Diseases Caused Due To Lawn Grass In Humans

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Abstract- *Maintaining a healthy, vigorously growing lawn is the best way to prevent a severe disease outbreak in turfgrass. Each square foot of turf contains about 500 to 1,000 individual plants, each requiring optimum amounts of water and fertilizer, the right mowing regime, and an aerated, well-drained soil. If any of these factors are missing or in excess, the grass may become stressed and more susceptible to disease.*

For a disease to occur, all three sides of the "disease triangle" must be present (Fig. 1). Even if a disease-causing pathogen is present, infection won't occur unless the environment (i.e., temperature, quantity of water, etc.) is conducive to disease development and susceptible grass is available. Selecting a turfgrass species that is adapted to the local climate and intended use, then following through with cultural practices that favor the grass rather than the pathogen, are important steps a home gardener can take to avoid severe lawn diseases.

Many common diseases are active only under specific environmental conditions and will affect the lawn only for a short time. When the weather becomes more favorable to growth of the turfgrass, the lawn will often recover on its own if proper cultural practices are followed. However, if conditions and practices that favor disease are allowed to continue, the result can be long-term damage to the lawn that is difficult to recover from. Although we can't control the weather, selecting the right grass and good cultural practices are keys to reducing disease. Fungicides are rarely needed for lawns when the right grass is planted and maintained correctly.

I. INTRODUCTION

The cause of lawn damage is often difficult to identify, and diseases aren't always the primary cause. It's a good idea to inspect your lawn once a week to immediately identify problems and act quickly to determine the cause before it's too late. Diseases tend to start off as small patches or spots of dying grasses that spread over time. If the damage is sudden, widespread, and severe, other pests or problems such as insects, pathogens, weeds, or environmental stress—such as too much or too little moisture or fertilizer—may be contributing to the observed symptoms. Damage that resembles disease symptoms may also result from incorrect watering, fertilizing, or mowing practices; damage from dog urine, herbicides, and other chemicals; poor drainage; compaction; vertebrate or insect damage; extremely high or low temperatures; competing vegetation; or thatch that is more than 1/2 inch thick.

Irrigation problems are the most common cause of discolored lawns. Fixing broken sprinklers and conducting "catch can tests" to ensure even water coverage might be all that is necessary to improve the health and appearance of a lawn. (See the Irrigation section.) No amount of fungicide will control a problem that results from poor watering practices.

Almost all lawn diseases are the result of pathogenic fungi that infect the blades, stems, or roots of turfgrass plants. Such diseases often are diagnosed by identifying symptoms of the disease and signs of the causal agent. Typical signs and symptoms include leaf spots; white, powdery growth; thin, open grass; and small to large areas of discolored or dying lawn. Visible parts of the pathogen (called signs)—such as whitish, cottony growth or small, hard, dormant structures (sclerotia)—are very useful in the identification process. Other typical symptoms of lawn diseases include "frog-eye" patterns (e.g., a circular area of dead grass with healthy grass in the center), leaf spots, rotted crowns and roots, yellow leaves, stunting, and wilting. Affected lawn areas can become discolored and lose density quickly.

Table 1 lists and describes the most common diseases occurring in home lawns in California. SeeThe UC Guide to Healthy Lawns for more information about how to manage lawns and diagnose problems.

II. SELECTING A SUITABLE LAWN GRASS

All types of turfgrass have positive and negative characteristics. There is no one perfect turfgrass suitable for all lawns. The type of grass you choose for your lawn should be compatible with your climate, anticipated use and maintenance level, and aesthetic desires; it also should have some resistance to common diseases.

Cool-season grasses (e.g., bluegrasses, fescues, ryegrasses, etc.) perform best at daytime temperatures between

70° to 85°F. Warm-season grasses (e.g., bermudagrass, seashore paspalum, St. Augustinegrass, and zoysiagrass) perform best between 80° to 95°F. Often, diseases most impact grasses when they aren't vigorously growing. Cool-season grass is more prone to disease infestations during the summer, while warm-season grasses are more prone to diseases in late fall through early spring.

Make every effort to choose a grass that grows well in your conditions. For instance, too much shade causes stress that can lead to disease development. Similarly, some species are more heat- or drought-tolerant than others.

New and improved cultivars of lawn grasses offering greater disease resistance, color, texture, density, and uniformity have been developed the past several years. Contact a reputable nursery or the UC Cooperative Extension office in your county for specific recommendations. Also see the publication *Turfgrass Selection for the Home Landscape* listed in References.

III. CULTURAL PRACTICES TO REDUCE LAWN DISEASE

To prevent lawn diseases, employ cultural practices that promote a dense, vigorous, actively growing grass with good recuperative ability. Good cultural practices include irrigation, fertilization, mowing, soil cultivation, and thatch removal. Table 1 outlines cultural practices that help prevent specific diseases.

Irrigation

Much of California has a Mediterranean climate characterized by rainfall in winter and spring and very little rain during summer and fall. Throughout the state, lawns require irrigation. It's important to follow sound watering practices—whether watering by hand or using an automated system—to promote an environment favoring growth of the lawn rather than disease. Applying too much or not enough water can result in unhealthy, slow-growing grass that is vulnerable to pathogens.

SAMPLING FOR COMMERCIAL LABORATORY DIAGNOSIS

When a disease outbreak in a home lawn is suspected, the best course of action may be to seek the professional services of a plant disease diagnostic laboratory. Accurately identifying the problem before symptoms become severe allows for corrective action to be taken before there is an unnecessary loss of large lawn areas. Contact a nursery or your local UC Cooperative Extension office for a list of diagnostic laboratories.

An accurate diagnosis depends on the quality of the sample submitted, so the way a sample is taken is important. Collect entire grass plant samples—leaves, stems, roots, and soil—from several lawn areas that appear to exhibit different stages of the observed symptoms. It is a good idea to sample on the edge of an infected area, making sure to include plants that are just beginning to show symptoms. Remember that the pathogen isn't always active in the part of the grass plant exhibiting disease symptoms, so be sure to include the entire plant. For example, symptoms observed in the foliage such as chlorosis (yellowing) or wilting could be associated with a vascular wilt or a root rot. Also, take samples from plants just beginning to show symptoms; often dead turf will be overrun with secondary fungi and bacteria that may be decomposing the dead turf, making accurate diagnosis difficult.

Place samples in a plastic bag and carefully label it. Placing a moist paper towel in the bag will help keep the samples as fresh as possible during transport. Don't allow roots to dry out. Attach a written description of the type of lawn and symptoms you observed. Also include information on cultural management practices, any chemical applications that have been made, and any other relevant information that might be useful in making an accurate diagnosis as well as the date the sample was collected and your name and contact information.

Keep the samples cool and moist, and submit them as soon as possible; refrigerate as necessary, but don't freeze them. Sending the samples by Priority Mail or Next Day delivery is optimum.

Waterlogged soils are poorly aerated, which restricts root growth, promotes some diseases, and allows algae and moss to thrive. In general, a deeply watered lawn develops a deeper and more extensive vertical root system, which provides it with greater drought and disease resistance than a shallowly watered lawn.

Turfgrasses vary in water requirements. Warm-season turfgrasses are more drought-resistant than cool-season grasses and require about 20% less water. See Table 2 for information on how many minutes to water warm- and cool-season lawns each week in various parts of California, based on the output of the irrigation system or hose-end sprinkler. It is best to water the lawn thoroughly at longer intervals, until runoff just begins, rather than watering a little every day.

The number of times to water each week depends on how long the irrigation system can run before water just starts to puddle or run off the soil surface. For example, if a grass needs 40 minutes of irrigation each week but runoff begins after 20 minutes, water twice a week for 20 minutes. In cases where soil takes up water so slowly that runoff occurs before 10 minutes, water cycling is necessary. To cycle, irrigate until runoff just begins, turn the system off, and repeat the process in 30 minutes before the soil surface dries out. Several cycles per day might be necessary to apply the desired amount of water.

To determine sprinkler output, conduct "catch can tests" by setting small, empty, straight-sided, equal-sized containers such as tuna or cat food cans on top of your lawn every 10 to 15 feet between sprinkler heads operated by the same valve (Fig. 2) and run the system for 15 minutes. After 15 minutes, turn off the system and measure the amount of water in each can with a ruler to determine the average amount of water per can. To find the average, add up the measurements from all the cans and divide this number by the number of cans used. Multiply this number by four to calculate the sprinkler output rate per hour. Compare this number to the outputs listed inTable 2 to determine how many minutes you need to irrigate weekly. Conducting can tests regularly also is useful for determining how evenly irrigation water is distributed over the area watered and allows for sprinkler head misalignments and other mechanical problems to be discovered and corrected.

The best time to water is early in the morning, when evaporation rates are lowest and water pressure is at its peak. Irrigating in the afternoon is wasteful because of higher evaporation rates; also, prolonged damp conditions in the evening can encourage disease development. Remember that irrigation requirements change from month to month and irrigation might not be needed at all if it has rained. Reset your sprinkler system to meet your lawn's changing irrigation needs.

Fertilization

Applying the correct amount of fertilizer is an important aspect of maintaining a healthy, dense lawn with good disease resistance. Fertilization influences turfgrass growth, which in turn influences the recuperative ability of stressed grass. All turfgrasses require nitrogen, and certain sites may also require other nutrients, including iron, on a regular basis. Applying too much nitrogen, especially in a highly soluble, fast-release form, can result in excessive, succulent leaf and stem growth, leading to increased opportunities for fungal penetration that might result in diseases such as brown patch, Pythium blight, and leaf spot. Over-fertilized lawns also require more frequent mowing and watering. Conversely, lawns grown under nitrogen-deficient conditions are prone to dollar spot, rust, and red thread diseases.

For moderate, even growth, apply a total of 4 to 6 pounds of actual nitrogen per 1,000 square feet of lawn area annually. Avoid applying more than 1 pound of actual nitrogen per application. Sandy soils require the same amount of nitrogen as clay soils, but apply it at lower rates and more frequently. Fertilizer should be applied during the active growing season of the grass, which generally is during spring and summer for warm-season grasses and during fall and spring for cool-season lawns.

Mowing

Maintaining a lawn at the recommended mowing height will improve its ability to resist diseases and give it greater aesthetic appeal. The frequency with which the lawn is mowed should be based on the growth rate of the grass. Lawns should be mowed often enough so that no more than one-third the length of the grass blade is removed at any time. Removing too much of the grass blade can increase the susceptibility to several diseases by depleting food reserves in the plant, making it difficult for the plant to recover from stress and injury. Repeated scalping kills or greatly reduces the vigor of a turfgrass. Maintain sharp mower blades to avoid mechanical damage to turf.

When grass is mowed regularly, clippings can be left on the lawn, a practice called "grasscycling." Grasscycling hasn't been found to significantly increase thatch or disease incidence. For additional information, see *Mowing Your Lawn and "Grasscycling"* listed in References.

Soil Cultivation and Thatch Removal

Soil compaction reduces root growth as well as recuperative ability, thus increasing a lawn's relative susceptibility to diseases. Soil cultivation, such as coring or aerification, will improve shoot and root growth and recuperative ability while decreasing the likelihood of disease and insect damage. Cultivation should be done during times when the grass is growing vigorously and can take advantage of the reduction in soil compaction (spring and fall for cool-season turf and early summer for warm-season grass).

Thatch is a partially decomposed layer comprised of roots, stems, rhizomes, crowns, and stolons above the soil surface. Up to 1/2 inch of thatch is beneficial: it provides

insulation to roots, reduces soil water evaporation, cushions playing surfaces, and can prevent soil compaction. However, thatch layers greater than 1/2 inch should be removed to avoid restricting water entry into the root zone.

Several turfgrass pathogens can survive in the thatch layer, including those that cause summer patch, leaf spot, and melting-out diseases. Heavy thatch may also lead to fairy ring problems. Bermudagrass, Kentucky bluegrass, and kikuyugrass produce more thatch than most other turfgrasses and require regular dethatching. Equipment rental businesses often carry dethatching (verticutting) machines that are specifically designed to remove thatch from home lawns.
The UC Guide to Healthy Lawns provides additional information on how to choose turfgrass species as well as how to irrigate, fertilize, and manage your lawn to prevent disease.

Table 1. COMMON LAWN DISEASES IN CALIFORNIA

Dollar spot

Pathogen: *Sclerotnia homeocarpa*, *Lanzia* sp., *Moellerodiscus* sp.

Susceptible grasses: bermudagrass, annual bluegrass, fescue, ryegrass, Seashore paspalum, zoysiagrass

Symptoms: small, circular spots from 1–5 inches in diameter; spots might merge to form large, irregular areas; leaves appear watersoaked then brown, often exhibiting a reddish band across the leaf; fine, white cobwebby threads seen in early morning

Conditions favoring disease: moderate temperatures (60°–80°F); excess moisture or water stress; fog; thatch; survives in soil as hard, dark structures (sclerotia)

Prevention: fertilize adequately; reduce thatch; water appropriate length of time to a depth of 4–6 inches but don't extend interval too long; maintain air circulation; compost top dressings can suppress disease

Chemical treatment: if present in previous years, fungicide might be useful; apply in early spring or fall before symptoms occur

Fairy ring

Pathogen: *Agrocybe* spp., *Marasmius oreades*, *Lepiota* spp., other *Basidiomycete* spp.

Susceptible grasses: all lawn grasses

Symptoms: a dark green band of turf develops in a circle (4 inches up to 30 feet) or semicircle in moist turf; mushroomsmight or might not be present; an area of brown, dying grass might occur just behind the dark green band; a second ring of dying grass might appear inside the circle; weeds commonly invade

Conditions favoring disease: soils high in thatch or undecomposed organic matter containing lignin

Prevention: apply adequate nitrogen; aerate soil for better water penetration, water heavily in holes for several days; verticut if more than 1/2 inch of thatch accumulates; rake mushrooms to improve appearance of turf; to eliminate, remove turf and root zone containing white, cottony mass to a depth of 12 inches and 2 feet beyond outer edge of the ring; refill with clean soil and reseed or resod

Chemical treatment: fungicides available, but control has been erratic

Fusarium blight

Pathogen: *Fusarium culmorum*, *F. tricinctum*

Susceptible grasses: Kentucky bluegrass
Symptoms: small, circular, grayish green areas, ranging from a few inches up to a foot in diameter; some plants in center can survive, giving a frog-eye appearance; the crown or basal area of dead stems has a reddish rot and is hard and tough; dead foliage appears bleached

Conditions favoring disease: daytime temperatures of 85°–95°F; drought-stressed areas in full sun; survives in thatch and grass residues

Prevention: water appropriate length of time; don't apply more than 1 pound nitrogen/1,000 square foot/application or more than 6 pounds annually; use a mixture of 20% perennial ryegrass when seeding bluegrass; mow at highest recommended height; verticut if more than 1/2 inch thatch

Chemical treatment: fungicides don't give complete control in California; make application in spring before or just after symptoms appear

Gray leaf spot

Pathogen: *Pyriculria grisea*

Susceptible grasses: fescues, kikuyugrass, ryegrasses, St. Augustinegrass

Symptoms: irregular blighted patches of turf with bleached spots with dark margins on leaves; ryegrass develops a fishhook appearance

Conditions favoring disease: daytime temperatures of 85°–95°F; high humidity or rainfall; overwatered and overfertilized turf

Prevention: irrigate properly; don't overfertilize; reduce shading; increase air movement

Chemical treatment: fungicides are available, but cultural controls are more practical

Microdochium patch (pink snow mold)

Pathogen: *Microdochium nivale*

Susceptible grasses: annual bluegrass, bluegrasses, fescues, ryegrasses, zoysiagrass

Symptoms: circular patches of 1–2 inches that can enlarge to 12 inches; leaves first appear watersoaked, then reddish brown, and finally bleached; minute, gelatinous spore massessometimes seen on dead leaves; white or pinkish fungal threads might be seen in early morning; more prevalent in Central and Northern California

Conditions favoring disease: consistently cool temperatures (40°–65°F) and wet conditions; high nitrogen applications in fall; neutral or alkaline soil pH; pathogen survives in grass residues

Prevention: reduce shade and improve soil aeration and water drainage; water appropriate length of time; avoid excess nitrogen, especially in fall; maintain soil pH between 6.5–6.7.

Chemical treatment: if a serious problem in past, have licensed applicator apply fungicide in fall before symptoms appear

Leaf spot

Pathogen: *Bipolaris* spp. and *Helminthosporium* spp.

Susceptible grasses: bermudagrass, bluegrasses, fescues, kikuyugrass, ryegrasses, zoysiagrasses

Symptoms: circular to elongated brownish spots with brown centers and dark brown or purple borders on leaf blades, sheaths, and stems; crowns and roots frequently have a dark brown rot; crown-infected plants might die in hot, windy weather, leaving thinned areas throughout the turf; spores are windborne

Conditions favoring disease: warm temperatures (70°–90°F) for bluegrasses, ryegrasses, and fescues; cool temperatures (60°–70°F) for bermudagrass and zoysiagrass; high humidity; low clipped turfgrass; most severe with excess nitrogen fertilization or deficiency

Prevention: reduce shade; improve soil aeration and water drainage; avoid dry spots and too much nitrogen fertilizer; maintain as high a cutting height as possible

Chemical treatment: fungicides available but often not warranted

Pythium blight (Grease spot)

Pathogen: *Pythium* spp.

Susceptible grasses: all grasses

Symptoms: small, circular spots (2–6 inches) that run together; blackened leaf blades rapidly wither, turn reddish brown, lie flat, stick together, and appear greasy; roots might be brown; in humid conditions, masses of fungal mycelium might appear

Conditions favoring disease: low spots that remain wet; warm temperatures (80°–95°F daytime, >68?F night time); survives as spores in soil for long periods

Prevention: reduce shading; improve soil aeration and water drainage; water appropriate length of time; avoid mowing wet grass and applying high levels of nitrogen during hot, humid weather

Chemical treatment: fungicides available but primarily prevented by cultural practices in California

Rhizoctonia blight

Pathogen: *Rhizoctonia solani* AG1-A, AG 3

Susceptible grasses: bluegrass, annual bluegrass, fescues, ryegrasses

Symptoms: first appears as small, irregular brown patches or rings that can enlarge to many feet in diameter; centers might recover resulting in rings of diseased grass; leaves and sheaths become watersoaked, wilt, turn light brown, and die; in light infestations, roots usually not infected and plants often recover; soil-inhabiting fungus that forms fine, fungal threads in soil or on turfgrass

Conditions favoring disease: excess thatch and mat along with high temperatures (80°–95°F); high humidity; soft, lush growth due to excessive nitrogen; most common in warm, inland areas

Prevention: reduce shading and improve soil aeration and water drainage; water appropriate length of time to a depth of 4–6 inches; avoid excess nitrogen; maintain thatch less than 1/2 inch

Chemical treatment: fungicide useful if disease severe in past or for seedlings in young turf

Rhizoctonia large patch

Pathogen: *Rhizoctonia solani* AG 2-2LP

Susceptible grasses: bermudagrasses, kikuyugrass, St. Augustine grass, zoysiagrass

Symptoms: first appears as small, irregular brown patches or rings that can enlarge to many feet in diameter; centers might recover resulting in rings of diseased grass; leaves and sheaths become watersoaked, wilt, turn light brown, and die; plants pull out easily from soil with rotten stolons, in light infestations, roots usually not infected and plants often recover; soil-inhabiting fungus that forms fine, fungal threads in soil or on turfgrass

Conditions favoring disease: excess thatch and mat along with cool temperatures (60°–70°F); wet soil conditions

Prevention: reduce shading and improve soil aeration and water drainage; water appropriate length of time to a depth of 4–6 inches; avoid excess nitrogen in the fall; maintain thatch less than 1/2 inch

Chemical treatment: fungicide useful if disease severe in past

Red thread

Pathogen: *Laetisaria fuciformis*

Susceptible grasses: bentgrasses, bermudagrasses bluegrasses, fescues, ryegrasses

Symptoms: red thread may kill turfgrass in patches that are 2–8 inches in diameter, or the disease may occur over large areas without killing the plants; pink web of fungal threads bind the leaves together; look for pink, gelatinous fungal crusts projecting from the leaves to help identify this disease

Conditions favoring disease: common under conditions of mild air temperatures (60°–75°F) and extended periods of leaf wetness; often appears on plants deficient in nitrogen during periods of cool or warm temperatures if there is adequate moisture (e.g., excess irrigation or rainfall)

Prevention: proper irrigation and fertilization can reduce the incidence; adequate nitrogen usually can prevent this disease from occurring; prevent drought stress by irrigating turfgrass based on evapotranspiration needs of the turfgrass; provide adequate air circulation; reduce shading

Chemical treatment: fungicides rarely warranted except in severe cases

Rust

Pathogen: *Puccinia* species

Susceptible grasses: all grasses

Symptoms: irregular patches of weak turf covered with rust colored growth (spores)

Conditions favoring disease: moderately warm air temperatures (70°–75°F) and extended periods of leaf wetness favor development; turf that is deficient in nitrogen is more susceptible

Prevention: maintain turfgrass vigor by following proper irrigation and fertilization requirements for turf species; mow regularly and remove clippings to reduce number of spores if lawn is infected

Chemical treatment: follow proper cultural practices; fungicides shouldn't be needed

Spring dead spot

Pathogen: *Ophiosphaerella korrae*

Susceptible grasses: bermudagrass, Seashore paspalum, zoysiagrass

Symptoms: circular areas of dead grass 6–12 inches in diameter appear in spring when growth resumes; spots might coalesce to form large areas; typically affects turfgrass more than 2 years old

Conditions favoring disease: affects dormant plants; most severe when soil temperatures are < 65°F; survives as sclerotia and in infected roots and stolons

Prevention: remove dead grass; fertilize in summer to maintain vigor; don't overfertilize in late summer; water appropriate length of time

Chemical treatment: fungicides available but primarily prevented by cultural practices in California

Summer patch

Pathogen: *Magnaporthe poae*

Susceptible grasses: bluegrasses, fine fescues

Symptoms: circular, yellow or tan areas of dead and dying plants up to 1 foot in diameter; can have green, apparently healthy plants in center; roots, crowns, and stolons have dark brown fungal hyphae on them; vascular discoloration and cortical rot occur in later stages

Conditions favoring disease: high temperatures (> 85°) in late spring through the summer; most severe when turf is mowed low or when soil moisture is excessive

Prevention: aerate soil and apply slow-release nitrogen; improve drainage; reduce compaction; water appropriate length of time; don't mow too low; control thatch; reduce soil pH if higher than 7

Chemical treatment: systemic fungicides in fall usually necessary when disease has been severe

For currently registered fungicides, see *UC IPM Pest Management Guidelines: Turfgrass* listed inReferences.

Table 2. Minutes to Irrigate Warm- and Cool-season Turfgrass per Week in California.

Central Coast	San Joaquin Valley
Northeastern Mountain Valleys	Sierra Mountains
Northern Coast	Southern Coast
Northern Inland Valleys	Southern Deserts
Sacramento Valley	Southern Inland Valleys

WARNING ON THE USE OF CHEMICALS

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