was a poster child for the cat with psychological over-grooming disorders, The bald belly syndrome and the old, old terms of feline endocrine alopecia which we know does not exist anymore. What we now call this is symmetrical alopecia of cats and it is simply a descriptive term for any one of a number of

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diseases; but one of the first ones of cats to think about is does this cat have a bacterial and yeast infection of the skin? Cats simply, they are very busy they have got 23 hours a day dedicated to sleeping, they simply do not have time to sit there and lick their belly because they have got other things to do. These cats lick and over-groom because they are physically uncomfortable. It is either pain or it is something else.

This particular cat could have demodex. This cat could have malassezia and bacterial pyoderma. This cat could have food allergy. This cat could have flea allergy. This cat needs a logical workup.

Where most of you have maybe recognized yeast and bacterial overgrowth in cats or particularly just yeast has been in recurrent otitis externa in chronic otitis media in cats. Now this is a classic allergy cat. If any of you have seen the brown follicular plugging around cats with itchy ears, they itch. Cats get seasonal allergies, I know because I live with one named Henry and you can tell by the time of the year. He just starts crazy scratching at his ears, and he is just an itchy cat. This cat here had ear mites, plain old ear mites, but that got secondarily infected, and the next thing we knew is we had wild overgrowth of bacterial and yeast infection. This cat responded beautifully to treatment, but he was presented to me at 11 o'clock at night as an emergency. I said, 'Did you guys do cytology?' and, you know, no; medicine people, you know, if you cannot radiograph it, maybe...we do not know what it is. So, anyway, I'm like, 'Cmon, dermatology, TPR, skin scrapings.' So, and then we have the cats with proliferative ears and then the cats that are really important and the cats that you need to pay attention to are cats that come to you with recurrent otitis externa and chronic otitis media. In these cats, the most common cause of otitis externa in cats is undiagnosed otitis media. It takes about two years, on average, for someone to make that connection in some retrospective studies that we have done. Cats, when they get chronic otitis media or chronic otitis, everyone seems to think it is due to a polyp; it is not. Cats get pseudomonas and cats get yeast overgrowth.

Now, what you are looking at here is an otoscope, and that otoscope is attached to a cone inside of a cat's ear and what we are doing here is...this is a Tom Cat catheter and we have gently threaded it through the ear, passed the tympanic membrane, causing a small surgical incision, and have placed it in the middle ear canal and we are flushing fluid up, and this is a very first flush from the ear and everything you are seeing there, that cloudy debris, that is malassezia. So, these cats that have got chronic infections, they may have malassezia, and it may be due to allergies, it may be due to a poorly treated ear mite infestation, which is actually one of the most common triggers, in my experience, particularly once I started working in shelters, because one of the first things you do in shelters is they will treat everybody for ear mites, but they treat them once, you know, hoping that they will get a home on the next cycle, but if they are there for more than about 30 days, it will kind of become a chronic problem, and these cats will go on to become intensely pruritic, and the next thing you know is that they have

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deep ear infections. These cats do very well with treatment, but they do require a middle ear flush.

Now, there is nobody in this room who has not seen some form of this, which is facial lesions in cats, particularly chin acne. Chin acne is a clinical sign; it is not a particular one diagnosis. You can have infectious causes of it. You can have this cat here, was brought to dermatology via the dentistry service, asking, 'Do you think this cat's unilateral lesions could be due to dental disease?' and, by golly, it was. This cat was rubbing its face very, very badly just because it was painful, but the lesion did not go away with the dental because there was untreated infection present there.

Then, here is a cat with the true, really deep disorder, deep chin acne, or disorder of keratinization. Cats, on their chins, have got great big sebaceous glands and so when they are rubbing up against you, as most of you know, they are not just loving you, they are marking you as a territory to all other cats. Well, in some cats, these become tortuous caverns filled with debris, just giant blackheads, and these rupture, cause a lot of pain, they become secondarily infected, and this is something that is really difficult to manage and provide quality of life.

Then, there is the infamous, easy to diagnose (ha ha!) idiopathic facial disease of many of the smush-faced cats, particularly Persians, where they will get this idiopathic black debris. I do not like to believe in idiopathic diseases; I think that condemns a cat to a life without a diagnosis. Many of these cats are allergic. Many of them have got yeast and many other allergic diseases are well under control as long as the owner does a lot of treatment and control for the malassezia overgrowth. That was Silvio, and he was a purely allergic cat, and he did great.

My absolute favorite thing is cats that bite their toes and do toe-licking. My cat only does it at night because that is when we groom is at night, particularly in bed, but when the owners come in and they say, 'Oh, my cat's chewing his feet' I am absolutely delighted because, generally, I know that we can find a diagnosis for it. Foot-licking in cats is, you know, generally not normal, particularly when they cause damage, but yeast and bacterial overgrowth is very common, and these cats get yeast and bacterial overgrowth underneath the nail bed. So, if you have a cat that comes in, is really itchy and you cannot figure what it is, look underneath the toenails because you may see this black debris; that is a hallmark of overgrowth, particularly of yeast and bacteria, and you can diagnose this cytologically. Many cats that have got systemic diseases, particularly diabetes mellitus, will develop concurrent yeast infections, and that becomes really problematic. That is where we get into good friends with the medicine department because they are asking us how to manage this pruritic cat that has got diabetes because we cannot give him glucocorticoids, and I'm like, 'No problem, we got this,' and we go ahead and we can help with that.

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Now, malassezia also, unfortunately, can be a red flag for cats that have got serious skin diseases. Whenever you get malassezia, it is because there has been a change in the normal organization flora, fauna biology of the skin; something is amiss. It is not perfect; you get overgrowth and then you have disease. Well, the cat on the left has a paraneoplastic syndrome and it has a tumor and because of that, the cat is systemically ill and has widespread hair loss and that, again, triggered yeast overgrowth. The cat here has a thymoma, and this is probably one of the hallmark diseases where if you have a cat with intense scaling and a lot of yeast overgrowth, you quickly need to do a skin biopsy and work that cat up for a possible thymoma. Those are probably two of the most common types of presentations or flags for systemic illnesses.

Skin cytology is easily done in a dog with a glass slide because dogs, you know, they are a little bit easier to manage, but in a cat, it does not work that way, so you have to practice out of the big box store, and as the joke goes in dermatology for me is that I use Scotch tape and clothespins to help my diagnostics. You can easily put a piece of Scotch tape against a cat without causing any harm to anybody, stain it, and then be able to go ahead and look at the...(Computer presentation problems...Okay, this thing is haunted and it is not just me! You can help me. Oh, please help me! Let me check something. Sorry.)

Okay, so I will just keep chatting. Down at the bottom, you will see a scalpel blade and a flat skin-scraping spatula. That brings us to one point. I abhor the use of skin-scraping scalpels, excuse me, of scalpel blades in the use of cats, and that is because they are sharp. I feel that they can cause too much damage to cats, to people, and also, you know, I think it kind of looks pretty horrible taking a scalpel blade out, you know, and scraping it against the table and then use it on your patient. So, what we use are skin-scraping spatulas, which are basically weighing spatulas, and we go ahead and use those for doing both skin scrapings on cats and also for digging material out from underneath the nail beds of cats. What this allows us to do, then, is to go ahead and spread that material out onto a glass slide and view some cytology. (Computer problems...How are we doing there? I have to end the presentation for one second to take you out of it automatically forwarding. Just bear with me one second.)

I do not embrace technology. I just got a smartphone and it has been a very long two weeks.

I still like a blackboard with a piece of chalk. Okay, all right, hopefully, now...

All right, so the treatment of malassezia, or let me just go back to my toy, here. I carry pockets of these around, and every student who graduates the derm service – and we try not to fail too many of them – gets their own little spatula like a little reward, but these cost about a dollar, and they can be sterilized, and they are wonderful. Nobody gets hurt; it is great and, again, cause no harm to anybody in the exam room.

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All right, now for treatment of malassezia. Malassezia causes a major disruption in the quality of everybody's life, particularly the owner and the cat; it is very, very itchy. So, when you have a cat with really itchy malassezia overgrowth in the ears, steroids are a must because you need to provide some relief from the pruritus. Steroids also inhibit the production of oils in the ears, which allow the yeast to overgrow. Now, if you have got a cat that is itchy enough to be coming into your clinical practice and it needs some treatment and you find yeast on your diagnostics, you also need systemic antimicrobial therapy. (We are not totally done with this thing running by itself. I am glad you are liking this because this is good!) Cats also may need concurrent antimicrobial therapy. Now, we do not want to abuse antibiotics. Dermatologists have gone full circle back to before we had antibiotics, back in the dark ages, to now going with a lot of topical therapy. This works really good in cats because the number one thing in cats that is important is coat hygiene. A cat that has got a nice coat is generally a cat that is feeling pretty good and is grooming. Cats with skin disease, for a lot of reasons, have got dirty coats, matted coats; they retain a lot of hair. So, yes, you can bathe them and, actually, I find dogs a lot more troublesome to bathe than cats, personally. I would rather bathe a cat anytime, but many people do not like that idea and, for the most part, most cats would rather not do that; you know, I mean, they will do it, but they would rather not do it. What they do like, and what works really well, is to do a lot of extra grooming with them and what you can do is you can apply topical therapy to cats that they will tolerate. First, you will groom them with a flea comb and then you can just spray the flea comb with a 2% chlorhexidine solution and comb that through the cat very nicely, and that will, in itself, resolve a lot of the secondary bacterial infections, prevent the use of systemic antibiotics, you know, cats are hard and everything makes them vomit, and so, you know, many people are jumping to using injectable antibiotics in cats, which we do want to avoid.

Another product that has come out very nicely by Douxo is a Chlorhexidine and Climbazole Mousse, and it looks just like your own hair mousse. You just shake up the can, you mousse it up, rub it all over the cat; Henry the cat, who hates everything, just looked at me and said, 'What was that, mom? How about some more?' and it works very, very well. So, this is generally something that is very easy to treat. One of the things about malassezia that is very important to remember is that it is caused by some type of disruption and either that is a hit and run; something came, caused a disruption, you have been left with microbial overgrowth, or it is a recurrent disease. If you successfully treat one of these, a cat with this, and it recurs, start looking down the road for what are the particular causes, and the big group is allergies.

Okay, all right, now, cutting edge stuff. Something new. For those cats with allergies and those cats that have got malassezia as a trigger and someone is going to ask someplace on a little card, 'How many yeast are too many?' If the cat is itchy, one yeast is too many. If a cat is itchy, I will treat them, even if I find one or two, because it is a hypersensitivity, but cats will develop allergies just like dogs do and now there is a brand new product that has just recently been

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licensed, and it is allergy drops. Because it is an oral liquid that we can use to desensitize cats, just like we do for allergies to pollens and molds, this is the first time we have a product available to us where we can put the malassezia antigen in it and administer it to cats, hypersensitize them, and make these recurrences a lot less. (I did not do that...okay...but, it is wonderful.)

Okay, ringworm. Hopefully, things are under more control under ringworm than malassezia here. All right, dermatophytosis. Everybody in this room knows someone with ringworm and if you would all take off your shoes and socks, I bet we could probably identify about 50% of the population here with it. I want this point to stay with you. Every single person knows someone, either that or you have got some little kid running around in your house with that and keep thinking about it. Does your...the things and all the mysteries about dermatophytosis and all the myths that we are going to talk about, you know, do they lock you up in your room until you are cured? You know, do they dip you in bleach? I mean, do they give you weird treatments? No, no, no, no. Everything that happens to people is very analogous to what goes on in cats. It is a little bit about education across the board and physicians are a little bit behind on that; we are well ahead of it.

What is all the fuss about with ringworm? Well, first of all, I want to say – and this is really an important point – is what is all the fuss about? You know, we were able to find with the very first grant that we have gotten from the Winn Foundation that *Microsporium canis* was not part of the normal fungal flora of cats. They were not reservoirs of infection. If you found it, it was there, and it was not supposed to be there because cats had a really bad reputation, to the point where it was recommended to get the cat out of the house because you know it is a reservoir of infection. Well, not true. There is no evidence that *M. canis*, like many other diseases in cats, is becoming more virulent. It is contagious and easily transmitted, but it is not life-threatening. This is a treatable and curable disease. Skin lesions usually do not cause any terrible long-term damage; you might lose a little hair, but it grows back, and it has a very, very good prognosis. With all of that said, it is exactly like many other skin diseases that we find in shelters and in private practices such as cheyletiella, sarcoptes, otodectes, fleas and ticks, and, as a matter of fact, it is probably a lot more benign than fleas and ticks because it does not transmit other diseases, but it is of importance, and that is why! It is now required. You must get everyone's written permission to show their face and since the cat did not agree, we had to blind him, too!

So, this is disease of public health and veterinarians have to, and many of them do, from the things that I have been preaching because gosh knows I have more soapboxes in my trunk than anybody else. All the things we do for a new cat or a new kitten that is taken into our practices and our homes and that, you know, we will do dewormings and we will do a heartworm test and we will put them on flea control, and even if you miss cheyletiella and even if you miss fleas, just by the luck of what you do routinely, you will have identified and removed one of those other parasites or problems that are so similar to dermatophytosis. The thing that needs to be added

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now to your plan is a routine fungal culture, if you are not already doing it, because that is what we need to do to identify and screen cats at the time of adoption to make sure that they are not carrying spores or are not actively infected because this does not go over very well at all, not at all. Children are particularly susceptible because we all know that most cats never walk the first four months of their life; they live in somebody's arms, which is perfectly fine, which is perfectly fine.

I am going to present an amount of research here; some of it is mine and some of it is my colleagues, and everyone is happy that we are talking about it. This is kind of a cool thing, an update on the transmission and the pathogenesis. The primary mode of transmission to cats of ringworm is direct cat-to-cat contact. You can have some fomite transmission, but this is the big one. Somebody actually...Bernard Mignon, a colleague of mine, developed a cat hair follicle that you could grow in cell culture, which I thought was darn cool to begin with, but then he took it one step further and then put *Microsporum canis* spores, infected spores, the kind that kind of drop off the cat when they have got it, onto the skin and found out that those little spores start sticking within two hours; it peaks at about six and then if there is moisture, essentially watering them, they will germinate, and they start sending down roots. So, this means, very simply, that the very best way of keeping a cat free from exposure of dermatophytosis really is keeping them away from the source and keeping them away from other cats. This is really pretty amazing, you know, within six hours.

Where do the infections start? On the thinly haired areas of the skin. Why? Because any place a cat can groom and any place it can cause any kind of obstruction to disease is going to inhibit the infection. When you look at these models, you can find positive direct exams with a Wood's lamp and direct cytological exams within less than one week post inoculation. This was really a cool thing to find out because when Dr. DeBoer and I were doing our experimental model of infection for dermatophytes, we saw this and we thought, ooh, this was, you know, must be something just about our model, you know, just something unique to us. Well, it is not; it is unique to all cats, and it will explain a few other things about cats that have been a mystery for a while.

Okay, now, this is a giant leap of faith here. If this was 10 years ago, I would have been up here and I would have been showing you tons and tons of slides about the different clinical presentations of ringworm. That is not how I do it anymore, and this comes from working in shelters and probably looking at maybe, easily, twenty, thirty thousand cats and their cultures over these last decades with Dr. Newbury. New way to think about this disease. There are three clinical presentations and that makes it much easier. The first one is a simple infection, and this basically means the cat has a disease, but this cat or our kitten is relatively healthy, and this cat is going to respond well to therapy. It does not matter how severe the disease is on the body, but if that cat is healthy, it is going to do great because recovery is dependent upon good cell-

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mediated immunity, and you have got that in the cat that is healthy. In a cat that is compromised, different story. This is not a treatment challenge. So, for those of you who have got, you know, someone is going to ask me, 'How do I treat it?' There are a lot of different ways of treating it, but much of it depends upon, 'Do I have a simple infection or not?' Many, many therapies will work quite well because, literally, these cats are 'dying to cure' because they can. This is acute but a treatable and curable disease; it is self-curing.

Now, second type of infection is a complicated infection, and what complicates it? Well, in the grand scheme of things, it is when there is another problem present. In this one kitten here, upper respiratory disease. Immediately, that cat is complicated for so many reasons. We know topical therapy is important, but are you really going to be getting that cat wet and hypothermic. The cat has to eat; he does not want to eat. It is hard to medicate them. They may have oral ulcers, not from lime sulfur; I have never seen it from lime sulfur but from upper respiratory diseases. Maybe the cat has been a treatment failure. Maybe the owner is a nightmare to work with...lots of things. Maybe it has been referred and a lot of things have been done with it. Breed related. We now know that rex cats, for some reason, rex cats are particularly difficult to treat, more so than our long-haired cats. There is something unique about their hair coat. These represent a treatment challenge, and this is where you need to get a lot more aggressive with your treatment planning.

Okay, and then the last one, the one that kind of got us all into this in the beginning, was the lesion-free, culture-positive cat that was deemed the reservoir of infection, which does not exist. These cats that are lesion-free but culture-positive, we need to stop and think about what that means. You saw the cat. You examined the cat. You took a culture. You get your results 7 to 14 days later, and you are looking at them. Looking at those culture results is from two weeks, seven to 10 to 14 days ago. All right. Today, we do not know what that cat looks like. You have got to get that cat back in. It is not like a CBC where you can run it in 15, 20 minutes; it is a test that takes some time. So, these cats need to come back in to your clinic and based on work in shelters that we have done, and this was a shelter where I did every single culture for almost four years, and they took in 7000 cats. This is my little hands doing all those cultures, and then we would chase down every single cat, you know, Sandra and I, and we would look at them in white light, which is like this light, or a flashlight, but then used a Wood's lamp on every single cat, and repeat the cultures.

Here is what we found: Upon examination of a cat whose initial culture was positive but reported as being lesion-free, the cats broke into two groups: Lesion-free, culture-negative. They were false positives. They were fomite carriers. Somewhere along the line between being admitted and getting their admitting culture, which could be just a few minutes, they ran across some spores, which were picked up on a toothbrush culture, and they were culture-positive. While

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they were in a cage getting better, they groomed, no spores. Or, the cats at that time when we looked at them had lesions, and those lesions generally tended to be in places where they were easily missed: the toes, the nose, under the hood. How many people look under the armpits of cats? It is a very, very unique area that cats and kittens will have, and they were too small to see at examination. This goes back to that first work I showed you about transmission, where, you know, within five to seven days you can have infected hairs. Unless you spend a lot of time looking at cats and have a lot of time to look at that cat, you may miss those lesions, so this is what is really, really important is to come back and repeat those cultures on those cats and particularly a Wood's lamp.

That cat does not look very distressed to anybody in this room, okay. Maybe he has got...it looks like he has been rubbing his eyes. It can be a lot of things. You put a Wood's lamp on him and he looks really different; you can see some glowing. A good place from years of missing things and now I know now to look is look into the bell of the ear. Remember, those spores have to defeat the skin immune system and the grooming, so where is a good place to go if you want to set up house and you are a fungal spore? In some place where a cat is not...unless he has got a buddy that is going to suck his ears clean, is in the ears, so look there. That is really helpful, and those are those little bitty ones here.

Okay, now, eating crow. Again, many years ago, if you talked to me I would have said, 'Oh, I hate Wood's lamps. I hate them. Fifty percent of cats are not culture-positive.' New piece of information: I spent about 12 cups of Starbucks coffee one day chasing that little fact down to an article in the human literature where they were talking about people, and it got perpetuated to the veterinary literature that 50% of strains of *Microsporium canis* do not glow. Based upon my experience in shelters, a cat with *Microsporium canis*, active infection, untreated, always glows.

**(From the audience)** Thank you! I have been looking for those nonglowing cats and I have not found them.

**Dr. Karen Moriello:** No, the nonglowing cats are going to be the ones that were culture-positive, lesion-free, that were fomite carriers. Those are the ones, okay, and let's say they got trichophyton but that is a little bit. We are talking about *M canis*. There have been no outbreaks of trichophytions in shelters.

So, a Wood's lamp is an incredibly valuable tool. Lesions are easily missed in white light. Even if you are looking at a cat with any skin lesion, get that Wood's lamp out because you would not believe what you could see with a Wood's lamp. I am going to tell you, everybody says, 'Oh, it is so hard, you know, the apple green.' No, apple green is really not hard to mistake; it really is not. The hairs glow, not the scale, and if you cannot find the glowing, lift up the crusts. Now, a very, very nice woman gave me this as a gift and that is when I realized that not only do I need my

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glasses all the time but that the Wood's lamp I was using without magnification was really doing me a disservice because I was missing a lot of glowing hairs and that really, really helped.

I work with a lot of shelters, I deal with a lot of outbreaks, hundreds of them. I had about 400 toothbrush cultures that I have asked my student with good eyes, you know, the 22-year-old work-study student. I said, 'Would you please put your Wood's lamp on these?' and she did, and she picked up the culture-positive ones, and then I said, 'Okay, you marked them, now go mix them all back up and put them together again, put them back in their bags.' I went back and looked at them with a regular Wood's lamp and then with magnification, and I could not believe how many I missed without the magnification. This was these little bitty tiny specks of glowing hairs, so even if you are a very busy person and you get your culture and you aggressively do it and you just do not see those Wood's lamps glowing, those hairs glowing at the time of exam, take a little bit of time after you have had your coffee and, you know, during the downtime, find yourself a dark corner with your magnification, and you will be surprised at the number of glowing hairs in those bristles. They are there. They are especially there.

I love to show this one to people, particularly this is from a shelter cat, and this is a cat in a big... he was rescued from a hoarders' organization; I should not say it was an organization, the ASPCA recognized it, right, got the cats, got me involved and said, 'Okay, would you do the cultures?' I said, 'Sure, fine.' I got some pictures out of it, but here is the cat, and this is what we look like under white light. Here is what we look like under a Wood's lamp. Totally different story. Here is another cat. Somebody came through and said, 'Oh, that cat's got a flea allergy,' but because they were under direct orders to Wood's lamp every cat with skin lesions, different story. More than one problem going on, so Wood's lamps are very, very, very useful.

Along comes a Wood's lamp; what do you do with it next? You do a direct exam and, again, this has been beaten up in the literature as being a really difficult thing. It is not a difficult thing; anybody can do this. You just need a few glowing hairs, and you can easily teach yourself to do this. First of all, I want to tell everyone you do not have to go get clearing agents. You all have it; you have got mineral oil. You just need mineral oil to look at the hairs, so right away you do not have to worry about damaging your scope. You just pluck your glowing hairs out, put them in mineral oil, put a cover slip on it, and look at them. Under 10X right here, all the nice hairs that are nice and thin and very orderly are healthy. All the ones that are kind of thickened and kind of pale, those are infected. This is at 10X. First-year veterinary students, once we teach them to do this and they do a really great job with this, you know, and we do all sorts of fancy testing in practice, and so if you are not doing this because somebody told you you cannot, back up, you can do it. You guys are cat people. You can all do it. Cat people do this, and the reason it is important to do this is...this is what this hair looks like under oil, and all these little spores up in here, that are the infective spores that get in the environment. Everyone wants to know, 'What is the fastest way of getting a diagnosis?' This is our SNAP Test. An exam with a Wood's lamp.

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You find the hairs. You look at them, and you see them abnormal; that is confirmation that there is infection, and that is as fast as you can get it, and if for some reason you cannot find your glowing hairs, your Wood's lamp works not only on cats, it has absolutely no fear of a microscope. Just put your glowing hairs, or where you think your glowing hairs are, back onto the slide, grab your Wood's lamp, turn the lights out, throw everybody out, take a look, and it will glow. All you then have to do is just manipulate your stage while you are looking down through it, and you will see nice, kind of blue-green glowing and then you can go ahead and look at it under regular light and see it. So, until we can get Dr. Frank's PCR test up and running, and I have been sharing hairs with her, this is the best you have. Actually, you can do this in about 10 or 15 minutes and we will treat just based on that.

Okay, fungal cultures. I am personally a toothbrush fungal culture person because I feel you miss less, it is easier, cats actually are kind of scared, they like it. It gives you something to do when you are talking to the client and think a little bit; works great. You can buy toothbrushes for four cents each from hospitality stores, the things that supply these big organizations and hotels with toothbrushes. You can buy them online for about four cents. Everyone asks me, 'What kind of culture medium do you like?' It is not the brand you use but how to use it. You have to incubate it at warmer temperatures. This room temperature stuff does not work; at about 80°, it is easy to do. To make your own little incubator you just need a Playmate cooler, put a fish tank thermometer in it and a heater, and it will warm it up. It needs to be examined daily to confirm the diagnosis microscopically, and red does not mean that you are it.

So, this is *Microsporum canis*, the classic. This is a highly suspect culture. *Microsporum canis* is pale. It grows very slowly or very quickly, depending upon the isolate of it, but pale, white colonies that have a red rim of color around them as they grow are great. This is not a diagnostic test appropriate for cat practices. RapidVet-D is a screening test. If you carefully read the literature, it says put a Wood's-lamp-positive hair on the fungal culture medium. Well, if you have got that, you might as well just do a direct exam and away you go. This is just a screening test. I am just a little opinionated on this stuff, just a ticket. The last check I do, they did a little over 100,000 cultures since starting just in shelter medicine from the receipt, so I think we are good at that.

Pillars of treatment. There are a few. The first one is reasonable confinement, and I want to stress the word 'reasonable,' because cats are part of a family. To an easily cleaned room, systemic and topical therapy is necessary. The two drugs I use are itraconazole and terbinafine. Decontamination and disinfection and monitoring cats weekly, and it is absolutely cost effective because we are going to talk about something called the global cost of therapy. Now, confinement means just something where you can confine the cat and make it a safe environment for the cat, a place...you know, if you have got a

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cat with ringworm, you have got kittens, you have probably got kittens, okay, yeah, you have got kids, too, and they are going to want to interact. That cat needs that interaction, so you need to make it someplace clean. If people wear clothes that they can change after they have played with the kitten, transmission keeps low. Spores get everywhere, so you want to make sure that they are not putting the cat in someplace terrible like the basement; keep your closet doors shut. These seem like really logical things, but you would be surprised. You want to do reasonable confinement, and another reason you want to do weekly cultures is you do not want that kitten, or that cat that is a newly adopted family member, confined anymore than they do because a caged, even though cats will clear up faster in a cage, is really not a very good place for a cat over a long period of time.

Now, treatment. Why do you need systemic and topical? If this is our glowing hair and this is the hair follicle, systemic treatment only works at the hair follicle level. That is the only place that any of the drugs work. Griseofulvin we do not use anymore because with terbinafine and with itraconazole, they are superior drugs. They only work at the hair follicle. The problem is is that those spores go up the hair and the only thing that is going to get them is a topical treatment; that is the only way it kills them, and those spores are a big problem when you are monitoring cats. Do I shave cats? I always put my favorite shaved cat down there. No, I am not an advocate of shaving cats. Comb out those broken hairs with your flea comb. Clip those cats if you have to with children's blunt-tip scissors. If you need to use electric clippers, you need to be extraordinarily careful because I would rather have you not clip the cat than to deal with thermal burns, which happen very frequently. This glowing hair right here is what these guys are. Why do the hairs glow? They glow because the metabolite from *Microsporium canis* gets painted on to the hair. Why do you always have to do a fungal culture on a cat that has got glowing hairs? Because not every glowing hair is culture positive. That glowing is from the chemical, and so later during treatment you may still have glowing hairs, but that cat may be culture-negative.

What research I have been involved in? Again, seed money has led us to being able to do great studies on topical therapy and systemic therapy, looking at experimental models and field models where we have looked at many drugs, but the two that are my favorite are itraconazole and terbinafine. You can use them daily, and one of my favorite protocols is to use either one of them for 21 to 28 days along with concurrent therapy and then stop. The nice thing about itraconazole and terbinafine is they lag and they stay in the skin for several weeks afterward. There is a protocol where itraconazole is licensed in Europe for week-on, week-off therapy. They tell you just do it six weeks, is enough; that is not enough. It is not enough until the cat is cured. There is no reason to use ketoconazole on cats, makes them sick, and fluconazole was a real big interest because it was generic but right now, terbinafine, you can get 90 tablets for 10 to 12 dollars, and depending upon the cat, that can be a lot of doses, so you do not really need to even go there. Twice a week topical therapy until cured. Now, the confirmed, based on

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studies that we have done both in vitro, backed up in vivo in shelters and, most recently, in a very large shelter with endemic dermatophytosis that Dr. Newbury and I worked with one year to eradicate it from the shelter. The ones that we can use are lime sulfur, ketoconazole, or miconazole. Currently, right now, I have been looking at accelerated hydrogen peroxide; it is very antifungal in vitro. We have just started an in vivo test. Ketoconazole rinse and shampoo, very antifungal. Climbazole Mousse, again, is very antifungal, and then terbinafine spray is absolutely great, except it is something for people, and so you spray it, people spray it on their feet, it is Lamisil spray, okay, but the problem is most people do not stick their toes in their mouths like a cat might, so I do not collar cats when I treat them topically because there is not any need to do it, but if you use terbinafine spray on a cat, you probably might have to collar them because we do not know the safety of that drug yet, but there are some other things. My feeling is that any topical therapy is better than no topical therapy on a cat.

In shelters we will use lime sulfur, we use a Rose & Garden sprayer; actually, cats do this really well. We can do 20 to 30 cats in a half an hour. The key is warm water with the lime sulfur. Cats do not like cold water, and they do really well, and you have to coat them. The thing that is really neat about lime sulfur – I know it smells, but is really neat – is that it gives off little plumes of antifungal vapors after it dries. It was originally developed to treat the Champagne grapes in Bordeaux, France, and that is what they found out. I thought, 'Oh, this is really great!' because I was tracing the history about lime sulfur back and, yes, it was, you know, probably one of the first organic treatments back in Roman and Greek days, but that is really where the lime sulfur mix came up that we are using now, and, again, I do not collar cats.

Here we come to another very controversial issue, of which I will not move away from: Mycological versus clinical cure. This is the same cat, only two weeks apart. Cats, I always say, you must treat them until you have two negative fungal cultures. Some cats will clinically cure before they are fungal-culture cured; that is two cultures. On the other hand, some cats will be mycologically cured before they look clinically cured. Those are the cats that come in and have had a really rough life. They have been rescued. They are being treated and they maybe have been clipped, with some mats removed, or they were not in the greatest of shape. They are culture negative but they have not directed their energy toward growing their hair coat back, so they are culture negative, they are cured, but they look kind of ratty. So, the only way to know is by fungal culture. In studies that we have done, the mean number of days to cure, when we have done weekly cultures, is between 14 and 42 days. What this means is the number of days to cure, and that date is from the second negative fungal culture. So we still have to add some days on there to finalizing it, but that means that we are getting negative fungal cultures very quickly on these cats, and I will show you why in a second. So, that is a pretty short period of time, and so we are kind of over-treating some cats, and the only way to really know if you are doing it is to do it weekly.

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Here is my plea to consider going with weekly treatment. Consider the global cost of treating a cat. You need to confine them. Now, there are cat issues and family issues. We all know this. Quality of life issues are really important. Extra cleaning of the home or the facility or the cattery, very important. We do not want to have to do that anymore than we have to, and you do need to do extra cleaning for that. Oral medication, we want to use as much as we need to, but as little as possible, and we do not want to have to do anymore topical therapy than we need to because it is not pleasant for anybody. So, weekly fungal cultures provide feedback on spore counts and cure. Also, just think about this: If you are one of those people who does a culture at four weeks and then you wait for the results, and then you do another one. What are you doing in between there? Are you giving the cats drugs? Are you confining them? Are you still dipping them? What are we doing? Because it really does depend on the cat.

Another thing that has come out of my research is that it is no longer any good to say a positive culture versus a negative culture. All three of these cultures that you are looking at up there are positive, but they mean different things. This one here has a single positive culture on it. That is a single little arthrospore that I showed you, dropped onto that fungal culture plate. This one has just a few more, and this one, wow! That is a cat that is really infected where there is a lot of spores. So, when we monitor cats for treatment...this started as a research tool, and not in the DeBoer and Moriello lab, it started back in the '50s when they were doing the original studies with guinea pigs. They found out that you had to do weekly cultures and monitor weekly cultures to look at cure rates because as infections worsened, culture numbers went up, as infections got better and the guinea pigs cured, they went down.

This is data from one of our study cats. This cat came in, he was treated, and he was Wood's positive and direct positive. After seven days, he – we call this a P3 because he had more than 10 colonies – was still a P3. Within week two, he was down, over here, to less than 10 colonies. By week three, he had one to four colonies, and then by week four, was no growth, and then continued on with no growth. So, we are culturing them weekly. I can tell this client, I can tell this shelter, I can tell whomever I am reporting to, this cat is getting better. I can see this going down the road. I can tell you this. If I was somebody who was going to go, and my rule of thumb was, I am not going culture the cat maybe until, you know, maybe week six because I have seen that in the literature. So you get your first culture at week six, well, guess what? You have missed a couple of weeks where that cat was already cured. You have really overtreated him. Now you have got to wait another couple of weeks to get another culture. You are going to be treating that cat, confining the cat, doing a lot more while he is already cured. So, again, it is really the only way you can do it is to go with weekly treatment and when you add up all of those costs, it is cheaper. When you are in a shelter, the cost of one fungal culture is equal to one animal care day, so, therefore, it makes it hugely, hugely important.

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Now, back to this, back to your friends, maybe not you, with ringworm, and back to your cat with ringworm. Everybody knows something. My recent work has been on decontamination and I guess I just want to tell you, just make a, you know, explain what is contamination. Here is our kitten with ringworm. Hair falls into the environment. That is what it looks like microscopically. This is what it might look like under a Wood's lamp, and under a microscope here, but these little hairs and these little spores end up on fungal culture plates. What does that do? If the environment is contaminated, the cat is going to roll around and get dusty. Just take out...just everybody please, go home with a flashlight, find your cat, turn the light on; you are going to see dust. That cat is going to have spores stuck in dust. Spores like dust, and what can happen is you will get a false positive test.

The major problem with environmental contamination is not transmission of the disease. This is the only documented case report I could find of transmission from environment to a kid. I have seen it in shelters when people have grabbed one infected cat and then grabbed another, or have used a contaminated clipper, but just a cat in an environment, even in our experimental studies where the rooms were contaminated, they did not get infected. They needed cat-to-cat transmission. So, the problem with environmental contamination is it makes it difficult to interpret when your cat has a cure, and you end up overtreating.

So, myth-busting. This is in a book, out of a textbook, for veterinarians. Once you get in the house, you cannot get rid of it. That is so false, and this is what really freaks clients out is you tell them the cat, that, you know, there is environmental contamination and their mind immediately goes to...what is on TV right now? The black mold of everything. All these terrible storms, all this terrible damage. Ringworm spores just lay on the ground like M&M's, waiting to get swept up. They cannot multiply in the wood, in the environment, anywhere. They cannot do that. They can only live in cat hair, so unless you are living in a house with cat hair like the old lady who lives in a shoe, it is not going to multiply! It is just going to lay there. So this is a myth, that it invades things. So, it is very, very good on our part.

Another thing. It is in the air. People come to me and they say, 'Oh, I'm breathing it. I need to wear a mask.' I'm like, 'No, nope, you don't, mm-mm, no.' In a field study where I was absolutely convinced that maybe, that they were blowing around, I went in there. There were 30 cats in a shelter treatment area. I put fungal culture plates over these vents and as the hairs were all blowing around, I was expecting that all my culture plates would grow positive. They did not and I was like, 'Aw, didn't work.' I did it again and it did not again and did not again, and then finally I said, 'Where is this stuff going?' and I thought, 'Why don't we check the furnace filter?' By golly, that furnace filter was positive, so your furnace filters are trapping your hairs. So, moral of the story, get a good furnace filter. So, that is great.

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So, the evidence to date: Environmental control for ringworm needs to be constant and continual; if it is all you can do, it is tremendously important. The two most important steps, the two important steps, are aggressive mechanical removal of hairs and debris and then scrubbing it, like Grandma used to do. Aggressive scrubbing with a detergent and then rinsing it clean with water. There is no disinfectant that is a one-step disinfectant; that is all malarkey. If you read the labels, it always says clean it, clean it, do an aggressive cleaning, not effective in organic material. There is no such thing as a one-step cleaner, and you have to rinse them because most disinfectants are inactivated by detergent residue.

Okay, so mechanical removal. In this particular shelter, what we did is we, over eight weeks, we monitored 20 different sites, and we had almost up to 30 cats at one time, and all they did was exactly what I told them, was mechanical removal, washing them, twice weekly disinfection with a 1:100 dilution of bleach and, at the very most, we had four sites that were positive. The week that we had four sites that were positive was because somebody forgot to change the gown that they were wearing when they were dipping cats. So, we did not have it blowing around; we did not have it anywhere. That is I think is pretty convincing, but that was not good enough, so I made my resident, Dr. Bill Oldenhoff, do a weekly one-year surveillance at a veterinary teaching hospital, so a veterinary clinic, and we did random weekly cultures, 14 different sites; he will tell you 1800 cultures later and a little bit of wrist pain, and what we found was that routine mechanical cleaning of the floor throughout the day and twice weekly cleaning and the use of quaternary ammonium cleaner revealed rare isolation of spores. However, the dermatology room happened to be the hot spot, so if any one place was to be positive, it was our room, and that was because the place where the cats were coming in for this was the hot spot. So, it was not throughout the whole hospital. So, anytime we had a cat that was positive, we chased that cat all through the hospital no matter where he went and did cultures to look to see whether or not this cat was spreading spores, and it was not. As long as we kept him wrapped in a towel, he was good to go.

Now, for ringworm cleaning, make your life easier; mechanical removal, get friendly things. I like this stuff by the 3M Easy Trap, and I do not get any money from them; I have asked them for money. They will not give me any money. They will not give me any samples, and I tell them I do this. This stuff is like sticky paper. It is like Post-it notes, and it looks just like a Swiffer and it picks up debris everywhere, and it is very, very nice to do it, but sweeping, if you use a vacuum cleaner, do not use anything where it blows out like a Shop-Vac; use something with a cup when you do not have a bag to do it with, but sweeping and the swiffing works great and then, washing.

This is a room in a shelter where there were a bunch of kittens that had ringworm, and we were concerned about upper respiratory disease. We completely decontaminated this room simply by washing everything with soap and water, and it was amazing, so mechanical removing

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did it. Again, I have already coached about there is no such thing as a one-step cleaner and disinfectant, and a lot of companies will sell that to you and try to, and do not believe it, but, basically, mechanical removal, because these ringworm spores fall to the ground, they stick to dust, and, therefore, they can be removed. They are just like M&M's. Then, get friendly cleaning. Remember the business about moisture? You do not want wet, moisture, and mops all over your clinic, so what I really like, again, 3M – and again they will not give this to me – they have these things called flat mops. They are very nice because what you do is, it is a reusable, and so this is a big state to be eco-friendly in, pads that will really scrub up and clean an area. They come with these little tiny, you just squeeze it out, containers where you can put your detergent in there and clean the area, then you can rip off that little Velcro flat mop, put your disinfectant in there and then go right over it, and it is really easy. You could buy it on Amazon.com for about, I think it was like \$1.19 the last time I looked, and they are really, really easy to use, so if you have got a clinic, then this is so much nicer than that big, dirty bucket of water, and that big, dirty bucket of water is bad.

In some of the early studies that I did where I really beat up a lot of disinfectants, it is because what we did them on was very dirty environments. We used them on contaminated areas, so the only thing that came up positive was formalin and undiluted bleach. Well, neither of those are really kind of friendly to be using, so let's talk about bleach. I have concerns about bleach, as most of you do; pet and human health concerns. It needs to be fresh because it breaks down and watch out for purchase expiration dates. I once had a project go completely sideways because the bleach we were using for our positive control was expired. So you have to buy it fresh. Who would think bleach would have an expiration date, just like soda pop. It needs to be mixed fresh and more frequently if it is in a spray bottle, the bottle needs to be dark. Less effective if there is detergent residue, and it can be totally ineffective if there is too robust a challenge, so if you go and spritz it on an area that is very dirty, it will not work. It will not penetrate hairs. In what concentration? When the area looks clean, is absolutely clean, you can use it safely at 1:100.

Research on disinfectants. Many of the things that are labeled as antifungal, they use trichophyton, and so what we did find is, I had another very industrious research student and what we did is, we thought, 'Let's go ahead and let's look at those things that are over the counter that are available for use for people,' and we looked at a number of products. What we actually did is we took small swatches of cloth and we contaminated them with a little over 5000 infected spores, which is a lot, and then went ahead and sprayed them with the products that were labeled there, including Trifectant, which I beat up a lot in previous studies, and sprayed them once to kind of mimic somebody doing a spritz and then five times to mimic a thorough application. What we found was that a lot of the products that are available to you over the counter are extraordinarily antifungal when used aggressively and thoroughly, and they are

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ready to mix. One of the latest products that many people are probably using is accelerated hydrogen peroxide or Accel. This is something I really like because it is very good against staphylococcal bacteria, which is a big problem in a lot of practices.

For those of you who use clippers, you are probably wondering if I have done anything with clippers; nothing escapes me, and I can tell you that if you can mechanically remove all of the hair and spores from your clippers and then use Clippercide and spray them and follow the instructions, which is to spray it real thoroughly, let it sit for 10 minutes, you will absolutely be able to kill spores. If you are traveling to various shows and that, you should never leave home without your Accel spray and Accel wipes because they are very effective against...Accel wipes will help you remove a lot of...mechanical removal of debris and Accel for 10 minutes on an area is antifungal.

Now, to laundry. That is my latest project funded by the Winn Foundation. This is not my basement, but the original studies were done in my basement because I thought I cannot do this study if I will not ask people to clean...let me back up. If I am going to tell people how to clean something, I better be able and willing to do it in my own house, and so my husband will attest to our basement being a laboratory. What we did is we looked at various different ways to find out what is the most dangerous kind of laundry combination you can have with infected spores. So, what we did is, we took infected – I took, he watched and made coffee – and we did various combinations, and what we found is that if you really want to enhance the spread of contaminated spores from a wet contaminated area to laundry that is uncontaminated, make sure everything is wet. Wet, infected material on wet towels, we had 90% contamination. The next one, again, if the infected towel was dry but the uncontaminated areas were wet, 50%, and, again, if the towels were clean and uninfected but wet, infected; dry-dry was the least one. I would pretty much tell you probably the safest thing to do is if you have got contaminated material, bag it up, wash it as quick as you can, do not keep it in contact with anything else. In humans, they suspect that over 50% of transmission of fungus, of an athlete's foot fungus, from one member or family member occurs because of the laundry.

Okay, and so then, on the second part, we are not done with all of the study, we still have the carpeting and that is in progress, but we looked at, 'Hey, what about laundry?'; you know, what temperature do we need to wash things in? So, what we did is we took macerated infected hairs, so we took a bunch of infected hairs, grind them up, not in the kitchen, obviously – some things are done in a laboratory – took something about this size that was either made of linen, denim, or terry cloth, and gave it a contamination of 5000 infected spores per piece and then did 100 of them. I washed things in cold water, cold water with bleach, then cold water with bleach and then a dryer, and then repeated it again with hot water. The cold water was whatever was cold coming out of my particular basement and hot water, we had to crank up the hot water pretty hot to get it to 60° centigrade, which is the recommended temperature for human laundry,

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and what did we find? Well, we found that, basically, washing things worked pretty darn well to get rid, just plain old washing with a detergent, really removes infected spores, and in those things, we only...in the first study, with just cold water and detergent, we found only 16 incidences where things were still positive, and, again, it was just one to four colonies per plate, and the hardest thing to wash was denim. Take-home message: Do not wear denim around infected cats. When we used bleach and cold water, there was no transfer to uninfected material, because I threw some uninfected towels in there, and no contamination, so bleach is a pretty good thing to use. Hot water and detergent, we just had two positive transfers and, again, it was on denim. The problem was that although the hot water, which is about 140° Fahrenheit – I am almost done – is very, very antifungal. It does not stay that temperature in the laundry tub, so you really have to make it hot, but if you add bleach to it, you are in good shape. So, basically, there was also no contamination. So, the best recommendation – and here is where I am ending – is, best recommendations for washing: Keep it separate. You can use hot or cold water, use bleach, hand washables, which should be the only reason why you would wash something in cold water and not use bleach, wash them several times, and line-dry them. Again, you are looking at 140°, so you are going to have to take a meat thermometer to do that testing, but it is very, very hard to maintain it. Routine washing with a half a cup of bleach was very effective, and I think that should bring a lot of comfort to people to know that you can just wash things and get rid of infected spores. So, thank you very much and thank you for letting me go overtime.

(End of Session)

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