

STANDARD DEVIATIONS: Aporkalypse

Greetings,

African Swine Fever (ASF) isn't a problem. In America. Yet. In China and Eurasia, though, ASF is a huge problem, and it provides a picture of pandemic dynamics we should pay attention to. I have addressed ASF in other posts ([STANDARD DEVIATIONS: Porcine Pandemonium and Proselytizing Preparedness](#), 4/22/19) and I'm not going to dwell (too much) on the virology. I think it's important (and interesting) to look at lessons and questions this epidemic exposes.

ASF is a highly contagious, virus-caused hemorrhagic disease with no treatment or vaccine. The disease has a 100 per cent mortality rate in pigs. The only response to control disease is to depopulate, cull, destroy, euthanize (pick your poison) all exposed swine. Humans do not suffer from this virus; but human activity is responsible for the epidemic.

Since being reported last August 2018, China is believed to have lost around 40 % of its swine population, or around 170,000,000 pigs. That's a lot. All told, a quarter of **all** pigs will be lost.

You can imagine how that impacts China. Food, income, productivity; this kind of loss is going to have consequences.

Does ASF affect us, here?

We've lost our biggest buyer of soybeans (feed) but now we are exporting pork (food), so there's this kind of give-and-take that occurs in the wake of the epidemic. But there are other equations that figure into the calculus, and I wanted to touch on one that we, as lab rats, can get our heads around, heparin.

We use a bunch of it. How many green tops do you have on the shelf, floors, bench, and in the centrifuge? How many clinics are flushing lines and pushing heparin around in dialysis? How many patients are being treated with a heparin therapy for DVT, ECMO, or surgical procedures? China produces ~80% of all the world's heparin. Almost entirely from pig. Heparin is derived from mucosal tissue of pig intestine. Cut off the supply of pig intestine and guess what happens to heparin supply?



Fortunately, we understand the fragility of supply chains, and we have been through this before with heparin, and more than once.

Here are just three historical examples:

- Another source of heparin is tissue from bovine lung. But the risk of prions revealed in transmissible spongiform encephalopathies (TSEs) like Creutzfeldt-Jakob disease (CJD) has shut this supply down.
- Hurricane Maria, the tenth-most intense Atlantic hurricane on record and the most intense tropical cyclone worldwide in 2017, obliterated much of Puerto Rico. When Hurricane Maria hit, there was a heparin shortage due to the loss of Pfizer's plant there.
- And pig disease has been an issue before. In 2007, Blue Ear Virus (Porcine Reproductive and Respiratory Syndrome virus, PRRSV), caused a respiratory syndrome and became endemic in Asia—leading to a shortage of pigs and a shortage of heparin. Sound bad? **PRRSV may have caused a measly 2 million pig deaths; just barely over 1% of what we're seeing with ASF!**



{PRRS - Blue Ear Virus}

As the Blue Ear Virus showed, there may be a six- to nine-month lag before a shortage would be seen in the US, and pharma has stored a bunch of supply but it does have a limited shelf-life.

There are some estimates that 25% to 35% of all the pork mucosal intestine available for production of heparin in China will be lost secondary to this outbreak.

“Currently, there is no apparent evidence yet that the pig shortage in China is impacting the heparin supply in the United States,” House Energy & Commerce (E&C) Committee leaders have stated. “However, the US heparin supply is already stressed. As of June 19, 2019, FDA added heparin to the drug shortage list, and in recent years there have been periodic heparin shortages.”



The Chinese domestic pig population will take more than five years to recover from the outbreak, if ever (Rabobankamerica.com), due to the challenges of restocking that include a lack of solutions to prevent disease and the need for additional investment to restock herds.

So, does ASF affect us, here? Will ASF affect the health of our human patients? Almost certainly. Heparin supply will eventually see dramatic shortages because of the raw product loss to ASF. Shortage will translate to issues in patient management and delivery of care, whether at a dialysis or phlebotomy chair.

As production becomes impacted, will prices climb exponentially? Will hospitals, clinics, and individuals be making difficult choices? Look for “new” innovations in the market as companies roll out alternatives to porcine-based heparins. And issues with quality assurance and contamination may arise from a wide array of producers trying to get in on a fragile, exploitable market that’s ripe for abuse.

What we learn from ASF and heparin can apply to our lives and labs. If a bad flu or, worse, a highly infectious pathogen we don’t expect, comes along, will we be ready? It won’t be heparin in short supply, but PPE.

What would it mean for mankind to encounter a virus that’s 100% lethal, hardy, and easily transmissible? We’re seeing happen in real time to swine.

Have a great week and be safe,

Bryan

p.s. Okay, that’s the newsletter. The rest is just me....

What will the timing look like for heparin? Here’s my prediction. Now, this ain’t my wheelhouse, but....I’m going to speculate that the cost of heparin is about to change. Pork cost in China has risen 57% as of September 1, 2019 and is expected to have doubled by the end of the year. The cost of pork in China has risen and porcine derived products are bound to follow suit. Major heparin producers are sitting on a stockpile of heparin and hoarding raw material. As soon as the market acknowledges a gap in pipeline material (pig intestine), prices will jump; even though the companies selling the stuff have plenty on-hand. Heparin will become a commodity that makes a few folk a bunch of money before it becomes readily available again.





{ASF, no vaccine, no treatment and 100% fatal.}

African swine fever virus (ASFV) is a large, double-stranded DNA virus in the Asfarviridae family. Natural hosts, warthogs and bushpigs in Africa, do not get disease and a soft tick (genus *Ornithodoros*) is the likely vector in the wild. Historically, outbreaks have been reported in Africa and parts of Europe, South America, and the Caribbean. More recently (since 2007) the disease has been reported in multiple countries across Africa, Asia and Europe, in both domestic and wild pigs. In Asia, the disease was reported for the first time in China (People's Republic of) in August 2018, in Mongolia in January 2019, then in Vietnam in February 2019, in Cambodia in March 2019, and in Hong Kong (SAR-PRC) in May 2019.

The cost for heparin injectable solution (1000 units/mL) today is around \$209 for a supply of 50 milliliters, depending on the pharmacy you visit.

A heparin shortage trickles down to every level of the hospital. It's like McDonald's running out of ketchup.



WAYS OF TRANSMISSION



The ASF virus can be spread through contact with infected animals, their excretions, or carcasses.



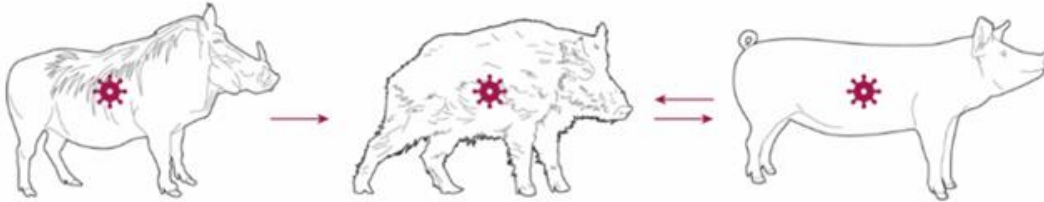
Bites by infectious ticks



Contact with objects contaminated by the virus such as clothing, vehicles, and other equipment.



Ingestion of meat or meat products by infected animals - kitchen waste, swill feed



Warthogs are naturally resistant to the virus and usually do not develop clinical disease. They get infected as piglets and develop life-long immunity.

Wild boars, in which the virus is endemic, are usually exposed through contact with warthogs

Domestic pigs are exposed through contact with infected pigs from other farms and wild boars. Spread is facilitated by human activities, like movement of animals due to trade, or sale of infected meat or animals.

SYMPTOMS

Clinical signs of African swine fever are variable and not always easy to recognise, but can include:

