Serologic Survey of Pandemic (H1N1) 2009 Virus, Guangxi Province, China

To the Editor: Since mid-April 2009, a new influenza A (H1N1) virus, now called pandemic (H1N1) 2009 virus, has caused influenza outbreaks in humans in North America (1) and a worldwide pandemic (2–4). Human pandemics occur when a new virus subtype emerges that is capable of human-to-human transmission in a population with little or no neutralizing antibodies to the new virus (4).

The current outbreak presents the first opportunity to directly observe this process. We used hemagglutination inhibition (HI) and virus neutralization (VN) assays to detect antibodies in 4,043 serum samples from residents (7–84 years of age) of 2 counties in Guangxi Province, People’s Republic of China, collected during July–August 2008. These persons were mostly farmers who lived in rural areas. Serum samples were obtained, transported, and frozen at –80°C as described (5). All serum samples with A/Brisbane/59/2007 (H1N1) (titers ≥40) were screened for neutralizing antibodies against Sw915. These VN-positive samples were negative for Sw915. These findings suggest that some cross-reactivity exists between CA04 and other Sw915-like H1 subtype viruses circulating in the pig population in southern China, and that sporadic human infection with H1 swine viruses has occurred in rural China, where exposure to pigs is common.

In contrast, screening all 4,043 serum samples with A/Brisbane/59/2007 showed that 159 (3.9%) samples had HI titers ≥40, of which 116 (2.9%) had neutralizing antibodies (titer ≥40) (Table). Only 3 serum samples from persons >60 years of age were VN positive for B59. Because the study group was not vaccinated, these results likely reflect natural infection rates for seasonal influenza virus (H1N1).
Table. Serum antibodies to pandemic (H1N1) 2009 virus A/California/04/2009 and influenza A virus (H1N1) A/Brisbane/59/2007 in unvaccinated and vaccinated persons, Guangxi Province, People’s Republic of China*  

<table>
<thead>
<tr>
<th>Virus, titer</th>
<th>No. (%) unvaccinated persons, n = 4,043</th>
<th>No. (%) vaccinated† persons, n = 22</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HI</td>
<td>VN</td>
</tr>
<tr>
<td>Pandemic (H1N1) 2009 virus A/California/04/2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–80</td>
<td>64</td>
<td>10</td>
</tr>
<tr>
<td>&gt;160</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>70 (1.7)</td>
<td>12 (0.3)</td>
</tr>
<tr>
<td>Influenza A virus (H1N1) A/Brisbane/59/2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40–80</td>
<td>131</td>
<td>64</td>
</tr>
<tr>
<td>&gt;160</td>
<td>28</td>
<td>52</td>
</tr>
<tr>
<td>Total</td>
<td>159 (3.9)</td>
<td>116 (2.9)</td>
</tr>
</tbody>
</table>


22 serum samples from vaccinated persons had no neutralizing antibodies against CA04, but all had high seroconversion rates for B59 (Table).

Our results suggest that most persons in our study population from Guangxi, China, are seronegative for pandemic (H1N1) 2009 virus (1). Serum samples from only 0.3% of persons tested neutralized the novel CA04 strain. This finding contrasts with findings from the United States that serum samples from ≈11% of unvaccinated persons had antibodies against CA04 (7). Furthermore, all CA04-positive persons in our study were ≤60 years of age; the US study reported a 33% seropositive rate for this age group.

These differences may have been caused by the high proportion of seasonal influenza vaccination coverage in the United States when compared with results from our unvaccinated population from southern China. Therefore, we suggest that vaccination against seasonal influenza, rather than exposure to older, seasonal, influenza viruses (H1N1), which may be genetically and antigenically similar to pandemic (H1N1) 2009 virus, as suggested (7), might have generated partial protection against this new virus. No persons in our vaccinated control group had neutralizing antibodies against CA04.

We hypothesize that the absence of neutralizing antibodies in our control group, all of whom had been vaccinated 3 times, suggests that prolonged and repeated vaccination is required for partial immunity to CA04 or that older vaccines may confer some degree of protection. If these serologic differences are indicative of increased susceptibility, we would expect higher infection attack rates in largely unvaccinated populations than in vaccinated populations in countries such as China.

Acknowledgments

We thank Dongmei Tan, Lili Deng, Lijuan Zhang, and Wenshan Hong for technical support.

This study was supported by the Oxford University–Li Ka Shing Foundation Global Health Program, the area of excellence scheme of the university grants committee of the Hong Kong special administrative region government (grant AoE/M-12/06), and the national institutes of health (NIH, national institute of allergy and infectious diseases contract HHSN266200700005C). S.R. is supported by the Fogarty international centre (NIH grant 3R01TW008246-01S1).

Honglin Chen,† Yong Wang,† Wei Liu, Jinxia Zhang, Baqing Dong, Xiaohui Fan, Menno D. de Jong, Jeremy Farrar, Steven Riley, Gavin J. D. Smith, and Yi Guan

†These authors contributed equally to this article.

Author affiliations: Shantou University Medical College, Shantou, People’s Republic of China (H. Chen, J. Zhang, S. Riley, G.J.D. Smith, Y. Guan); The University of Hong Kong, Hong Kong special administrative region, People’s Republic of China (H. Chen, J. Zhang, S. Riley, G.J.D. Smith, Y. Guan); Guangxi Medical University, Nanning, People’s Republic of China (Y. Wang, X. Fan); Guangxi center for disease control and prevention, Nanning (W. Liu, B. Dong); and hospital for tropical diseases, Ho Chi Minh City, Vietnam (M.D. de Jong, J. Farrar).

DOI: 10.3201/eid1511.090868

References


Address for correspondence: Yi Guan, State Key Laboratory of Emerging Infectious Diseases, Department of Microbiology, Li Ka Shing Faculty of Medicine, University of Hong Kong, 21 Sassoon Rd, Pokfulam, Hong Kong, Special Administrative Region, People’s Republic of China; email: yguan@hkucc.hku.hk