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Global dermatophyte infections linked to human and animal health: A scoping review

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 7 February 2025 and was last updated on 7 February 2025.

INTRODUCTION

Review question / Objective We aim to update our current understanding of dermatophytes that impacts both human and animal health. The range of animal hosts and their corresponding dermatophyte species will be summarized, as well as clinical manifestations, treatment challenges and antifungal susceptibility profiles.

Background Dermatophyte infections are a common cause of skin diseases in humans and animals. This group of pathogens were originally suspected to be geophilic (soil-loving), but have gradually adapted to infect vertebrates overtime through soil contact and carriage on animal fur. Common dermatophyte species found on animals are often considered to be zoophilic (animal-loving), such as *Microsporum canis* and

Trichophyton species (*T. verrucosum*, *T. mentagrophytes*). It is suspected that some anthropophilic (human-loving) dermatophyte species can be traced to an animal origin, such as *T. interdigitale* that is suspected to have evolved from zoophilic *T. mentagrophytes* often found on rabbits. An animal-to-human transmission may occur via direct contact, such as petting or farming, or indirectly from the environment as infectious propagules (e.g., arthroconidia) can remain viable for years under optimal temperature and humidity conditions.

Unlike animals, humans lack fur, hence an infection by zoophilic or geophilic dermatophytes – outside of their natural habitat – may induce severe inflammations. One example is *M. canis* infections causing tinea capitis in children, which may lead to the secondary development of kerion characterized by a deep follicular invasion, resulting in edematous and pustular lesions with

alopecia. Dermatophyte zoonoses is a unique clinical entity that can present a diagnostic challenge due to its inflammatory appearance (e.g., pustules, papules, swelling), which can resemble bacterial infection or noninfectious dermatitis. This increases the risk of mistreatment with one or multiple courses of anti-bacterial agents or corticosteroids without testing for possible fungal infection. Morrell and Stratman (DOI: 10.1080/1059924X.2011.605715) reviewed 51 patients diagnosed with *T. verrucosum* infection – most often linked to a contact history with cattle – in the United States, of which 51.0% (26/51) were empirically treated with topical/oral antibiotics or topical corticosteroids. Most patients required specialist referral before being diagnosed and treated for *T. verrucosum* infection, with an average wait time of 41.5 days between the onset of symptoms and the ordering of fungal culture. These findings highlight the importance of taking an animal exposure history, occupation (e.g., farmer, breeder), and conducting confirmatory tests for patients presenting with inflammatory lesions that are atypical for dermatophytoses.

Rationale Recently, the U.S. Centers for Disease Control and Prevention (CDC) has advocated for the One Health framework in managing fungal diseases, which considers environmental and animal factors in examining the spread and resistance development of human diseases. When a patient is infected with zoophilic dermatophytes, it is advisable to form a collaborative framework between dermatologists and veterinarians to identify the animal source and prevent further spread or re-infection. The lack of antifungal stewardship practices, such as susceptibility testing, is a common issue affecting both human and veterinary healthcare. Abuse of over-the-counter medications, particularly antifungal ointments admixed with corticosteroids, has been linked to the spread of a new dermatophytic species – *T. indotineae* – causing severe, recalcitrant dermatophytoses in the Indian subcontinent. Although *T. indotineae* has not demonstrated zoonotic potential, healthcare providers are advised to remain vigilant, in view of other related species, such as *T. erinacei*, that can be transmitted from pets.

METHODS

Strategy of data synthesis Three electronic databases will be queried: PubMed, Embase (Ovid) and Web of Science (Core Collection). The following subject headings/search terms are selected: “Trichophyton”, “zoonosis”, “zoonoses”, “Arthroderma benhamiae”, “Arthroderma

vanbreuseghemii”, “Arthroderma simii”, “Microsporum canis”, “Nannizzia gypsea”, “Microsporum gypseum”, “bat”, “bird”, “cat”, “calves”, “camel”, “cattle”, “chicken”, “dog”, “equine”, “feline”, “fowl”, “fox”, “goat”, “hedgehog”, “horse”, “livestock”, “leopard”, “llama”, “mammal”, “mar-mot”, “monkey”, “pet”, “pig”, “porcupine”, “poultry”, “primate”, “ruminant”, “rabbit”, “reptile”, “rodent”, “sheep”, “swine”, “tortoise”, “wildlife”.

Eligibility criteria The inclusion criteria were reports of dermatophyte infections in animals, or dermatophyte infections in humans with a reported history of animal contact, published between 2009 to 2024. To differentiate infection from mere colonization, or dermatophyte carriage in animals due to human contamination, studies reporting asymptomatic cases or without the reporting of symptoms were excluded. Animal model experiments were excluded. Non-dermatophyte molds and yeasts were excluded. Non-English articles, reviews, conference proceedings and expert opinions were also excluded.

Source of evidence screening and selection De-duplication and title/abstract screening were carried out using Covidence (<https://www.covidence.org/>). Screening was conducted by authors Tong Wang and Susmita, any disagreement was resolved through discussion with author Aditya K. Gupta.

Data management Data will be tabulated using Microsoft Excel with the following parameters: author name, year, region, type of study (animal infection vs. human infections linked to animals), mycology testing, animal type, number of subjects, site of infection, symptom, pathogen identification, antifungal susceptibility testing, treatment. Based on the taxonomic classification proposed by de Hoog et al. in 2017 (DOI: 10.1007/s11046-016-0073-9), *Microsporum gypsea* was synonymized with *Nannizzia gypsea*; under “one fungus, one name”, the teleomorph *Arthroderma* was synonymized with *Trichophyton* (*A. benhamiae* = *T. benhamiae*, *A. van-breuseghemii* = *T. mentagrophytes*, *A. simii* = *T. simii*).

Language restriction Non-English articles will be excluded.

Country(ies) involved Authors are from Canada, Bangladesh, and the United States.

Keywords dermatophyte; ringworm; tinea; zoonoses.

Contributions of each author

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