

Veterinary Mycology

Introduction, History, General Properties, and Scope

‘*Mykes* (Greek word): Mushroom’

Mycology is the branch of biology concerned with the study of *fungi*, including their genetic and biochemical properties, their taxonomy and applications.

Veterinary mycology is the study of veterinary important fungi and fungal diseases in animals. The term ‘mycosis’ (mykes = mushroom) is used to describe the infection of human, animal, birds and plants which is caused by numerous pathogenic fungi. The term ‘**mycotoxicosis**’ describes the diseased condition produced by the ingestion of mycotoxins (intoxication). When the fungi produce the pathogenesis due to toxin production by the fungus after entry within the host, it is known as ‘**mycetism**’ (Samanta *et al.* 2014)

Fungi are ubiquitous and the majority are saprophytic; only a few of the thousands of recognized species are pathogenic for animals or humans. Most species that do infect animals are limited, by nutritional requirements and host defences, to the superficial skin or subcutaneous tissues. However, fungal infections in the immunocompromised host can be very serious. Systemic fungal infections are the most serious and some are limited to particular geographical regions.

General Properties of Fungi

Fungi are eukaryotic protista; differ from bacteria and other prokaryotes.

Fungi rank among the lower plants (Thallophyta).

Lack photosynthetic pigment, **absorb all nutrients from the environment** - heterophilic-saprophytic or parasitic existence, chemoorganotrophic and spore-bearing.

Non-motile.

Body comprises of mycelium/ thallus and spores.

Cell walls containing **chitin** (rigidity and support), **mannan**, and other **polysaccharides**.

The cytoplasmic membrane contains ergosterols.

Possess true nuclei with nuclear membrane and paired chromosomes.

Reproduce asexually, sexually, or by both.

Unicellular or multicellular.

It varies in size and complexity, ranging from the single-cell microscopic yeast to multicellular molds, puff balls and mushrooms.

Some fungi that exist in the mycelial form in nature at room temperature will convert to a yeast form at 37°C in the tissues of animals. These fungi are called as ‘**dimorphic**’ and the shift is called as ‘**YM (Yeast to Mold) shift**’.

History of Mycology

The term ‘**Mycology**’ was coined by **H.S. Berkley** (1834) as a study of fungi.

Hippocrates (460–377 BC) first documented oral pseudomembranous candidiasis and he described it with the name of ‘aphthae albae’ which was later supported by Galen (130–200 BC).

The first description of dermatophytosis was recorded by Celsus, a Roman encyclopaedist who described a suppurative infection of the scalp (‘porrigo’ or ‘kerion of Celsus’) in *De Re Medicina* (30 AD).

Throughout the middle ages several descriptions of dermatophytosis are produced where it was described as 'tinea' (Latin term).

Micheli (1729) published *Nova genera Plantarum* (written in copper plate) in which he established several genera of fungi such as *Aspergillus*, *Mucor*, etc. However, the pathogenic potentiality of fungi in human or animals remained uncertain.

Robert Hook (1665) first illustrated the pathogenic role of rose rust (*Phragmidium mucronatum*) in his book 'Micrographia'.

In 1835, **Agostino Bassi**, an Italian lawyer and farmer, first reported a **fungal infection (muscardine) of silkworm** and illustrated that a microbe can cause an infection.

Robert Remak (1837–1841), a Polish physician, described the first human mycosis (*Tinea favosa*).

Gruby (1844) first described the aetiologic agent of tinea endothrix, later became known as *Trichophyton tonsurans*. The work of Remak and Gruby established the mycology as a separate branch of medical science.

The **histoplasmosis** in human was first notified by **Darling** (1906), an American pathologist who observed it during an autopsy of a Martinique native person who died with tuberculosis-like syndrome in Panama.

Raymond Jacques Adrien Sabouraud (France) compiled the description of **dermatophytes (Trichophyton)** in his book *Les Teignes* (1910) which was based on his observation in artificial culture. This authentic book initiated the development of medical mycology.

Gomori (1946) first developed a stain for the microscopic observation of fungal cells in tissue which was later modified by Grocott in 1955. Kligman (1951) used the periodic acid Schiff stain for histological demonstration of fungi.

Gridley (1953) later modified PAS stain by replacing periodic acid with chromic acid which can reveal both hyphae and yeast cells in tissues.

Sir Edwin John Butler (1901) started the systemic study of fungi (*Pythium*, *Phytophthora*) and he is known as the '**Father of Indian mycology**'.

First described:

Reaumur (1749)	Avian Aspergillosis in Birds
Fresenius (1863)	<i>Aspergillus fumigatus</i> - First detected in the lung of a great bustard (<i>Otis tardaga</i>). He was also the first to use the term 'aspergillosis' for this respiratory disease
Rivolta (1873)	(<i>Histoplasma capsulatum var. farciminosum</i>) was first demonstrated in the pus, the causative agent of Epizootic lymphangitis in horses. However, it was isolated in 1896 by Tokishiga in Japan.
Smith (1884), a Veterinarian working in India	Chronic cutaneous granulomatous disease in horses known as ' bursattee ' in local Indian language

Scope of Mycology

Mycologists study the properties of fungi, for example, mushrooms, molds, truffles, yeasts, and lichens. They also study how fungi can be utilized to profit society (for instance, in food or the environment) and the dangers fungi may present.

Practical Use of Fungi

Humans eat many fungi and use others to make cheeses, alcoholic beverages, and bread.

Some fungi are used to produce antibiotics for the treatment of bacterial infections, for example, the ascomycete *Penicillium*.

Genetic research on fungi is leading to applications in biotechnology e.g., insulin-like growth factor can be produced in the fungus *Saccharomyces cerevisiae*.

Job perspective

A Mycologist can get a job in the industry since it has many applications for the [production of enzymes](#), dyes, [antibiotics](#), biofertilizers, Spawn, mushrooms, etc. You need to have practical experience and knowledge in the field of Mycology.

Veterinary mycologists do have scope in [clinical research](#) pertaining to the [diagnosis and treatment of fungal infections in animals](#).

Reference

Caffarena, R. D., Rabaza, A., Casaux, L., Rioseco, M. M., Schild, C. O., Monesiglio, C., & Riet-Correa, F. Samanta, 2015. Veterinary Mycology, DOI 10.1007/978-81-322-2280-4_1 © Springer India

Notes by Dr. Kirtika Padalia, Department of Botany Uttarakhand Open University, Haldwani
