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Laboratory diagnosis, molecular characteristics, epidemiological and clinical features of an outbreak of measles in a low incidence population in Australia

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ABSTRACT

Background: Prompt and accurate laboratory diagnosis of measles is essential for case detection, outbreak management and ongoing surveillance in low incidence countries. Several disease markers are employed for diagnosis and are important to determine epidemiological and molecular characteristics for future control measures.
Objectives: To report different disease markers, genotypes and epidemiology of a measles outbreak in Australia, a low incidence country.
Study design: A retrospective descriptive study of the clinical and epidemiological features and laboratory diagnosis in 16 confirmed measles cases using measles serum IgM/IgG, antigen detection (IFA), viral RNA detection by real-time PCR and genotyping results for respiratory and urine specimens processed in one reference laboratory.
Results: Of the 16 confirmed measles cases, 11 were young adults aged between 20–35 years and 15 were not age-appropriately vaccinated. The most common genotype detected was D9 (11/16), followed by D4 (1/16) and D8 (1/16). Two imported cases were from the Philippines (D4) and Italy (D9). Of six disease markers, respiratory swab PCR and serum IgM gave the highest percentage (100%) of positive samples for confirmed cases followed by urine PCR (90.9%), serum PCR (66.6%), urine IFA (54.5%) and respiratory IFA (46.2%).
Conclusions: Measles should be considered in the differential diagnosis of a presentation with fever and rash, even in countries in the elimination phase of measles control. Genotyping is a powerful molecular-epidemiological tool to assist low incidence countries towards eradication goals. Improving vaccination coverage remains essential, particularly in young adults and travellers.

1. Background

Measles is a highly communicable viral disease that may lead to serious complications.[1] The incidence is low in many developed countries including Australia. However, since late 2009, many outbreaks in several developed countries especially in Europe have occured.[2] Since 2000, measles notifications for Australia have ranged from <1 to 9 cases per million per year (range 10–190 per year, average 82 per year); in 2011, 190 cases were notified.[3] To achieve and maintain elimination status, measles must be confirmed or excluded as a matter of urgency by specific testing for all patients presenting with a fever and maculopapular non-vesiculating rash.[4]

Accurate and prompt laboratory diagnosis is essential for the public health response. Diagnosis is based on measles IgM detection in serum, measles antigen detection, viral RNA detection and, less frequently, virus isolation.[5] Genotyping of measles virus (MV) allows the origin of measles importations to be traced, particularly in countries that have reached the elimination phase, such as Australia.[4]

2. Objectives

To define the epidemiology and molecular epidemiology of a measles outbreak that occurred on the east coast of New South

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Table 1
Immunization, contact history, genotype and disease outcome of confirmed cases of measles.

Case no.	Sex/age (years/months)	Date of onset of rash	Immunization history	Contact history/link	Cluster number	Genotype	Hospitalized/duration	Complications
1	F/17	16/2/11	Not vaccinated – parent conscientious objector	Travelled in Italy during exposure period	1	D4	No	
2	F/21	01/3/11	Not vaccinated – parents conscientious objector. Vaccinated as a contact	Case 1 (sister)	1	N/A	No	
3	F/30	03/3/11	UNK	Unknown source case. Visited ED during exposure period	2	[a]	No	
4	M/30	15/3/11	UNK	Case 3 (wife)	2	D9	Yes – 3 days and 8 days	Encephalitis
5	M/31	05/3/11	UNK	Unknown source case/epi link	3	D9	Yes – 3 days	
6	M/29	20/3/11	UNK	Case 5	3	D9	No	
7	F/33	23/3/11	UNK	Case 5	3	D9	No	
8	M/3	11/3/11	Not vaccinated – contraindications	Unknown source case/epi link, but on paediatric ward at time of exposure	4	D9	Long term inpatient	
9	F/1.2	22/3/11	Not vaccinated, was 2 months overdue for the 1st dose	Case 8 (brother) and visited paediatric ward during exposure	4	D9	No	
10	M/1.1	11/3/11	Not vaccinated, was due for the 1st dose but developed measles	Unknown source case but visited paediatric ward during exposure	4	[a]	No	
11	F/10	21/3/11	Not vaccinated – contraindications	Contact of case 10 (brother) and inpatient of paediatric ward	4	D9	[b]	
12	F/34	20/3/11	UNK	Contact of case 10 (son) and visited paediatric ward	4	D9	Yes – 4 days	Pregnant
13	F/26	10/2/11	Not vaccinated as not provided in country of origin	Travelled in Philippines during exposure period	5	D9	Yes	
14	M/35.	06/3/11	UNK	Travelled to work with case 13 on a few occasions	5	D9	No	
15	M/34	17/4/11	UNK	Unknown source case/epi link	–	D9	Yes – 6 days	Pneumonitis, very high LFT
16	M/18	23/4/11	Yes, 2 doses	Attended University where other cases were known to have attended	–	D8	No	

UNK, immunization status not known by case or doctor; N/A, not available.
[a] PCR negative at reference laboratory.
[b] Child had many admissions due to multiple medical and congenital conditions.