# STANDARD DEVIATIONS: The Nina, The Pinta, and the Spirochete?

Greetings,

If you are in Salt Lake City, happy Indigenous People's Day! If you live elsewhere in Utah, happy Columbus Day!

Now, I don't know about you, but Columbus Day has not been my most memorable holiday. Sure, as a 3rd grader it was a challenging poem and three ship names to remember, but the sparkle kind of faded pretty quickly after that. Let's face it, candy at Halloween, gifts at Christmas, and fireworks for the 4th of July are just a bit more enticing. If you work for the State and are interested in disease, death, epidemics, the cruelty of the slave trade, the dark underbelly of our history, and a mystery behind the death of the holiday honoree.....it's the Mother Lode! It might be my new favorite.

Firstly, it's a State holiday! So, while you guys are having to work on this Monday in your hospital laboratory, I've got the day off! Secondly, the true story is gruesome and brutal. Third, there is more to the story behind Columbus than most people know and, lastly, it's a great holiday to talk about biosafety! What could be better?

Columbus Day is a U.S. holiday that commemorates the landing of Christopher Columbus in the Americas, October 12, 1492. It's a holiday surrounded by celebration, controversy, conquest and contagion.

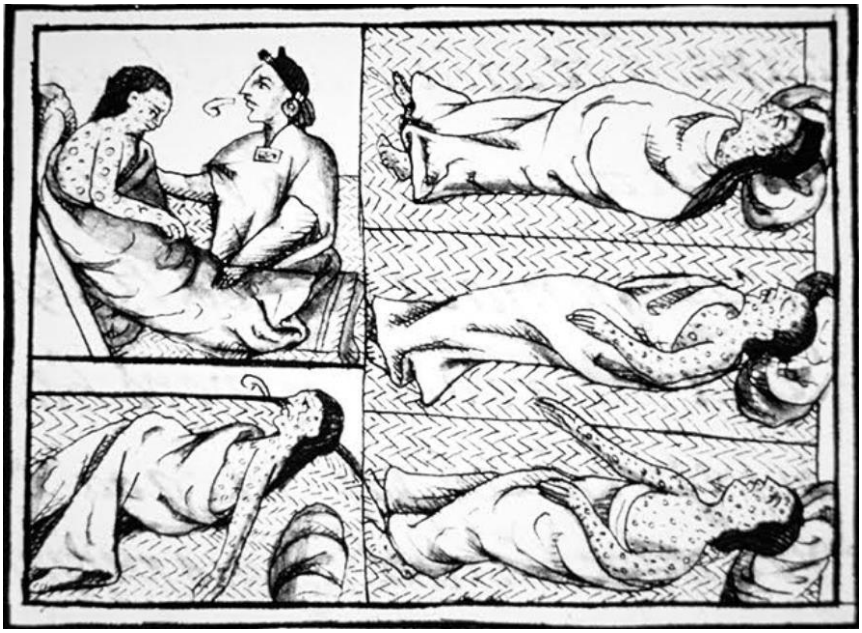
There are reasons that the holiday is steeped in controversy.

It is now known that Vikings had established "New World" colonies as early as the 10th century in Greenland and Newfoundland. But perhaps more telling is the evidence that **Columbus was responsible for a decimation of indigenous populations through exploitation and epidemic disease**. Native Americans and other groups have protested the celebration of an event that resulted in the colonization of the Americas, the beginnings of the transatlantic slave trade and the deaths of millions from murder and disease.

We now know that the legacy of Columbus is forever bound to the **deaths of millions** of indigenous people due to diseases brought from Europe to the New World. The Taino (a subset of Arawak peoples) had no idea what was in store as they greeted the arrival of the Spaniards in 1492. Perhaps surprisingly, the explorers had no idea what they would bring home, either.

**It was actually the second voyage (1493-1496) that brought epidemic disease.** Crew members on that trip became ill (probably influenza) and infected natives of Hispaniola, Cuba, and Jamaica. The devastation is blamed on a lack of exposure to the pathogens in the native population.

The main killers were Old World germs to which Indians had never been exposed, and against which they therefore had neither immune nor genetic resistance. **Smallpox, measles, influenza, and typhus** competed for top rank among the killers. As if these had not been enough, **salmonella**, **diphtheria, malaria, mumps, pertussis, plague, tuberculosis, and yellow fever** came up close behind.



**This wasn't all one-sided.** At least one Native American disease became a scourge that crossed back across the Atlantic to Europe. That disease was **SYPHILIS**. And it has done major damage in the time since it was introduced by Columbus' New World expeditions.

The first syphilis epidemic broke out among armies in Italy at the Siege of Naples, in 1495. It is thought to have been brought back from the Americas by Spanish mercenaries. The initial syphilis epidemic is believed to have killed several million Europeans as it made its way through the continent.

And syphilis continues to this day to be an epidemic disease. Approximately 36 million people worldwide have syphilis today, with 12 million new cases each year according to the World Health Organization. Congenital disease is a horrible and growing problem along with evolving anti-microbial resistance.

**And here is the kicker**. Our honorary explorer, Christopher Columbus, died in 1506 (age 54) from a **heart attack.** The attack is attributed to an illness he suffered from after his voyages, "**reactive arthritis**". Not only did he become nearly disabled over time due to his relapsing arthritis, which affected his lower extremities, but he also had a **wound that constantly reopened** and he suffered from periods of blindness due to **bleeding from his eyes**. The diagnosis is deduced by following clues scattered throughout historical documents pertaining to the man.

His arthritic syndrome, (termed **Reiter's syndrome** in early studies and now called "**spondyloarthritis**") which causes joint pain and swelling, is in fact triggered by an infection, most often in the intestines, the genitals or the urinary tract. Although joints in the knees, ankles, and feet are the usual targets, inflammation also commonly affects the eyes, skin, and urethra. The root cause may either be an enteric bacterial infection, including salmonella,

shigella, Yersinia, campylobacter, or a sexually transmitted disease, such as chlamydia or **syphilis**.

Now, historians argue that Columbus may have had a food poisoning that caused the condition. And Reiter's is known to occur as an immune disorder in HLA B27 positive individuals in food poisoning. But I'm going to point out some interesting facts about "reactive arthritis" and the suspects of Columbus' affliction: shigella, chlamydia or syphilis.

Reactive arthritis from a gastrointestinal infection like shigella, salmonella, campylobacter or Yersinia is almost always preceded and accompanied by dysentery. Presentation is seen within days of infection and duration is limited to weeks or months with affected persons returning to a normal state within a year. Ocular involvement is seen but is usually mild and characterized by a discharge. Long-tern cardiac issues are rarely, if ever, seen.

Reactive arthritis caused by chlamydia following urogenital infection (*Chlamydia trachomatis*, the most prevalent sexually transmitted bacterial infection in the US, and a State Lab assay!) is the most common spondyloarthritis etiology. Most cases resolve in the first six months, but chronic arthritis is seen in 30-50%. And these patients do experience conjunctivitis, but typically unilateral. It is not known as a causative agent of heart disease. Chlamydia may not be symptomatic but those who experience symptoms are affected with typical signs soon after infection which are pronounced.

Syphilitic arthritis is a common complaint for congenital and acquired disease. It presents in all stages of the disease and in different forms. The first sign of syphilis is the classic chancre sore which can occur at more than one site. Ocular problems are also common to syphilis. And cardiovascular disease is noted sequelae of syphilis including aneurysm and damaged heart valves. Syphilis is notorious for its latency and Columbus' complaints are classic signs of tertiary stage disease (10-30 years post infection).

**Did Christopher Columbus have syphilis?** I guess we'll never know. The explanation of a reactive arthritis caused by food poisoning falls short of explaining his heart disease and other chronic symptoms. His biographies do not describe a Chlamydia like disorder. His condition is explained in all symptoms by a late stage syphilitic condition. AND, he is the one responsible for bringing the *Treponema Pallidum* organism home from his adventures and instigating an epidemic that is still on-going today. His death has a signature consistent with its etiology. What do you think?

What goes around comes around?

And, so**, here comes my spiel**. Epidemics occur when pathogens find a pathway around immunity. Novel pathogens that arise in animal vectors or a geographical locus may confer immunity in an evolutionary sense to the populations that co-exist with the animal or environment where the pathogen is endemic. But, when that pathogen is introduced to a susceptible host population with naked immunity, it is free to exploit the advantage. This is what happened to the Native Americans when Europeans brought their diseases, like smallpox, **and to Europeans returning with syphilis**.

And now we understand that viruses and novel influenzas are found or are developing in swine, birds, bats, and other animals that may cross over to humans. Ebola, SARS, MERS CoV, and HIAI represent contenders for contagion that may have similar outcomes as those brought by Columbus to the New World. Even once treatable diseases, like syphilis, where multi-drug antibiotic resistance is evolving threaten to become diseases of epidemic proportions.

Just another reminder of the importance of risk awareness and the culture of biosafety! Happy Holiday!

Have a great week and be safe,

Bryan

p.s. Guesses vary, but it's thought that 20-50 million people were living in the Americas just before Europeans arrived. Ninety-five percent were killed by new disease exposure. WHY?

For thousands of years, Europeans had lived with domestic animals, developing immunity to diseases tied to organisms evolving in that environment. They also lived in denser populations with continual exposure to numerous pathogens and without a protective sanitation system. This promoted and selected greater immunity and adaptation. War and trade in Europe also contributed to exchange and selection of immunity among the population. They often died of disease but also survived by evolving immune response.

As hunters and gatherers, Native Americans lacked that kind of exposure. All of these things resulted in Europeans being regularly exposed to many more pathogens than Native Americans were seeing. And the Americas were geographically isolated from these organisms. The Europeans' immune systems simply developed to ward off the worst of some of the nastier diseases that incapacitated entire Native American populations.

Europeans still suffered from those Old-World diseases; they were just not as susceptible.