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Investigating Influenza: Preventing Spread of IAV-S at Swine Shows

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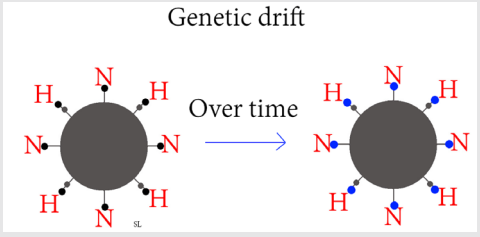
Swine influenza, otherwise known as IAV-S (Influenza A virus-swine) or H1N1, has been a growing concern over the past several years and for good reason. The CDC estimates that 61 million people were infected with H1N1 in 2009 alone and as many as 575,000 people have died from H1N1 worldwide since its initial appearance in 2009. What makes this virus so infectious, and how can it's spread be limited?

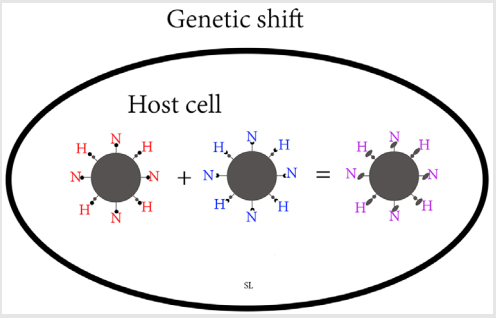
What even is a virus? Viruses are disease-causing agents that use the host's own cellular machinery to replicate and spread within the body and to the world beyond. Viruses generally damage host cells when they exit infected cells, leading to the symptoms seen or felt during viral infections.

You may notice that each year the influenza vaccine is different. This is because there are multiple strains of influenza and new strains are frequently formed. New strains result from changes to the genetic information of influenza viruses, and these changes occur through two primary mechanisms, genetic drift and shift. Genetic drift refers to very small changes in the genetic makeup of a virus that lead to limited alterations in the appearance of influenza virus. When a virus undergoes genetic shift, however, large changes are made to the DNA sequence of a virus and results in considerable alterations in the appearance of a virus.

Genetic drift results from much milder changes in influenza genetic material and lead to limited changes in the H and N of an influenza strain.



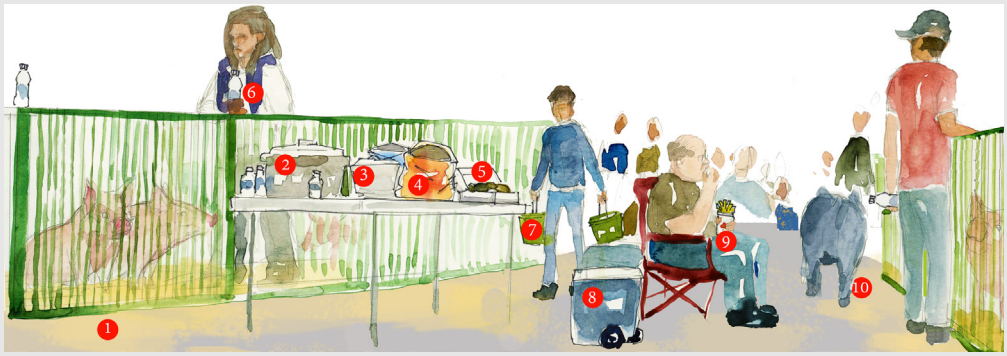
Genetic shift refers to transfer of large pieces of genetic material between two distinct strains of influenza virus, leading to new strains of influenza with H and N that are different from either of the original strain



Genetic shift leads to formation of viruses that can cause considerable harm to humans and animals due to rearrangement of two viral surface structures, referred to as hemagglutinin and neuraminidase (aka H and N). These pegs allow influenza viruses to attach to host cells and are what white blood cells, the bodies defense, recognize when an individual becomes infected with a form of influenza they have met previously. However, influenza can become unrecognizable to white blood cells when it rearranges its H and N through genetic shift, leading to disease and possibly even death in susceptible individuals.

What does it take for two unique influenza viruses to meet up undergo genetic shift? Proximity. Case in point - youth swine shows provide excellent opportunities for H1N1 and possibly other strains of influenza to be transmitted to people from swine or vice versa. Influenza, in general, is spread through two primary mechanisms. The first mechanism being transmission through aerosolized droplets that are released when pigs or people breath, cough, etc, and the second being when people or pigs come into contact with nasal secretions from either species.

Many individuals attending or participating in swine exhibitions are unaware that they are putting themselves and others at risk. A large Michigan swine show took place recently. The show was very well assembled with many outwardly healthy hogs participating. However, a large number of the exhibitors could be seen eating and drinking in the hog pens or very near (<10 feet away) hog pens. Not only that, but there were multiple areas set up along or in the alleyways where people were cooking



food in crockpots or had large trays of food. This may not seem problematic to the average individual, but these were high traffic areas which were visited by multiple people that had been handling hogs, increasing the possibility of these locations serving as reservoirs for H1N1 and other diseases.

The above diagram below shows 10 of the behaviors or actions which can lead to increased spread of influenza (and other diseases) between people and pigs at shows. It should be noted that all of the listed observations were seen at the show mentioned above.

In the graphic above, behaviors and observations which promote spread of influenza between humans and swine. 1: Shavings on the ground from pigs and people moving in and out of pens. 2: Slow cookers. 3: Containers with cut fruit. 4: Bags of chips, pretzels, and other easy to grab snack items that can be eaten as people move to and from pens. 5: Boxes of donuts, muffins, or pastries. 6: Bottles of pop or water being consumed by exhibitors while in pig pens. 7. Individuals carrying buckets in and out of pens would occasionally stop and grab a food item on their way to or from pens. 8. Coolers of food or beverages. 9. Consumption of finger foods in alleyways. 10. Pigs moving up and down alleyways next to people consuming food/beverages.

Some aspects of influenza cannot be controlled or prevented against, such as genetic alterations leading to new influenza viruses. However, there are measures that can be taken to limit the spread of influenza and help prevent formation of previously unseen influenza strains. Don't attend swine shows if you think you might be sick with influenza. Don't eat or drink near swine and be sure to wash your hands before and after interacting with pigs and before consuming food or beverages. These steps may be simple and easily overlooked but are vital in limiting the spread of the disease which has infected millions.

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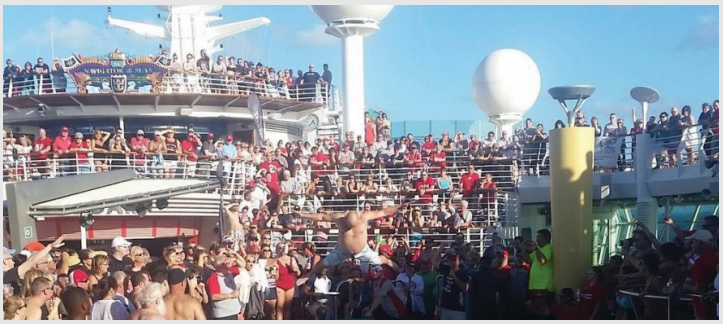
Biocontainment and a Cruise Ship – Oh the Irony!

By: Madonna Gemus, MSU Swine Veterinarian, gemus@msu.edu

I was most fortunate to have the opportunity to join several friends on a vacation at the end of January. The thought of several days in the sun and warmth far far away from the cold and blustery Michigan weather was something I had been looking forward to for several months. My friends and I decided to take a cruise for many reasons - the promise of great food, good entertainment, ease of transport, and plenty of off-ship activities should we choose to participate, to name only a few.

It's important to understand that as a swine vet it's quite possible that I may notice some things that others may not. The first thing I became aware of immediately upon boarding the ship was that probably over half of the 4,000 individuals on board could be classified as geriatric. The second thing I learned was that essentially once the gang ramp is lifted, with the exception of the entertainers, we were all trapped.....there were no new entrants, and nobody was leaving the ship. After hearing a few coughs and sniffles indicating the potential for influenza or other respiratory virus on board, knowing that norovirus (a nasty GI bug) can spread like wildfire on cruise ships, and having a sense that a large percentage of my co-inhabitants were likely susceptible to contracting any type of virus simply due to their age, I was interested to know whether the cruise ship had established practices that aimed to minimize spread from person to person. Do you see how my mind works? To me, this scenario isn't much different than trying to prevent the transfer (biocontainment) of a respiratory or GI virus in swine facilities.

A few years ago, when PEDv first affected our industry, I began working with Melissa Millerick-May – an industrial hygienist/exposure scientist whose research is focused on minimizing human and animal exposures to environmental contaminants (including viruses and bacteria) with an aim to prevent the development of disease. In speaking with her, she frequently talks about how small changes in behavior (think management routines) often at little-to-no cost can make a huge impact in terms of preventing illness, often resulting in the end in significant cost savings. She describes the most difficult task as trying to convince or 'train' a person to change a particular practice or way of working in a way that stops the 'spread' of contaminant, but she notes that once the change is made, the individual finds it to have been relatively easy.



In the 1960's, Dr. Maxwell Maltz reported that it only takes 21 days of changing a behavior to form a new 'habit'. The actual 'number of days' has been debated over the years, but I can tell you from my experience on the cruise, that when it comes to preventing the spread of pathogen amongst passengers, the staff whipped-us into ship-shape within a very short period of time. How did they do this?

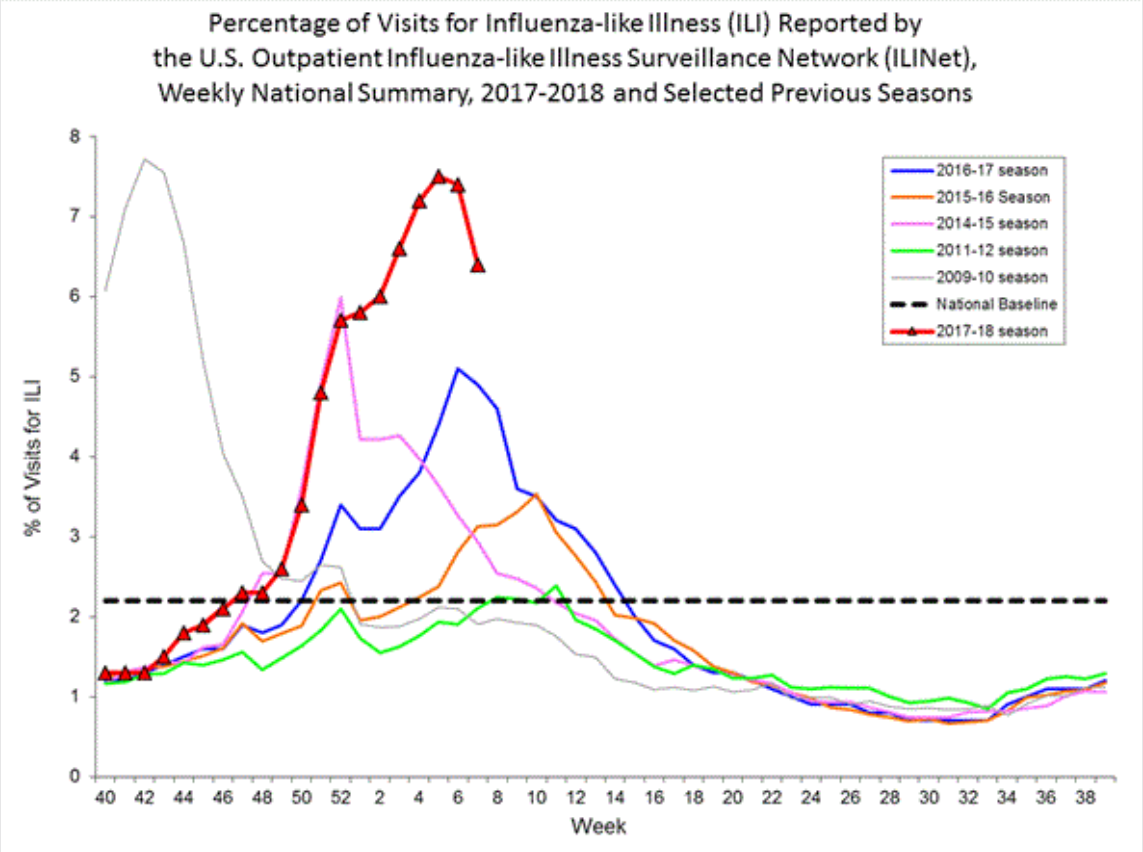
1. Eliminating spread via control of food consumption: For the most part, what and where we ate was a tightly controlled operation, preventing the possibility of bacterial contamination of food as well as cross-contamination of food from outside pathogen sources. Food consumption was contained within designated dining areas. There were no take-away containers available with the exception of paper cups for beverages. All plates and cutlery were 'real', and the presentation of food was beautiful such that guests felt it was a 'privilege' to be afforded such a nice dining experience.

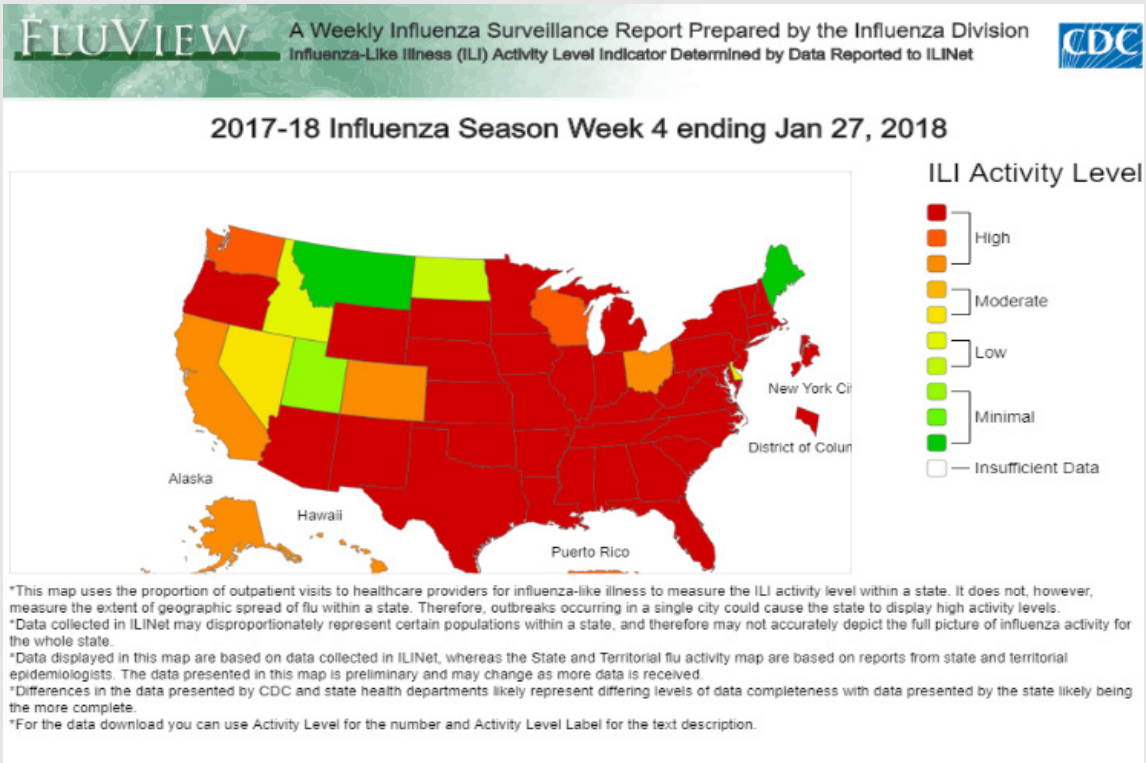
2. Controlling pathogen spread: Bacteria and viruses are often transferred from person to person or person to 'item' by contamination of the hands. Considering this, there was essentially an 'enforced' disinfection protocol on-board the ship. Prior to entering the dining rooms, salons, fitness room and even the elevators, there were hand disinfectant (Purell) stations, that dispensed copious amounts of antiseptic on to each guest's hands. Very quickly, we became aware that if we wanted to eat, we had

to disinfect our hands first. There were 2 lines formed for entry into the dining hall with a Purell station located at the head of each line. If you did not use the Purell, there was a person who ran over to you and squirted some in your hand. To avoid the insult of being chased down by a Purell Enforcer, people adopted the Pavlovian 'habit' of using the dispensers each and every time they came into view of a Purell station.

Perhaps due to these behavior changes, my co-inhabitants and I remained healthy. I did not hear coughing or sneezing, nor did I witness the nausea associated with GI bugs – other than perhaps some upright and jerky movements in the disco.

The rest of the United States were not so fortunate. The 2017-2018 season has seen the highest levels of influenza like illness (ILI) cases since 2009. (Shown at right). In the same week that we were enjoying balmy breezes and drinking Lemon Drops (yummy!), the ILI activity for most states was ranked high.





The point behind this story … I have been converted to the Melissa Millerick-May (M3) way of thinking … that efforts should be focused on controlling pathogen "at the source". With Melissa's knowledge, the creation and adoption of exposure control methods and with just a few changes in human behavior, we can bio-contain virus and bacteria before they spread.

Please join me in boarding the 'Love Boat' of pathogen control. I think you will find it helpful in not only preserving your own health, but also protecting the health of your herds. Want to know more about this approach? Contact me at gemus@msu.edu.

INFLUENZA AND YOU

By: James Averill, DVM, PhD, Michigan State Veterinarian

We have all heard about influenza A virus, otherwise known as the flu, and many of us have first-hand experience with the coughing, fever, chills, and body aches that come with it. 2017-2018 has been a particularly bad year for the flu, with many being sidelined from work or school for days after getting diagnosed with influenza. And while experts think the season has peaked and the infection rate will start to come down soon, the epidemic could last many more weeks or months, possibly even into the summer months.

Why is this important?

Influenza A is a virus that infects not only people, but also pigs and birds. Each species, whether people, pigs, or birds, typically has their own subtype of Influenza A virus that commonly infects and easily spreads within their own species. Humans have their own subtype that commonly circulates amongst people and pigs have their own subtype that commonly spreads between pigs. Occasionally, a pig or person is sick with the flu and the virus can jump between species. This is especially important at events where people and pigs come together, like at county fairs. The higher the incidence of circulating flu, the more likely there will be transfer between species. Influenza subtypes that infect a new species usually results in severe illness, especially in people, sometimes resulting in hospitalization, or even death. It's crucial that precautions are taken at exhibitions and fairs to minimize the potential for transfer of virus between pigs and people.

So what can be done to minimize risk?

The best way to minimize risk is to is vaccinate pigs, reduce stress, increase biosecurity, and minimize contact between pigs and people.

These precautions start months before fair time. Vaccination of show pigs with an appropriate Influenza vaccine well in advance of exhibitions can reduce the chance that they may become ill with influenza during fair. Most flu vaccines for pigs require two or more injections and must be completed at least a month in advance of exhibition. Additionally, there are withdrawal times, usually 30 days after vaccination, before pigs are allowed to go to market. It's important to work with your veterinarian and follow label instructions.

Reducing stress in show pigs is not an easy task. Exhibition in general is a stressful event for pigs. The pigs are taken from their familiar surroundings, shipped on a trailer, and housed in a hot barn with a lot of other pigs and hundreds of strangers wandering through looking at them. Research has shown that minimizing the time pigs are in these conditions to 72 hours or less reduces the number of pigs that break with influenza infection at the fair. This in turn reduces the chance that people will get flu from pigs when visiting the swine barn.

It is a decision for each fair board to make, however finding ways to limit pigs' time at the fair to three days will decrease rates of illness. One option is to stagger shows so breeding pigs are on the fairgrounds for the first three days, followed by a day for cleaning and disinfection of the swine barn, and then terminal pig shows for the last half of the fair. Every fair is different, and many fairs have found creative solutions that help exhibitors, the public and the pigs have a valuable and healthy experience.

Additionally, transporting pigs to the fair and showing them during cooler evening or early morning hours can reduce stress. Remember to always keep pigs well hydrated and cool, using box fans and frequent water spritzes. Minimizing stress keeps them healthier.

Lastly, biosecurity at the fair can not be emphasized enough. No matter how well show pigs are managed and how much their stress is minimized, it is possible that one pig in the fair will none-the-less break with a respiratory illness. Practicing good biosecurity will help reduce the spread of that illness to other pigs at the fair and result in less chance of exposure to the public. Cleaning and disinfecting weigh-in scales and sorting boards between loads at check in and nightly disinfection of wash stations will go a long way to minimizing spread of any illness in the barn. Keeping the public six feet or more from pens, limiting the public's barn access to a few hours of the day, and prohibiting them from eating or drinking in the barn are all good risk-mitigating practices. Lastly, hand sanitizers throughout the barn, and hand wash stations at its entrance and exit are essential.

Fair time is a special time of the year for everyone and a tradition valued by many. Good weather, good food, time with family and friends, and hours of independence and growth for exhibitors. By following these practices, we can make sure everyone stays healthy and fairs continue to be a place where the public can learn more about agriculture.

All comments and suggestions should be directed to the:

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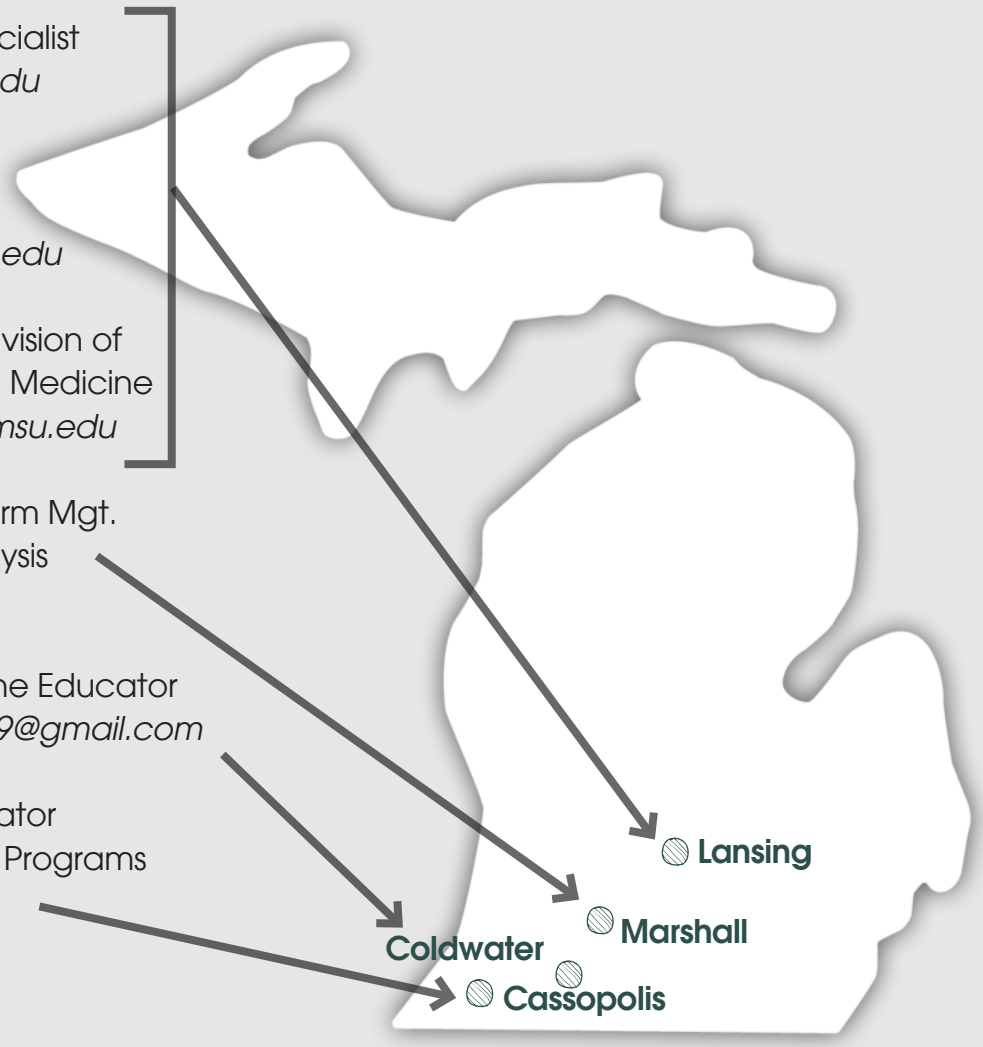

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