Fungal Spores, Dormancy, and Dispersal

What are Fungal Spores?
- General definition: microscopic propagules that lack an embryo and are specialized for dispersal or dormant survival
  - Sexual spores tend to serve for dispersal
  - Asexual spores tend to serve for dormant survival
  - Some spores serve both purposes

What are Fungal Spores? (cont.)
- Spores differ from somatic cells:
  - Wall is thicker, often with pigments
  - Dense cytoplasm, poorly developed cytoplasmic components
  - Low water content, respiration rates, and protein/nucleic acid synthesis
  - High content of energy-storage molecules, e.g., glycogen, lipids, etc.

Spore Dormancy/Germination
- Dormancy is a general characteristic of most spores
- Two groups of spores based upon ability to germinate:
  - Constitutive dormancy
    - No germination in 'normal' conditions that stimulate somatic growth/development
    - Need to age or be activated by a specific trigger, e.g., heat shock
  - Exogenously imposed dormancy – remain dormant in unsuitable conditions, but germinate in response to nutrients

Spore Dormancy/Germination (cont.)
- Germination process
  - Hydration
  - Increase respiration
  - Increased synthesis
  - Outgrowth

Spore Dormancy/Germination (cont.)
- Constitutive dormancy
  - Mechanisms of release
    - Maturation process; or
    - Triggering event that activates trehalase; or
    - Removal of endogenous inhibitors
  - Ecological aspects – germination of
    - Coprophilous fungi triggered by digestive tracts of animals
    - Pyrophilous fungi triggered by fire/heat
**Spore Dormancy/Germination (cont.)**

- Exogenously imposed dormancy
  - Mechanism – fungistasis due to microbial activity in soil
    - Nutrient competition (probably key cause)
    - Release of microbial metabolites
      - Ethylene
      - Allyl alcohol
      - Ammonia
    - Both actions, but not antibiotics

**Ecological implications of fungistasis**

- Plant pathogens wait until exudates (nutrients) become available; crop rotation can inhibit pathogenesis [germination lysis]
- Release of host-specific molecules that stimulate germination [breed plants that don’t release these molecules]

**Spore Dispersal**

- Ballistic dispersal – coprophilous fungi
  - Phototrophic
  - Explosive discharge
  - Large projectile
- Insect dispersal (e.g., bark beetles and Dutch elm disease due to *Ophiostoma ulmi* and *O. novo-ulmi*)

**Spore Dispersal (cont.)**

- Appendages of aquatic fungi
- Motility of zoospores
- Airborne spores
- Rain drops