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# Measles outbreak in the metropolitan region of Campinas, Sao Paulo State, Brazil

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## ABSTRACT

Brazil has not had endemic circulation of the measles virus since 2000. Between May and June 2011, the Metropolitan Region of Campinas, State of Sao Paulo, Southeastern Brazil, reported three cases of measles. This report presents a descriptive study of the cases, control measures, and the search for a possible source and secondary cases. The genotypic characterization of the virus identified genotype D4, circulating in Europe. Secondary cases or index case were not found. The control measures and adequate vaccination coverage in Metropolitan Region of Campinas contributed to the interruption of disease transmission.

**DESCRIPTORS:** Measles, epidemiology. Measles vírus, isolation & purification. Disease Outbreaks. Metropolitan Zones. Epidemiology Descriptive.

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## INTRODUCTION

It is thought that the endemic transmission of measles in Brazil in 2000 was interrupted due to the intensification of surveillance activities and to the high coverage of vaccination against the disease.<sup>4</sup> Since then, sporadic cases have been registered, all associated with importation of the virus.<sup>5</sup> The state of Sao Paulo recorded four cases between 2000 and 2010.<sup>6</sup>

Epidemiological surveillance services (ESS) in the municipalities of Americana and Nova Odessa, in the Metropolitan Region of Campinas (MRC), identified three cases of measles between May 20 and June 1, 2011. These cases had a history of moving between the neighboring municipalities of Santa Bárbara D'Oeste and Sumaré, in the MRC, during the period of transmissibility.

A team composed of technicians from the *Centro de Vigilância Epidemiológica do Estado de São Paulo* (CVE-SP – Sao Paulo state epidemiological surveillance center) travelled to the MRC. The aim of this study was to confirm and describe the measles outbreak and to investigate sources of infection and possible secondary cases.

## METHODS

A descriptive study was carried out of the three identified cases of measles, detailing their clinical evolution, vaccination situation and locations frequented by the respective carriers during the incubation and transmission periods, as well as their contacts during these periods.

After confirming the dates on which symptoms began, it was possible to establish incubation periods after exposure to possible sources, as well as establishing transmission periods and maximum time for secondary measles cases to appear.<sup>8</sup> Thus, the investigation comprised the period April 1 to June 17, 2011.

Contacts within the household and at work were investigated, as well as educational and health care establishments.

Doctors' notes, archived in the educational institutions or workplaces frequented by the confirmed cases, were revised. Those investigated were diseases involving rashes, respiratory symptoms, high fevers or without specifications. Serology results positive or negative for measles and/or rubella in public and private laboratories in the four municipalities were revised, excluding routine ante-natal exams.

Dengue notifications in the municipal ESS with negative serology but with records of fever and rash or without any recorded symptoms were re-evaluated.

Simple random samples of patients, care providers and health care professionals present in the health care establishments during the period that the cases were cared for were selected, considering a prevalence of 50.0% and a confidence limit of 5%. These individuals were contacted by telephone and asked about any symptoms in the period in question. Up to three attempts were made to establish telephone contact, at different times and on different days. It was deemed to be a loss if there was no response to after these three attempts. Contact was made with parents or guardians, if the selected individual was a minor. It was deemed to be a compatible case if the individual reported fever and a rash. Individuals classified as compatible cases were interviewed face-to-face, using a semi-structured questionnaire developed for the study.

Suspected cases were those involving coughing and/or runny nose and/or conjunctivitis, as well as fever and rash.

Cases with a diagnosis (clinical or laboratorial) of another disease were ruled out.

Biological samples were collected from suspected cases that were symptomatic fewer than 28 days before the investigation. Stored serum samples from patients with symptoms were collected and tested for measles. Suspected cases were re-classified as confirmed if their serum test had IgM positive for measles.

## RESULTS

Case 1, male, seven years old, resident in Americana and pupil in the municipality of Nova Odessa, reported on May 20, 2011. Symptoms started on May 7, 2011 and rash on May 10, 2011.

Case 2, female, 42 years old, mother of case 1, teacher in her son's school, symptoms manifested on May 18, 2011 and rash on May 21, 2011.

Case 3, male, 21 years old, resident in Nova Odessa, student in Santa Bárbara D'Oeste and working in Sumaré. Symptoms started on May 3, 2011 and rash on May 8, 2011.

Cases 1 and 2 had no record of vaccination as the family chose to practice alternative medicine. Case 3

<sup>4</sup> Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Guia de Vigilância Epidemiológica. 7. ed. Brasília (DF); 2009.

<sup>6</sup> Secretaria da Saúde de São Paulo. Centro de Vigilância Epidemiológica Prof. Alexandre Vranjac. Divisão de Doenças de Transmissão Respiratória. São Paulo; 2011 [cited 2012 May 18]. Available from: [http://www.cve.saude.sp.gov.br/htm/cve\\_im.html](http://www.cve.saude.sp.gov.br/htm/cve_im.html)

had records of measles vaccine at ages nine months and 15 months, and he reported acute lymphoid leukemia and chemotherapy at age six.

The three cases denied having travelled internationally or having had contact with someone recently returned from abroad.

All three presented maculopapular rash accompanied by runny nose, two cases had dry cough and fever. One reported malaise, sore throat and conjunctivitis. None of them had complications or were hospitalized. All recovered without lasting injury.

Laboratorial confirmation of measles occurred as IgM antibodies were detected enzyme immunoassay and IgG seroconversion in paired serum samples. It was possible to identify the genotype D4 virus in clinical samples of cases 1 and 2.

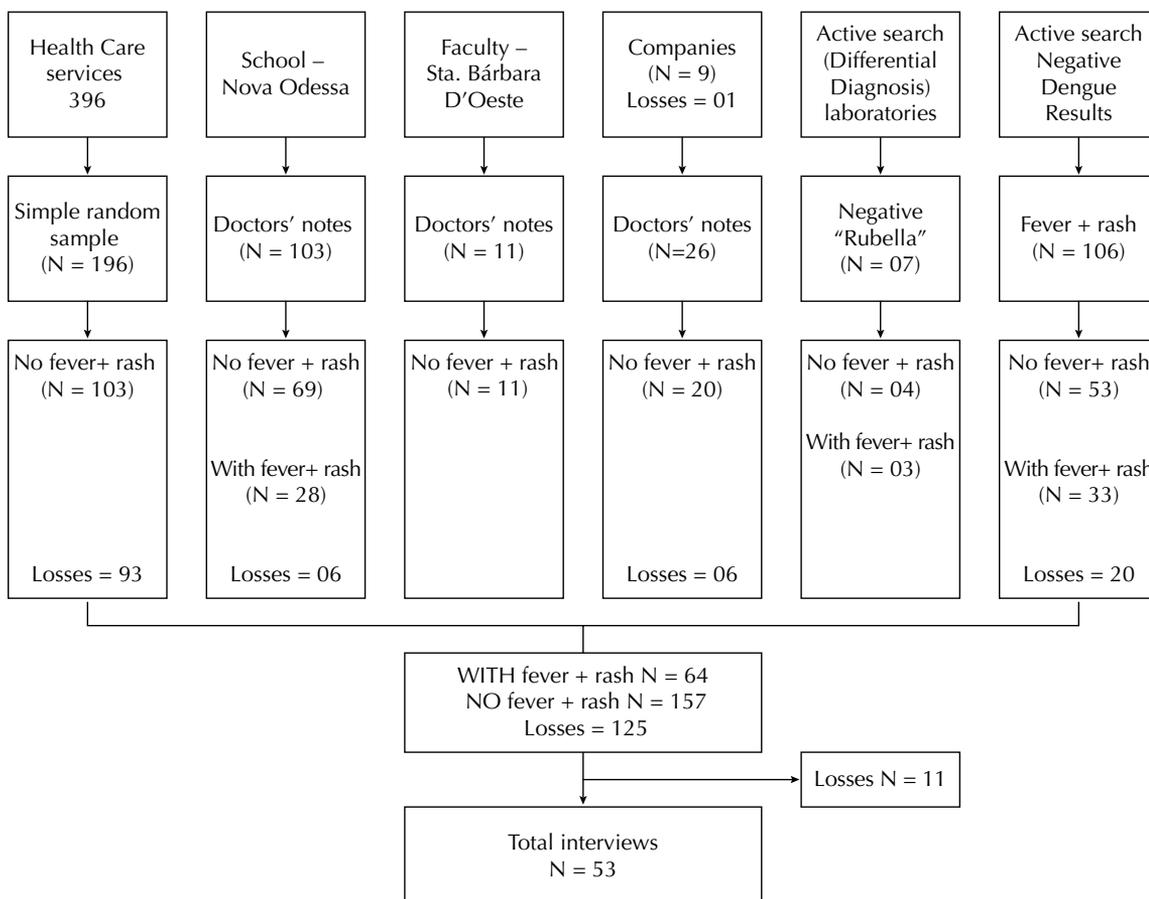
In addition to 53 compatible cases found in the active search, three other cases identified during the Santa Bárbara D'Oeste ESS actions fitted with the definition of compatible cases and were included in the study (Figure).

The 56 compatible cases were aged between zero and 48 years, with a median age of 18. Of these, 15 (27.0%) were re-classified as suspected cases after interviews and 18 (32.0%) were ruled out. Of these, one had serology positive for dengue, while the other 17 (30.0%) had clinical diagnoses of chickenpox.

Of the remaining 38 compatible cases, 25 had been vaccinated, presenting documentation at the interview, all with at least one dose of measles vaccine.

The 15 suspected cases presented coughing and/or runny nose and none presented conjunctivitis. Of these, one had samples for serology and virus isolation taken within the timespan, and presented negative results. Eleven suspected cases had been previously investigated in the laboratory as suspected dengue cases. Their serum samples were collected and tested in a public health laboratory for measles and rubella, all with non-reactive results.

In three suspected cases, laboratory investigation was not possible. However, these cases had been vaccinated, receiving at least one dose of measles vaccine.



**Figure.** Flow chart of active search for measles cases (N = 53). Americana, Nova Odessa, Santa Bárbara D'Oeste and Sumaré, State of Sao Paulo, SP, June to August 2011.

## DISCUSSION

There was a measles outbreak in the MRC in 2011, with three confirmed cases, after more than ten years with no recorded cases in the region. The cases met the standardized definition of suspected cases, with a characteristic clinical picture and laboratory confirmation.<sup>a</sup> The study did not identify a direct relationship between the three cases and a possible imported source case. No epidemiological link was found between case 3 and cases 1 and 2. The active search did not find any secondary cases.

Previous lack of virus circulation in the region and isolation of the virus genotype D4, then circulating in Europe,<sup>2</sup> suggest the virus was imported. In 2011, up to the month of November, there were more than 26,000 cases of measles reported in Europe, with 115 outbreaks in 36 countries. Poor vaccine coverage is the cause of sustained transmission of the disease in the region. France, which recorded more than 14,000 cases in 2011, had vaccine coverage of between 87.0% and 90.0% between 2004 and 2010.<sup>2</sup>

The MRC is the second largest metropolitan region in the state of Sao Paulo in terms of gross state product (GSP). The investigation showed intense mobility of individuals between the diverse municipalities in the region, due to living, working, leisure activities and studying. In addition, foreigners frequently circulate in this region, which contains multinational companies and an international airport.<sup>c</sup>

In 2010 and 2011, the MRC recorded MMR vaccine coverage above 98.0%.<sup>d</sup>

There had been no measles cases in a decade due interruption of endemic circulation since 2000 and

high vaccination coverage.<sup>4</sup> This situation may make rapid recognition and diagnosis of the disease difficult. Delayed notification interferes in investigating the chain of transmission and in implementing timely control measures.

Individual susceptibility to the disease was determinant in the occurrence of these three cases of measles. Cases 1 and 2 had not been vaccinated because personal choice. Individuals deciding against vaccination for ideological reasons have been involved in other measles outbreaks.<sup>2,3</sup> Case 3 had received two doses of the measles vaccine, but had developed acute lymphoid leukemia at age six, treated with chemotherapy. Patients with leukemia can have diminished levels of antibodies against vaccine antigens after chemotherapy.<sup>1,5</sup>

There were some limitations to the active search, mainly concerned with losses associated with impossibility of establishing contact by telephone, refusals to respond to the questionnaire or access to doctors' notes. The individuals were interviewed up to three months after the symptoms, which could result in memory bias.

The highly contagious character of measles, and its endemic circulation in various countries, together with globalization, maintains the potential risk of it being reintroduced into Brazil. It is important that high levels of vaccine coverage in the population are maintained, and that Brazilian travelers are alerted to the need to keep their vaccinations up to date before travelling and reinforce this recommendation for visitors before entering the country. In addition, health care professional should remain alert to the disease and epidemiological surveillance should be active in order for measles cases to be identified quickly.

<sup>c</sup> Empresa Brasileira de Infraestrutura Aeroportuária. Superintendência de Planejamento Aeroportuário e de Operações. Movimento Operacional da Rede Infraero de Janeiro a Dezembro de 2010. Brasília (DF); 2010 [cited 2012 May 18]. Available from: <http://www.infraero.gov.br/images/stories/Estatistica/2010/set.pdf>

<sup>d</sup> Ministério da Saúde. Sistema de Informação do Programa Nacional de Imunizações. Avaliação do Programa de Imunizações (API) [software]. Brasília (DF); [s.d.].

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The authors declare that there are no conflicts of interest.