



**Australian Government**  
**Department of Health**

# COMMUNICABLE DISEASES INTELLIGENCE

2019 Volume 43  
<https://doi.org/10.33321/cdi.2019.43.26>

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Andrew J Henderson and Kari AJ Jarvinen

# Communicable Diseases Intelligence

ISSN: 2209-6051 Online

This journal is indexed by Index Medicus and Medline.

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Communicable Diseases Intelligence (CDI) is a peer-reviewed scientific journal published by the Office of Health Protection, Department of Health. The journal aims to disseminate information on the epidemiology, surveillance, prevention and control of communicable diseases of relevance to Australia.

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Department of Health  
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## Short report

# Modified measles with an atypical presentation

Alexandra M Uren, Bhakti R Vasant, Deborah Judd, David FM Looke, Andrew J Henderson and Kari AJ Jarvinen

## Abstract

We report symptomatic confirmed modified measles infection in a person with one documented MMR (measles, mumps, rubella) vaccination and travel to Indonesia. No secondary cases were identified, consistent with other case reports of modified measles infection. The infectivity of modified measles for contact tracing requirements requires further elucidation.

Keywords: modified measles, atypical measles, measles, infectivity, contact tracing, MMR, communicable disease

## Background

In 2014 the World Health Organization announced that measles was eliminated from Australia, although cases are continually imported from countries where measles is still prevalent.<sup>1</sup> With large numbers of Australians travelling overseas, including destinations where measles is endemic, incompletely vaccinated or unvaccinated individuals may be exposed to measles. To reduce risk of infection, all individuals born during or after 1966 who have not acquired natural immunity or received two doses of MMR are recommended to be vaccinated prior to travel.<sup>2</sup>

Measles typically causes a predictable clinical syndrome that consists of fever, cough, coryza, conjunctivitis and Koplik spots, followed by a maculopapular rash starting at the hairline, spreading to the rest of the body and associated with high-grade fever ( $>38^{\circ}\text{C}$ ).<sup>3</sup> The infection is communicable from one day before prodromal symptom onset until four days after rash onset.<sup>4</sup> Risk factors for serious complications (meningitis, sepsis) include immunosuppression, malnutrition including vitamin A deficiency, age less than five years or over 20 years and pregnancy.<sup>5</sup> Since vaccination, measles incidence and complications have decreased substantially.<sup>2</sup> Previously described cases of modified measles

have suggested lower infectivity, which could have implications for public health risk and contact tracing requirements.<sup>6,7,8,9</sup>

We describe modified measles infection in a person with incomplete vaccination following overseas travel.

## Case presentation

A 25-year-old female presented to an Emergency Department (7 March 2017) with a 3-day history of fever and diarrhoea. She had recently returned (3 March) from a 10-day holiday in Indonesia. On initial examination she was febrile at  $38.8^{\circ}\text{C}$  with a patchy localised rash over her right wrist and ankle. No cough, coryza or conjunctivitis was noted. She reported complete immunisation but had only one recorded MMR vaccine given at age six (along with a complete record of other vaccinations received in Australia). The case was admitted to hospital with no contact precautions and discharged shortly thereafter. Pathology investigations for Dengue virus, Cytomegalovirus, Epstein-Barr virus, Leptospirosis, Q fever, Zika virus, Malaria and Human Immunodeficiency virus were all non-reactive.

On review by an Infectious Diseases Physician two weeks post-discharge (22 March), measles

**Table 1. Summary of measles serology**

	<b>Acute Serology</b>	<b>Convalescent Serology</b>
<b>Measles IgM</b>	Negative	Low positive
<b>Measles IgG</b>	Low positive	Positive

and rubella serology on acute and convalescent samples was requested to rule out other infectious causes for the rash. Acute phase serology revealed low positive measles immunoglobulin G (IgG) and negative immunoglobulin M (IgM), whilst convalescent serology revealed strongly positive measles IgG and low positive IgM (Table 1). Retrospective measles polymerase chain reaction (PCR) testing was added and detected on a nasopharyngeal swab from initial presentation. On later discussion with laboratory staff, it was noted that the PCR cycle time to positivity was considered high.

Contact tracing was initiated, although as more than 144 hours had elapsed since contact with the infectious case, post-exposure prophylaxis was not recommended.<sup>4</sup> Contact tracing involved information provision for a range of settings including a GP practice, pathology companies, hospital wards, shopping centres and other public areas. A total of six household contacts were identified in addition to those in group settings.

## **Discussion and conclusions**

Serology testing on the acute sample suggested the case had some immunity to measles following a single dose of MMR administered in 1998. Measles was confirmed by convalescent serological testing and nasopharyngeal PCR after other tests for febrile illness were unremarkable. Due to delayed diagnosis, contact tracing was limited to information and recommendation for serological testing. No secondary cases of measles were identified within three months of the case's illness.

Our findings suggest that clinicians need to consider measles in individuals with incomplete

vaccination and atypical presentation, particularly if there is history of travel to an endemic region or contact with a traveller with measles.

This case report adds further evidence for lower infectivity of modified measles with no secondary cases and highlights the potential requirement for updated contact tracing recommendations in this scenario. Other case reports have shown that individuals with modified measles and history of prior vaccination have more robust levels of plaque reduction neutralisation (PRN) titre, reflecting an immunity booster response.<sup>6</sup> These case studies also identified no secondary cases.<sup>6,7</sup> In measles outbreak reports in healthcare workers with two documented MMR vaccines, no onward transmission of measles has been reported.<sup>8,9</sup> Measles infection may occur in a small proportion of individuals with two documented MMR vaccinations as a result of primary vaccine failure or waning immunity.<sup>10,11</sup> Measles virus PCR cycle time to positivity could be considered an indicator of modified vs classic infection, with evidence of higher cycles of threshold (i.e. lower viral load) corresponding to modified measles infection,<sup>12</sup> however time to positivity can be affected by sampling issues or time to sampling which makes interpretation difficult. Further studies are required to investigate the infectivity of modified measles versus classic measles, particularly if modified measles does not result in secondary cases. This could indicate that highly resource-intensive contact tracing may not be required. In the meantime, isolation and contact tracing (as outlined by the Measles National Guidelines for Public Health Units)<sup>4</sup> should be recommended in all cases of modified measles.

## **Learning points**

Modified measles may present atypically.

Non-immune or incompletely vaccinated travelers returning from measles endemic countries should be considered at risk of measles infection.

Serology requires interpretation on a case-by-case basis, considering patient's clinical, vaccination and travel history.

Patients born after 1966 with only one (and rarely two) documented MMR vaccine can still be at risk of measles infection.

Further studies are required to assess the infectivity of modified measles.

If modified measles is found to have low infectivity, contact tracing guidelines could be developed that are not as resource-intensive, in line with the reduced risk to public health.

Modified measles infection may be an emerging public health issue as the Australian population shifts towards vaccine-dependent immunity.

## Acknowledgements

We thank Jamie McMahon, Glen Hewitson, Amanda De Jong, Doris Genge and Neelima Nair for molecular diagnostic work at Forensic and Scientific Services; Penny Hutchison for initial public health management; Alun Richards and Heidi Carroll for public health advice; and Kate McCarthy for microbiology advice.

## Competing interests

None declared.

## Patient consent

Written and verbal consent obtained from case to publish anonymous case and clinical details.

## Ethics approval

Ethics approval not required as Public Health follow-up of measles is covered by the *Public Health Act, Qld 2005*.

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