



THE PERCEPTION AND REALITY OF RINGWORM TRANSMISSION

by Annette Uda

Traced back to the 15th century, ringworm has a long and evolving history of how it's treated and perceived. As suggested by its name, this highly contagious fungal infection, characterized by a distinct circular rash in humans, was at one time believed to be caused by parasitic worms.

In the coming centuries, ringworm was understood to be a fungal infection, but the name stuck and belief in the ways it can be (or not be) transmitted also remained stuck. Ringworm can be transmitted from animals to humans (and from humans to animals) by direct contact with contaminated sources—this is without debate—but can ringworm also be transmitted through the air?

A VERY BRIEF HISTORY OF RINGWORM PERCEPTION AND TREATMENT

While little was known about ringworm at the time, in the 1800s, its spread among humans was generally attributed to poor hygiene and diet. In the April 1912 publication of *Popular Science Monthly*, an explanation of “immigration law as it stands since the legislation of 1907” noted the required mandatory exclusion of immigrants with “loathsome or dangerous diseases,” including ringworm.

Up until the mid-twentieth century, treatment for

ringworm was something akin to “slash and burn,” with hair removed and caustic chemicals applied to destroy the fungus. In 20th century London, children with the fungal infection were relegated to “ringworm schools” and treated with x-rays.

How ringworm was spread and treated was more closely and accurately examined during the Second World War when members of the military began contracting ringworm and other fungal diseases, particularly in tropical locations, and during the 1950s when the toxicity of contemporary ringworm treatment was called into question.

But what do medieval names, immigration laws, London ringworm schools, x-rays and military movements have to do with ringworm in dogs and cats? In short, how ringworm is spread in animal care environments remains a subject of debate and knowledge should always be evolving. As indicated by the name of this fungus, nothing about ringworm is a straight line.

WHAT CAUSES RINGWORM IN PETS?

Ringworm is caused by pathogenic fungi known as dermatophytes. Among the dermatophytes that cause ringworm, the *Microsporum canis* fungus is responsible for 98 percent of the ringworm cases in cats and 70

percent of ringworm in dogs (followed by *Microsporum gypseum* at 20 percent and *Trichophyton mentagrophytes* at 10 percent).

In addition to dogs, cats and humans, ringworm can occur in all domesticated species of animals. The fungus feeds on the dead keratin in upper layers of skin, hair and nails. The tell-tale patchy hair loss in animals is the result of easily broken, weakened and brittle hair shafts. As the fungal spores multiply, the infection can spread. Ringworm can typically remain viable for up to 18 months.

Generally speaking, ringworm is more common in cats than in dogs, but geographic location can also play a role. As the fungus thrives in a warm, damp environment, not surprisingly, ringworm is reportedly more common

in the southern part of the United States. Since Hurricane Harvey hit the Houston, TX area in 2017, the Houston Humane Society notes an increase of ringworm that shows no signs of abating. Ringworm flourishing is attributed to the area's typical warmth and humidity.

Not every pet or person exposed to ringworm spores will experience an infection. A variety of factors play a role, including age, health, suppressed or compromised immune system and nutrition, as well as the number of spores present to establish the infection during the circumstances of the exposure.

HOW IS RINGWORM TRANSMITTED?

Ringworm is transmitted by direct contact with the fungus, whether from

an infected animal or person (including an asymptomatic carrier), a contaminated fomite or surface. The spores of the ringworm fungus are remarkably hardy; able to remain viable for longer than 18 months given the right environment. Direct contact transmission of ringworm, as just described, is without debate, but is there another mode of transmission? Can ringworm be aerosolized? And, if so, can it still cause infection?

Arnold Plotnick, MS, DVM, ACVIM, a board-certified veterinary internist, feline specialist and the owner of Manhattan Cat Specialists describes the potential for aerosolized ringworm fungus:

“Spores are small and may also be carried on air currents and on dust particles. Once the spores reach the coat,



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**RINGWORM TRANSMISSION
REALITY EVOLUTION**

Despite increasing discussion of ringworm fungus aerosolization, there is no doubt the common perception that it is not aerosolized is firmly entrenched but, as documented above, the premise that it can be aerosolized is not without support. Bearing in mind the previously discussed 2003 study and the uncertainty in the sampling methods of the 2014 study, here is the minimum of what is known: The ringworm spore is no greater than three microns, an easily aerosolized size, and the spores can remain viable for at least a year and a half.

Google “ringworm” and virtually every article kicks off with some variation of “ringworm is a fungus, not a worm.” A 15th century understanding of this fungal infection commonly persists because of perception without knowledge. For some, there is no debate as to how ringworm is—and isn’t—transmitted. But when the health of animals and the humans who care for them is at stake, the goal should be to never stop learning and evolving to safely prevent the spread of disease. Additional studies may help further understand the transmission of ringworm. +

if they survive the cat’s natural defense mechanisms (for example, grooming and sunbathing), they adhere to and invade cells called keratinocytes on the hair shaft and skin (and occasionally, the nails) and they germinate, initiating the infection...”

Microsporum canis, the dermatophyte responsible for 98 percent of the ringworm cases in cats and 70 percent of ringworm in dogs, is between two and three microns in size. That is, as suggested by its name, microscopic. In an animal care environment, fungus spores that are continuously shed create a high pathogen load, depending on the number of infected animals.

As further described by Dr. Plotnick, “Ringworm spores can persist in the environment for a long time, perhaps 18 to 24 months. The spores are microscopic and can be spread easily by air currents and contaminated dust, and through heating ducts and vents.”

The premise that ringworm spores can be aerosolized finds notable support in a 2003 study: “Environmental Detection of *Microsporum Canis* Arthrospores in the Households of Infected Cats and Dogs,” published in the *Journal of Feline Medicine and Surgery*. The researchers, collecting air samples using a Sas super-100 air sampler found, “In this study, infected cats appeared to be a striking source of contamination in their environment, and also provoke a massive airborne presence of viable fungal elements.”

In the 2014 clinical review, “Feline Dermatophytosis: Aspects Pertinent to Disease Management in Single and Multiple Cat Situations,” also published in the *Journal of Feline Medicine and Surgery*, the author acknowledges, “The question of airborne transmission of spores inevitably arises, both in private homes and in shelters,” and cites the above-referenced 2003 article.

However, in contrast to that earlier study, Dr. Plotnick describes, “In a field study conducted by the author, airborne transmission of spores was monitored in a dedicated treatment facility. Contact plates placed over forced air heating vents on random sample days were never found to be culture positive, even though at times more than 20 cats were present in the facility. However, furnace filters during this time period were always culture positive, indicating that infected hairs and spores were drawn into air vents and trapped in the furnace filter and not being blown throughout the facility.”

Can the 2003 study and 2014 be reconciled? It may come down to air sampling methodology. In short, a school of thought holds that putting plates in front of an air supply vent is not a valid air sampling strategy. Impaction of spores on the plate requires a velocity faster than what is simply needed to spread spores within a room, which may explain why spores were not collected in the 2014 study.