

# STANDARD DEVIATIONS: Killer K-9 Klebsiella!

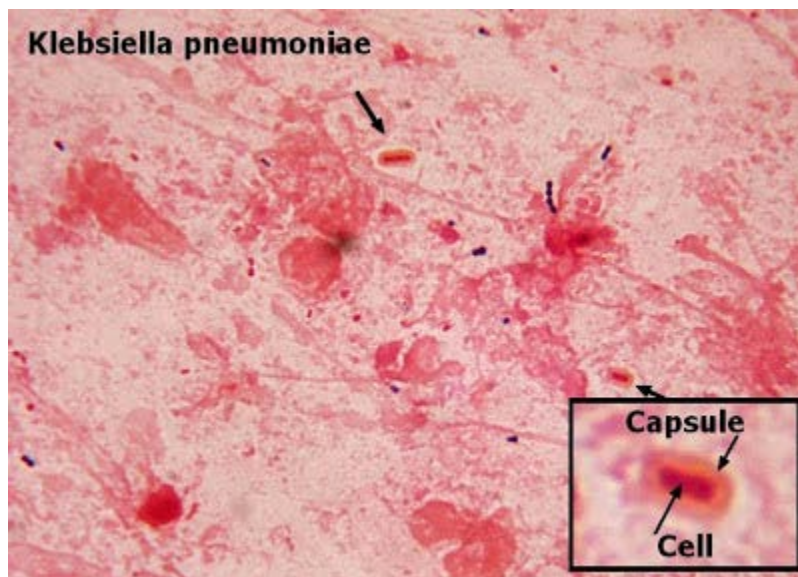
Kids, keeping you in the know,

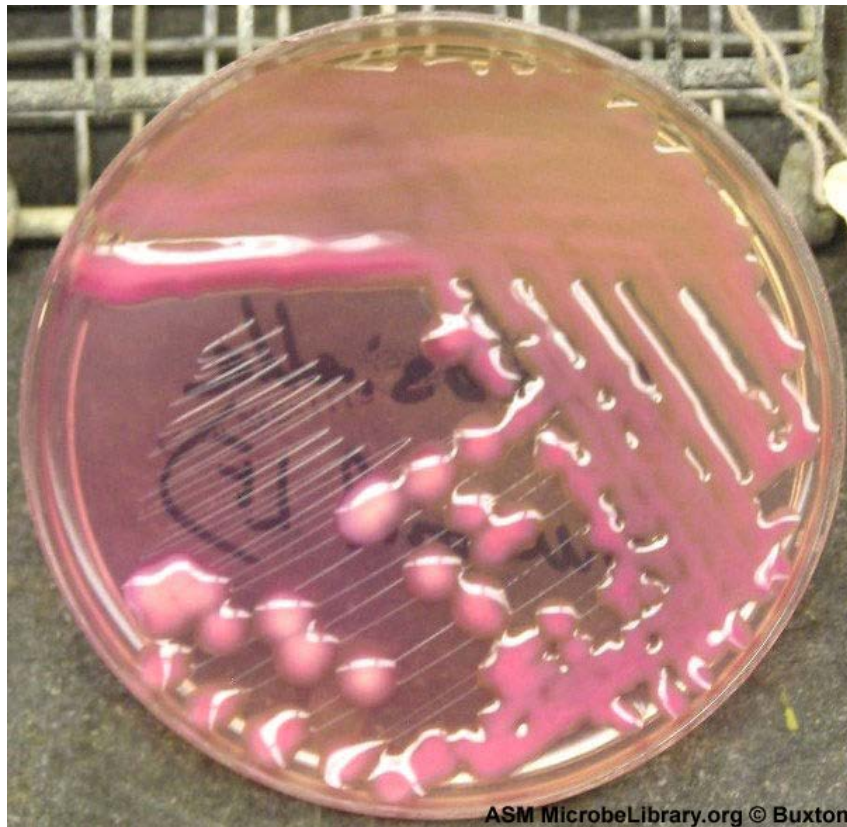
Either hypervirulence or antimicrobial resistance are bad characteristics for any bug to have. To have them both in the same organism is a deadly combination. This is a description of a *Klebsiella* strain on the move that has Infectious Disease experts more than a little concerned.

*Klebsiella* is a genus of nonmotile, Gram-negative, oxidase-negative, rod-shaped bacteria with a polysaccharide-based capsule. The cells generally measure 0.3 to 1.5  $\mu\text{m}$  wide by 0.5 to 5.0  $\mu\text{m}$  long. They can be found singly, in pairs, in chains or linked end to end. Like the other members of Enterobacteriaceae, and as facultative anaerobes, they grow pretty easily at 35° to 37 °C.

*Klebsiella* species are found everywhere in nature. *Klebsiella* species are routinely found in the human nose, mouth, and gastrointestinal tract as normal flora; however, they can also behave as opportunistic human pathogens. *Klebsiella* species are known to also infect a variety of other animals, both as normal flora and opportunistic pathogens.

*K. pneumoniae* is the most common cause of nosocomial respiratory tract and premature intensive care infections, and the second-most frequent cause of Gram-negative bacteremia and urinary tract infections. The ability of *K. pneumoniae* to colonize the hospital environment, including carpeting, sinks, flowers, and various surfaces, as well as the skin of patients and hospital staff, has been identified as a major factor in the spread of hospital-acquired infections.





A new hypervirulent (hypermucoviscous) variant of *Klebsiella pneumoniae* has emerged. The term hypermucoviscoid is used to describe its ability to better ingest and use iron, and to increase capsule production. In 2017, an outbreak in a Chinese hospital resulted in deaths for several patients. It's now increasingly recognized in Western countries. Defining clinical features are the ability to cause serious, life-threatening community-acquired infection in younger healthy hosts, including liver abscess, pneumonia, meningitis and endophthalmitis and the ability to metastatically spread (unusual for enteric Gram-negative bacilli) in the non-immunocompromised. Despite infecting a healthier population, significant morbidity and mortality occurs. A case was seen in Nevada of last year, in a woman from Asia, and its presence here is expected to increase. This strain is also carbapenemase producing making its resistance an increased risk factor.

Well, not to be outdone, another *Klebsiella* spp. Has now been identified that is resistant to Tygecycline. This is a new (relatively...2005) antibiotic used as last-ditch therapy for many CRE (Carbapenemase Resistant Enterobacteriaceae) bugs, and only in hospitals. It's our secret weapon against carbapenemase producing *Klebsiella* spp (KPC-producing organisms). The bacteria harboring the resistance are *Klebsiella pneumoniae*, which frequently are associated with hospital-acquired pneumonia, bloodstream infections, wound and surgical site infections, and meningitis. These *K. pneumoniae* turned out to belong to two clones that have been disseminated to hospitals worldwide.

And now, this tige cycline-resistant bacterium has adapted to living in companion animals—in this case, **dogs**. Companion animals have been a neglected link in research into antimicrobial resistance. Human pathogens adapting to animals is a mechanism for increasing the spread of resistance. When that happens against one of the last therapeutic options for complicated

infections in humans, and that organism displays an aggressive knack for hypervirulence, the scenario darkens.

Consider the amount of contact we have with companion animals and the likelihood of a shared biome and it becomes clear that we should try to understand the implications. From a biosafety perspective the exposures of humans and companion animals should be a consideration in how resistance is given leverage in a pathogen's evolution. Remember everything your Grandmother told you about kissing the dog!

Have a great week and be safe,

Bryan

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