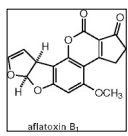
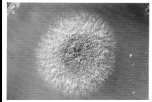


Curso de Graduação em Engenharia de Alimentos

Disciplina ZMV-0368
Microbiologia Fundamental


aflatoxin B₁





• **Morfologia, Ultraestrutura e Taxonomia de Fungos**

Carlos Augusto F. de Oliveira
Professor Titular
ZEA/FZEA/USP - Pirassununga

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Fungos

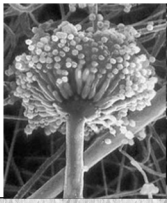
Eucarióticos, unicelulares, multinucleados e heterotróficos, caracterizados por uma parede celular quitinosa:
Reino FUNGI

Maioria apresenta crescimento filamentosos e em colônias multicelulares (agrupados como micélio)

Crescem na forma de uma massa disforme

Se espalham rapidamente, podendo cobrir muitos cm² em 2 a 3 dias.

Micélio=composto por filamentos ou hifas

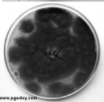
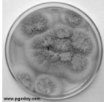
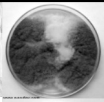


2

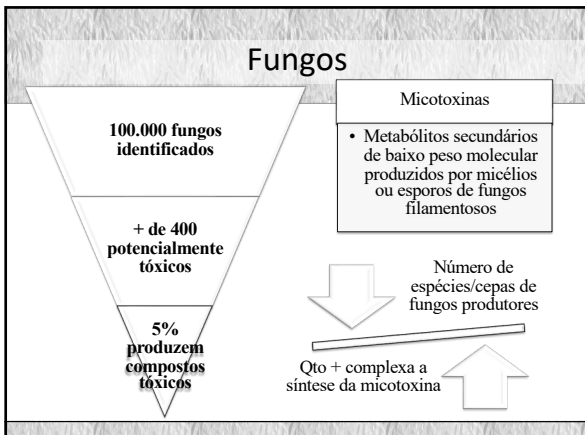
Fungos

Desenvolvem-se em:

- Quase todas as condições climáticas do mundo;
- Qualquer suporte sólido ou líquido;
- T°C entre 10 e 40°C;
- Intervalo de pH de 4 a 8;
- Atividade de água acima de 0,70 (podendo também crescer em uma superfície muito seca).



3

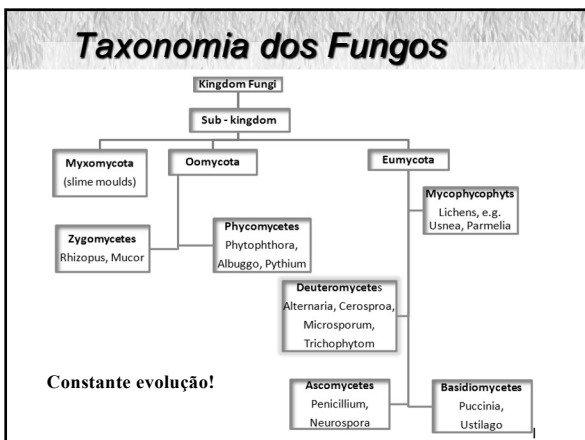


4

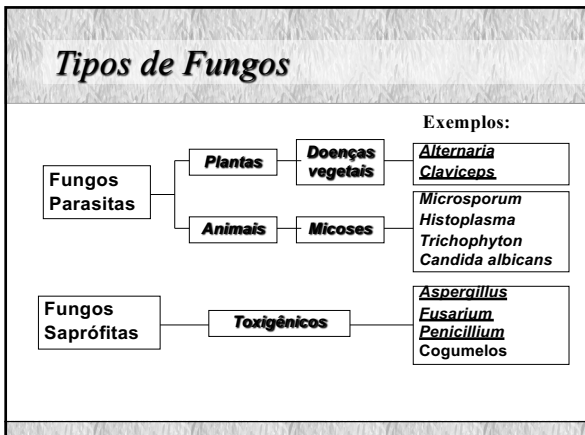
Classificação dos Fungos

- FUNGOS:
 - ✓ Unicelulares: leveduras
 - ✓ Pluricelulares:
 - Mofos ou bolores
 - Cogumelos

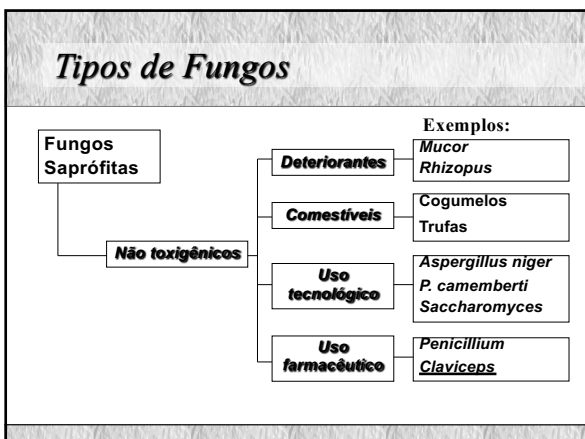
5



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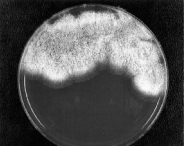


8

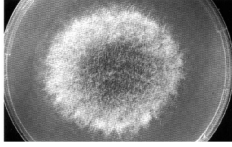
MOFOS OU BOLORES

- Características:
 - ✓ Fungos filamentosos sem forma definida
 - ✓ Filamentos = hifas
 - ✓ Conjunto de hifas = micélio
 - ✓ Formam colônias com aspecto de algodão ou polvilhado

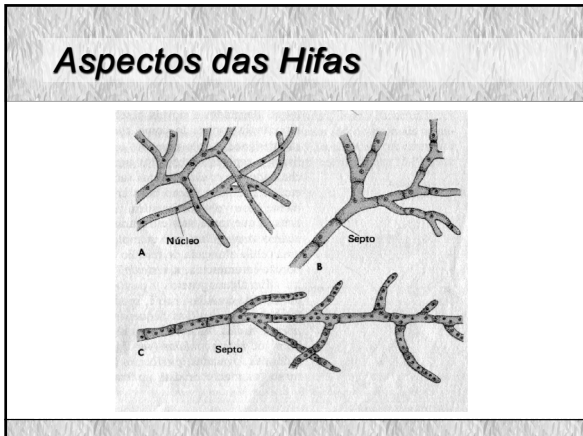
A. flavus em ágar sangue de carneiro



Mucor pusillus em ágar PDA



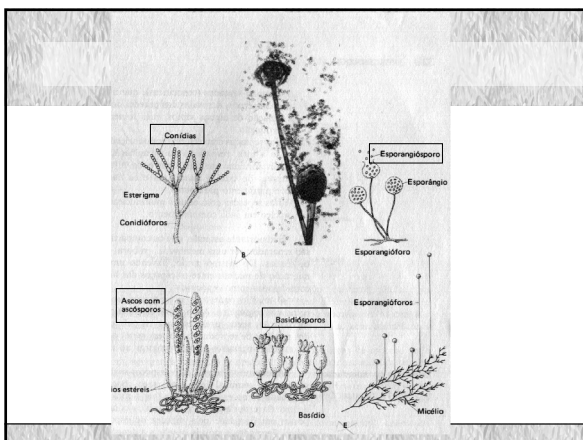
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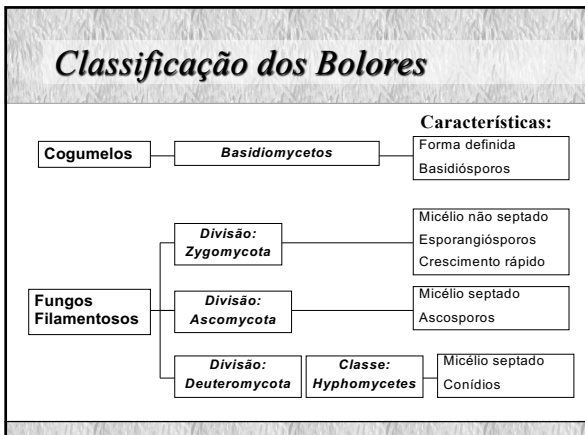
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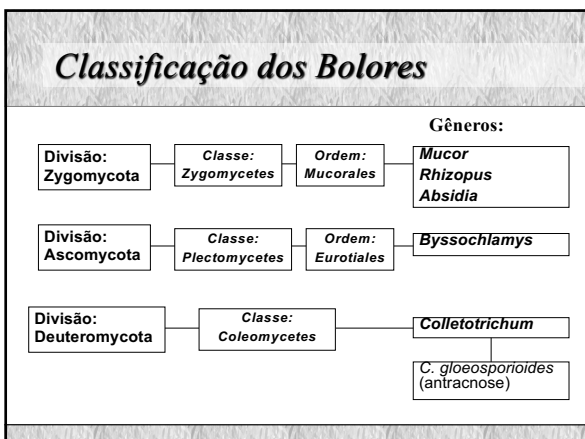
11



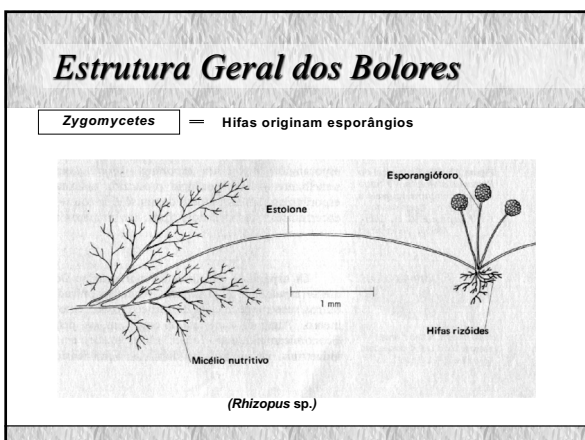
12



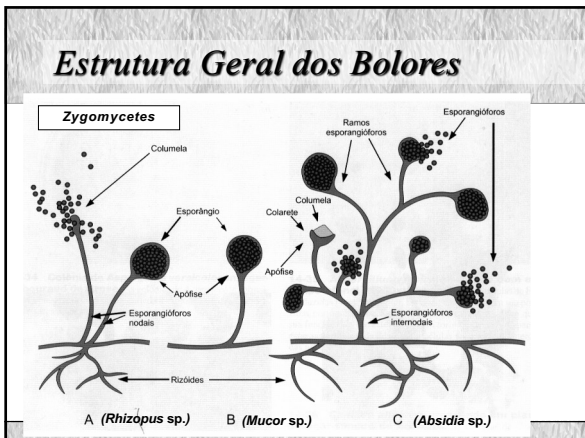
13



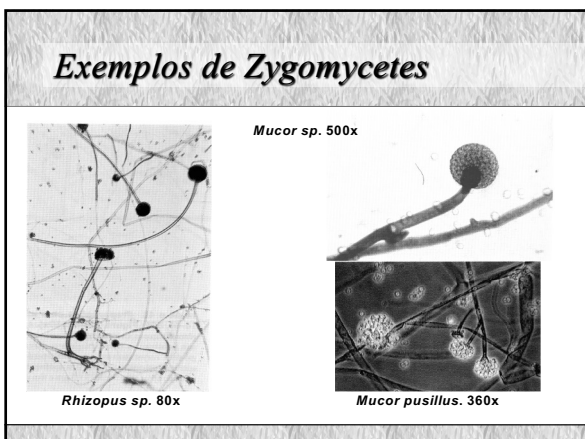
14



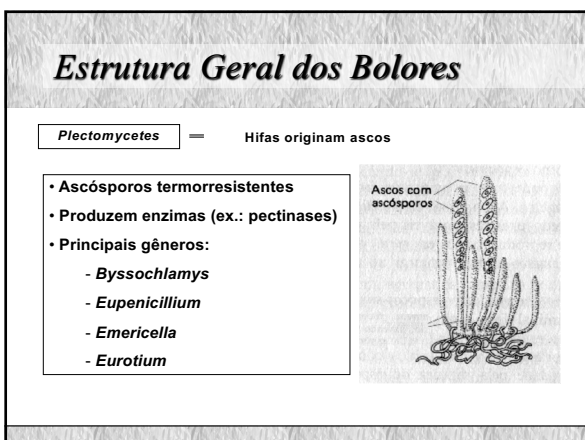
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Classificação dos Bolores

Divisão: Deuteromycota	Classe: Hyphomycetes	Ordem: Hyphomycetales	Gêneros: Alternaria Aspergillus Botrytis Cladosporium Fusarium Geotrichum Penicillium Stachybotrys Trichotecium
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Estrutura Geral dos Bolores

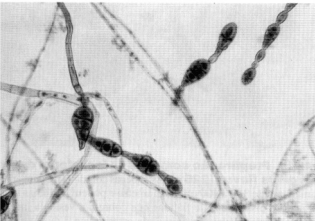
Deuteromycetes

Hyphomycetes = Hifas originam conídios

Gênero Alternaria

-Produzem podridão parda/negra em frutos (ex.: maçã, figo, tomate cítricos)

-Micotoxinas produzidas: alternariol, ácido tenuazóico

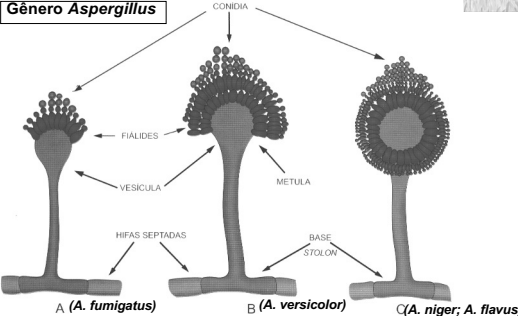


Alternaria sp.
(500x)

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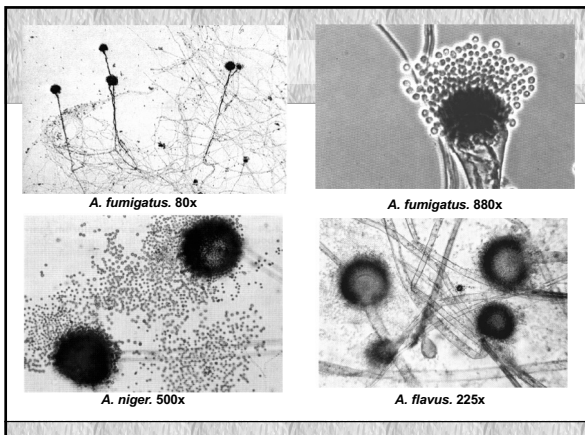
Estrutura Geral dos Bolores

Gênero Aspergillus



A (*A. fumigatus*) B (*A. versicolor*) C (*A. niger*; *A. flavus*)

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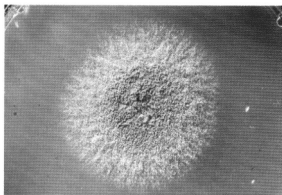


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Exemplos de Aspergillus

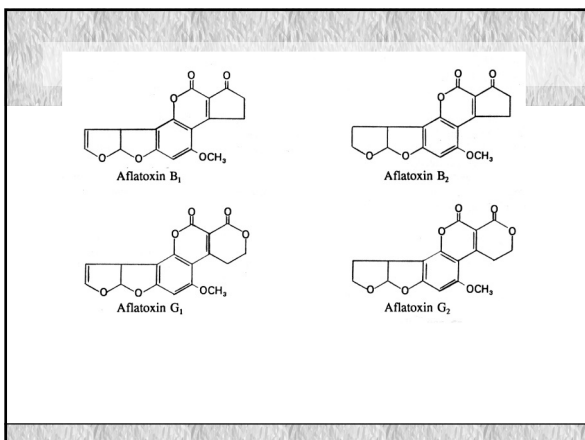
☛ Toxigénicos:
-A. flavus, A. parasiticus, A. nomius: aflatoxinas B₁, B₂, G₁, G₂, esterigmatocistina, ácido ciclopiazónico);
-A. ochraceus: ocratoxinas A e B);

☛ Uso tecnológico: A. niger



A. flavus (ágar Czapeck, 6 dias)

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Estrutura Geral dos Bolores

Gênero *Penicillium*

The diagram shows the general structure of a Penicillium mold. It consists of a central stalk (RAMOS) that branches into several smaller stalks (METULAS). Each METULA further branches into many smaller stalks (FIALIDES). At the end of each FIALIDE are numerous small, round spores (CONIDIA). A micrograph to the right shows a similar structure of Penicillium sp. at 250x magnification, with the caption: *Penicillium sp. 250x (coloração: calcofluor)*.

Labels in the diagram:
CONIDIA
FIALIDES (Em segunda ordem Esterigmatas)
METULAS (Em primeira ordem Esterigmatas)
RAMOS

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Exemplos de *Penicillium*

Toxigênicos:

- *P. verrucosum* (ocratoxinas);
- *P. citrinum* (citrinina);
- *P. patulum* (patulina)

Uso tecnológico: *P. camemberti*, *P. roqueforti*, *P. candidum* (ex.: queijos)

The micrograph shows Penicillium sp. at 500x magnification. Below it is a photograph of a round piece of cheese with a white, moldy surface, illustrating the use of Penicillium in cheese production.

Penicillium sp. 500x

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Estrutura Geral dos Bolores

Gênero *Fusarium*

-Produzem podridão parda em cereais (ex.: milho, trigo, aveia, cevada)

-Produzem toxinas: fumonisinas, zearalenona, tricotecenos (T-2, HT-2, DON)

The micrograph shows Fusarium sp. at 500x magnification, highlighting the Microconidias. Below it is a photograph of a mold culture on a petri dish.

Fusarium sp. 500x

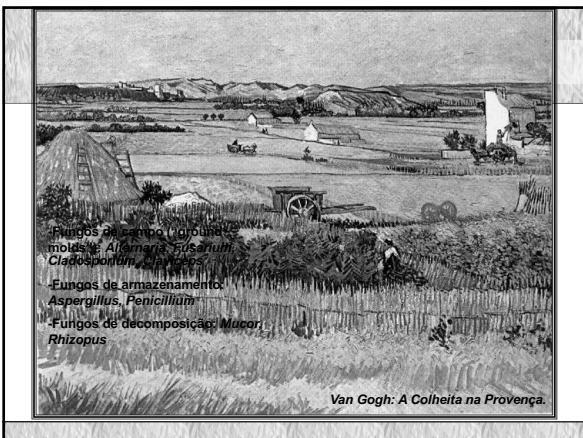
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Principais Toxinas de *Fusarium*

☞ Gênero *Fusarium*:

- ✓ *F. graminearum*, *F. roseum*: Zearalenona
- ✓ *F. sporotrichoides*, *F. poae*, *F. nivale*, *F. culmorum* e outros: Tricotecenos (Nivalenol, Deoxinivalenol -DON, T-2, HT-2 e outras)
- ✓ *F. verticillioides* (moniliforme), *F. proliferatum*, *F. subglutinans*: Fumonisinás

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-Fungos de campo (ground molds): *Alternaria*, *Fusarium*, *Cladosporium*, *Chaetomium*
-Fungos de armazenamento: *Aspergillus*, *Penicillium*
-Fungos de decomposição: *Mucor*, *Rhizopus*

Van Gogh: A Colheita na Provença.

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