

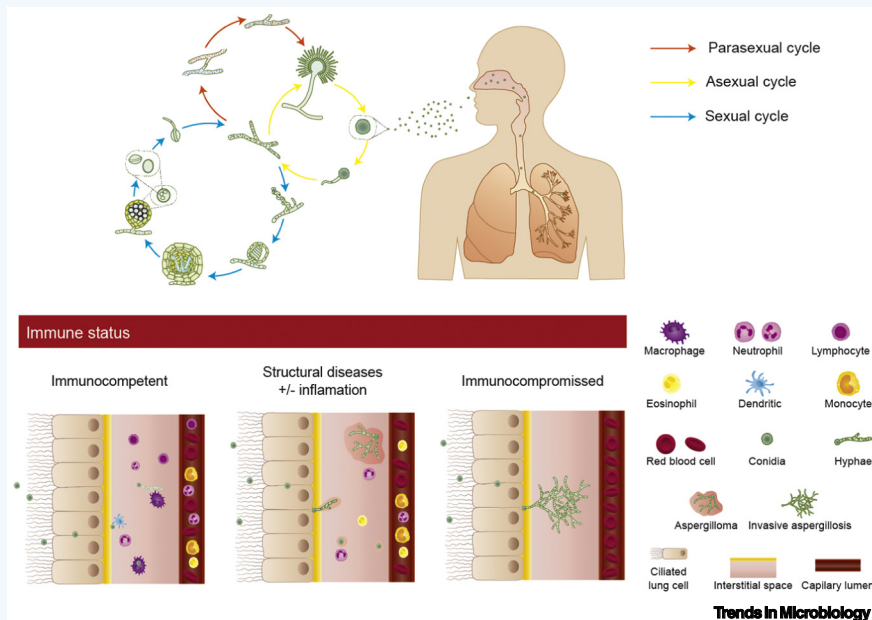
Aspergillus fumigatus

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KEY FACTS:

A. fumigatus is a saprophytic fungus found in soil. It grows on decaying vegetation of subtropical and warm temperate latitudes.

The whole genome of *A. fumigatus* Af293 (29.4 Mpb, and 9926 predicted genes) was published in 2005.

A. fumigatus reproduces asexually and sexually by producing hydrophobic conidia and ascospores, respectively. Conidia (2–3 μm) can reach the alveoli in the lungs.

The cell wall is composed of α- and β-glucans, chitin, and galactomannan, and is an essential point of interaction between *A. fumigatus* and the host.

A. fumigatus has a very fast growth rate and it has evolved many efficient mechanisms for carbon, nitrogen, and micronutrient assimilation in both normoxic and hypoxic conditions.

DISEASE FACTS:

There are more than 200 000 documented human life-threatening aspergillosis infections annually.

Human infections caused by *A. fumigatus* can range from allergic diseases to invasive aspergillosis, depending on the host's immune state.

The *A. fumigatus* cell wall contains PAMPs, such as β-1,3-glucan and chitin, which are recognized by host PRRs, such as dectin 1 and CR3 (complement receptor 3) on innate immune cells.

There are three classes of antifungals for treating aspergillosis: azoles and polyenes targeting ergosterol, and echinocandins targeting the synthesis of β-1,3 glucan.

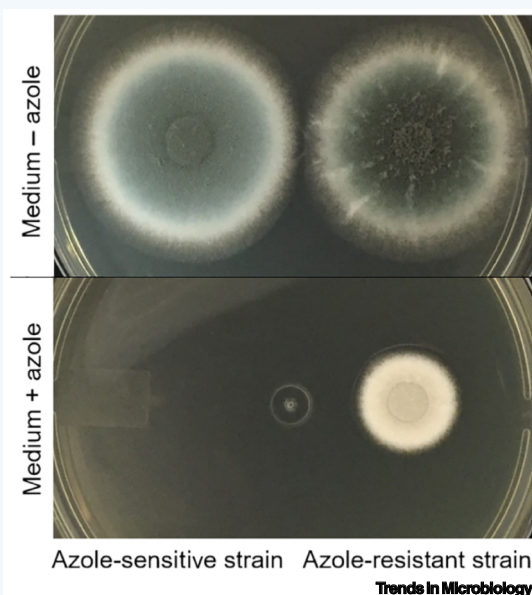
The first case of azole resistance was reported in 1989 in California.

The target of azole resistance is the 14-sterol demethylase encoded by *cyp51A* and *-B* genes.

Humans inhale hundreds of *Aspergillus fumigatus* conidia daily. Conidia germinate and produce hyphae or mycelia that eventually form a colony. The recognition of *A. fumigatus* pathogen-associated molecular patterns (PAMPs) by the pattern-recognition receptors (PRRs) of innate immune cells induces the phagocytosis and killing of the fungus and cytokine signaling that regulates the activation of adaptive immune responses and epithelial host defense. Severe asthma with fungal sensitization (SAFS), allergic bronchial pulmonary aspergillosis (ABPA), chronic pulmonary aspergillosis (CPA), invasive pulmonary aspergillosis (IPA), and invasive bronchial aspergillosis (IBA) are some of the human diseases caused by *Aspergillus* species. *A. fumigatus* is able to evade the host's innate immune system through the production of conidial hydrophobin (that can mask PAMPs on the cell wall) and melanin (which blocks the acidification of the phagosome and inhibits the NADPH oxidase complex responsible for the production of antifungal reactive oxygen species).

TAXONOMY AND CLASSIFICATION:

- KINGDOM:** Fungi
- PHYLUM:** Ascomycota
- CLASS:** Eurotiomycetes
- ORDER:** Eurotiales
- FAMILY:** Trichocomaceae
- GENUS:** *Aspergillus*
- SPECIES:** *Aspergillus fumigatus*



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