

## Bird flu markers in wastewater may come from wild birds, study led by Oregon State shows

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New research shows that wild birds can account for much of the avian influenza virus evidence found in wastewater in Oregon, suggesting wastewater detections of the virus do not automatically signal human, poultry or dairy cattle cases of bird flu.

The study looked at the new clade of avian influenza virus that first appeared in the United States in January 2022 and by the end of 2024 had infected poultry and cattle throughout the country.

“The virus has been detected in wastewater sporadically throughout the U.S. and the results of this research may provide some additional context as to what the origin of those detections may be,” said Tyler Radniecki, a professor in Oregon State University’s College of Engineering who studies microorganisms in wastewater.

Radniecki and collaborators at OSU, the Oregon Health Authority and the Oregon Department of Agriculture analyzed nearly three years of wastewater surveillance across 20 communities in the state.

Detections of the avian influenza H5N1 H5 subtype were most frequently found in or near communities with important wild bird habitats, the authors note. There was no association between H5 subtype detections in wastewater and outbreaks of infected poultry, or the location of dairy farms or dairy processors.

“One assumption is that wastewater H5 detections indicate human or dairy cattle cases of bird flu,” Radniecki said. “However, our work detected H5 in wastewater two years prior to the spillover of bird flu into dairy cattle, in a state that has not had any cattle outbreaks and only one human case. This work demonstrates that wild birds are also important contributors to the wastewater H5 signal.”

The new clade of avian influenza virus – clade refers to a group of organisms that include a single common ancestor and all of its descendants – traveled efficiently via migratory wild birds across the United States, and by December 2024 more than 112 million poultry in 49 states were affected.

In March 2024, there was a multistate outbreak among dairy cattle. Nine months later, more than 700 herds in 15 states had been affected.

Throughout the outbreaks, wastewater surveillance has been used by the Centers for Disease Control and Prevention and state and local health departments as a monitoring tool, the researchers say. However, they add, interpretation of H5 in wastewater is complex because current testing practices do not distinguish between animal and human sources.

Radniecki and collaborators, including OSU colleagues Rebecca Falender, Christine Kelly and David Mickle, analyzed more than 500 wastewater samples that had earlier tested positive for the influenza A virus to see which ones contained the H5 subtype of the virus.

“This is the most comprehensive sample of retrospective avian influenza A H5 subtype testing in wastewater in the United States to date,” Radniecki said. “Wastewater surveillance picked up on avian influenza’s emergence in Oregon birds six weeks before other surveillance systems did, and the study offers important perspectives as to what the results mean.”

The samples had been collected from 20 wastewater plants in Oregon between September 2021 and July 2024. The analysis led to 21 H5 detections from wastewater treatment plants in 12 cities, with no association between the detections and poultry outbreaks in the surrounding county or grade A dairy processing facilities or dairy farms in the area.

“Instead, we found that the communities with the most detections contain important habitats for migratory wild birds such as seasonal wetlands and estuaries of major rivers,” said Falender, a wastewater epidemiologist in the OSU College of Engineering and the paper’s lead author. “Wastewater surveillance for avian influenza provides additional data that strengthens ongoing bird flu surveillance efforts, but nuance matters in interpreting the results.”

That means paradigms used with other types of wastewater surveillance data, like the novel coronavirus, may not work as well for zoonotic diseases such as avian influenza, Falender said. Laboratories, public health

officials and state departments of agriculture need to work together when interpreting the results of surveillance for avian influenza, she said, adding that's how results are interpreted in Oregon.

"For example, we know how many poultry outbreaks, dairy farms and dairy processors are within Oregon's sewershed boundaries because of our close collaboration with the state Department of Agriculture," Falender said. "They have been monitoring and testing wild birds and agricultural animals in Oregon for years now."

Melissa Sutton and Paul Cieslak of Oregon Health Authority and Ryan Scholz and Harrison Hall of the Oregon Department of Agriculture participated in the research, which was published today in *Morbidity and Mortality Weekly Report*, a journal of the CDC.

-30-

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