Estimated Incubation Period and Serial Interval for Human-to-Human Influenza A(H7N9) Virus Transmission

Lei Zhou, Qun Li, Timothy M. Uyeki

Author affiliations: Peking University Health Science Center, Beijing, China (L. Zhou); Chinese Center for Disease Control and Prevention, Beijing (L. Zhou, Q. Li); Centers for Disease Control and Prevention, Atlanta, Georgia, USA (T.M. Uyeki)

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We estimated the incubation period and serial interval for human-to-human–transmitted avian influenza A(H7N9) virus infection using case-patient clusters from epidemics in China during 2013–2017. The median incubation period was 4 days and serial interval 9 days. China’s 10-day monitoring period for close contacts of case-patients should detect most secondary infections.

As of April 2019, a total of 1,568 confirmed cases of avian influenza A(H7N9) virus infection acquired in China have been reported in humans since the virus emerged in spring 2013 (1,2). A large increase in infections occurred in China during the fifth H7N9 virus epidemic (2016–17), prompting concerns of increased H7N9 virus transmissibility in humans (3). However, as of June 2019, only evidence of limited, nonsustained human-to-human transmission has been reported (3).

Field investigations of case-patients with confirmed H7N9 virus infections are critical to assessing possible human-to-human transmission. The incubation period for H7N9 virus infection has been estimated to be 3–7 days (4–6). However, the incubation period estimated in these studies primarily reflects sporadic poultry-to-human transmission; no study has specifically focused on the incubation period for human-to-human H7N9 virus transmission. Although the kinds of exposures, amount of virus per exposure, and routes of exposure might differ between poultry-to-human and limited human-to-human H7N9 virus transmission, whether the incubation periods differ is unknown. Data on the incubation period for H7N9 virus in the setting of human-to-human transmission can help determine the appropriate duration for monitoring exposed close contacts, including healthcare personnel, of confirmed H7N9 case-patients.

We analyzed the data on all clusters of epidemiologically linked H7N9 case-patients collected during field investigations of 5 epidemics that occurred in mainland China during 2013–2017 and that were reported to the Chinese Center for Disease Control and Prevention (China CDC).
Our use of median values to describe the epidemiologic parameters for H7N9 case-patients in the 14 clusters might have led to an overestimation of the incubation period and serial interval for human-to-human H7N9 virus transmission. For example, parametric analyses performed with data from much larger datasets (mostly H7N9 cases resulting from poultry exposures), in which data with right-skewed distributions were censored, were reported to provide shorter estimated incubation periods (4–6.8). The incubation period could also have been overestimated among case-patients with multiple exposure days to an index case-patient, if infection did not occur on the first day of exposure. Therefore, further comprehensive epidemiologic investigations to better define the transmission dynamics of human-to-human H7N9 virus transmission are critical. Nevertheless, our findings suggest that China’s policy since 2013 for a 10-day monitoring period for close contacts of H7N9 case-patients should detect most symptomatic secondary infections.

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About the Author
Dr. Zhou is chief of the Branch for Emerging Infectious Diseases, Public Health Emergency Center, China CDC, Beijing, China. Her research interests are prevention and control of emerging infectious diseases and pandemic influenza preparedness and response.

### References
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Appendix

**Appendix Table.** Estimated serial intervals for influenza A(H7N9) virus infection in setting of probable human-to-human transmission among 14 epidemiologically linked clusters of case-patients in mainland China, 2013–2017*

<table>
<thead>
<tr>
<th>Epidemic wave</th>
<th>Serial interval for clusters of blood-related contacts, d, n = 6, median (range)</th>
<th>Serial interval for clusters of unrelated contacts, d, n = 8, median (range)</th>
<th>p value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>10 (8–12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second</td>
<td>9</td>
<td>7.5 (6–9)</td>
<td>0.480</td>
</tr>
<tr>
<td>Third</td>
<td>10</td>
<td>7</td>
<td>ND‡</td>
</tr>
<tr>
<td>Fourth</td>
<td>5</td>
<td>12.5 (10–15)</td>
<td>0.221</td>
</tr>
<tr>
<td>Fifth</td>
<td>11</td>
<td>7 (6–11)</td>
<td>0.346</td>
</tr>
<tr>
<td>Overall</td>
<td>9.5 (5–12)</td>
<td>8 (6–15)</td>
<td>0.650</td>
</tr>
</tbody>
</table>

*The serial interval was defined as the time in days from illness onset of an index case-patient to the illness onset of a secondary case-patient in each cluster. A cluster of probable human-to-human influenza A(H7N9) virus transmission was defined as 2 or more epidemiologically linked cases in which a secondary case-patient had exposure to an ill index case-patient but no reported poultry exposure. ND, not done.
†Wilcoxon rank-sum test was used to compare the distribution of serial intervals, and p<0.05 was considered significant.
‡Only one blood-related cluster and one unrelated cluster occurred during the third epidemic wave.