

**Risk Assessment Summary:** Evaluating the Risk of Wild Bird Exposure to Highly Pathogenic Avian Influenza Virus in Leachate from Landfills Accepting Poultry Carcass Waste

**Bottom Line:** Subtitle D Municipal Solid Waste landfills should be among the carcass disposal options considered during an outbreak given the “low” to “negligible” risk of reintroducing the disease to commercial flocks via wild birds (i.e., waterfowl and gulls.)

**Note:** This analysis defines *negligible risk* as the likelihood that the exposure will occur is insignificant or not worth considering. *Low risk* means it is very unlikely that an exposure will occur.

*Landfill to waterfowl and gulls.* Our analysis found that there is a *low* estimated risk of waterfowl and gull exposure to highly pathogenic avian influenza (HPAI) virus under the “Current Guidance” conditions identified in Table 1 for managing the disposal of infected poultry carcasses in landfills. With additional management steps as described in the table below, this risk may be reduced from *very low to negligible*. When landfill leachate is further treated at a municipal wastewater treatment plant using secondary treatment with activated sludge followed by tertiary treatment with chlorine, the risk of wild bird exposure associated with treated leachate would be reduced to *negligible*. Increasing the time before leachate is recirculated over waste from 30 to 60 days is also an option to reduce the exposure of gulls to HPAI virus.

*Waterfowl to poultry exposure.* The risk of HPAI virus spread to poultry from waterfowl infected by landfill leachate would be *negligible* for 1996-97 Asian goose Guangdong lineage H5 HPAI viruses and non-Asian lineage HPAI viruses. Because Asian H5 HPAI strains can spread between waterfowl, those viruses are likely already present in waterfowl at the time of disposal. If the outbreak involves a non-Asian H5 HPAI strain, the virus is unlikely to spread efficiently within the waterfowl and the poultry population.

**Table 1. Risk of wild bird HPAI exposure in Subtitle D Municipal Solid Waste Landfills following disposal of 150,000 table-egg layer birds (280 tons of waste)**

	“Low Risk” Under Current Guidance	“Very Low to Negligible Risk” Achieved Using Any 1 of the Following 3 Options
<b>Waste Depth*</b>	Carcass waste is placed in a trench in an area of the landfill under intermediate cover; the depth of waste below the trench is at least 30 feet	Depth of waste below the carcass trench is at least 60 feet
<b>Temperature of Waste Column</b>	Majority of the waste column is above 21° Celsius or 70° Fahrenheit	Majority of the waste column is above 40° Celsius or 104° Fahrenheit
<b>Flock Selection</b>	Disposal of infected flocks detected using passive surveillance	Disposal of flocks from barns testing negative from infected premises detected using active dead-bird surveillance and real-time reverse transcriptase polymerase chain reaction testing protocols
<p>*Assuming carcass waste is placed at a sufficient distance from the side edges of the landfill so leachate is unlikely to seep through the sides or edges of the landfill <b>and</b> at a sufficient distance from gas collection pipes to avoid channeling, per standard landfill practice.</p> <p>Results of this analysis are based on the disposal of 150,000 birds comprising 280 tons of waste and may vary with larger quantities.</p>		

**Background:** During recent outbreaks of HPAI in commercial poultry, some landfill operators refused carcass waste from infected flocks due to concerns that disposal could release virus-contaminated fluid and expose wild birds to virus. USDA recommended waste disposal guidelines requiring a minimum of 30 feet of municipal waste below the carcass waste layer and a 30-day delay in recirculation of leachate over waste. These measures reduce the potential for virus survival and subsequent exposure of wild birds at landfills where an artificial wetland is used or gulls forage on the open face of the landfill. We evaluated the risk of exposure to leachate under current guidelines and under other optional waste management scenarios.

**Analytical Approach:** We developed a simulation model to predict the final infectious HPAI virus concentration in leachate and the associated risk of exposure of wild birds visiting an artificial wetland following the disposal of an infected poultry flock in a Subtitle D Municipal Solid Waste landfill. First, we estimated the amount of fluid released from poultry carcass waste. Then we predicted the degree of thermal inactivation of the HPAI virus in carcass fluid as it drains through the waste column. In warmer landfills, temperatures reach at least 40° Celsius in the majority of the waste column due to microbial activity in the presence of moisture. To be conservative, we also evaluated HPAI virus inactivation in landfills with cooler temperatures.

The rate of thermal inactivation of HPAI virus in the leachate was estimated from data on inactivation of avian influenza viruses. We also accounted for the effects of dilution on the final virus concentration due to mixing of carcass fluids with other leachate. Then, we predicted the probability of infecting waterfowl (e.g., mallard ducks, Pekin ducks, and white Chinese geese) exposed to HPAI virus in holding basins, using data from inoculation studies, and gulls foraging on the open face where leachate is recirculated.

Finally, we used scenario analysis to evaluate the potential impact of each mitigation option and to address uncertainty in key variables, such as the rate of leachate flow through the waste column.

**Results:** Overall, the risk of exposure of wild birds following direct burial of poultry carcass waste from a commercial flock with a high estimated level of HPAI infection ranges from *negligible to low, depending upon initial level of virus contamination in poultry carcasses, leachate flow rate, the landfill waste temperature profile, and time to recirculation, among other factors*. Disposal of carcasses in bio-containment bags for the sole purpose of reducing virus concentration in leachate was not shown to effectively decrease risk. When landfill leachate is further treated at a municipal wastewater treatment plant using secondary treatment with activated sludge followed by tertiary treatment with chlorine, the risk of wild bird exposure associated with treated leachate would be reduced to negligible.

Other management steps to further lower risk are described in greater detail in the full report.

**Notes:** This summary of the study is being provided for critical emergency planning and emergency management information sharing. The full report will be available upon request when it is finalized.

If you have questions or want more information about the study contact:

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