Research Debunks Pathogen Evolution Hypotheses

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In a classic case of “chicken or egg” detective work, scientists at North Carolina State University and The Institute for Genomic Research have concluded that previous hypotheses about the evolution of one of the world’s worst pathogens – *Phytophthora infestans*, the pathogen that caused the Irish potato famine in the 1840s – are wrong.

By sequencing the set of all genes, or genome, inside the cellular power plants, the mitochondria, of the different strains of the pathogen, Dr. Jean Beagle Ristaino, professor of plant pathology at NC State, and a team of researchers discovered that type II strains did not evolve from the type I strains, as was previously hypothesized. Instead, Ristaino and her colleagues say that the strains evolved from a common ancestor and that the type II strains diverged earlier than the type I strains.

The research is published in the January 2006 edition of *Current Genetics*.

There are four different strains, or haplotypes, of *P. infestans* – types Ia, Ib, IIa and IIb. The fungus-like pathogen causes severe lesions on leaves of potato and tomato plants. Ristaino called into question prevailing theories that the Ib strain of the pathogen caused the Irish potato famine in a paper published in the journal *Nature* in 2001, and published findings that pointed the finger instead at the Ia haplotype in 2004.

“We wanted to know how the four strains evolved and how they are related to each other,” Ristaino said. “This will help us learn how
mutations, or changes in the genome, are leading to sensitivity to fungicide, for example.”

The Ib strain has been termed the ancestral strain by other researchers. Ristaino and her team discovered that while the Ib strain is most closely related to the common ancestor – it has the fewest mutations of the four strains – evidence suggests that it diverged from the common ancestor later in time than the divergence of the type II strains.

Type Ia and IIa still affect potato plants around the world; in fact, more fungicide is sprayed for potato late-blight, which is caused by *P. infestans*, than any other potato disease, Ristaino said. Type IIb has a large number of mutations, which could explain why it is so rare and why it most often affects tomato plants instead of potato plants, she added.

Ristaino’s lab is currently investigating the center of origin of *P. infestans*. She hypothesizes that the pathogen originated in South America and perhaps made its way to Europe and the United States via exports of potato seed on steamships.

The late-blight pathogen led to the Irish potato famine, which killed or displaced millions of Irish people, and other epidemics across the world.

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