

Spread of *Sporothrix* spp. through respiratory droplets from infected cats: A potential route of transmission

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Abstract

Cases of cat-transmitted sporotrichosis in Brazil have increased in recent years. We collected respiratory secretions expelled while sneezing from 28 cats diagnosed with sporotrichosis. We identified the presence of *Sporothrix* spp. in respiratory droplets expelled in the sneeze of infected cats. The results raise concerns about a new transmission route for cat-transmitted sporotrichosis. Physicians who diagnose and treat human cases of sporotrichosis should be aware of this potential new transmission method to improve clinical suspicion. Approximately half of patients with granulomatous conjunctival sporotrichosis did not report experiencing traumatic injury from cats.

Lay Summary

Cat-transmitted sporotrichosis is a zoonosis in geographic expansion from Brazil to other Latin American countries and is considered a public health problem. Data suggest that transmission can occur through the sneeze of an infected cat. The One Health approach is necessary to control the disease.

Keywords: transmission, One Health, sporotrichosis, zoonoses, diagnosis

Cat-transmitted sporotrichosis (CTS), caused by *Sporothrix brasiliensis*, is an emerging fungal disease that has become a major public health concern in Brazil, affecting thousands of humans, cats, and hundreds of dogs in recent years.¹ The CTS epizootic outbreak has crossed the Brazilian border and it has been documented in countries like Argentina and Paraguay.² Data suggest a rapid increase in human cases in Brazil; a referral hospital in Curitiba, Brazil reported an increase in incidence from 0.27 cases/100 000 patients in 2011 to 30.4 cases/100 000 patients by July 2021.³ Recently established human and animal surveillance and control programs have utilized the One Health approach, leveraging interdisciplinary partnerships to help combat further spread.⁴

Enzootic and zoonotic transmission of CTS usually occurs through the implantation of *Sporothrix* yeasts through scratches, bites, and even by direct contact with heavily contaminated cutaneous feline lesions.⁵ In cats, the most frequent clinical manifestation of sporotrichosis consists of ulcerated skin lesions, but it can also present with nasal involvement, sneezing, and rhinorrhea.⁶ Mucocutaneous lesions can harbor a high burden of the infectious yeast forms of *Sporothrix brasiliensis*.⁷

Ocular manifestations of human sporotrichosis (e.g., granulomatous conjunctival sporotrichosis) have been associated with facial trauma, although non-traumatic methods of infection such as droplet exposure on mucous membranes are possible.^{4,8} In a recent outbreak, seven employees of a veteri-

nary hospital were diagnosed with sporotrichosis after exposure to an infected, injured cat; one employee was diagnosed with ocular sporotrichosis after the infected cat sneezed directly in her face.⁹ The isolation of *Sporothrix* in the nasal cavity and the occurrence of sneezing episodes in cats have been reported previously,^{10,11} which supports our hypothesis that *Sporothrix* can be transmitted through sneezing and respiratory secretions from infected cats.



Figure 1. Cat sneeze collection technique with sporotrichosis.



Video 1. Cat with sporotrichosis sneezing directly into the Mycosel agar plate (Supplementary material).

We collected respiratory secretions expelled while sneezing from 28 cats diagnosed with sporotrichosis. Infected cats were diagnosed using skin cytology and culture of skin lesions. We placed a *Mycosel* agar plate (BD) in front of the animals' nostrils and used a nasal swab to stimulate sneezing (Fig. 1 and Video 1). Samples were incubated at 28 °C–30 °C for 4 weeks

in the Mycology laboratory of Hospital de Clínicas. This study was approved by the Research Ethics Committee on the Use of Animals at PUCPR under number 01691.

Of the 28 respiratory specimens collected, 20 (71%) grew *Sporothrix* spp; fungal isolates were identified using morphological characteristics. The main cutaneous manifestations observed in the cats participating in the study were disseminated. Most were in the head (29%) with a predominance of the nasal cavity (24%) and ears (14%), involvement in the paws (13%) and tail (11%) were also frequent. The enrolled cats were subsequently treated for sporotrichosis at a referral hospital, the Veterinary School Clinic of the Pontifical Catholic University of Parana (CVE/PUCPR).

With this study, we identified a possible novel route of transmission of *Sporothrix* spp. through feline respiratory secretions expelled during sneezing. The respiratory droplets created by a sneeze contain viable *Sporothrix* yeasts that could infect humans and other animals who experienced mucocutaneous exposure (Fig. 2).

From a One Health approach, control and prevention of sporotrichosis should focus on reducing both cat-to-animal and cat-to-human transmission. Transmission of *Sporothrix* spp. from cat-to-human can occur at several different human-animal interfaces (e.g., veterinary clinics, pet shops, households). Veterinary care frequently involves procedures that stimulate the production of respiratory droplets (e.g., nasal swabs); animal restraint and other close contacts can directly expose staff to infectious exudates. To prevent cat-to-human transmission of *Sporothrix*, personal protective equipment (PPE) such as gloves, face shields, long-sleeved coats, and eye protection are recommended for handling a cat with suspected sporotrichosis.¹⁰

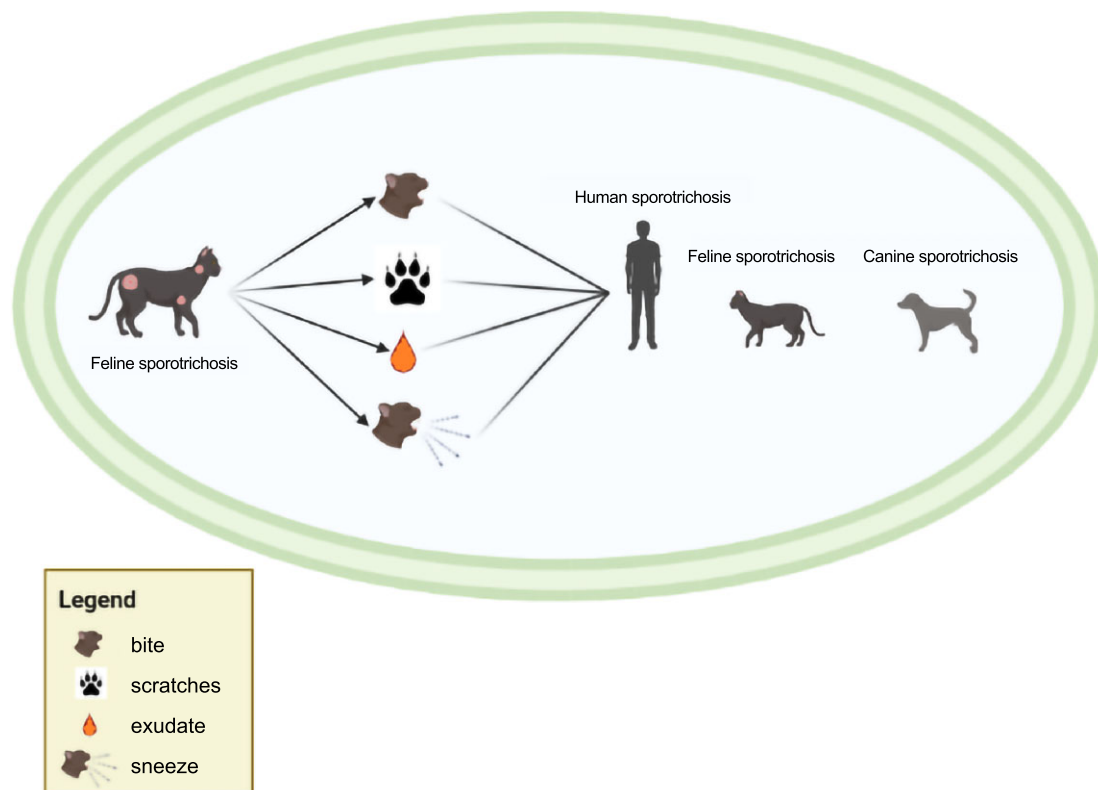


Figure 2. *Sporothrix* transmission routes from infected cat. Transmissibility can occur through bites, scratches, contact with exudate from highly contaminated feline lesions, or through the sneeze of an infected cat. All of these forms can infect humans, other cats, and dogs.

This study's findings highlight the importance of eye protection to prevent mucosal exposure to both secretions and infectious respiratory droplets. Because this study identified viable yeasts in respiratory droplets from sneezing, decontamination, and disinfection of surfaces after procedures (e.g., with 1% sodium hypochlorite) can prevent further transmission.¹²

To prevent cat-to-human transmission in a household environment, pet owners of infected animals should be educated on isolation recommendations (e.g., infected animals should be isolated from other animals and humans), the use of personal protective equipment (i.e., face shields, gloves, and eye protection), and proper animal handling, especially during medication administration, to prevent scratches and bites. Precautions should be maintained until the animal is clinically cured and there are no signs of disease. Pet owners should also be aware of the signs and symptoms of human disease to encourage early diagnosis and treatment in case of any zoonotic transmission.

To prevent the spread of cat-to-animal transmission, pet owners should prevent their domestic animals from interacting with free-roaming cats by keeping them indoors and promptly seeking veterinary care for sick animals. Cats are commonly owned in Brazil and many have access to the outdoors; most are unneutered and have contact with animals outside of their household.⁵ Knowledge about CTS transmission and clinical signs can help pet owners protect their animals and seek early veterinary care as necessary.

One Health partners and collaborators such as veterinarians, physicians, health authorities, epidemiologists, and microbiologists should be made aware of the potential spread of *Sporothrix* through respiratory droplets. These findings highlight the importance of avoiding direct contact with infected animals; if contact is unavoidable, eye protection and masks can prevent mucosal exposure to infectious droplets.

Supplementary material

Supplementary material is available at [Medical Mycology](#) online.

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Declaration of interest

The findings and conclusions of this paper are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention (CDC).

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