as the therapy of choice for such infections. In our study, the rates of nonsusceptibility to colistin, tigecycline, and gentamicin were 19%, 31%, and 35%, respectively. Third, many patients have severe clinical conditions caused by hematologic malignancy and other concurrent conditions (e.g., renal failure, heart disease).

In conclusion, in areas where KPC-Kp is endemic, progress in treating hematologic malignancies could be slowed by the emergence of severe KPC-Kp infections. In these settings, the early identification of patients likely to be colonized and/or infected by KPC-Kp strains represents a major step toward preventing and containing the spread of these strains among hospitalized patients. Policies on empirical treatment might need to be revised, depending on the possibility of serious infections caused by carbapenem-resistant *Enterobacteriaceae.*

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References

1. Tumbarello M, Spanu T, Caira M, Trecarichi EM, Laurenti L, Montuori E, et al. Factors associated with mortality in bacteremic patients with hematologic malignancies. Diagn Microbiol Infect Dis. 2009;64:320–6. http://dx.doi.org/10.1016/j.diagmicrobio.2009.02.008
2. Trecarichi EM, Tumbarello M, Spanu T, Caira M, Fianchi L, Chiusolo P, et al. Incidence and clinical impact of extended-spectrum-β-lactamase (ESBL) production and fluoroquinolone resistance in bloodstream infections caused by *Escherichia coli* in patients with hematological malignancies. J Infect. 2009;58:299–307. http://dx.doi.org/10.1016/j.jinf.2009.02.002
3. Tumbarello M, Viale P, Viscoli C, Trecarichi EM, Tumietto F, Marchese A, et al. Predictors of mortality in bloodstream infections caused by *Klebsiella pneumoniae* carbapenemase–producing *K. pneumoniae*: importance of combination therapy. Clin Infect Dis. 2012;55:943–50. http://dx.doi.org/10.1093/cid/cis588
4. Qureshi ZA, Paterson DL, Potoski BA, Kilayko MC, Sandovsky G, Sordillo E, et al. Treatment outcome of bacteremia due to KPC-producing *Klebsiella pneumoniae*: superiority of combination antimicrobial regimens. Antimicrob Agents Chemother. 2012;56:2108–13. http://dx.doi.org/10.1128/AAC.06268-11
5. Satlin MJ, Calfee DP, Chen L, Fauntleroy KA, Wilson SJ, Jenkins SG, et al. Emergence of carbapenem-resistant *Enterobacteriaceae* as causes of bloodstream infections in patients with hematologic malignancies. Leuk Lymphoma. 2013;54:799–806. http://dx.doi.org/10.3109/10428194.2012.723210

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Neisseria meningitidis Serogroup W135 Sequence Type 11, Anhui Province, China, 2011–2013

To the Editor: *Neisseria meningitidis* colonizes the nasopharynx of humans and can cross the epithelial barrier of the nasopharynx, causing septicemia, meningitis, or both (*1*,*2*). In Anhui Province, China, there has been a previously high risk for epidemic cerebrospinal meningitis. Before 2012, all meningococcal diseases were caused by *N. meningitidis* serogroups A, B, and C, and the unique sequence type (ST) 4821 clone of serogroup C was first identified in this region during 2003–2004 (*3*).

No widespread epidemics of cerebrospinal meningitis and no *N. meningitidis*–associated deaths have occurred in Anhui since bivalent meningococcal vaccines against serogroups A and C were first used in 2003 (*4*). During 2011–2013, however, 15 infections caused by *N. meningitidis* serogroup W135 ST11, which belongs to a hyperinvasive lineage (*5*), were reported in Hefei, Anhui Province. Two of the cases (1 each in 2012 and 2013) were fatal and occurred in patients who denied having recently traveled, which suggests that the clone may have spread in an endemic fashion. The 2 patients also had no history of vaccination with tetravalent polysaccharide vaccine (serogroups A/C/Y/W). The other 13 cases occurred in close contacts of the patients who died.

The fatal cases of serogroup W135 infection were in 14- and 17-year-old boys. One of the boys had dropped out of school and worked in a hotel. He sought medical care for a headache with sudden onset, vomiting, and high fever (temperature 40°C). The other boy was a junior college student. At hospital admission, he had vomiting, diarrhea, and high fever (temperature 39°C).

According to the Chinese surveillance system, meningococcal disease is reported by local hospitals to the local Center for Disease Control and Prevention and then to the provincial Center for Disease Control and Prevention, where specific measures are taken to control and prevent the disease. Serogroup W135 infection in the 2 boys in Hefei was identified and reported by different hospitals. Both boys reported that they had not traveled outside Hefei in the 2 months before illness onset or had any contact with persons with meningococcal disease. A total of 61 close contacts were identified for the boys.

Despite treatment, the 2 boys died of disseminated intravascular coagulation and multiple organ failure. Cerebrospinal fluid and blood specimens

were cultured on chocolate agar for 24 h; results showed bacterial growth consistent with the features of *Neisseria* spp. Four isolates were identified as serogroup W135 by using specific antiserum (Remel, Lenexa, KS, USA).

Throat swab specimens were collected from the 61 close contacts of the 2 boys; all contacts were asymptomatic. Gram staining and biochemical tests confirmed the presence of *N. meningitidis* in 13 of the 61 samples, and slide agglutination, using specific antiserum, showed that all 13 isolates from contacts were serogroup W135.

Pulsed-field gel electrophoresis (PFGE) (*6*), multilocus sequence typing, outer membrane protein gene (*porA*) variant region subtyping, and antimicrobial drug susceptibility tests were used to characterize the 17 isolates. PFGE patterns (pulse types 1 and 2) for the isolates were indistinguishable and shared >96% similarity with the dominant patterns, including patterns for isolates from Guangdong, Guangxi, and Jiangsu Provinces, China (Figure). All isolates had the same multilocus ST (ST11) and PorA subtype (P1.5,2), which belong to the multilocus ST11/electrophoretic type 37 complex (*7*). Results of Kirby-Bauer testing showed that all 17 isolates were resistant to sulfamethoxazole and sensitive to penicillin, ampicillin, ceftriaxone, cefotaxime, meropenem, minocycline, chloramphenicol succinate, and rifampin. Resistance to ciprofloxacin, which, to our knowledge, had not previously been reported for *N. meningitidis* from mainland China, was shown for 70.6% (12/17) of the isolates.

Since 2000, *N. meningitidis* W135 ST11 disease has become a serious problem worldwide (*8*,*9*). In mainland China, serogroup W135 ST11 cases have recently been reported in Guangdong, Guangxi, Zhejiang, Jiangsu, and Henan Provinces (*10*), but no deaths were reported until 2012, when the first of the 2 boys died in Anhui Province (online Technical Appendix, http://wwwnc.cdc.gov/EID/article/20/7/13-1138-Techapp1.pdf). According to the PFGE, multilocus sequence typing, and PorA typing results, the dominant clonal complex detected in Hefei matches the dominant type recently detected in other Chinese provinces. Pathogenicity characteristics of the isolates from Hefei and epidemiologic investigations indicate that the *N. meningitidis* W135 ST11 clone has emerged in Hefei, raising the possibility of its introduction into other regions.

Meningococcal polysaccharide vaccines A and C are being used for routine vaccination in China. However, meningococcal diseases caused by *N. meningitidis* serogroups other than A and C, especially those belonging to hyperinvasive lineages, are an emerging problem that must be addressed. The 2 fatal meningitis cases in Hefei highlight the need for further epidemiologic surveillance to monitor the incidence of meningococcal disease caused by serogroup W135 and the need for better public health strategies to control the disease.

Testing of the 17 isolates from Hefei for antimicrobial drug susceptibility indicated that sulfamethoxazole is not effective against serogroup W135 ST11 infection and that 70.6% of isolates were resistant to ciprofloxacin. Our findings indicate that changes in the molecular and epidemiologic characteristics of *N. meningitidis* in China should be monitored to enhance our ability to respond to emerging meningococcal disease.

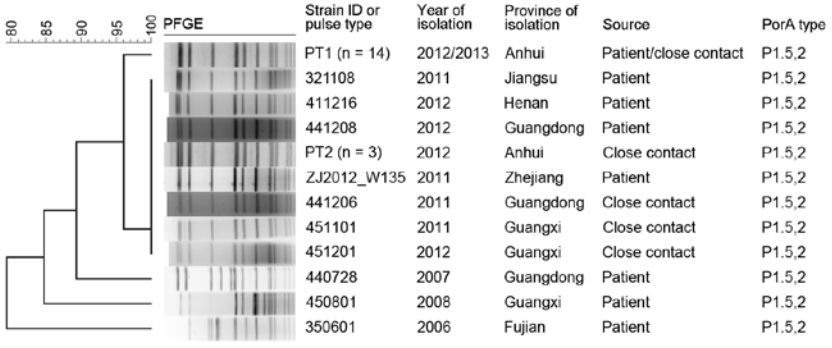

Figure. Pulsed-field gel electrophoresis (PFGE) pattern–based cluster analysis of 27 *N. meningitidis* serogroup W135 isolates from China: 17 isolates were collected from persons in Hefei City, Anhui Province, and 10 were collected from persons from other provinces in China. Clustering was performed by using the Dice coefficient and an optimization setting of 1.2%. The dendrogram was generated by using the unweighted pair group method with averages. All isolates belong to the multilocus sequence type 11/electrophoretic type 37 complex.

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References

1. Caugant DA. Genetics and evolution of *Neisseria meningitidis*: importance for the epidemiology of meningococcal disease. Infect Genet Evol. 2008;8:558–65.

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http://dx.doi.org/10.1016/jmeegid.2008.04.002
2. Hill DJ, Griffiths NJ, Borodina E, Virji M. Cellular and molecular biology of *Neisseria meningitidis* colonization and invasive disease. Clin Sci. 2010;118:547–64.
3. Shao Z, Li W, Ren J, Liang XF, Xu L, Diao BW, et al. Identification of a new *Neisseria meningitidis* serogroup C clone from Anhui Province, China. Lancet. 2006;367:419–23. http://dx.doi.org/10.1016/S0140-6736(06)68141-5
4. Zhou H, Gao Y, Xu L, Li M, Li Q, Li Y, et al. Distribution of serogroups and sequence types in disease-associated and carrier strains of *Neisseria meningitidis* isolated in China between 2003 and 2008. Epidemiol Infect. 2012;140:1296–303. http://dx.doi.org/10.1017/S0950268811001865
5. Lemos AP, Harrison LH, Lenser M, Sacchi CT. Phenotypic and molecular characterization of invasive serogroup W135 *Neisseria meningitidis* strains from 1990 to 2005 in Brazil. J Infect. 2010;60:209–17. http://dx.doi.org/10.1016/j.jinf.2009.11.014
6. Doyle TJ, Mejia-Echeverry A, Fiorella P, Leguen F, Livengood J, Kay R, et al. Cluster of serogroup W135 meningococci, southeastern Florida, 2008–2009. Emerg Infect Dis. 2010;16:113–5. http://dx.doi.org/10.3201/eid1601.091026
7. Sacchi CT, Lemos APS, Popovic T, Cassio de Morais J, Whitney AM, Melleset CEA, et al. Serosubtypes and PorA types of *Neisseria meningitidis* serogroup B isolated in Brazil during 1997–1998. Overview and implications for vaccine development. J Clin Microbiol. 2001;39:2897–903.http://dx.doi.org/10.1128/JCM.39.8.2897-2903.2001
8. Apicella MA. Extrameningeal complications of *Neisseria meningitidis* serogroup W135 infection. Clin Infect Dis. 2004;38:1638–9. http://dx.doi.org/10.1086/421030
9. Weidlich L, Baethgen LF, Mayer LW, Moraes C, Klein CC, Nunes LS, et al. High prevalence of *Neisseria meningitidis* hypervirulent lineages and emergence of W135:P1.5,2:ST-11 clone in southern Brazil. J Infect. 2008;57:324–31. http://dx.doi.org/10.1016/j.jinf.2008.07.014
10. Shao Z, Zhou H, Gao Y, Ren H, Xu L, Kan B, et al. *Neisseria meningitidis* serogroup W135, China. Emerg Infect Dis. 2010;16:348–9. http://dx.doi.org/10.3201/eid1602.090901

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Early Public Response to Influenza A(H7N9) Virus, Guangzhou, China, May 30–June 7, 2013

To the Editor: On May 15, 2013, surveillance in live poultry markets (LPMs) identified an influenza A(H7N9) virus–infected chicken in Guangzhou, the capital of Guangdong Province, China. During May 30–June 7, 2013, we conducted a population-based survey in Guangzhou to investigate changes in the public's buying behavior at LPMs and to determine the public's attitude toward potential implementation of specific interventions against avian influenza in LPMs. Behaviors and attitudes in 3 residential areas of Guangzhou were compared: urban districts, Conghua (a semirural area), and Zengcheng (a semirural area where subtype H7N9 infection had been detected in an LPM on May 15, 2013). These locations were chosen to compare possible urban–rural differences in live poultry exposure, as observed in an earlier study (*1*), and to assess the effect of epidemic proximity on the public's attitude and behavior.

Study participants were recruited by using the Mitofsky–Waksberg 2-stage sampling method (*2*). First 120, 60, and 60 telephone prefixes in urban districts, Conghua, and Zengcheng, respectively, were randomly selected. Then for each prefix, telephone numbers were randomly generated and called until 5 households were successfully recruited. Within each household, the person whose birthday was closest to the interview date and who was ≥15 years of age was invited to participate in the telephone interview. Using a standardized questionnaire, we collected demographic information and information on behavior related to buying live poultry from LPMs, attitudes toward measures for reducing avian influenza transmission in LPMs, and perceived risk for infection from LPMs.

Of 1,930 persons recruited, 1,196 (62.0%) completed the interview. Information on age was missing for 19 persons, so they were excluded; thus, a total of 1,177 persons were included in the analysis. Responses from the 3 residential areas were generally comparable, with the exception that respondents from urban districts reported higher levels of education and personal income (online Technical Appendix, http://wwwnc.cdc.gov/EID/article/20/7/13-1155-Techapp1.pdf). Compared with the overall Guangzhou population (*3*), the respondents were slightly better educated and less likely to be single (online Technical Appendix).

We used logistic regression models (*4*) adjusted for age, sex, and education level to calculate the percentages and 95% CIs related to buying live poultry from LPMs, attitudes, and risk perception in each area and for the sample as a whole. During the 2 months before the survey, ≈33.5% (95% CI 29.7%–37.5%) of the sampled households bought live poultry from LPMs at least once a week (Table). The number of households that bought live poultry on a weekly basis was substantially lower in Zengcheng than in urban areas. After the epidemic in Zengcheng was announced, 59.1% (95% CI 55.1%–63.0%) of all respondents reported buying less poultry or having completely stopped buying live poultry. Compared with respondents in the other 2 areas, Zengcheng respondents were more likely to report a reduction in buying (Table).

Most respondents expressed support for the policy of introducing 1 or 2 monthly market rest days in Guangzhou, but only 21.1% (95% CI 18.1%–24.4%) agreed with complete closure of LPMs (Table). Zengcheng respondents were more likely to agree on closure of LPMs. Approximately

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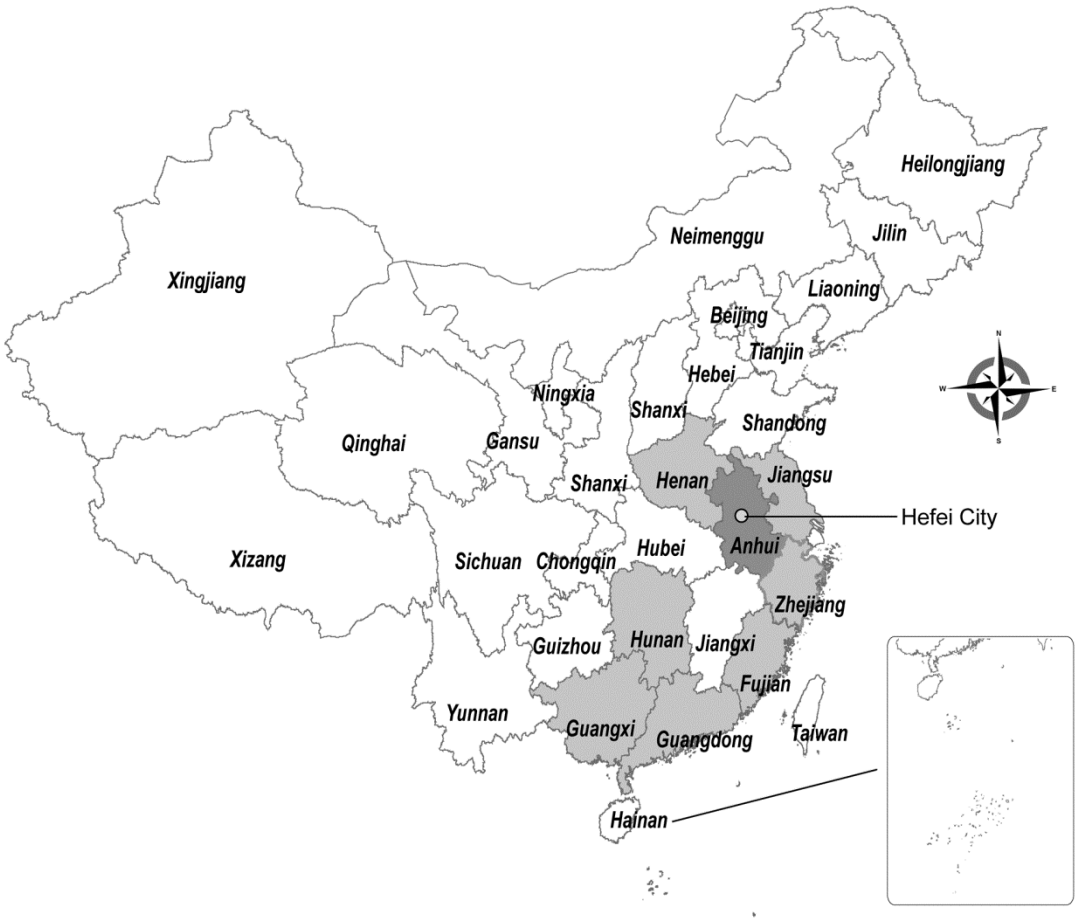
Technical Appendix



Technical Appendix Figure. Distribution of cases of meningococcal disease caused by serogroup W135 identified in China, January 2006–March 2013. The provinces with reported cases of serotype W135 meningococcal infection are indicated by light gray shading. The city of Hefei, where fatal cases occurred in 2 boys in 2012 and 2013, respectively, is indicated by dark gray shading.