Fungi Have Many Faces

Omnipresent Microorganisms with a Broad Spectrum of Action

by Konrad Müller Christiansen
The mere thought of truffles or mushrooms makes a gourmet’s mouth water! It is fungi that make Roquefort and Camembert mature and develop their characteristic taste. There would be neither bread, nor beer nor wine without fungi. Fungi maintain the fertility of the soil, and they are useful in waste disposal.

Fungi fulfill essential functions in the metabolism. Along with bacteria, they break up the nutrients in the gastrointestinal tract. The metabolic products produced by them have an inestimable, essential significance for the treatment of life-threatening infections. But fungi do not merely produce active substances against bacteria. The Cyclosporin formed by the Norwegian soil fungus blocks the repulsion of the foreign organ after transplantation. It is also effective in chronic cases of Polyarthritis.

However, fungi are not merely useful. They also produce toxins, such as the *Amanita phalloides* or the *Aspergillus flavus* in moldy foods. They cause allergies and often even deadly infections. They produce carcinogenic substances, attack the skin, mucous membrane and nails, weaken inner organs such as the lungs, kidneys and brain, and they invade heart, liver and blood vessels with their network of cellular hyphae.

Fungi are very vital organisms with many faces, and they are omnipresent. On the one hand, they cause illnesses, and on the other hand, they cure diseases. Fungal diseases, or mycoses, have increased worldwide in recent decades, and they are frequently hard to diagnose and therapeautize. Because medical remedies gained from fungi destroy pathogenic bacteria, biological niches develop, in which fungi settle. Patients with AIDS or malignant tumors frequently have a weakened immune system and are, therefore, often threatened by fungal infections. The massive spreading of the vaginal Candidiases in recent decades is connected with the worldwide application of oral contraceptives.

There are about 500,000 fungal species on Earth. Biologically, they are closely related to the plant kingdom. Due to the structure of their cell walls, as well as their type of nutrition, they are positioned between plants and bacteria and form the “fungal kingdom.“ Morphologically considered, one differentiates two large groups, namely the thread fungi and the yeasts.

Among the filamentous fungi are, first of all, the mushrooms in the woods. But what is gathered by citizens in the late summer to eat with pleasure, and what is considered to be characteristic for fungi in general, is only the fruiting body. It forms the spores, from which new mushrooms grow. The actual fungus consists of a subterranean network that is irregularly branched out and formed by interweaving cell threads, the so-called mycelia. Among the filamentous fungi are also the dermatomyces, which attack the skin, as well as the mold fungi known from the household. Yeasts, whether round or oval, are unicellular fungi with a distinct cell wall, which - in contrast to the thread fungi - form a pseudomycel. They multiply vegetatively by sprouting and/or splitting. Many yeasts ferment sugar into alcohols under anaerobic conditions.

Fungi are incapable of synthesizing carbohydrates from carbon dioxide and water with the help of light. Their source of nutrition is the organically bound carbon of dead and living organisms. As parasites, they live at the expense of the host, whom they damage, or not. This depends, on the one hand, on the fungus and, on the other hand, on the defensive mechanisms of the host.

Some thread fungi have the characteristic of acting pathologically on people and animals. Among the pathogenic fungi are, among others, Dermatmyzes, on the one hand, and Aspergillus and such yeasts as Candida and Cryptococci, on the other hand. Clinically important is that yeasts do not always behave like yeasts, and thread fungi do not always behave like thread fungi. For instance, *Candida albicans*, a genuine yeast, can also invade the mucous membrane of a human body as a thread fungus, while pathogenic thread fungi of the species Histoplasma can spread within tissue like yeasts.

The pathogenic fungi can be arranged in two different groupings. In one group, we are dealing with genuine, pathogenic fungi with distinct pathogenic properties. They are very aggressive and can invade also healthy human bodies.
with intact immune systems. The dermatophytes, which attack skin and nails, belong equally into this group as the highly virulent fungi of the species Histoplasma, which trigger infections of the internal organs.

The fungi of the second group are generally harmless. However, they can completely unfold their pathogenic properties in people with weakened immune systems, if the opportunity arises. These so-called opportunistic fungi, to which belong representatives of the species Candida and Aspergillus, exploit the weakness of the organism, but behave less pathogenic. They are eliminated by the immune system. However, if there is a defensive weakness, such as with AIDS, Leukemia, etc., they can become a life-threatening danger for the patient.

The term of “mycoses” summarizes, in general, infections or infestations caused by diverse fungi in diverse organs of the body:

- **Dermatomycoses** are infections of the skin,
- **Vaginal candidiases** are diseases of the vaginal mucosa,
- **Onychomycoses** are infestations of the nails of fingers and toes,
- **Mycoses of the internal organs**, such as Candidiases, Cryptococcoses, Histoplasmoses.

Certain pathogenic fungi cause the appearance of characteristic disease profiles, for instance:

- **Trichophytes** cause unpleasant inflammations on the hands, feet, and nails;
- **Fungi** of the Aspergillus species attack the pulmonary tissue, but they can also migrate and spread into other organs;
- **Candida albicans**, the typical yeast fungus, causes diverse infections of the skin, the mucous membranes: e.g. the vaginal mucosa in women, and internal organs;
- **Wangilla dermatitidis** form knots beneath the skin and cause inflammations of the meninx;
- **Cryptococci** preferentially attack the brain.

A clear diagnosis of fungal diseases is generally difficult, because the clinical symptoms are barely differentiable from bacterial infections. For instance, Aspergillosis can be taken for Tuberculosis. Even serological determinations are not always clear, such as with Cryptococci. In Candidiases the diagnosis can be especially difficult, because antibodies, which could give an indication of the pathogen, are already present in healthy conditions.
A delayed or a wrong diagnosis can have fatal consequences for the patient. When patients - especially those with AIDS or Leukemia - suddenly experience fever in the course of their cytostatic therapy or after major surgery and when, at that point, an antibacterial therapy fails, one must absolutely consider a fungal infection.

Millions of fungal spores surround us. We inhale them, or pick them up during gardening work or in the swimming pool. Fundamentally, nobody can withdraw from them; they and the spores formed by them are omnipresent. Healthy people, for instance, can safely inhale the spores of Aspergillus. However, if the immune system is weakened, the inhaled spores can no longer be “destroyed” by the macrophages, the first-line protective barrier of the organism. An infection of the lung is the result; the fungus invades the pulmonary tissue and can destroy it. Even Candida albicans, the notorious yeast fungus, which we constantly carry on our skin and host in the gastrointestinal tract, becomes pathogenic only if the endogenous defensive system gets out of control, or if the natural population of bacteria has diminished or fully destroyed by antibiotic drugs. It is important to know that a Candida infection is practically never caused by pathogens from the environment, with the exception of newborn babies in birth clinics. The patient always falls ill with a strain he had been carrying inside.

In serious cases of fungal infections, the pathogens at first exert mechanical pressure on the infected organ. They invade the tissue and penetrate into it with their cell threads, and destroy it. Moreover, proteases and phospholipases are set free, which dissolve the human tissue. With the aid of these enzymes, the fungus digs its way through the organism, leaving behind a trail of destruction. The body’s own defences try to fight the invaders. However, under certain conditions, the immune reaction can also turn against its own organism.

Among the fungal infections, which nowadays can be therapeutized quite successfully, are especially the Dermatomycoses, Onychomycoses, and Candidiases of interior mucous membranes, such as in the vagina. Today’s doctors have different preparations and medications in every possible application form at their disposal. However, to this day, therapy of dangerous organmycoses is by no means easy for the doctor; it can be time-consuming and is not always safely crowned with success.

Editorial Comment:
This article is a granted repeat publication. It appeared first in the periodical, The Practical Doctor, #14/1993, showing other pictures and in slightly different wording. At that time, the latest therapeutic position on the mycoses problem could not yet be taken into account. As is well known, SANUM preparations which are now available for targeted application in diversified forms, now especially also including ALBICANSAN and EXMYKEHL as biologically active preparations for the treatment of mycoses, are rendering an essential service.

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Fig. 2: Raster electronic microscopic picture in 3000 fold enlargement of a Candida albicans (sprout mycelium), a yeast fungus, which is found in mycotic diseases with diverse appearance forms. It constitutes the manufacturing base for the SANUM preparation ALBICANSAN, and is a component also of the SANUM preparation EXMYKEHL.