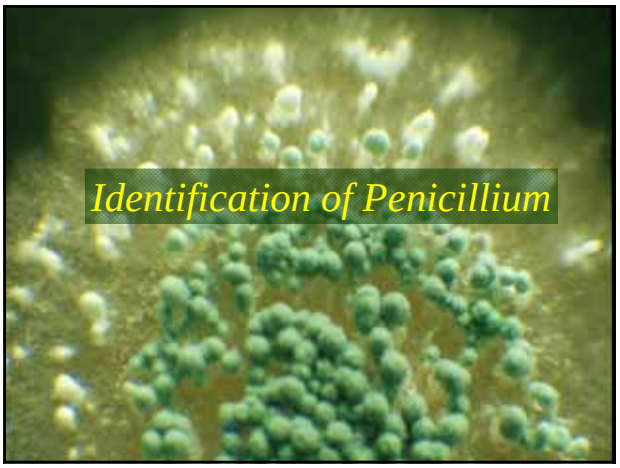
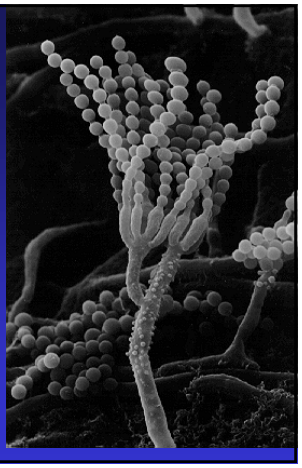


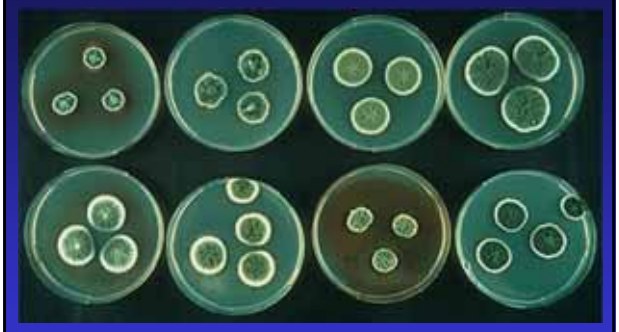
Penicillium

- a common genus with more than 250 species
- two ascomycetous teleomorphs (*Talaromyces* and *Eupenicillium*)
- has preference for moderate and colder climates
- spoilage agents, industrial application, mycotoxins
- Only a few species are pathogenic



Overview of presentation

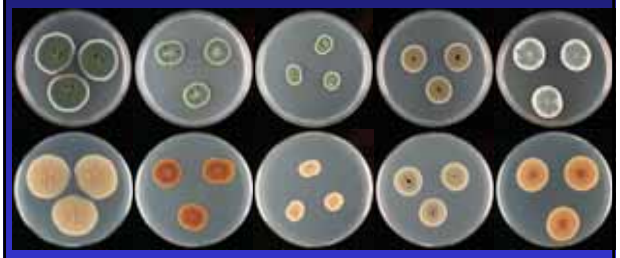
- Macro-morphology:
  - Colony colour (obverse/reverse)
  - Colony size
  - Exudate
  - Soluble pigment
- Micro-morphology:
  - Branching pattern
  - Shape phialide
- Ehrlich test

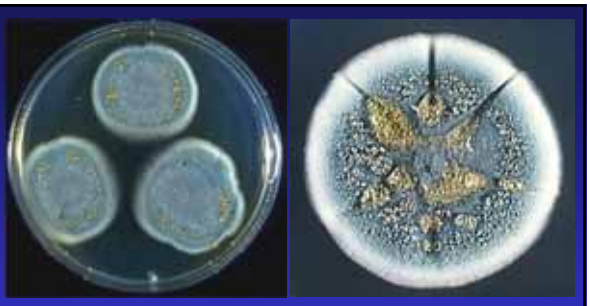


Colony colours and diameters in various Penicillium species - obverse

Reverse in various Penicillium species

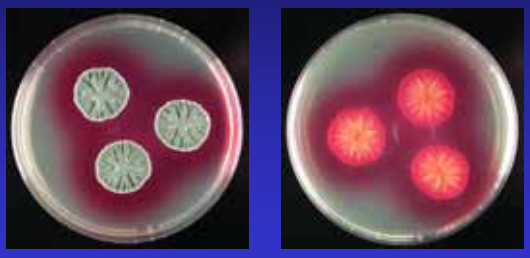
Various colony diameters in *Penicillium*





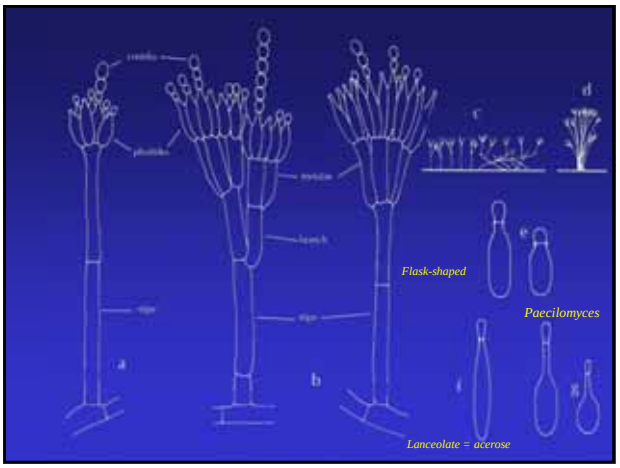
Exudate production in Penicillium

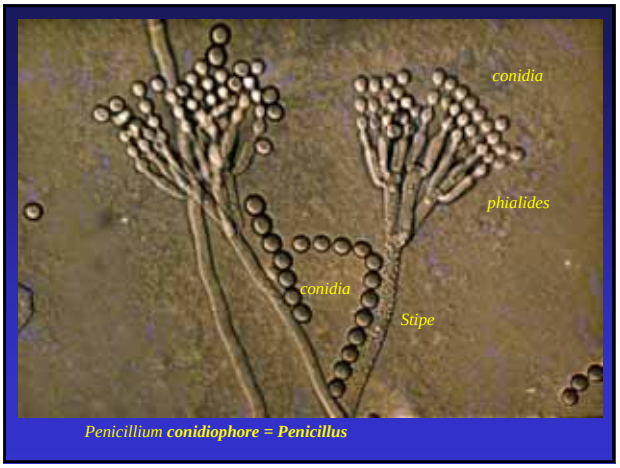
Soluble pigment production in *Penicillium*



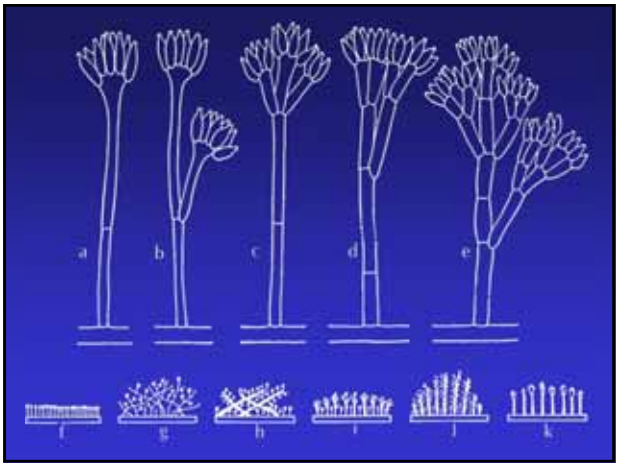
Summery of presentation I

- Macro-morphology:
  - Colony colour (obverse/reverse)
  - Colony size
  - Exudate
  - Soluble pigment
- Micro-morphology:
  - Branching pattern
  - Shape phialide
- Ehrlich test





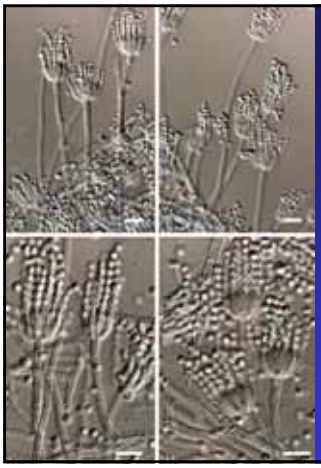
Penicillium ***conidiophore = Penicillus***



BRANCHING PATTERNS IN *PENICILLIUM*

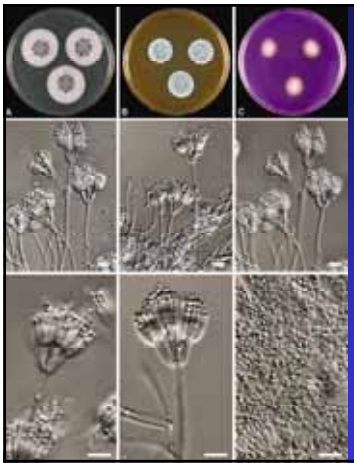
monoverticillate *biverticillate* *biverticillate* *terverticillate*

Differences in branching pattern and shape phialides!



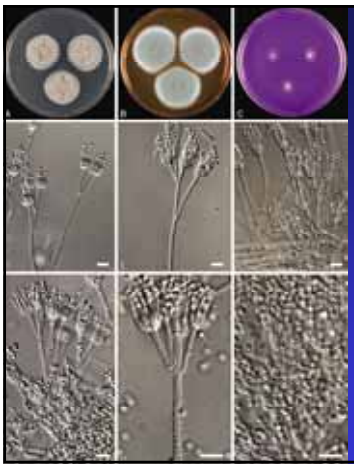
Penicillium glabrum

Monoverticillate
(= unbranched, simple)



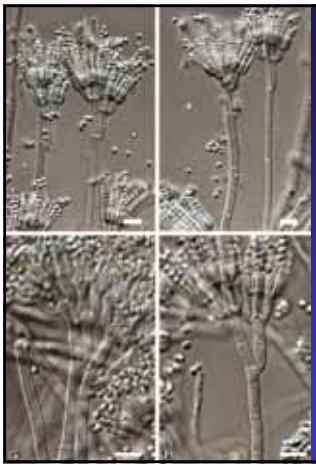
Penicillium citrinum

Biverticillate
(=one-stage branched)



Penicillium corylophilum

Biverticillate
(=one-stage branched)

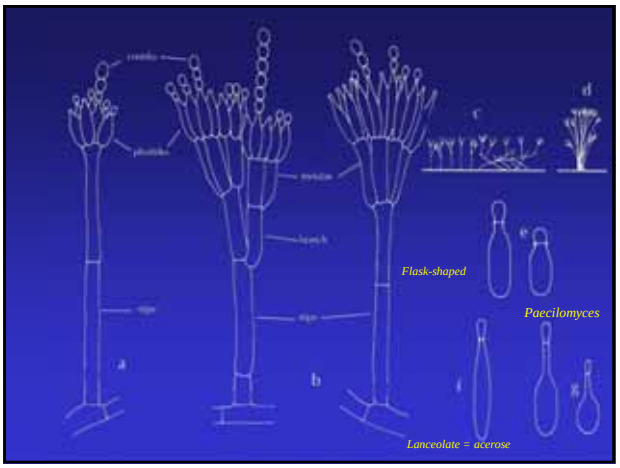


Penicillium brevicompactum

Terverticillate
(=Two-staged branched)

Penicillium expansum

Terverticillate
(=Two-staged branched)



Paecilomyces

- Phialides with broad base and long narrow neck
- Conidiophore branching irregularly
- Cultures mostly not green
- Thermophilic

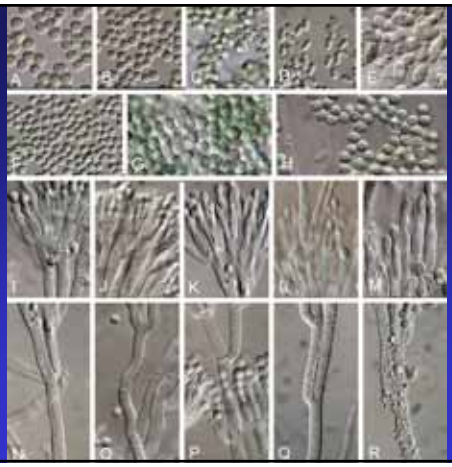
Paecilomyces variotii

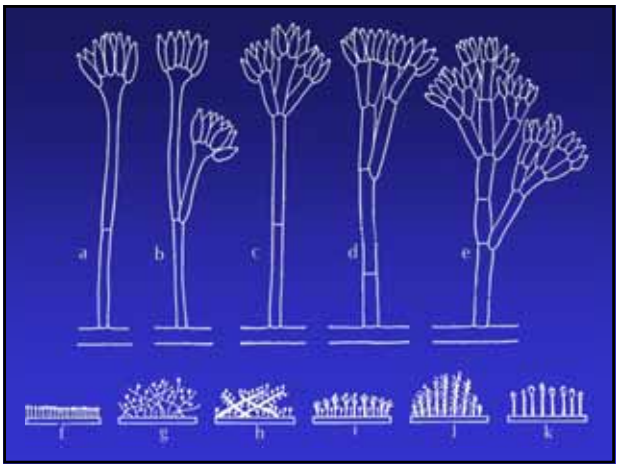
Penicillium Biverticillium

- Penicillus biverticillate = one-staged branched
- Phialides acerose = lanceolate

Flask-shaped phialides

Lanceolate phialides





Colony surfaces in Penicillium

Cultivation for identification

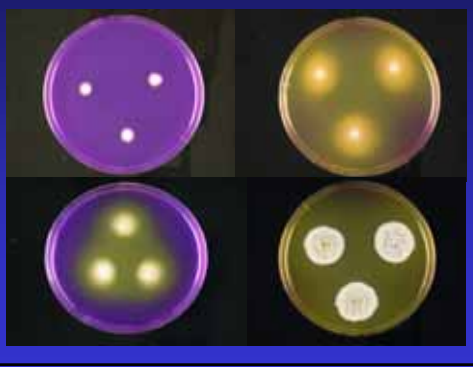
- Czapek Yeast agar (CYA):
  Macro-morphology
- Czapek Yeast agar (CYA) incubated at 30°C
  Colony diameter (and ratio with 25°C)
- Malt Extract Agar (MEA): macro- and micromorphology
- Creatine agar (CREA), used for identification of terverticillate *Penicillia*
- Yeast Extract Agar (YES), only macro-morphology
- Incubation 7 days at 25°C

CREA: Creatine Sucrose agar

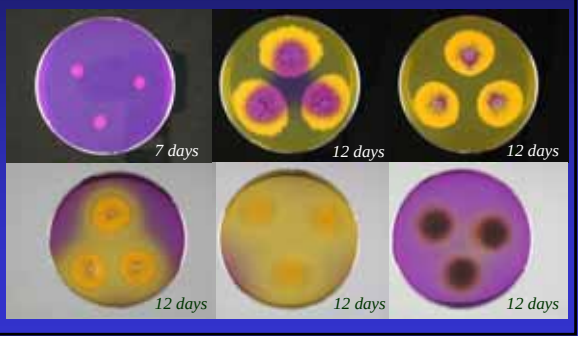
Creatine(1 H_2O)	3 g
Sucrose	30 g
KCl	0.5 g
$MgSO_4.7H_2O$	0.5 g
$FeSO_4.7H_2O$	0.01 g
$K_2HPO_4.3H_2O$	1.3 g
Bromocresol purple	0.05 g
Agar	15 g
Distilled water	1000 ml

Final pH 8.0 ± 0.2 (adjust after medium is autoclaved).
NOTE: a modification of CREA (=CRE) with 1.6 g $K_3PO_4.7H_2O$ can also be used.

Examples growth on CREA



Acid / Base production on CREA



Ehrlich reaction

- Filter paper test; detection of presence of indole metabolites
- Plug for 7 days old CYA culture
- Place filterpaper with Ehrlich reagens on the mycelium side of the plug (propeller)
- Read after 5 and 10 minutes
- No reaction / violet (/yellow / brown)

Ehrlich reaction patterns

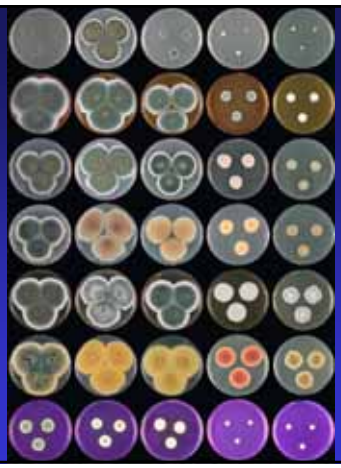
Violet reactions

No reaction

Summary of presentation II

- Macro-morphology:
  - Colony color (obverse/reverse)
  - Colony size
  - Exudate
  - Soluble pigment
- Micro-morphology:
  - Branching pattern
  - Shape phialide
- Ehrlich test

Macroscopical features



CYA, obverse - 30°C

MEA obverse

CYA obverse

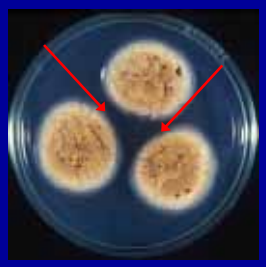
CYA reverse

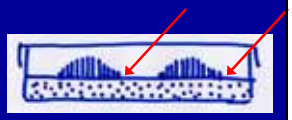
YES obverse

YES reverse

CREA obverse

Microscopic preparation of *Aspergillus* and *Penicillium*





Lactic acid with analine blue
Drop of alcohol
Preparations from Malt Extract Agar

SIM 49: Penicillium subgenus *Penicillium*: new taxonomic schemes, mycotoxins and other extrolites (accessible via CBS homepage; "Studies In Mycology")

On-line database about Penicillium subg. Penicillium:
http://www.cbs.knaw.nl/databases/index.htm (select Penicillium database)