Putting the 'S' in Disease Control

BY KARL DANNEBERGER

Recent news has been filled with the possible Avian flu outbreak. The likelihood that tens of million of people worldwide could be infected is making many health and government officials nervous. The potential spread of this pandemic is in many ways beyond human grasp, while preparing for its onset is even more mind-boggling.

Although preparing for and effectively controlling turfgrass diseases does not rank on the same scale as flu pandemics — let alone having a disease control "budget" of more than $7 billion dollars — preparing for a disease outbreak is applicable to our field.

Focusing on a common disease of turf — dollar spot — recent research shows that preparing for potential summertime outbreaks may reduce its severity. Turfgrass pathologists and researchers at several universities, including Rutgers University, The Ohio State University and Purdue University, recently submitted a paper at the American Phytopathology Society Meetings entitled, "Impact of Fall and Spring Fungicide Applications on Dollar Spot." As the title implies, either a fall or spring fungicide application or both can reduce the amount of dollar spot the following spring and early summer.

The timing of these fungicide treatments is still being defined. However, given that dollar spot occurs on creeping bentgrass and *Poa annua* for most of the growing year, the cost savings from a late or early application may be significant in that fewer spring and early summertime applications are needed.

A second disease — anthracnose — occurs anytime *Poa annua* and/or creeping bentgrass is under stress. Similar to dollar spot, controlling anthracnose is especially difficult when treating it curatively. Superintendents in the northeast United States have practiced an early treatment strategy for anthracnose. A fungicide application is made in late fall to reduce disease infection and pathogen levels prior to the start of the next year.

The theory behind early treatment is based in a large part on how pathogen populations develop. Population growth occurs when "births" are greater than "deaths" (immigration is excluded in this explanation). No matter how small the difference, eventually the population will increase at an exponential rate until food or resources like space become limiting. Plotting population growth produces a sigmoid (S-shaped) curve or, as it is sometimes called, a growth curve.

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Pathogen population growth begins slowly (the bottom part of the curve). However, as the population reaches a critical level, it increases rapidly. For example, if we took a hypothetical organism that doubled in size every 30 seconds, it might start off slowly doubling from two to four, then eight, 16, 32, 64, 128, etc. As this number increases rapidly, it reaches the exponential phase or the midsection of the S-shaped curve. If we were to extrapolate and say in this example that the middle part of the curve is the critical level for disease damage, it becomes obvious at what point our disease control practices are most effective.

If we target our control practices at the bottom, flat part of the S-shaped curve, our practices will suppress and slow the development of the pathogen, considerably taking longer to buildup to the unacceptable disease level. However, if we target our practices to the middle part of the S-shaped curve or the exponential phase, depressing or knocking down pathogen population levels becomes considerably more difficult.

Fungicide applications made in the fall and early spring to control diseases are targeted to keep the pathogen population low. Thus, the period required to reach epidemic proportions takes longer to build up during the growing season.

Continued research should help define the window of opportunity in the control of turfgrass diseases. Early prevention appears to be important not only in human health but also in turf health.

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