

Please read this bit first

The HPCSA and the Med Tech Society have confirmed that this clinical case study, plus your routine review of your EQA reports from Thistle QA, should be documented as a "Journal Club" activity. This means that you must record those attending for CEU purposes. Thistle will **not** issue a certificate to cover these activities, nor send out "correct" answers to the CEU questions at the end of this case study.

The Thistle QA CEU No is: **MT00025**.

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

Cycle 24 - Organism 7:

Serratia marcescens

Until the 1960s, *Serratia marcescens* was considered harmless - so safe, in fact, that the military secretly dispersed it across U.S. cities in germ warfare studies. During one such test in 1950 - "Operation Sea-Spray" - Navy vessels cruised the San Francisco coast, spewing huge amounts of the bacterium into the air over the city. At least one hospital noticed an increase in pneumonia patients. In the 1970s, when the military disclosed the tests, a San Francisco family sued over a pneumonia death they blamed on *Serratia*. Courts ruled the government was immune from such lawsuits.

Today, *Serratia marcescens* is considered a harmful human pathogen which has been known to cause urinary tract infections, wound infections, and pneumonia. *Serratia* bacteria also have many antibiotic resistance properties which may become important if the incidence of *Serratia* infections dramatically increases. *Serratia* can be distinguished from other genera belonging to Enterobacteriaceae by its production of three special enzymes: DNase, lipase, and gelatinase.

Serratia is normally not harmful to healthy people but it is what is known as an opportunistic pathogen. Given the opportunity, *Serratia* can spell trouble. In people with a compromised (weakened) immune system, *Serratia* can cause infection of the blood (sepsis), wound infections, and infections of the endocardium (of the heart) and the urinary and respiratory tracts.

And part of the problem is that the high-risk groups for the flu who most need the flu vaccine are precisely those with a weakened immune system. Another part of the problem is that the finding of *Serratia* in the vaccine is a red flag, It is a warning that who knows what else may be contaminating the vaccine.

Chiron's Fluvirin vaccine was pulled after the potentially dangerous *Serratia* bacteria was found in some lots. Vaccine making is nasty business, and microorganisms thrive in the warm egg-based brew used to produce the flu shot. The microbe-rich solution is treated with thimerosal, as a sterilizing agent, to kill all the bugs. Most mercury is removed before packaging, though 25 micrograms-per-dose remain in each 10-dose vial, to avoid contamination from repeated puncture of the seal by syringes. This vaccine was contaminated with *Serratia* at the company's factory in Liverpool, England.

Serratia bacteria can trigger a cascade of life-threatening illnesses, including heart-valve infections, pneumonia and septic shock when injected into vulnerable patients. The bacterium was blamed for a deadly outbreak of meningitis in Contra Costa County in 2001, which was traced to injected drugs legally mixed by a Walnut Creek pharmacy.

Diagnosis is established by culture of the organism. Serratia species grow well on enriched media (e.g., blood agar) at 35-37o C. They are non-lactose fermenters and are motile. Serratia species produce extracellular DNase at 25 o C and gelatinase at 22 o C. They elaborate lipase and are resistant to colistin, ampicillin and cephalothin. These properties are unique to Serratia, but not all Enterobacteriaceae. Not all S. marcescens organisms produce the typical red pigment prodigiosin.

Therapy would include an anti-pseudomonal beta-lactam plus an aminoglycoside. Most strains are amikacin susceptible, but reports of resistance to gentamicin and tobramycin are increasing. Quinolones are highly active against most strains. Definitive therapy rests on susceptibility testing.

CPD Questions:

1. Why was contamination of a flu vaccine by Serratia marcescens so dangerous?
 2. What antibiotics are recommended for treatment of this organism in your laboratory?
How does this compare with those mentioned above?
-