July 29, 2015

ZAHP (Zoo and Aquarium All-Hazards Preparedness and Response Fusion Center) Chat: HPAI and the Fall Migratory Season

Welcome (Yvonne Nadler, DVM, MPH - ZAHP Program Manager)

Information on HPAI and other issues in preparedness will be available on the ZAHP website available at zahp.aza.org

Introduction (Jeanie Lin, DVM, MPH, MLA - Veterinary Medical Officer National Emergency Management, Animal Care, United States Department of Agriculture)

Animal Care is administering a long list of projects on zoo emergency preparedness and has been working on getting onto the agricultural community's radar when it comes to these issues where the USDA licensed exhibitor community has previously been left out of discussions.

HPAI Update (Darrel Styles, DVM, PhD - Senior Staff Veterinarian Surveillance, Preparedness, and Response Division, National Preparedness and Incident Coordination Staff, USDA APHIS Veterinary Services)

USDA is working to prepare on the national level for a reemergence of highly pathogenic avian influenza (HPAI). This has been quite challenging to do while dealing with de-population clean-up in commercial poultry sector. This discussion will provide a brief overview of the current outbreak and forecast for the Fall and following Spring. Plans for exhibitors are still being reviewed, but there is an idea of the general direction.

Background

While Eurasian HPAI H5N1 (EA H5N1) was first identified in Asia in 1996, the progenitors of the current pathogenic clades emerged at Lake Qinghai in 2005, and just recently there was another die off on that lake so that is not finished yet. EA H5N1 has been circulating in waterfowl throughout Asia giving rise to new reassortant viruses. Eurasian HPAI H5N8, H5N6 and H5N2 (completely Eurasian) are the most robust. Taiwan is still battling EA H5N2 and EA H5N8, and Vietnam is battling H5N1 and H5N8.

EA H5N8 likely arrived in North America sometime in the latter part of 2014 and generated the reassortant viruses we have here today, namely Eurasian/North American HPAI H5N2 (EA/NA H5N2) – a reassortant of an endemic low pathogenicity North American H5N2 and Eurasian H5N8. There was an instance where EA/NA H5N1 was detected but that virus has only been

identified in a single bird and does not appear to be as robust. In the Spring of 2015, EA H5N2 precipitated catastrophic outbreaks largely in commercial poultry in the upper Midwest.

Current Situation

Biologists have been in the field since July 1st to work with banding teams to sample the wild migratory waterfowl on the pre migration ponds. This will give a window for the estimated prevalence of what the U.S. may be challenged with in the Fall. Waterfowl are the natural hosts/reservoirs for low pathogenicity avian influenza viruses. Select species of the *Anatidae* (dabbling ducks) are well adapted to these Eurasian strains while other waterfowl appear to have a higher threshold of infection and demonstrate some resistance. Federal and state biologists and wildlife managers are mobilizing so a national surveillance program will be in place by the Fall migration. We may have an idea of the estimated prevalence in wild waterfowl by mid to late August – and it will likely be found in all flyways. Canada geese, snowy geese, and perhaps other waterfowl may be resistant to infection since only a few positive birds have been detected… raptors however are susceptible largely through contaminated meat; and there has been 100% mortality in that group so far. Recently there was also a chickadee report, one of the first passerine species. We don't suspect it will be the last such report, but it is unlikely Passeriformes will be vectors of these viruses and any reports are likely just spill over from major poultry outbreaks and perhaps directly from infected waterfowl.

A national surveillance plan was distributed to states, focusing efforts on dabbling duck habitats as they should be the most likely reservoirs for the EA H5 viruses. Information will be reported on the APHIS website as were the previous detections.

Outbreak dynamics will be hard to predict. Birds moving south first are generally teals in September in the Mid-Atlantic or October in Gulf States. We are focusing on those birds as well for early sampling. The West Coast is a bit different than other flyways because movement is different. In the Easternmost flyways (i.e. Central, Mississippi, and Atlantic), waterfowl are pushed southward by weather fronts and their northern range is typically limited by the thaw line (where open water can be found consistently), although there are some duck populations in the far north found in artificially warmed environments such as around electric power plants etc. where there is unfrozen water. How much of a role non-migrating species will have in impacting potential outbreaks is unknown at present. Birds may move more freely in the Pacific flyway because of the temperate climate as opposed to the East where the majority tend to winter in the south where there is open water and food available.

To recap the recent outbreaks, in the late Winter of 2014 both EA H5N8 and H5N2 were detected in the Pacific flyway from December – March. EA H5N2 was eventually detected in both the Central and Mississippi flyways in the Spring of 2015, suggesting that this virus arrived

at a low prevalence sometime in 2014 and may have amplified on the wintering ponds. As birds moved northward in the Spring, they tend to concentrate in the upper Midwest where high density domestic turkey populations are found. Turkeys have historically demonstrated a lower threshold of infection by avian influenza compared to chickens. That seems to be the case with these EA H5 viruses. There is epidemiological evidence to show initial outbreaks resulted due to contamination from wild birds, but there is also evidence to show that once the infection was established in domestic poultry, the infection was perpetuated throughout the domestic farming system probably through insufficient biosecurity measures.

We have yet to detect viruses in Atlantic flyway but think that is a matter of time. Early surveillance may show that it is already there.

In the Fall it will be hard to predict the degree of exposure from infected wild waterfowl but we should have some data on the estimated prevalence in wild birds. Will it be a repeat of what we saw in the Upper Midwest? It is hard to say but it is unlikely. Broilers seem to have a high resistance to this virus. We need a very high dose to infect most chicken and broilers which probably have idiosyncrasies regarding their immune status that may convey some resistance compared to older domestic birds such as turkeys or layers. We have seen changes as viruses adapt to domestic poultry, but as it begins to adapt it makes it much more difficult to re-infect ducks and other waterfowl.

We anticipate that EA H5 viruses will ultimately be found in all US flyways in the Fall of 2015 but at what prevalence remains to be determined. There may be new reassortants in the virus population other than EA/NA H5N2. Spillover into the domestic poultry compartment may occur and we expect to see backyard flocks infected and perhaps some commercial premises (mostly turkeys, and thus eastern North Carolina is particularly concerning due to the high turkey population). We do not anticipate a high degree of infection in broilers unless there is a change in the virulence of the EA H5 viruses for chickens. The forecast for Spring 2016 will depend on how persistent the EA H5 viruses are in the wild waterfowl populations.

Recommendations for Zoos

ZAHP will come out with follow-up information, but we encourage the community to form a relationship with their State animal health officials as they will largely determine what happens in an outbreak. It is these state officials that usually have the final word on matter such a de-population so that communication is critically important. We would suggest having other plans in place as well. There are general templates like the Outbreak Management Plan available that would need to be tailored to your specific facility.

Some additional suggestions:

Remove or contain feral fowl, such as free-ranging peafowl etc. that could spread disease or introduce the virus into enclosures, which should be relatively bio-secure.

Mitigate viral spread from open/exposed water features. USDA Wildlife Services is helping to provide input on how to discourage wildlife on zoo grounds so you don't have lot of non-migratory fowl (e.g. Canada geese etc.) bringing the virus on to zoo premises (either by fomite or reservoir).

The ZAHP Fusion Center will be the primary method of distribution for information and other resources.

Vaccinations:

There are several vaccine platforms in development, but they are largely targeted towards domestic poultry. There should be perhaps two or three platforms that could be used on non-domestic avian species by late Fall or early Winter however not every vaccine will be appropriate for non-domestics due to the formulation of the vaccines.

In poultry, the vaccination schedule is typically at one day of age in the hatchery (depending on the vaccine formulation), followed by a booster at three weeks of age. For birds that may have maternal antibodies, these typically wane by three weeks of age so the vaccination schedule with some products (e.g. inactivated vaccines) will have to be delayed to ensure that there is no interference. Typically, avian influenza vaccines provided protection from disease but not infection, but this is dependent on the form of immunity (e.g. cell mediated vs. humoral) and the titer at the time of exposure. Titers in poultry at a GMT 1:40 may protect against disease but not infection while GMTs of 1:80 may provide considerable resistance to infection and virtually eliminate shed.

The vaccines recommended for use in non-domestic avian species will likely emulate inactivated vaccines since the modified live and vectored products may be unpredictable. We do not know the behavior of vaccines in many non-domestic avian species nor do we know the vaccination schedule. In poultry where vaccination is practiced, typically there is a priming dose given followed by a booster weeks later. Then subsequent boosters are given every six months, but what the vaccination schedule may be in species other than poultry is unknown.

Individual States will decide whether or not to vaccinate zoological collections. We need to discuss allowing vaccination in this sector since it would not affect trade of poultry products, but there may be some reluctance on behalf of State animal health officials. If there is a wide scale outbreak in poultry, it is likely that many trade partners will put further restrictions on

commodities which, in some ways, could make the decision to vaccinate zoological collections easier. State animal health officials will need to decide if they will allow vaccination in their State. There may be implications for moving vaccinated birds between States due to different restrictions, and certainly international movement will be challenging if not impossible. It is hard to work out all of this policy ahead of time but we are trying to work this out with State partners and other stakeholders.

Question and Answer (Facilitated be Yvonne Nadler with answers by Darrel Styles)

1. What is the current status of vaccination possibilities for zoo birds? Have any been approved? Any in use? How do facilities express interest in participating in any upcoming trials?
    a. Currently, there is no vaccination for EA H5 occurring in the U.S. There should be potentially two or three products within the next 3 – 6 months that would be suitable for zoo species. Not all vaccines for poultry would work for non-domestic birds.
    b. There are none currently in use. This may change if there is a lot of impact in commercial poultry sector.
    c. To express interest, email Darrel…He will pass on to the appropriate people. Colleagues in ARS (Agricultural Research Service) are doing most of the field studies.

2. What are the potential implications of vaccination for zoo birds? Movement? Continued surveillance, etc.? Are the proposed vaccines DIVA (Detecting Infected from Vaccinated Animals) compliant?
    a. There could be some interference with movement. Birds would be monitored with some sort of mark or microchip.
    b. There is no widely accepted DIVA test for avian influenza vaccination that is recognized internationally because influenzas may re-assort, and existing tests might prove to be inaccurate. Samples could also show up positive with a vaccine so that could be inappropriate.
    c. Would recommend molecular surveillance (PCR) at this time.

3. Have any zoos been approved for on-site use of antigen capture tests as a quick screen for sick birds? Can these tests be administered by USDA accredited veterinarians?
    a. These are already commercially available tests and they are not restricted. You could get primers for publications and do PCR testing, but you must report positive birds to State officials. The best thing to do is to contact State

officials for any testing since the government *may* underwrite the cost of testing and the State and National labs will have to corroborate results anyway.

4. What is the latest best theory on how the infection is getting in to poultry operations?
    a. The epidemiology is still being elucidated. Some seem to be associated with point source infections (i.e. contamination from wild birds) through breaks in biosecurity, but once established in domestic poultry the virus may be moving between farms due to human factors such as contaminated clothing or equipment.

5. Have any wildlife facilities diagnosed AI at their facility, how has the USDA dealt with it, and what was the outcome.
    a. One or two rehabbers /falconers were infected due to avian consumption of contaminated meats. Index cases were associated with exposure to contaminated meat but lateral transmission occurred once on premises. Not all raptors at the facility were infected, and the facilities were released from quarantine once tested negative and the facilities were cleaned.

6. Can you please address the chickadee situation? Folks are concerned about passerine susceptibility and what that may mean for collections.
    a. There was a report of a single chickadee. Don't be surprised if we see more in other orders of birds, but realize this is not an indication that any others but *Anatidae* will be acting as primary vectors (However passerines could mechanically carry into an environment.) This is likely just spillover – incidental and there could be additional mitigating factors present like other viruses in the birds system leading to immunodeficiency. At this time there doesn't seem to be any indication that it is moving outside *Anatidae* to any considerable degree.

7. Are there dates when zoos (based on latitude perhaps) should go back on higher alert for the migration season?
    a. Yes, in September for the Mid-Atlantic when teal start moving into areas… would suspect a bit earlier on the west coast because of the warmer environment, but you would need to speak with someone on the flyway councils.

b. The best source for this information is your local flyway council – if you want to see the plans including hydraulic units those are publicly available. (General Flyway council is http://flyways.us/flyways/info
Some individual flyway websites have more information than others)

8. What measures are deemed most effective to take? Increased footbath placement? Increased disinfection of pathways through public aviaries? Increased surveillance (adding AI testing to gross necropsy) of any wild birds found dead or ill on grounds.
    a. Probably all of the above. It is prudent to have different shoes for each exhibit, different feeding implements, etc. particularly if the virus has been detected in the area. You want any materials directly entering exhibits dedicated to that exhibit only.
    b. Preventing movement of contaminated soil is probably a good area to focus on. At the very least would be prudent to have shoe covers.
    c. You need to be on top of cleaning footbaths, particularly if only using bleach. The best thing is still changing footwear
    d. Use common sense biosecurity measures – the ZAHP Center will be distributing some info on this.
    e. If there is a common pond you really want to focus on isolating and mitigating traffic to the area.

9. Please address the feeding of poultry: that it's OK to continue to feed NPIP (National Poultry Improvement Plan: virtually all commercially available poultry participates in NPIP programs) participating flocks. Poultry or carcasses with unknown status should not be fed. Freezing does NOT inactivate the virus, and prepare for continued rising poultry prices moving forward.
    a. We do not know the risk of this to big cats, though there has been some preliminary work in dogs, ferrets, and domestic cats it does not appear to cause serious illness (though it could re-assort). This is dangerous for birds of prey.
    b. It is ok to feed poultry, as long as you feel confident it is NPIP participant then it should be okay – there will be a heightened tests in place for this.
    c. Other good news is that broilers are very resistant to this virus so the likelihood of infection is much lower than it is for turkeys or layer chickens. The amplifying characteristic in turkeys may have been one of the factors in spillover to egg layers in Iowa.

10. Can you address the importance of changing uniforms? Certain facilities have stated that they are working toward having animal staff change uniforms once arriving at the zoo and not allowing uniforms to leave grounds, based on APHIS and AZA guidelines. Their Human Resources department is cautious about implementing these uniform changing policies without a specific **mandate** from a government agency or body with the authority to do so. Some current policies have all uniformed zoo staff wearing their uniforms to and from work. Could you comment on the importance of implementing this preventative measure for our uniformed animal staff to protect the zoo collection, provide maintenance and storage best practices and comment on how many zoos are currently implementing a restricted and preventative uniform policy? (i.e. when it may be appropriate to implement this)
    a. We cannot mandate that as a State or government entity. This would need to be a policy at zoo level, but it is a good idea as people arrive at zoo grounds, particularly as many have birds at home. Some good ideas would be to have footwear worn outside facility kept in a specific location, clothes laundered on premises, and create a line of demarcation between potentially infected and other infected or non-infected premises.
    b. You can't do anything about the public, but they won't be going into exhibits except free flying open bird exhibits. The good news is those birds have a low risk of infection. There not much you can do about this other than asking the public to wear disposable booties – though that may discourage them from going in.

11. Vehicle disinfection?
    a. Currently in infected premises tires and under-carriage are disinfected. For feed trucks / carcass trucks there may be need to clean the entire truck. Whether or not you to decide to do this with employee vehicles and or food trucks is an institutional decision. If you are very concerned and at a facility with no loading dock you can unload at entrance and manually move in goods or clean the truck at the entrance.

12. Can the virus be carried on the wind
    a. There is some epidemiological data to suggest that wind may have played a role in some of the Upper Midwest outbreaks. Some evidence indicates that short distance aerosol movement has occurred, some say up to 1 mile, but

those situations are not the type that would be commonly encountered in the area surrounding an exhibitor. These instances are mostly large scale poultry operations where you would be disturbing a lot of dust and dander that could contain particulates and that particulate would carry the virus.

b. For zoos, there is probably not a high risk of virus blowing from wetlands into a zoo. There would be more risk from a wild bird carrying virus onto zoo grounds. In terms of it blowing in from somewhere, that should not be a concern for zoos and other exhibitors.

13. Is banding surveillance mainly focused on waterfowl? Concerns about other reservoirs?
    a. We are opportunistically sampling other species of waterfowl, and have not yet moved to sampling other species of birds though any die offs will be investigated. Direct surveillance is largely targeted at waterfowl, particularly dabbling ducks.

14. Are permits needed for depredation of species on ponds?
    a. Yes, talk to State and federal agencies about take permits etc. to avoid issues with harassment of wildlife.
    b. Some concerns have been for wild turkeys, but again you would need to work with State and federal entities to deter them. If you wanted to try and remove Canada geese etc., you could work with your state and the federal Fish and Wildlife Service and USDA Wildlife Services.
15. Do institutions need to regulate or require vaccines in advance or will it be as-needed as a virus advances?
    a. This is not worked out yet, and is currently on an as-needed basis as virus spreads. It will still need to be worked out if vaccines can even be used in a particular State and when. Again – talk to State animal health officials.

16. How long does the virus live on fomites and outside the body?
    a. For most HPAI, it is fairly fragile so heat and desiccation are detrimental to its survival (probably why there have been no detections since mid-June) - though if the virus gets into the water it can persist for several months in the cold moist environment. If the water temperature climbs, the microbial activity can also degrade the virus. The virus has a very short lifespan if exposed to sunlight, though this clade was not specifically studied.

17. Detections in feral pigeons?

a. No, when studied with H5N1 it was very hard to kill the pigeons and they did not transmit it laterally. Pigeons are such a low risk that we actually allow importation of these from countries where HPAI is a problem
b. If the environment is contaminated and they are feeding there they can mechanically carry the virus in, but wouldn't worry too much about this because this particular virus has a very high threshold of infection for most species.

18. Are flamingos considered susceptible?
    a. Yes, traditionally considered to be.

19. Any recommendations for facilities where employees hunt ducks in fall.
    a. Refer to biosecurity measures – change clothing before entering grounds particularly if there is higher risk in your area. Duck hunting may be of less risk than ducks on grounds.

Closing (Steve Olson - ZAHP Program Supervisor, Vice President Federal Relations, Association of Zoos and Aquariums)

As a reminder, the ZAHP website will be launching any day at http://zahp.aza.org . Remember that while this was started as an agreement with AZA and USDA we are focused on the entire managed wildlife community so if there are other entities that you feel should be involved please let us know!