Dormancy Metabolism Characteristics

1. Minimal metabolic turnover

2. Low water content

3. General lack of cytoplasmic movement

4. Temperature optima for germination which are often very different than those for vegetative growth

357

Factors that influence spore dormancy

I. Internal factors
   a. Maturity
   b. Longevity
   c. Vitality
   d. Endogenous substrate reserves

II. External factors
   a. Temperature
   b. Light
   c. Hydration
   d. Aeration
   e. Chemical environment

360

Definitions

a. Maturity = whether or not spore is fully developed

b. Longevity = how long (max) a spore can live

c. Vitality = maximum germination capacity

d. Endogenous substrates: substrates that nourish spores during dormancy

361

Definitions

1. Dormancy - any rest period or reversible interruption of the growth or development of the fungus

2. Constitutional dormancy - germination is delayed by an innate property of the spore*

3. Exogenous dormancy - development is delayed only because of one or more unfavorable chemical or physical conditions of the environment**

*a) Barriers to nutrient or water penetration
b) Some internal metabolic block
c) The production of a germination inhibitor
d) Loss of a germination promoter

** dessication, absence of light, substrate

362

Other terms relating to spore dormancy

1. Activation - the application of an environmental or chemical stimulus to the spore (constitutionally dormant) to induce germination.

2. Maturation - the complex changes that must occur during spore development to produce a spore capable of dormancy and germination.

3. After-ripening - the treatments which a fungal spore must undergo in nature before it may germinate.

4. Germination - the resumption in the spore of normal metabolic processes that usually lead to the production of one or more germ tubes or buds.

363

Germination Events

1. Reduction of refractive index (probably due mainly to H_2O uptake)

2. Isotropic (nonpolar) growth of spore (probably due to both stretching of existing wall and some new wall synthesis

3. Formation of a new cell wall inside of old cell wall

4. Polar formation of new bud or germ tube (wall of new bud or germ tube usually formed by extension of new inner wall of spore)

368

Documented Components* of Protein Synthesizing Apparatus in Spores

1. Ribosomes**
2. tRNA
3. aminoacyl tRNA synthetase
4. Transfer enzymes
5. Elongation factors
6. etc.

*all components seem to be active when assayed in vitro.

**only a few types of spores have been found to have polyribosomes in dormant situation.

374

Evidence that Protein Synthesis is Essential for Germination

1. Conidia and ascospore germination of *N. crassa* inhibited by cycloheximide (also many other spores)
2. Conidia of ts mutants for protein synthesis of *N. crassa* will not form germ tubes (also many other species)
3. Conidia of some amino acid auxotrophs of *N. crassa* & other fungi will not germinate in unsupplemented media

375

Germination Categories of Spores

Group I = spores of most fungi in which the synthesis of RNA & protein appear to begin together, a short time after placement in germination medium

Group II* = protein synthesis precedes RNA synthesis (preformed message & polysomes)

Group III** = RNA synthesis precedes protein synthesis

*only a few examples
**very rare and not well documented

376