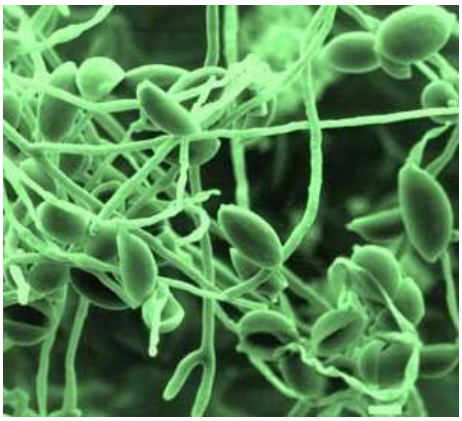
AWESOME stories

THE POTATO BLIGHT



The devastating blight, which impacted the potato crop throughout Ireland beginning in 1845, was caused by a fungus known as *Phytophthora infestans*. This image depicts an electron micrograph of *Phytophthora infestans* growing on a potato leaf. The lemon-shaped sporangia are involved in spreading the fungus (even to healthy, harvested crops which are in storage for future use). Under the right environmental conditions—when the temperature is cool (20 C or less) and relative humidity is very high (95-100%) - the "cytoplasm in the sporangia divide and many swimming zoospores emerge from each sporangium." Those zoospores spread the disease to other plants, potentially ruining potato crops over very widespread areas. Image online via the UK's Agri-Food and Biosciences Institute.

A devastating plant disease called "Late Potato Blight" ruins potato crops every year. Caused by a fungus known as *Phytophthora infestans*, the blight destroyed the Irish potato crop of 1845.

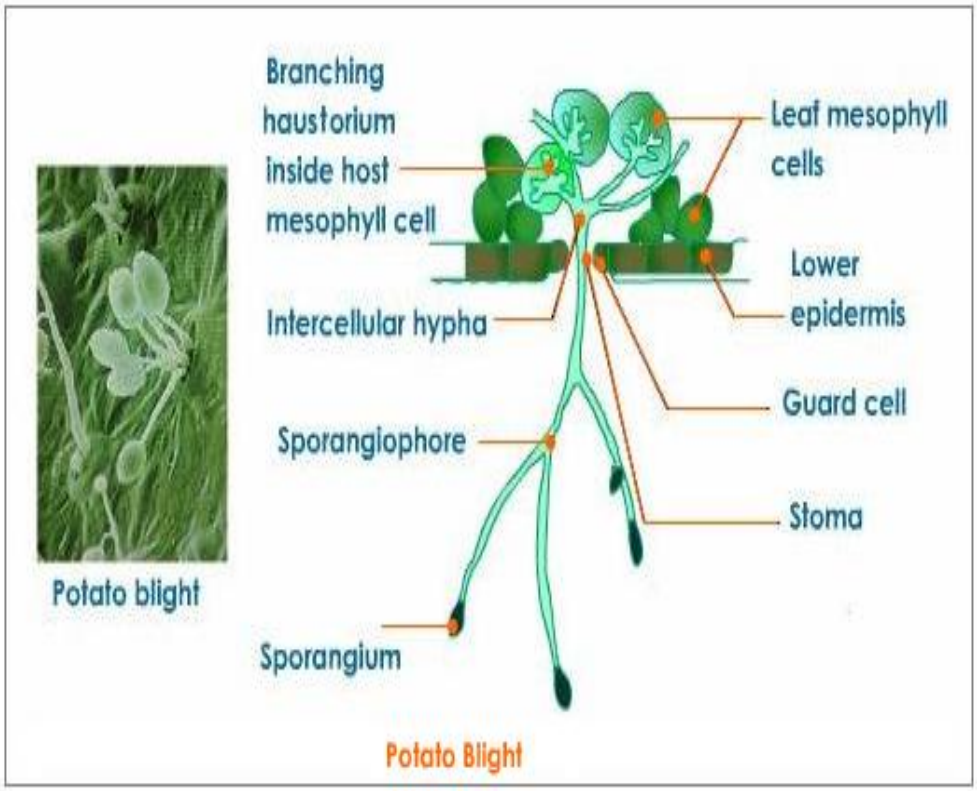
The disease first infects exposed leaves and stems of the potato plant. As the fungus grows (the link takes you to a drawing of its genetic map), it produces spores. When those spores are washed into the soil by rain or irrigation water, the fungus spreads. Once the fungus gets into the soil, it infects the tubers and causes them to rot.

Certain weather conditions help the disease. A prolonged rainy period, for example, will help the fungus grow and spread. Ireland had such a weather pattern during the summer of 1845.

Once the fungus takes hold of the plant, it can spread quickly. First it acts like a parasite, getting its food supply from the plant. Then it increases so rapidly the fungus becomes a pathogen, causing disease and massive losses.

The fungus itself is not very visible. It looks like a kind of white mildew on the surface of infected potato leaves and stems. The disease progresses, however, and as the tubers become infected they begin to rot.

When *Phytophthora infestans* ruins a potato crop, all of the diseased material has to be removed and destroyed. That includes the tubers. The reason for this is the pathogen can survive the change of season on infected plant materials, putting the next season's crop at risk.



Unchecked, the disease spreads until it runs out of food. By then, the whole potato crop can be destroyed, as it was in 1845 Ireland.

See Alignments to State and Common Core standards for this story online at:
http://www.awesomestories.com/asset/AcademicAlignment/THE-POTATO-BLIGHT-Great-Hunger-Irish-Potato-Famine

See Learning Tasks for this story online at:
http://www.awesomestories.com/asset/AcademicActivities/THE-POTATO-BLIGHT-Great-Hunger-Irish-Potato-Famine

Questions 2 Ponder

What Can Happen When a Fungus Runs Its Course?

In mid-19th-century Ireland, a potato fungus takes hold of the potato crop. The specific pathogen can survive a change of season, on infected plant materials, putting the next season's crop at risk.

If the disease is unchecked, it keeps spreading until it runs out of food. If the food for such a pathogen is the potato plant itself, this means that the entire potato crop can be destroyed before the fungus runs its course.

When this situation actually happens, as it did in Ireland between 1845-1849, the damage is not just to the crops but to the people and to the country.

Imagine that the potato fungus represents something else - or some other situation - which has the potential to destroy everything in its path until it runs its course. Could that something else be political? Could it be medical? Is it stoppable?

Is there ever a situation, that you can think of, which isn't stoppable with human intervention?

Is there ever a time when human intervention makes no difference whatsoever? Explain your answer.

Media Stream

1845 Potato Blight

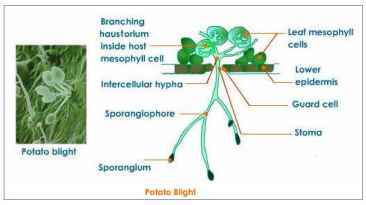
We learn more about the potato blight which caused Ireland such misery, during the mid-19th century, from the USDA.

This image, for example, depicts what happens to the potato plant itself. But:
• How does the fungus travel?
• How prevalent is it?
• How long does it take for lesions to appear (or infection to occur) from the time of first exposure?
• Do any plants have immunity from the fungus?
• If the fungus infects a plant, does it infect the whole plant?
• How can we prevent it (if at all)?
• What is the earliest-known infestation?
• Is the fungus still a problem?

The USDA tells us more:

Route of transmission: Phytophthora infestans form spores which can travel through the wind for at least a mile from an infected site. Spores require a host organism to survive the winter months. Infected plants material from the previous season can spread spores to uninfected plants in the current growing season. The pathogen is responsive to changes in weather, growing faster when it is humid and warm and drying off in cold weather.

Prevalence: Potato blight can effect crops worldwide, especially areas with high humidity and moderate tempuratures.



Generation Time: Lesions can occur within 3 to 4 days with spores forming 4 to 6 days from infection.

Immunity: Certain varieties of potato plants are resistance to the pathogen while other plants have leaves and stems that are disease resistance, but their tubers are still susceptible allowing the plant to survive as well as provide the pathogen a host.

Morbidity: Some plants have leaves and stems that are disease resistance, but their tubers are still susceptible allowing the plant to survive as well as provide the pathogen a host.

Methods of Prevention: The disease can be prevented by spraying fungicide on plants after periods of increased humidity and temperature. Cultivating potato varieties that are resistant to water mold is one method to combat the pathogen. However, susceptible varieties are still grown as they are commercially desirable.

When a crop is infected, all diseased material, especially the tubers, must be removed and destoryed as the pathogen can survive the change in season on infected plant materials. Eliminating the canopy through use of herbicides or strong acids two weeks before harvest can prevent tubers from being infected with blight.

Earliest Know Cases: In 1840, the pathogen migrated from central Mexico to the United States. From North America, the pathogen spread to Europe and then to the rest of the world. In 1845 and 1846 there was an outbreak of blight in Ireland that led, along with other factors, to a famine where a million to a million and half lives were lost.

Economic Impact: The disease, worldwide, cost 6 billion dollars annually. Many people point to the Irish potato famine or the great famine as an example of the problem with growing monoculture crops. Growing only commercial desirable varieties can lead to disease susceptibility and crop loss.
Click on the image for a better view.
Image and quoted information from the USDA (U.S. Department of Agriculture).
View this asset at: http://www.awesomestories.com/asset/view/1845-Potato-Blight

Leaves and Stems of the Potato Plant

Image online, courtesy the The American Phytopathological Society website.
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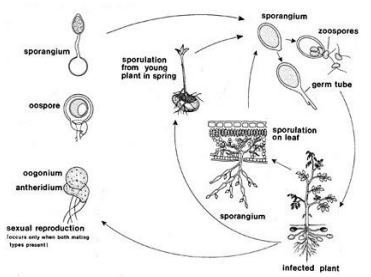
http://www.awesomestories.com/asset/view/Leaves-and-Stems-of-the-Potato-Plant

Rotting Potatos

Image online, courtesy The American Phytopathological Society website.
View this asset at: http://www.awesomestories.com/asset/view/Rotting-Potatos



Disease Spreading Cycle

Image online, courtesy The American Phytopathological Society website.
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Potatos Rotting in the Field

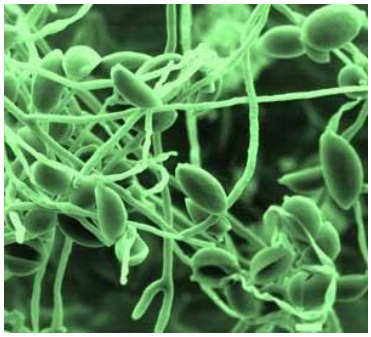
Image online, courtesy The American Phytopathological Society website.
View this asset at: http://www.awesomestories.com/asset/view/Potatos-Rotting-in-the-Field

Fungus on the Infected Potato

Image online, courtesy The American Phytopathological Society website.
View this asset at:
http://www.awesomestories.com/asset/view/Fungus-on-the-Infected-Potato

Infected Tubers Begin to Rot from Potato Blight

Image online, courtesy the Cornell University website.
View this asset at:
http://www.awesomestories.com/asset/view/Infected-Tubers-Begin-to-Rot-from-Potato-Blight



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