



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Letter to the Editor

Measles transmission during commercial air travel in Brazil

Keywords: Measles; Air travel; Brazil; Disease transmission

Airborne disease transmission during commercial air travel has been recently highlighted by the transmission of severe acute respiratory syndrome (SARS) to as many as 25 passengers in 2003 (Olsen et al., 2003; WHO, 2003) and by the risk of influenza H5N1 transmission, if person-to-person transmission became more common (Ozonoff and Pepper, 2005). Measles transmission aboard aircrafts, however, is believed to be uncommon (Amornkul et al., 2004; Mangili and Gendreau, 2005). A recent review found only three case studies describing measles transmission during commercial air travel; all in the United States (Amler et al., 1982; CDC, 1983, 2004; Mangili and Gendreau, 2005). We report the transmission of measles infection on an airplane that led to two secondary confirmed measles cases in Brazil in 2005.

In June 2005, an unvaccinated 36-year-old surfer was identified as the initial case of a measles outbreak in Brazil. This outbreak resulted in a total of six confirmed cases identified through passive and active surveillance (PAHO, 2005). As part of the outbreak control measures, 73,282 persons were vaccinated. This initial case was exposed to a confirmed measles outbreak in the Maldives during a surfing tournament. During the periods of incubation and communicability, this person traveled by air on international flights before arriving to Brazil and on five domestic flights within Brazil. Two secondary infections among fellow passengers traveling between São Paulo and Florianópolis on 17 June (1 day before the rash onset of the index passenger) were confirmed by viral isolation and serology. One of these secondary cases was an unvaccinated 38-year-old man with rash onset on 1st July, and the other was an unvaccinated 5-year-old child with rash onset on 3rd July. The child had not been vaccinated due to alternative medical practices. According to their boarding passes, the index passenger was in seat 8-A and the secondary cases in seats 5-K and 16-A. Of the 334 passengers traveling with this index passenger during his period of communicability, 118 were contacted and investigated. No other secondary cases were identified. The epidemiologic investi-

gation suggests that transmission may have occurred towards the end of the period of communicability of the index passenger.

Reports of measles transmission aboard aircrafts are infrequent and transmission may well be affected by the type of aircraft and the ventilation and filtration systems used. A higher proportion of large commercial aircraft than smaller planes use high efficiency particulate air (HEPA) filters (Mangili and Gendreau, 2005). Nevertheless, our experience may suggest that airplane-associated transmission is underreported in the scientific literature. Transmission of indigenous measles has been interrupted in the Region of the Americas, but cases related to importations from other regions of the world continue to occur (PAHO, 2005). As highlighted in this report, measles transmission during commercial air travel represents an important challenge to health authorities due to the large number of persons potentially exposed and the difficulties in tracing them. However, these authorities should be aware that secondary measles transmission to fellow passengers does occur. Therefore, measles persons-cases should be asked about history of air travel and fellow passengers subsequently contacted and investigated as part of the standard response to a measles case in countries with disease elimination goals.

Acknowledgements

We thank Dr. Jon K. Andrus for helping review the manuscript, and Ms. Beatrice Carpano, for her editorial assistance. The hard work and dedication of Brazil public health officials and field workers in controlling this outbreak deserve the highest recognition.

References

- Amler RW, Bloch AB, Orenstein WA, Bart KJ, Turner Jr PM, Hinman AR. Imported measles in the United States. *JAMA* 1982;248(17): 2129–33.

- Amornkul PN, Takahashi H, Bogard AK, Nakata M, Harpaz R, Effler PV. Low risk of measles transmission after exposure on an international airline flight. *J Infect Dis* 2004;89(Suppl 1):S81–5.
- CDC (Centers for Disease Control and Prevention). Interstate importation of measles following transmission in an airport—California, Washington, 1982. *MMWR* 1983;32(16), 210, 215–216.
- CDC (Centers for Disease Control and Prevention). Multistate investigation of measles among adoptees from China—April 9, 2004. *MMWR* 2004;53(14):309–10.
- Mangili A, Gendreau MA. Transmission of infectious diseases during commercial air travel. *Lancet* 2005;365(9463):989–96.
- Olsen SJ, Chang HL, Cheung TY, et al. Transmission of severe acute respiratory syndrome on aircraft. *N Engl J Med* 2003;349:2416–22.
- Ozonoff D, Pepper L. Ticket to ride: spreading germs a mile high. *Lancet* 2005;365(9463):917–9.
- PAHO (Pan American Health Organization). Measles/Rubella Weekly Bull 2005;11(30) [Available at: <http://www.paho.org/English/AD/FCH/IM/sme1130.pdf>, last accessed February 15, 2005].
- WHO (World Health Organization). Department of Communicable Disease Surveillance and Response. Consensus document on the epidemiology of severe acute respiratory syndrome (SARS). Geneva: WHO; 2003. WHO/CDS/CSR/GAR/2003.11 [Available at: <http://www.who.int/csr/sars/en/WHOconsensus.pdf>, last accessed February 15, 2006].

Fernando Ribeiro de Barros
Tereza Cristina Segatto
Expedito Luna
*Secretary of Health Surveillance,
Ministry of Health, Brazil*

M. Carolina Danovaro-Holliday*
Andrea Vicari
*Immunization Unit, Pan American Health Organization,
525 Twenty Third St., NW, Washington,
DC 20037, USA*

Cristiana Toscano
*Immunization Unit,
Pan American Health Organization, Brazil*

* Corresponding author. Tel.: +1 202 974 3856;
fax: +1 202 974 3635.
*E-mail addresses: danovarc@paho.org,
thiscarolina2@yahoo.com (M.C. Danovaro-Holliday)*

24 February 2006