What are diseases and how do I control them?

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What is a disease?

An abnormality in structure or function caused by a long-term association with an infectious agent that injures the plant or reduces its economic value.

Some diseases caused widespread damage in a short period of time...

...others might reduce the uniformity of a playing surface...

...others may reduce the aesthetic appearance of the turf.

Injury is caused by humans or non-living factors.
Five types of microorganisms cause disease

- **Fungi (1X)**
- **Nematodes (400X)**
- **Bacteria (2,500X)**
- **Mollicutes (25,000X)**
- **Viruses (36,000X)**

Number of Known Diseases by Pathogen Type

- **Viruses**
- **Mycoplasmas**
- **Bacteria**
- **Nematodes**
- **Fungi**

Percent of Disease Problems by Pathogen Type

- **Nematodes**
- **Fungi**

Diseases attack the turf in different locations

- **Foliar Diseases:**
  - Copper spot
  - Bipolaris & Drechslera leaf spots
  - Brown patch
  - Dollar spot
  - Gray leaf spot
  - Gray snow mold
  - Stripe leaf spot
  - Pink patch
  - Powdery mildew
  - Pythium blight
  - Rusts
  - Southern blight
  - Yellow tuft

- **Stem and Crown Diseases:**
  - Anthracnose basal rot
  - Algae
  - Bentgrass dead spot
  - Large patch
  - Melting out
  - White patch

- **Root Diseases:**
  - Bermudagrass decline
  - Fibrous root blush
  - Pythium root dysfunction
  - Pythium root rot
  - Rusty dead root
  - Scald of zoysiagrass
  - Take-all patch

Pathogen Terminology

- **Parasite** – organism that obtains its food from another living organism
- **Saprophyte** – organism that uses dead organic matter as food

Fairy ring fungi are saprophytes...they do not infect living plants
Pathogen Terminology

Pathogen – a parasite that causes disease

Obligate pathogen – organism that can survive only on or in living tissue

Facultative pathogen – an organism that is normally saprophytic but is able to cause disease under certain conditions

Facultative saprophyte - an organism that is normally pathogenic but is able to live as a saprophyte under certain conditions

Rust, smut, and powdery mildew fungi are obligate pathogens. They cannot grow and survive without a living host.

Three factors are required for disease to develop

Host
Environment
Pathogen
Disease

Mycology 101: Key Characteristics of Fungi

• need water or high humidity to grow
• grow and cause disease in a narrow temperature range
• ubiquitous - they are everywhere!
• primary role in nature is decomposition
• some able to use a living plant as a food source

Most pathogens are facultative saprophytes, surviving in the thatch and soil when not causing disease.

Hyphae are the basic vegetative structure of most fungi.
Masses of hyphae, visible to the naked eye, are called mycelium.

Many fungi also produce spores.

Some fungi produce spores directly on the leaf surface, while others produce them inside of special structures.

Disease Management Problems, Landscapes

Disease Management Problems, Golf Courses

Reasons for Increased Disease Problems in Golf Course Turf

• low tolerance for damage
• grasses selected based on playability, not adaptability
• varieties bred for agronomic qualities and stress tolerance, not disease resistance
• blends and mixtures not frequently used
• regular traffic and wear
• little flexibility in cultural practices

North Carolina Turfgrass Survey, 1999
Healthy, well-managed turf is very resistant to disease.

Turfgrasses are susceptible to disease when stressed and growing slowly.

Turfgrass species vary in their susceptibility to diseases.

Cultivars also vary widely in their susceptibility to certain diseases.

The Disease Cycle

1. inoculation - pathogen comes in contact with plant
2. penetration - pathogen gains entry into plant
3. infection - pathogen establishes a food relationship
4. colonization - pathogen spreads within the host
5. dissemination - pathogen spreads to adjacent plants via hyphae or spores
6. survival - pathogen prepares for survival when conditions are no longer favorable

The Disease Cycle: Terminology

- latent period - the length of time between infection and symptom expression
- incubation period - the length of time between infection and dissemination
- inoculum - the part of the pathogen that comes into contact with the host
- primary inoculum - inoculum that induces the initial infections in a disease cycle
- secondary inoculum - inoculum that disseminates to produce repeated cycles of infection
*R. solani* survives in the thatch when not causing disease. When conditions become favorable, the fungus grows out of the thatch, up the leaf sheath, and onto the foliage.

*R. solani* produces infection pads that facilitate penetration of the leaf surface. The pathogen then spreads to adjacent, healthy plants by producing mycelium. Foliar symptoms appear 2 to 3 days after infection occurs.

Repeated cycles of infection and spread lead to distinct patches visible from a distance.

Summary: The Brown Patch Disease Cycle