Avian flu virus unlikely to spread through water systems

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To test whether the H5N2 virus could survive water treatments, such as chlorine, UV light and bacterial digesters, chicken embryos were inoculated with the treated virus. Days later researchers removed fluid from the eggs and tested whether the virus survived and replicated. Credit: Alexis Wenski-Roberts/Cornell

A close relative of the highly pathogenic avian influenza virus (H5N1) can be eliminated by waste and drinking water treatments, including chlorination, ultraviolet (UV) radiation and bacterial digesters. The virus is harmless to humans but provides a study case of the pathways by which the influenza could spread to human populations.

Cornell researchers studied the related virus, called H5N2, to see whether a hypothetical mutated form of H5N1 could infect people

through drinking and wastewater systems. Researchers at Cornell and the U.S. Military Academy at West Point collaborated on the study, published in a recent issue of *Environmental Engineering Science*.

H5N2, a low-pathogenic avian influenza virus that is not contagious for humans, is physically similar to H5N1, which has been lethal to millions of birds globally and more than half of the almost 200 infected people mostly through handling infected birds, since 2003. Researchers and officials are concerned that if H5N1 mutates to transmit easily between people, a deadly global pandemic could occur.

"It is unknown if H5N1 is more resistant" than H5N2 to procedures used by the water management industry, said Araceli Lucio-Forster, the paper's lead author and a teaching support specialist in Cornell's Department of Microbiology and Immunology. Lucio-Forster will receive her Ph.D. in microbiology from Cornell in January 2007.

Because H5N1 requires high-level biosafety facilities, Lucio-Forster and colleagues used H5N2 as a surrogate virus. Given the similarities between the two viruses, she thinks that if H5N1 entered the water treatment system, "the virus should be inactivated, which means treated water may not be a likely source of transmission," said Lucio-Forster.

Overall, avian flu viruses do not survive well outside of a host. Still, the researchers tried to address concerns in the wastewater-treatment industry that if a human outbreak occurred, contaminated feces passing through the plant could infect plant workers and spread elsewhere through drinking water.

"You have some 50,000 treatment plants in the U.S., and all these operators that run the plants were concerned that if there were an influenza outbreak and everyone were sick, is it going to come into the plant and infect them and others," said co-author Dwight Bowman, a

professor of parasitology at Cornell.

To test the effectiveness of UV radiation for killing the H5N2 virus, the researchers exposed the virus in drinking water as well as in wastewater effluents to UV light at varying levels. The treatment was very effective in killing H5N2 at levels well within industry standards (and at lower levels than are used for killing Cryptosporidium and Giardia in water).

For chlorine, which is mostly ubiquitous in U.S. drinking water, the results were less definitive. Inactivation of H5N2 depends on both chlorine concentrations and time of exposure. On average, U.S. treatment plants treat drinking water with chlorine concentrations of 1 milligram per liter for 237 minutes. Under these conditions, the researchers found that H5N2 (and probably H5N1) would be mostly inactivated, but further studies are needed to see if the viruses stay active when they come out of feces or are at different pH and salinity levels.

Similarly, the small laboratory-scale study found that bacterial digesters also reduced H5N2 to undetectable levels after 72 hours, which is consistent with industry standards. The researchers also found that higher digester temperatures inactivated the virus more quickly.

Source: Cornell University