Avian Influenza A(H7N9) Virus Infections, Shanghai, China

To the Editor: On March 31, 2013, the National Health and Family Planning Commission of China notified the World Health Organization of 3 cases of human infections with avian influenza A(H7N9) virus. These cases were caused by a novel virus that was identified by laboratory testing at the China Centers for Disease Control and Prevention (CDC) on March 29 (1).

As of April 19, 2013, a total of 91 laboratory-confirmed human cases (17 deaths) of infection with avian influenza A(H7N9) virus were reported in 4 provinces in China (2). We report clinical features of 2 infected adults who died, 2 critically ill infected adults who recovered, and 1 infected child who had a mild case during this outbreak in Shanghai, China.

A 3.5-year-old boy had fever (39.5°C) for 3 days and mild rhinorrhea starting on March 31. He was admitted to a district pediatric outpatient clinic on April 1. At admission, the child was given oseltamivir for 5 days, even though signs and symptoms had resolved. Nasopharyngeal swab samples were positive by real-time PCR for avian influenza A(H7N9) virus. All symptoms resolved uneventfully by April 3, and CDC was notified that avian influenza A(H7N9) virus was identified in his respiratory sample. The patient was discharged on day 11 after illness onset.

The 4 adult patients were given diagnoses of severe pneumonia with shortness of breath, dyspnea, and marked hypoxia (Table). Duration from disease onset to severe illness was 5–7 days. At admission, the 4 patients with severe cases had decreased peripheral blood leukocyte counts and increased levels of aspartate aminotransferase; 3 had increased levels of lactate dehydrogenase (Table).

All 4 adult patients had radiologically confirmed pneumonia and bilateral patchy alveolar opacities or diffused lobar consolidation with or without pleural effusion (Figure, Appendix, wwwnc.cdc.gov/EID/article/19/7/13-0523-F1.htm). Findings on chest radiographs for severe cases requiring mechanical ventilation were consistent with those for acute respiratory distress syndrome.

Among the 4 severe cases in adults, a 52-year-old woman (patient 1) died from acute respiratory distress syndrome and multiple organ failure on days 14 and 10, respectively, after disease onset and 1–2 days after progression to respiratory failure. Two other patients showed improvement and were virus negative 6 and 4 days after antiviral treatment. After 23–24 days of treatment in an intensive care unit, the 2 patients with severe cases recovered and were discharged (Table).

The 2 patients who died were given methylprednisolone. Of the 2 patients who recovered, 1 was given a low dose of methylprednisolone for 1 week and the other was not given methylprednisolone. Although it is difficult to assess the role of glucocorticoids in treatment because of limited number of cases, caution is advised because of possible serious adverse events, including death, as reported for human infection with influenza A(H1N1) virus (4).

One of the adult patients reported exposure to poultry. The family of the child patient raised chickens and ducks, but these animals had no apparent disease, and cloacal swab specimens were negative for avian influenza A(H7N9) virus. One patient who died (patient 2) had frequent occupational exposure to poultry.

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influenza A(H7N9) virus resulted in the death of a veterinarian during an outbreak in the Netherlands (6). In the 5 patients reported here, avian influenza A(H7N9) virus caused fatal disease in 2 adult patients 52 and 49 years of age, who had other medical conditions. Older age has been reported to confer higher risk for developing more severe influenza-associated outcomes (7).

In conclusion, these cases indicated that avian influenza A(H7N9) virus might not be as virulent as avian influenza A(H5N1) virus in humans. Avian influenza A(H7N9) virus does not appear to cause obvious disease in poultry and causes mild disease in children. More severe disease in adults occurred among those that had concurrent diseases or were immunodeficient.

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References

1. Gao R, Cao B, Hu Y, Feng Z, Wang D, Hu W, et al. Human infection with a novel avian-origin influenza A (H7N9) virus. N Engl J Med. 2013 [Epub ahead of print]. http://dx.doi.org/10.1056/NEJMoa1304459

2. World Health Organization. Human infection with influenza A (H7N9) virus in China [cited 2013 Apr 22]. http://www.who.int/csr/don/2013_04_19/en/index.html

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**Table. Characteristics for 4 patients infected with avian influenza A(H7N9) virus, Shanghai, China**

| Characteristic | Patient 1† | Patient 2 | Patient 3 | Patient 4 |
|---------------|------------|-----------|-----------|-----------|
| Age, yrs/sex  | 52/F       | 49/M      | 67/M      | 65/M      |
| Exposure to poultry | None | Continuous | None | None |
| Sign or symptom at admission | Fever (40.6°C) for 7 d, cough for 1 d, difficulty breathing starting 7 d after illness onset | Fever (39.2°C) for 3 d, cough for 5 d, difficulty breathing and cyanosis starting 5 d after illness onset | Fever (39.7°C) and cough for 7 d starting 7 d after illness onset | Fever (39.0°C) for 5 d, cough for 2 d starting 5 d after illness onset |
| Physical examination results | HR 120 bpm, RR 40 breaths/min, BP 140/75 mm Hg, decreased breath sounds, no rales | RR 40 breaths/min, BP 240/160 mm Hg, diffuse moist rales | HR 100 bpm, RR 30 breaths/min, BP 110/78 mm Hg, moist rales mainly in left lung | HR 82 bpm, RR 21 breaths/min, BP 118/74 mm Hg, decreased breath sounds in lower left lung, no rales |
| Laboratory results | Leukocyte count, ×10^9/L | Neutrophils, % | Platelet count, ×10^9/L | AST, U/L |
| | 3.29 | 92 | 155 | 95 |
| | 2.9 | 69.1 | 7 | 258 |
| | 2.89 | 78.6 | 172 | 45 |
| | 3.74 | 76.7 | 82 | 77 |
| Medications after hospitalization | Oseltamivir | None | AZT started d 11 after illness onset | CEF started d 10 after illness onset |
| | Antimicrobial drugs | MOX started d 13 after illness onset | MOX started d 10 after illness onset | CEF started d 11–12 after illness onset, MOX started d 13 after illness onset |
| | Corticosteroids | MEP, 80 mg/d started d 14 after illness onset | MEP, 80 mg/d started d 10 after illness onset | MEP, 80 mg/d started d 11 after illness onset, decreased to 40 mg/d, stopped after 1 wk |
| | Immunoglobulin | Started d 13 after illness onset | None | Given d 11–15 after illness onset |
| Other conditions | Diabetes mellitus, surgery for thyroid cancer | Obesity | None | Hypertension |
| Outcome | Died d 14 after illness onset | Died d 10 after illness onset | Discharged 30 d after illness onset | Discharged 27 d after illness onset |

†Data for patient 1 were reported by Yang et al. (3) and are included for comparison.

†HR, heart rate; RR, respiratory rate; BP, blood pressure; AST, aspartate aminotransferase; LDH, lactate dehydrogenase; CPK, creatine phosphokinase; CK-MB, creatine kinase isoenzyme MB; MOX, moxifloxacin; AZT, azithromycin; CEF, ceftriaxone; MEP, methylprednisolone.
3. Yang F, Wang J, Jiang L, Jin JL, Shao LY, Zhang Y, et al. A fatal case caused by novel H7N9 avian influenza A virus in China. Emerging Microbes and Infections. 2013;2:e19. 10.1038/emi.2013.22.

4. Brun-Buisson C, Richard JC, Mercat A, Thébaut AC, Brochard L; REVA-SRLF A/H1N1v 2009 Registry Group. Early corticosteroids in severe influenza A/H1N1 pneumonia and acute respiratory distress syndrome. Am J Respir Crit Care Med. 2011;183:1200–6. http://dx.doi.org/10.1164/rccm.201101-0135OC

5. Update on human cases of influenza at the human–animal interface. Wkly Epidemiol Rec. 2013;88:137–44.

6. World Health Organization. Avian influenza: assessing the pandemic threat, 2005, Table 3, Documented human infections with avian influenza viruses [cited 2013 Apr 22]. http://www.who.int/flu/resources/documents/h5n1_assessing_pandemic_threat/en

7. Van Kerkhove MD, Vandemaele KA, Shinde V, Jaramillo-Gutierrez G, Koukounari A, Donnelly CA, et al. Risk factors for severe outcomes following 2009 influenza A (H1N1) infection: a global pooled analysis. PLoS Med. 2011;8:e1001053. http://dx.doi.org/10.1371/journal.pmed.1001053

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Pseudomonas aeruginosa

isolated from a patient hospitalized at Verona University Hospital, Verona, Italy. Integrons are ancient structures that have been present in bacteria for millions of years, indicating that bacteria had the means of acquiring and disseminating antibiotic resistance long before humans developed antibiotics.

Sources

1. Lauretti L, Riccio ML, Mazzariol A, Cornaglia G, Amicosante G, Fontana R, et al. Cloning and characterization of blavim, a new integron-borne metallo-β-lactamase gene from a Pseudomonas aeruginosa clinical isolate. Antimicrob Agents Chemother. 1999;43:1584–90. PubMed
2. Mazel D. Integrons: agents of bacterial evolution. Nat Rev Microbiol. 2006;4:608–20. PubMed http://dx.doi.org/10.1038/nrmicro1462
3. Stokes HW, Hall RM. A novel family of potentially mobile DNA elements encoding site-specific gene-integration functions: integrons. Mol Microbiol. 1989;3:1669–83. http://dx.doi.org/10.1111/j.1365-2958.1989.tb00153.x

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