Sung-Ching Pan  
Department of Internal Medicine,  
National Taiwan University Hospital,  
Taipei 100, Taiwan  
Institute of Epidemiology and Preventive Medicine,  
College of Public Health, National Taiwan University,  
Taipei 100, Taiwan  

Shey-Ying Chen  
Institute of Epidemiology and Preventive Medicine,  
College of Public Health, National Taiwan University,  
Taipei 100, Taiwan  

Jann-Tay Wang  
Department of Emergency Medicine,  
National Taiwan University Hospital,  
Taipei 100, Taiwan  

Wen-Chu Chiang  
Department of Emergency Medicine,  
National Taiwan University Hospital,  
Taipei 100, Taiwan  

Wen-Ping Tseng  
Chia-Ming Fu  
Department of Emergency Medicine,  
National Taiwan University Hospital,  
Taipei 100, Taiwan  

Mei-Shu Lai  
Wei-Chu Chie  
Institute of Epidemiology and Preventive Medicine,  
College of Public Health, National Taiwan University,  
Taipei 100, Taiwan  

Shan-Chwen Chang*  
Department of Internal Medicine,  
National Taiwan University Hospital,  
Taipei 100, Taiwan  

College of Medicine, National Taiwan University,  
Taipei 100, Taiwan  
E-mail address: changsc@ntu.edu.tw

*Corresponding author. Department of Internal Medicine,  
National Taiwan University Hospital, No. 7, Chung-Shan  
South Road, Taipei 100, Taiwan. Tel.: +886 2  
23123456x65401; fax: +886 2 23971412.

Accepted 21 October 2012

© 2012 Published by Elsevier Ltd on behalf of The British Infection Association.

http://dx.doi.org/10.1016/j.jinf.2012.10.027

Dear Editor,

From 2009 to 2010, countries on several continents, including Europe, experienced large outbreaks of measles. In Marseilles, this outbreak was predominantly associated with older children and young adults, including health care workers.\(^1,2\) Since its resurgence in the 1990s, diphtheria incidence has decreased in Europe, but circulation continues in some countries in eastern Europe with sporadic cases reported elsewhere.\(^3\) Four imported cases were reported in France from 2002 to 2008,\(^4\) and one autochthonous case in an unvaccinated individual was reported in 2011.\(^5\) Tetanus occurs everywhere in the world, almost exclusively in individuals who are inadequately immunized. In France, from 2007 to 2009, the reported yearly number of tetanus cases remained stable (8 cases), and there were 14 cases in 2010. Because of their poor living conditions, homeless people have poorer health and higher mortality than the general population.\(^6\) They have limited access to healthcare\(^7\) because of many barriers which could delay their presentation for healthcare and limit their access to immunization services. Consequently, vaccination coverage may be lower in the homeless population compared with the general population.

In 2010, in a prospective study of adult homeless individuals sheltered at two homeless shelters in the city of Marseilles, France, we evaluated the immunity of homeless individuals to measles, diphtheria and tetanus. Blood samples were collected and used to test for the presence of IgG antibodies against measles virus and the diphtheria and tetanus toxins. This study was approved by the local ethics committee under number 10-005.

Measles-specific IgG titers were determined and semiquantified using an enzyme-linked immunosorbent assay (ELISA), as recommend by the manufacturer [Enzygnost Anti-Measles Virus/IgG, Dade Behring-Siemens, Marburg, Germany]. Antibody titers above 400 mIU/mL were considered to be protective. The serum diphtheria and tetanus antitoxin IgG titers were determined using commercially available ELISAs [Diphtheria IgG ELISA and Tetanus IgG ELISA, IBL International GmbH, Hamburg, Germany], as recommended by the manufacturer. For diphtheria and tetanus, antitoxin titers above 0.1 IU/mL were considered to be protective.

Of 170 people that were included in the study, blood samples were obtained from 147 (86.4%). Measles-specific IgG titers were determined in 134 samples. A subset of 87 samples was selected to also determine the diphtheria and tetanus antitoxin titers. A detailed description of the study participants’ characteristics is provided in Table 1.

IgG titers at a level assumed to be protective against measles virus infection (>400 mIU/mL) were detected in 127 (94.8%) of the individuals tested (Table 1). Susceptibility to measles was significantly associated with a younger age (mean age 28.4 ± 6.0 years for non-immune homeless
individuals vs. 48 ± 15.8 years for immune homeless individuals; \( p = 0.001 \). Overall, 7.1% of the individuals who had been homeless for less than 5 years were susceptible to measles. By contrast, none of the individuals who had been homeless for more than 5 years were susceptible to measles. There was a significant difference in the mean age of the individuals in these two groups (44.8 years in the <5 year group vs. 52.4 years in >5 year group; \( p = 0.016 \)).

Seventy-four subjects (85.1%) had a protective diphtheria antitoxin titer (≥0.1 IU/mL) (Table 1); all of these subjects had a diphtheria antitoxin titer between 0.1 and 1.0 IU/mL. The proportion of individuals protected against diphtheria decreased as age increased (Table 1). However, there was no statistically significant difference in the proportion of protected individuals among the different age groups.

In total, 69 subjects (79.3%) had a protective tetanus antitoxin titer (≥0.1 IU/mL) (Table 1); 21 subjects (24.1%) had a tetanus antitoxin titer between 0.1 and 1.0 IU/mL, and 48 subjects (55.2%) had a titer between 1.0 and 5.0 IU/mL. The proportion of subjects with protective titers decreased as age increased (Table 1). The Pearson correlation coefficient was negative when age and tetanus antitoxin titer were compared (\( r = -0.370; p < 0.001 \)).

In our study, about 95% of the subjects surveyed had protective measles-specific antibody titers. This is comparable to the results obtained in a 2010 study of 154 healthcare workers (HCWs) in public hospitals in Marseilles, France, which demonstrated that 6.5% of the HCWs were not protected against measles. It should be noted that the WHO-UNICEF estimate of immunization coverage for MCV (measles-containing vaccine) in France were approximately 90% in 2010. In both homeless individuals and healthcare workers, all susceptible subjects were less than 40 years old (mean age: 28.3 years for homeless individuals vs. 23.9 years for HCWs).

Considering that the surveyed subjects were primarily born in North Africa (47.6%) or metropolitan France (26.5%), our findings for diphtheria vaccination coverage (85.1%) are comparable with those obtained in France (86.4%) and in Algeria (83%) but are higher than those reported in Morocco (29.4%).

Our results for tetanus vaccine coverage (79.3%) are also consistent with those reported in Morocco (76.1%) but are lower than those reported in France (98.5%). It should be noted that the WHO-UNICEF estimates of immunization coverage for DTP (diphtheria toxoid, tetanus toxoid and pertussis vaccine) in France were approximately 99% in 2010.

The serological profile of diphtheria immunity did not correlate with profile of tetanus immunity. Only 71.3% of the homeless individuals had protective antibody titers to both diseases (Table 2). Moreover, 8% of adults were protected against tetanus but were not protected against diphtheria.

In conclusion, this study highlights the need to improve the measles immunization status of homeless individuals less than 25 years of age. Migrants and refugees from countries at increased risk for diphtheria could be the source of an outbreak in the homeless population. Therefore, vaccination against diphtheria is recommended for all homeless individuals older than 25 years of age and all homeless migrants. Booster vaccinations against diphtheria should be considered for all adult homeless individuals. Furthermore, as recommended by the WHO, Combined

### Table 1

<table>
<thead>
<tr>
<th>Gender:</th>
<th>Measles</th>
<th>Diphtheria</th>
<th>Tetanus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>118</td>
<td>111 (94.1)</td>
<td>71</td>
</tr>
<tr>
<td>Female</td>
<td>16</td>
<td>16 (100)</td>
<td></td>
</tr>
<tr>
<td>Age group (years):</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>7</td>
<td>5 (71.4)</td>
<td>5</td>
</tr>
<tr>
<td>25–50</td>
<td>71</td>
<td>66 (93.0)</td>
<td>39</td>
</tr>
<tr>
<td>&gt;50</td>
<td>56</td>
<td>56 (100)</td>
<td>43</td>
</tr>
<tr>
<td>Birthplace:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Africa</td>
<td>59</td>
<td>56 (94.9)</td>
<td>37</td>
</tr>
<tr>
<td>Metropolitan France</td>
<td>37</td>
<td>36 (97.3)</td>
<td>22</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>21</td>
<td>18 (85.7)</td>
<td>13</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>8</td>
<td>8 (100)</td>
<td>9</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>9 (100)</td>
<td>6</td>
</tr>
<tr>
<td>Living in France since:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 years</td>
<td>47</td>
<td>42 (89.4)</td>
<td>27</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>53</td>
<td>52 (98.1)</td>
<td>39</td>
</tr>
<tr>
<td>Duration of homelessness:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;5 years</td>
<td>99</td>
<td>92 (92.9)</td>
<td>66</td>
</tr>
<tr>
<td>&gt;5 years</td>
<td>31</td>
<td>31 (100)</td>
<td>18</td>
</tr>
</tbody>
</table>

* Titer >400 mUI/mL.
  * Titer ≥0.1 UI/mL.
Table 2 Distribution of the protection against diphtheria and tetanus (\(\geq0.1\) UI/mL) in the homeless population.

<table>
<thead>
<tr>
<th>Immune status</th>
<th>All</th>
<th>No. (%) of donors age group, years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;25</td>
</tr>
<tr>
<td>Diphtheria protected* /</td>
<td>62</td>
<td>5</td>
</tr>
<tr>
<td>Tetanus protected* /</td>
<td>(71.3)</td>
<td>(100)</td>
</tr>
<tr>
<td>Diphtheria protected* /</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Tetanus unprotectedb /</td>
<td>(13.8)</td>
<td>(0)</td>
</tr>
<tr>
<td>Diphtheria unprotectedb /</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Tetanus unprotected /</td>
<td>(8.0)</td>
<td>(0)</td>
</tr>
<tr>
<td>Diphtheria unprotectedb /</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Tetanus unprotected /</td>
<td>(6.9)</td>
<td>(0)</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>5</td>
</tr>
</tbody>
</table>
|                | (100) | (100) | (100) | (100)

* Titer \(\geq0.1\) UI/mL.

b Titer \(<0.1\) UI/mL.

tetanus and diphtheria vaccine should be used, when a tetanus booster is required.

Funding

No funding was received for this study.

Conflict of interest

No conflicts of interest exist.

Acknowledgments

For their cooperation, we thank the medical and pharmacy students, interns, and fellows; researchers of the URMITE; the infectious diseases specialists who actively participated in the study. We also thank the directors and the staff of the 2 shelters.

References


Samir Benkouiten
Sékéné Badiaga
Claude Nappaz
*Aix Marseille Université, URMITE, UMR CNRS 7278, IRD 198, Inserm 1095, 13005 Marseille, France*

Rémi Charrel
*UMR190 Emergence des Pathologies Virales (Aix Marseille Université – IRD – EHESP), 13005 Marseille, France*

Didier Raoult
Philippe Brouqui*
*Aix Marseille Université, URMITE, UMR CNRS 7278, IRD 198, Inserm 1095, 13005 Marseille, France*

E-mail addresses: philippe.brouqui@univ-amu.fr, philippe.brouqui@ap-hm.fr (P. Brouqui)

*Corresponding author. Tel.: +33 491 32 43 75; fax: +33 491 38 77 72.

Accepted 20 October 2012

© 2012 The British Infection Association. Published by Elsevier Ltd. All rights reserved.

http://dx.doi.org/10.1016/j.jinf.2012.10.023

Seroepidemiology of Saffold cardiovirus (SAVF) genotype 3 in Japan

Dear Editor,

A new virus, Saffold cardiovirus (SAVF) belonging to genus Cardiovirus of family Picornaviridae has been identified and characterized, but its pathogenesis is not yet fully understood.\(^1,2\) SAVF type 3 (SAVF3) is thought to be the major genotype and is relatively frequently detected in patients with acute gastroenteritis and respiratory illness.\(^3–5\) In attempts to elucidate the pathogenesis, we conducted a seroepidemiological study of SAVF3 in Japanese people.

A total of 114 serum samples from subjects aged 0–66 years were collected in Gunma prefecture, Japan, in 2010. Subjects aged <5 years showed no evidence of infectious disease with minor congenital cardiac defect or inguinal