

Jean Beagle Ristaino,

William Neal Reynolds Distinguished Professor of Plant Pathology and Director of Emerging Plant Disease and Global Food Security Cluster, NC State University, Raleigh, NC

Dept. of Entomology and Plant Pathology, North Carolina State University, Raleigh, NC Jean_ristaino@ncsu.edu



Prof. J.B. Ristaino

*Dr. Ristaino works on the population genetics of historical epidemics of the pathogen that caused the Irish famine *Phytophthora infestans* and studies the population structure and epidemiology of modern day late blight outbreaks. Her lab is interested in the impact of migration, recombination and hybridization on the evolution of *Phytophthora* species. Her work has tracked migrations of *P. infestans* from its ancestral home in the Andes to the US and Europe. She developed pioneering research techniques for use of 150-year-old historic herbarium specimens to track epidemics. She is also using datamining of archival literature to map outbreaks. Her recent work with collaborators has used next generation sequencing to study historical outbreaks. Her lab also manages the disease surveillance network called USABlight.org. This surveillance system records late blight outbreaks, sends disease alerts to growers, and provides decision support tools for managing disease. She also conducts *Phytophthora* and molecular diagnostics workshops globally in the developing world and has described new species of *Phytophthora* and developed taxonomic keys for identification. Dr. Ristaino was named a Jefferson Science Fellow with the US Department of State in 2012 and has worked on a range of emerging plant diseases that impact global food security with USAID. She serves on the advisory board of the Triangle Center for Evolutionary Medicine. She directs a new faculty cluster at NC State on “Emerging Plant Disease and Global Food Security” and has led the Triangle Global Food Security Initiative. She was awarded a Fulbright Research Scholar award in 2017 and is currently on sabbatical conducting research at the University of Catania in Sicily. Dr. Ristaino’s research impacts the science of plant pathology, epidemiology, population genomics, food security and also impacts global science policy.*

La Prof.ssa Ristaino studia la genetica delle popolazioni di *Phytophthora infestans*, l’agente causale della malattia nota come peronospora della patata, responsabile della carestia che in Irlanda provocò

la morte per fame e stenti di oltre un milione di persone e ne spinse altrettante a migrare negli Stati Uniti d'America e in Australia. Ha dedicato particolare attenzione al confronto tra le popolazioni del patogeno che causarono la storica carestia con quelle associate ai recenti e improvvisi scoppi epidemici in varie parti del mondo. Ha pubblicato in prestigiose riviste scientifiche, tra le quali *Nature*. Il laboratorio da Lei diretto, presso la *North Carolina State University*, si interessa delle conseguenze delle migrazioni, ricombinazioni e ibridazioni sull'evoluzione delle popolazioni dell'agente causale della peronospora. Mediante l'analisi genetica delle popolazioni di *P. infestans*, effettuata anche su campioni custoditi in erbario e risalenti a più di 150 anni fa, ne ha ricostruito le migrazioni dall'areale di origine, nelle Ande, al Nord America e all'Europa. Ha applicato inoltre moderne tecniche di NGS per studiare gli scoppi epidemici di peronospora verificatisi di recente o nel passato. Coordina la rete di laboratori denominata *USABlight.org*, un sistema di sorveglianza per prevedere in tempo le epidemie di peronospora e predisporre adeguate misure di contrasto. Organizza in tutto il mondo, in particolare nei paesi in via di sviluppo, corsi di diagnostica per il riconoscimento di *Phytophthora* spp., ha descritto nuove specie di *Phytophthora* e sviluppato una chiave tassonomica per il riconoscimento delle diverse specie. È stata nominata *Jefferson Science Fellow* dall' *US Department of State* nel 2012 ed ha lavorato su numerose malattie emergenti delle piante che possono avere conseguenze sulla sicurezza alimentare. Fa parte del Consiglio Scientifico del *Triangle Center for Evolutionary Medicine*. Presso la *North Carolina State University* coordina il nuovo corso di studio *Emerging Plant Disease and Global Food Security* ed è stata responsabile della *Triangle Global Food Security Initiative*. Nel 2017 ha vinto una **Fulbright Research Scholar** grazie alla quale sta svolgendo un soggiorno di studio in Italia.

Tracking worldwide migrations, evolutionary relationships and reemergence of *Phytophthora infestans*: A threat to Global Food Security.

Plant disease is a limiting factor in agricultural production worldwide and many emerging pests and pathogen have become more severe with trade and changing climate. Plant pathogens cause global losses estimated to be as high as \$33 billion per year. One of the largest challenges we face in agriculture is to develop and deploy the appropriate technologies that will help reduce plant diseases and allow sustainable intensification of crop production. Phytophthora infestans, the causal agent of potato late blight, was responsible for the Irish potato famine. Historically, late blight of potato caused widespread famine in Ireland. The pathogen is still a threat to food security globally. In 2009, potato and tomato late blight epidemics in the US were the worst in modern history due to a “perfect storm” of widespread inoculum distribution from tomato transplants and conducive rainy weather events. We have developed a surveillance and mapping system called USABlight.org to report disease outbreaks and send alerts to stakeholders. We have also identified and tracked the spread of historic P. infestans using multilocus genotyping and next generation sequencing, geospatial analytics, data mining and pathogen detection methods. The same unique multilocus genotype, named FAM-1, caused both US and European historic outbreaks. The FAM-1 lineage was present for over a 100 years, shared allelic diversity and grouped with the oldest specimens collected in Colombia, and formed a genetic group that was distinct from more recent aggressive lineages. Population genomics data from historic P. infestans also links ancestral lineages to P. andina in the Andes. We are developing new knowledge and combining sensors, bioinformatics and geospatial surveillance tools to observe, contain and limit outbreaks by this important plant disease.