

Perspective

Reemergence of zoonotic sporotrichosis in Brazil as a public health threat

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Abstract

The incidence of the sporotrichosis has been alarmingly increasing in Brazil. The species is the primary causative agent of sporotrichosis, and its adaptation to the tropical climate and environmental conditions of the country creates a favorable scenario for an epidemic. In addition to Brazil, other South American countries and even Europe have reported cases of infection caused by *S. brasiliensis*. This perspective highlights the high incidence of sporotrichosis in Brazil, offering insights into the country's official data and its significance for public health.

1 Zoonotic sporotrichosis

Sporotrichosis is an infectious disease caused by fungi *Sporothrix spp.* and can be considered a zoonosis due to its ability to be transmitted between humans and animals. In its zoonotic form, the domestic cat is the primary vector, transmitting the disease mainly through scratches or bites. The biological habits and characteristics of cats facilitate their interaction with fungi colonizing branches and trees, either through scratching or direct contact with contaminated surfaces [1]. The sapronotic form of infection, though less common, can also occur in humans.

The clinical presentations of the disease are characterized by distinctive skin lesions at the site of a bite or scratch or even diffuse skin involvement following direct contact [without skin trauma] with exudates from an infected cat. In some specific cases, the disease may manifest in less common areas, such as the oral and ocular mucosa [1] (Fig. 1).

Oral and ocular manifestations of sporotrichosis are more frequently observed in immunocompromised patients, characterized by nonspecific chronic ulcers, often associated with the disseminated cutaneous form of the disease. These lesions can appear as reddish to yellowish ulcers located on the palate, tongue, buccal mucosa, and gingiva. In some cases, larger and more severe ulcers have been described. In the ocular region, the disease may also present as granulomatous conjunctivitis, with redness, swelling, and itching. Diagnosing these manifestations requires a multidisciplinary approach, including the correlation of clinical data, laboratory tests, and microscopic analyses [2, 3].

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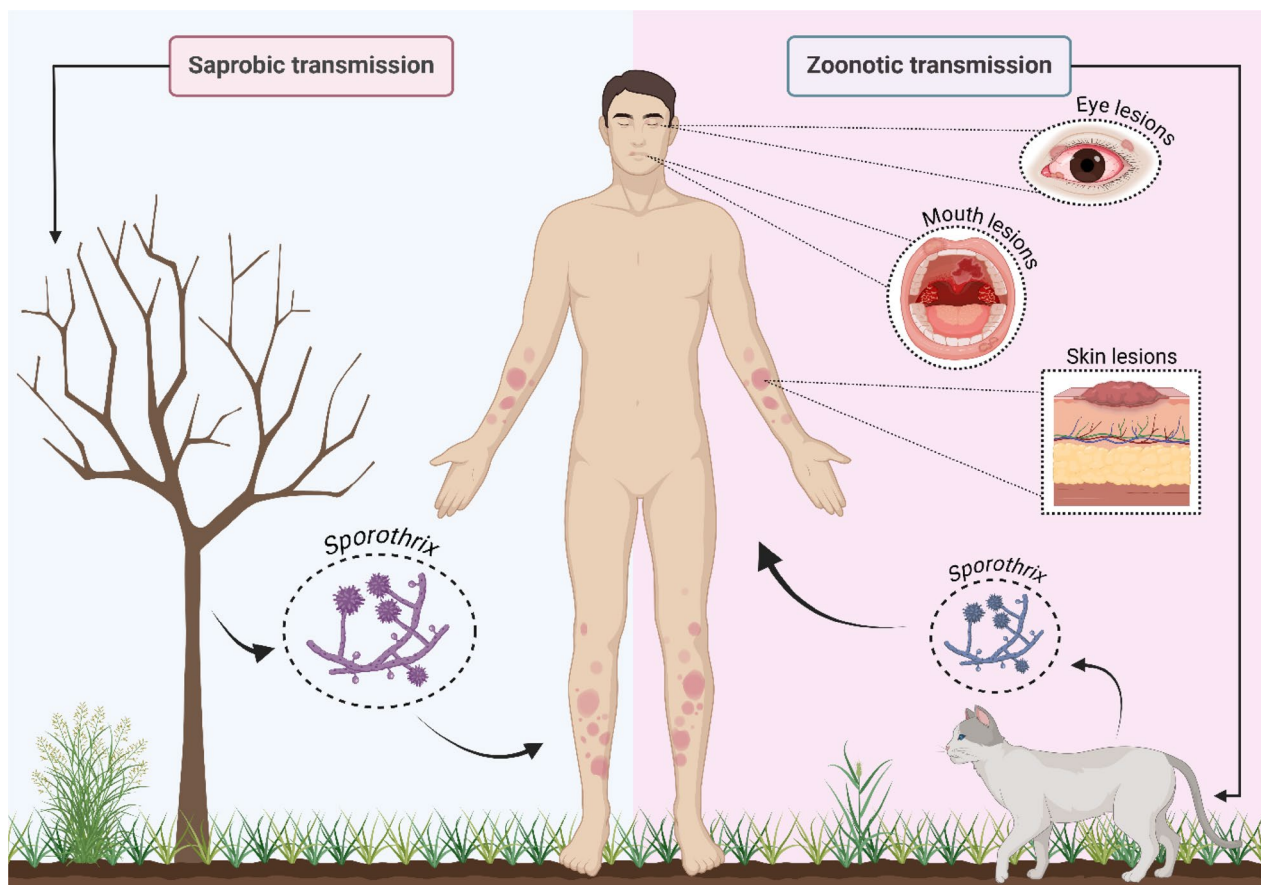


Fig. 1 Transmission and Clinical Manifestations of Sapronotic and Zoonotic Sporotrichosis in Humans

2 Epidemiological situation of sporotrichosis in Brazil

Since the first reported case of zoonotic sporotrichosis [cat-to-human] in Brazil in 1955, the number of cases has been increasing over the years. In 1990, there was a significant outbreak of the disease in cats, particularly in the State of Rio de Janeiro, and gradually the number of cases in humans and cats has been rising in other Brazilian states, with only the state of Roraima not reporting the disease in humans until 2019 [4]. Thus, the disease caused by the fungus of the genus *Sporothrix* spp. has been spreading alarmingly throughout Brazil, negatively impacting public health and keeping health authorities on high alert.

According to data from the Ministry of Health, in Brazil, 1,239 cases of infection by *Sporothrix* spp. were diagnosed in 2023, with more 945 confirmed cases up to June 2024. In the state of Paraná, located in the south of the country, where the disease has been included in the compulsory notification list since 2020, the number of new human cases increased from 253 in 2022 to 853 in 2023. In cats, the reports surged from 1,412 cases in 2022 to 3,290 in 2023 in Brazil [4].

Some studies attempt to estimate the global incidence of sporotrichosis, suggesting that more than 40,000 cases are diagnosed every year [5]. In Brazil, this estimate is more challenging due to the ineffective reporting system, which hampers a true understanding of the number of cases [6]. Strengthening epidemiological surveillance and record-keeping systems is considered essential for improving the identification and monitoring of cases in Brazil. The global estimate is alarming, and underreporting in Brazil prevents effective control and prevention measures. Investment in professional training, awareness campaigns, and the creation of legislation with public policies reinforcing compulsory notification are urgently needed to combat this public health challenge in a strategic and effective manner [5].

Figure 2 shows the incidence of human sporotrichosis in Brazil, according to data provided by official health agencies.

In Brazil, the compulsory notification of sporotrichosis is still not mandatory, except in some states and municipalities [4]. For this reason, the alarming increase in cases is easily understood, as underreporting of cases hampers

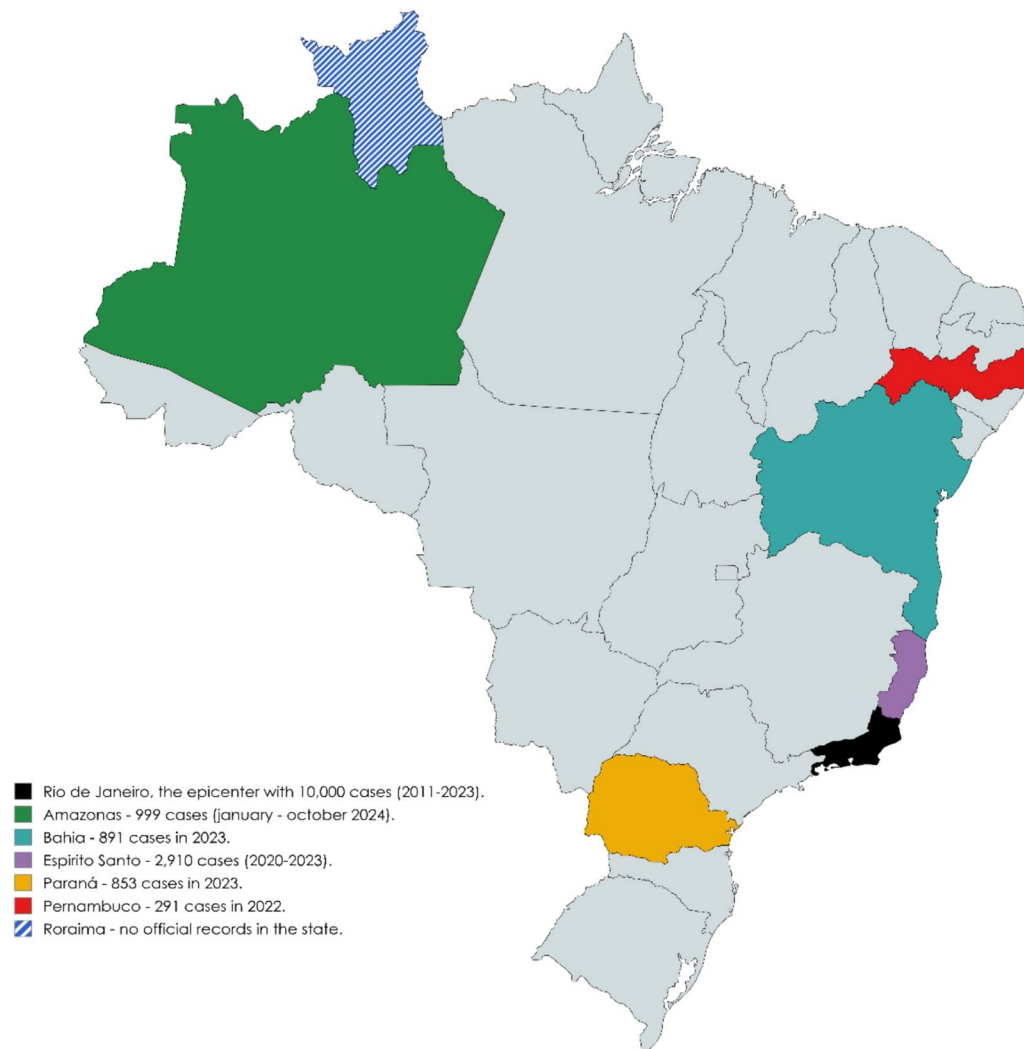


Fig. 2 Epidemiological Situation of Human Sporotrichosis in Brazil between 2020 and 2024 [4]

real-time knowledge of the disease's status, contributing to delays in control measures, and consequently contributing to the prevalence and incidence in certain regions. Furthermore, other very important factors are being pointed out by researchers to justify this imbalance, with a significant increase in fungal diseases, such as climate change, which, with rising global temperatures, has directly interfered with the adaptation and resistance of pathogenic microorganisms, such as *Sporothrix spp.*

3 Sporotrichosis and climate change

The environment plays a significant role in the emergence of infectious diseases that are important for human health. With population growth and urban expansion, human actions on the environment create conditions that favor the emergence and reemergence of diseases [7].

Fungi exhibit great adaptability and survival skills in the environment, as well as the ability to modify and manipulate hosts [8]. They are less tolerant of high temperatures, and this may be the only factor preventing them from adapting to mammalian hosts [7].

Each year, pathogenic fungi are responsible for over 1.6 million deaths worldwide [9]. However, greater emphasis is still placed on viral and bacterial pathogens due to their historical significance and the risk of deadly epidemics. Nevertheless, fungi can pose an equal or even greater threat to human life because of their significant capacity

to adapt to ongoing climate change and their ability to survive sapronotically, without the need for a direct host. Additionally, existing antifungal medications are extremely limited, and no vaccines are available for prevention [7].

Sporothrix brasiliensis was first described in Brazil in 2007 and is considered an endemic species of the country [10]. *S. brasiliensis* is the most common species in the zoonotic form of the disease, transmitted to humans primarily by cats, but the sapronotic form can also occur when humans come into contact with decaying trees and wood [1]. Due to its easy adaptation to the tropical climate, ability to infect warm-blooded hosts, and high virulence, *S. brasiliensis* has found Brazil to be the perfect location for an epidemic since it was first described. Additionally, the large number of cats in the country, combined with the lack of a robust notification system, has further contributed to the high incidence rates of the disease. However, reports of *S. brasiliensis* are not limited to Brazil; countries in South America, and even England, have recorded cases of the disease [1]. This highlights the fungus's ability to adapt and colonize different environments.

By adhering to the United Nations' Sustainable Development Goals [SDGs], Brazil can efficiently combat this previously silent threat. Through SDG 3 [Good Health and Well-Being], strategic actions can be developed to control the cat population, particularly in areas vulnerable to fungi, as well as training healthcare professionals, raising public awareness through educational campaigns, creating and enforcing public policies for responsible pet ownership, and promoting population control through spaying and vaccination.

The One Health approach should be employed in addressing human sporotrichosis, incorporating actions in animal health, with the participation of veterinarians in preventing and controlling disease transmission; environmental health, with more rigorous environmental impact studies in preservation areas and areas at potential risk for infectious diseases; and human health, with healthcare professionals focusing on more effective diagnosis, patient guidance, and proper treatment.

Recent studies reveal the current situation of sporotrichosis in Brazil. Researchers highlight the risks of the epidemic the country is currently facing and the chances of this problem worsening due to the favorable conditions that Brazil's tropical environment can offer to this infectious disease.

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Declarations

Competing interests The authors declare no competing interests.

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