

Measles in Orange County, 2015

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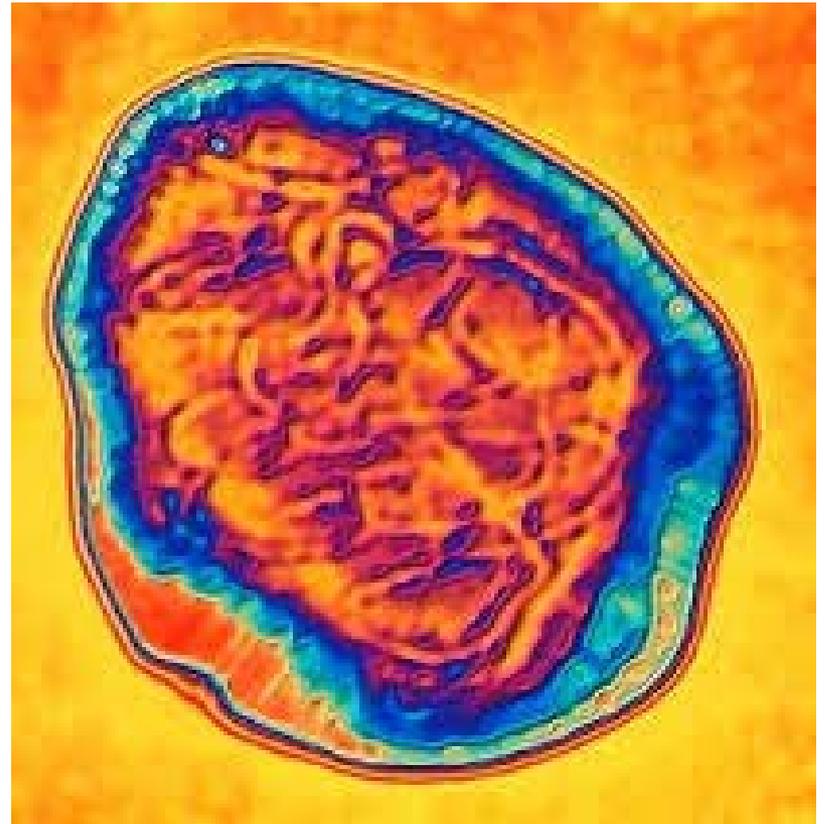


On January 2, 2015:

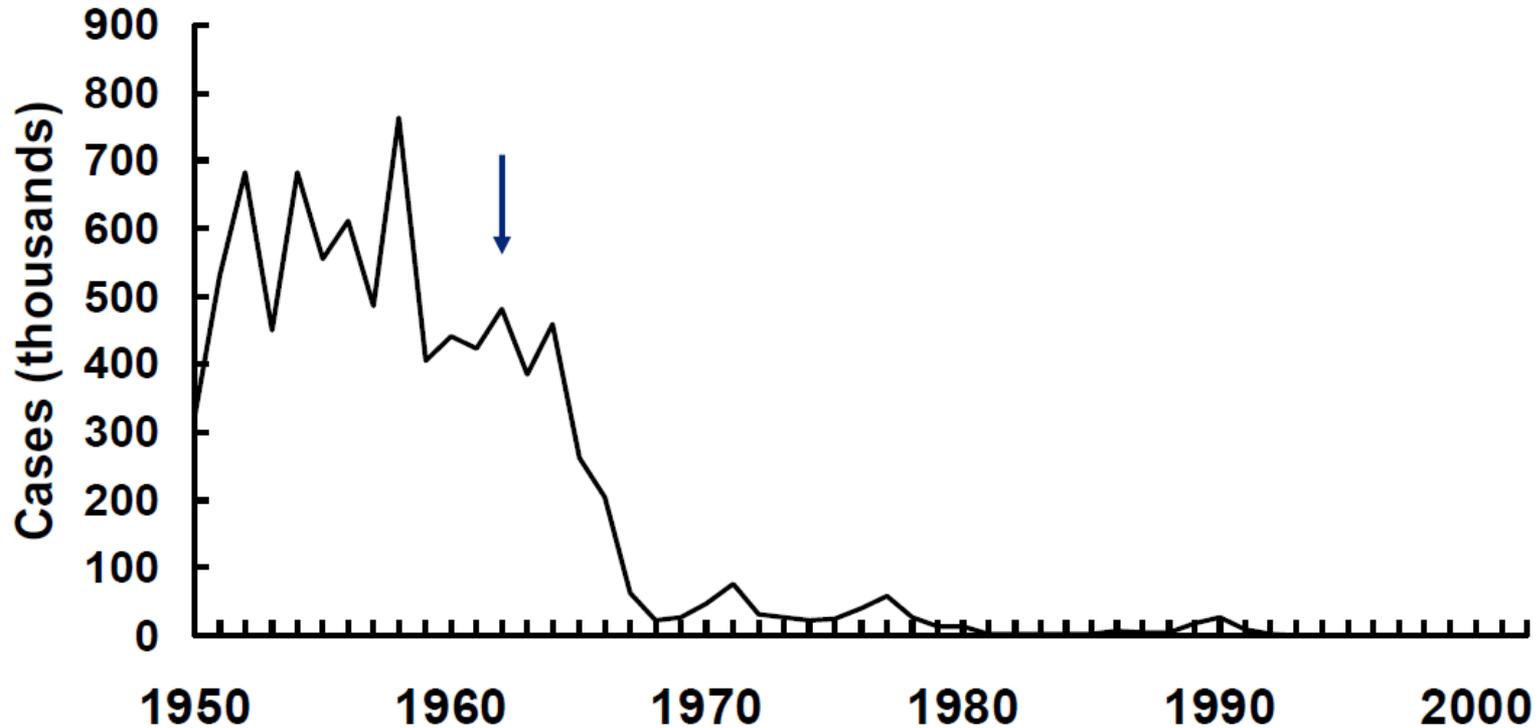
- A 3 yo Riverside patient was admitted to Children's Hospital of Orange County, differential diagnosis included measles
 - No travel
 - Did recently go to Disneyland
- 8 month old sibling admitted to CHOC on January 5
- Both diagnosed with measles by PCR

Measles Virus

- Infects only humans
- Contains:
 - Single-stranded, negative-sense RNA
 - Lipid envelope



Measles in the United States



Measles Around the World

- Endemic measles eliminated in United States in 2000
- Virus continues to be endemic in many parts of the world
- France had a major outbreak in 2010-2012
- Philippines had major outbreak from 2013-present

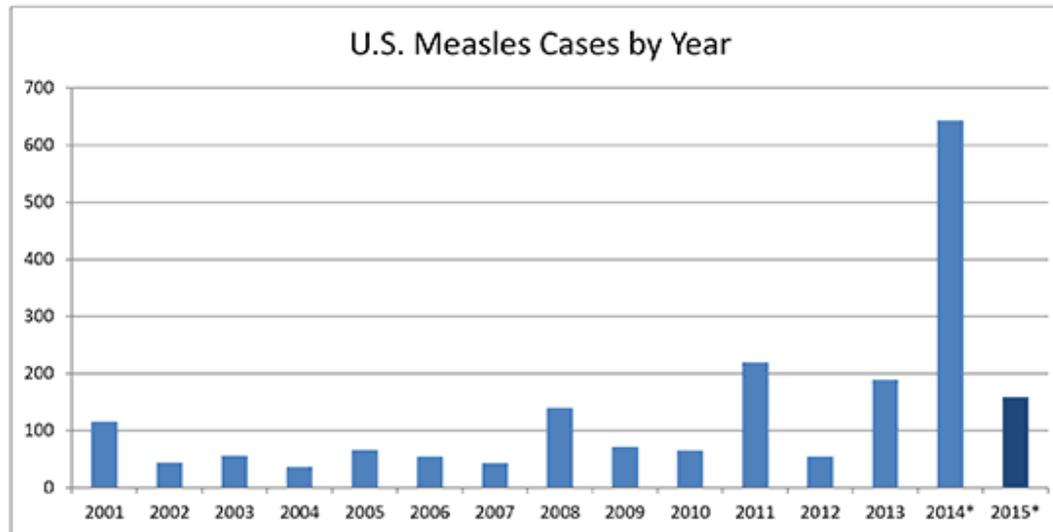


By the end of the Day on January 5

- 11 y.o. Orange County Resident also PCR positive for measles
- Went to Disneyland on 12/18
- 3 additional confirmed and 6 suspect cases of measles
- 7 in CA, 2 in UT
- All at Disneyland 12/17 or 12/18

Measles Nationally

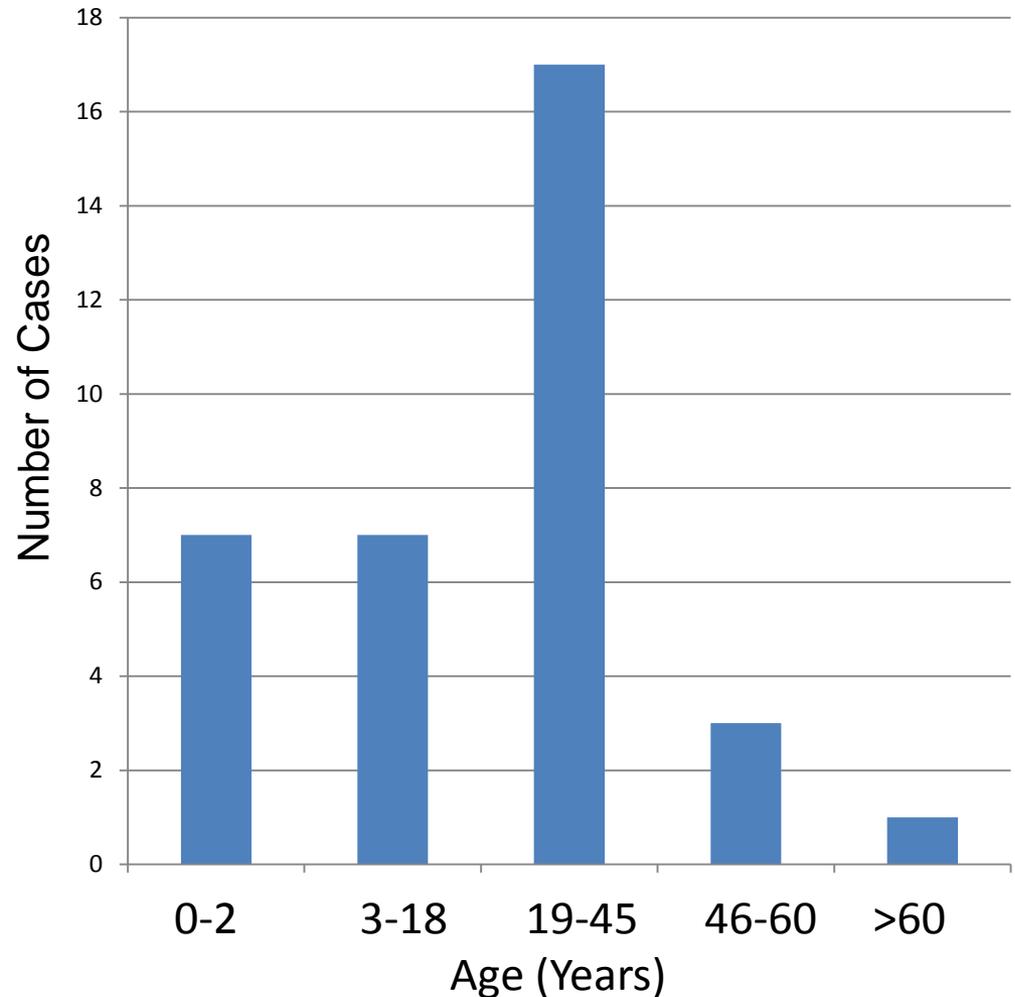
- From January 1 to June 26, 178 cases have been reported from 24 states
- 6% trace to Disneyland outbreak
- On April 17, 2015 measles outbreak was declared over in California



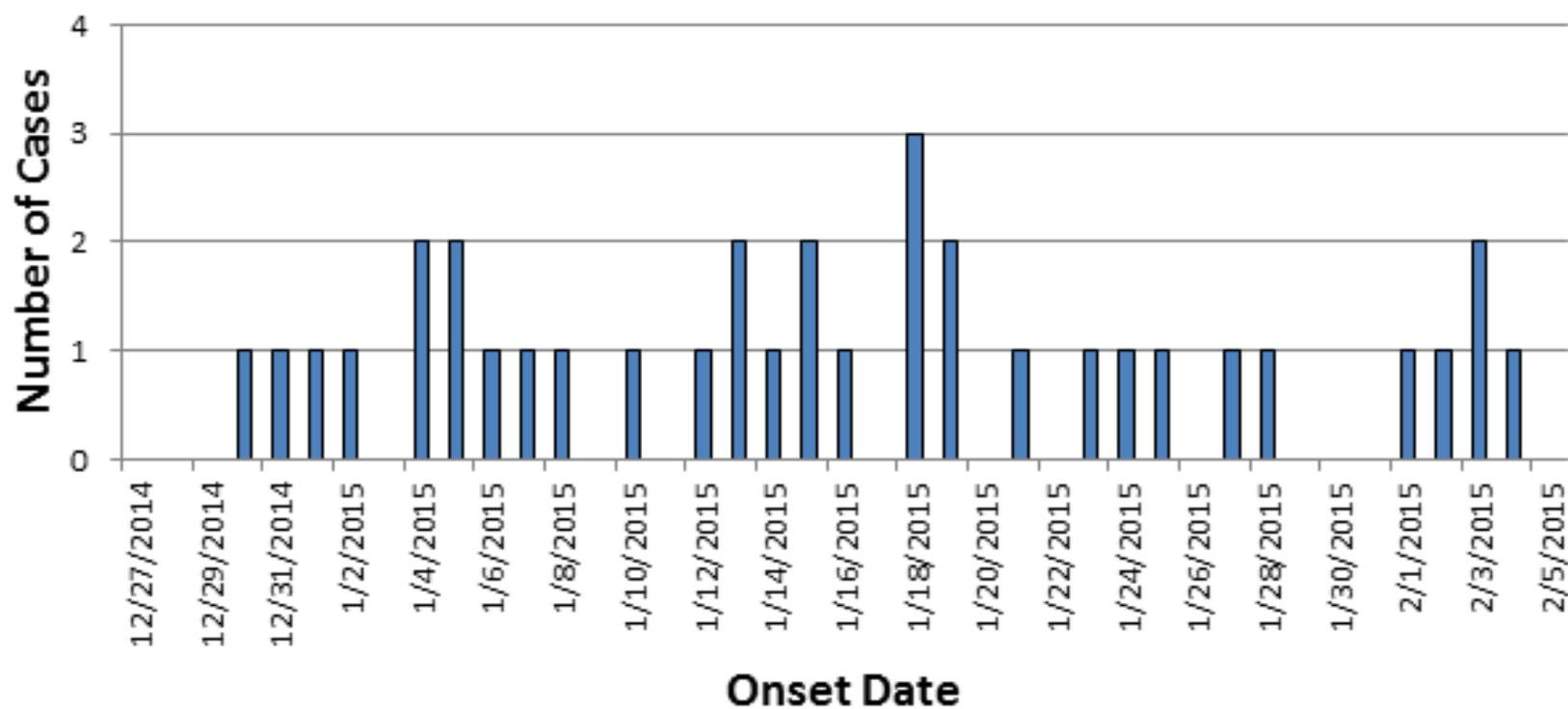
*Provisional data reported to CDC's National Center for Immunization and Respiratory Diseases

Measles in Orange County, 2015

- 35 cases
- 17 females
- Age range 9 months-70 years
- 14 children
- 5 hospitalized
- 22 cases in our County in first three months of 2014



Orange County Measles Cases Rash Onset Dates 2015 (n=35)



Immunization Status of Orange County Cases, 2014 and 2015

- 9 with 2 MMRs
- 2 with 1 MMRs
- 3 with evidence of seroimmunity
- 23 with uncertain immunization status
- 20 with no immunizations
 - 18 of 19 pediatric cases with no MMR
 - Two under one year of age
 - 10 vaccine refusers

Measles Symptoms

Measles Prodrome

- 8-12 day incubation period
- Prodrome lasts for 2-4 days and consists of:
 - Fever
 - Cough
 - Coryza
 - Conjunctivitis
 - Koplik's Spots
 - Prodromal phase makes people sick!

Rash Develops at About 14 Days

- Starts on face, often top of forehead, sometimes behind ears
- Spreads downward
- Initially maculopapular, then becomes confluent
- Most prominent on the face







Symptoms of 2014-15 Measles Cases

- Fever: 4 of 57 did not report fever;
 - For those with temperature information, all but 1 reported a fever over 101°F (101.2 to 104.7)
- Cough: 72%
- Coryza: 6%
- Koplik Spots (N = 41): 22%
- Conjunctivitis: 49%
- Diarrhea: 10%



Symptoms by Immunization Status, 2014 and 2015 OC Measles Cases

	Not vaccinated (n=20)	Vaccinated/serologic proof of immunity (n=12)	Unknown Vaccination Status (n=27)
Fever	100%	75%	92%
Cough	83%	42%	73%
Coryza	89%	25%	62%
Conjunctivitis	72%	8%	42%
Koplik spots	38%	12%	0%
Diarrhea	11%	10%	8%
Rash duration	6 days (4-8d)	4.2 days (4-5d)	5 days (2-9d)
Hospitalized	20%	0%	19%

Hospitalization & Complications

Most common complications include:

- Pneumonia
- Encephalitis
- Thrombocytopenia
- Otitis media
- 1 in 1000 die due to measles complications
- 12 hospitalized in Orange County with measles-related disease in 2014-2015
 - One otitis media
 - One pneumonia

Measles Testing

Measles Polymerase Chain Reaction (PCR) Testing

- Most specific test for diagnosis
- Oropharyngeal PCR very sensitive in first three days after rash starts
 - Nasopharyngeal PCR may be a bit less sensitive
 - In many instances, this is only test we would order
- Urine testing also sensitive, especially useful days 4-9 after rash starts

Measles Testing Results for 57 Measles Cases in 2014-15

	IgM	OP PCR	Urine PCR
Positive	35	47	20
Negative	13	3	5
Not done	9	7	32

All 15 unvaccinated patients tested were IgM +
For 10 Vaccinated Patients:

- 5 IgM negative, 3 IgM positive, 2 Not Done
- All 9 tested were OP PCR positive

Satellite Clinic Site

- For testing of suspect cases who have already been assessed by a medical provider
- Tests performed included:
 - Oropharyngeal PCRs
 - Serum IgM



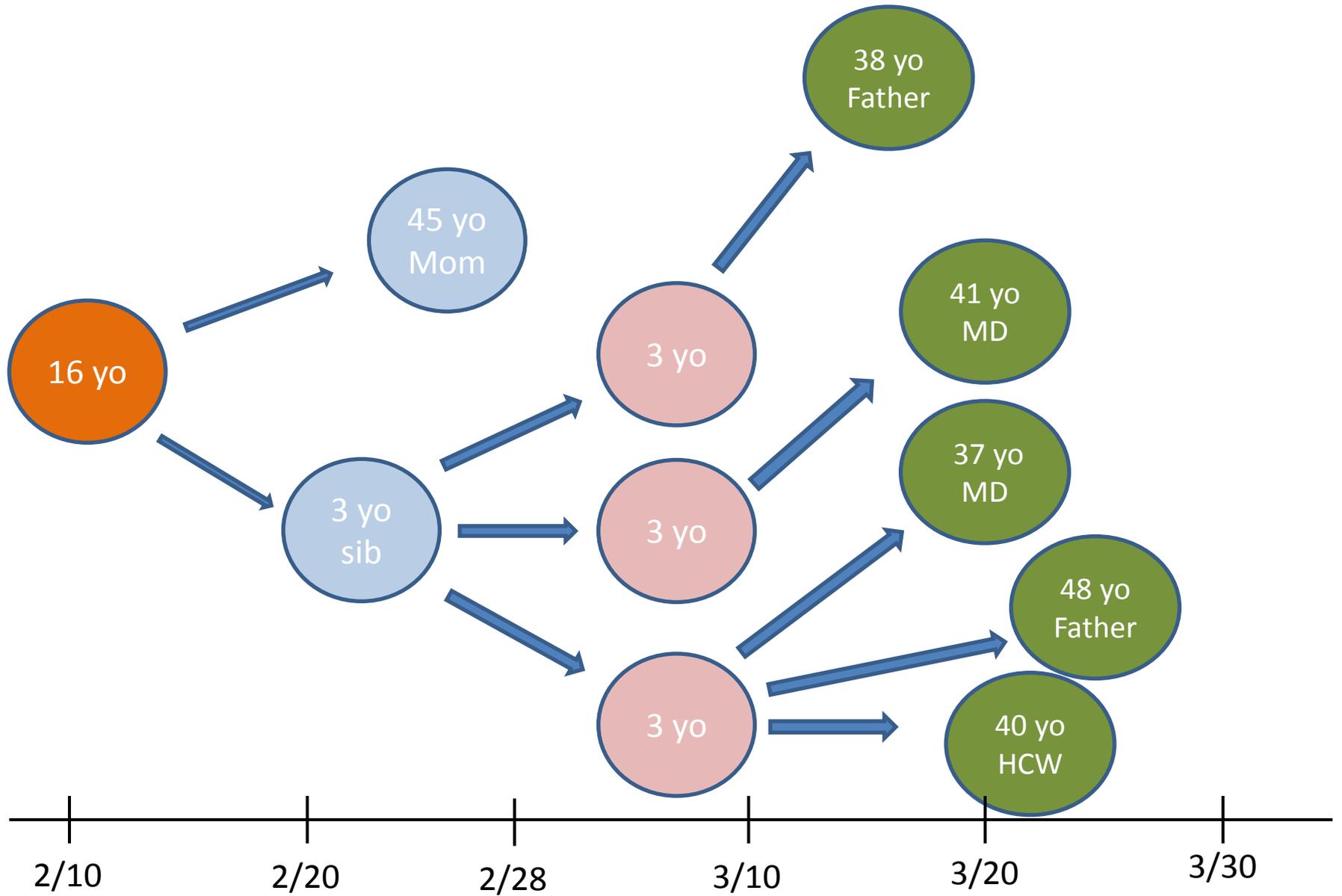
Measles is Passed by Airborne Route

- Very infectious
- Patients infectious from 4 days before rash starting until 4 days after rash starts
- Virus can remain in air after infected person leaves
 - CDC: 2 hours
 - California Department of Public Health: 1 hour
- No minimal period of exposure exists

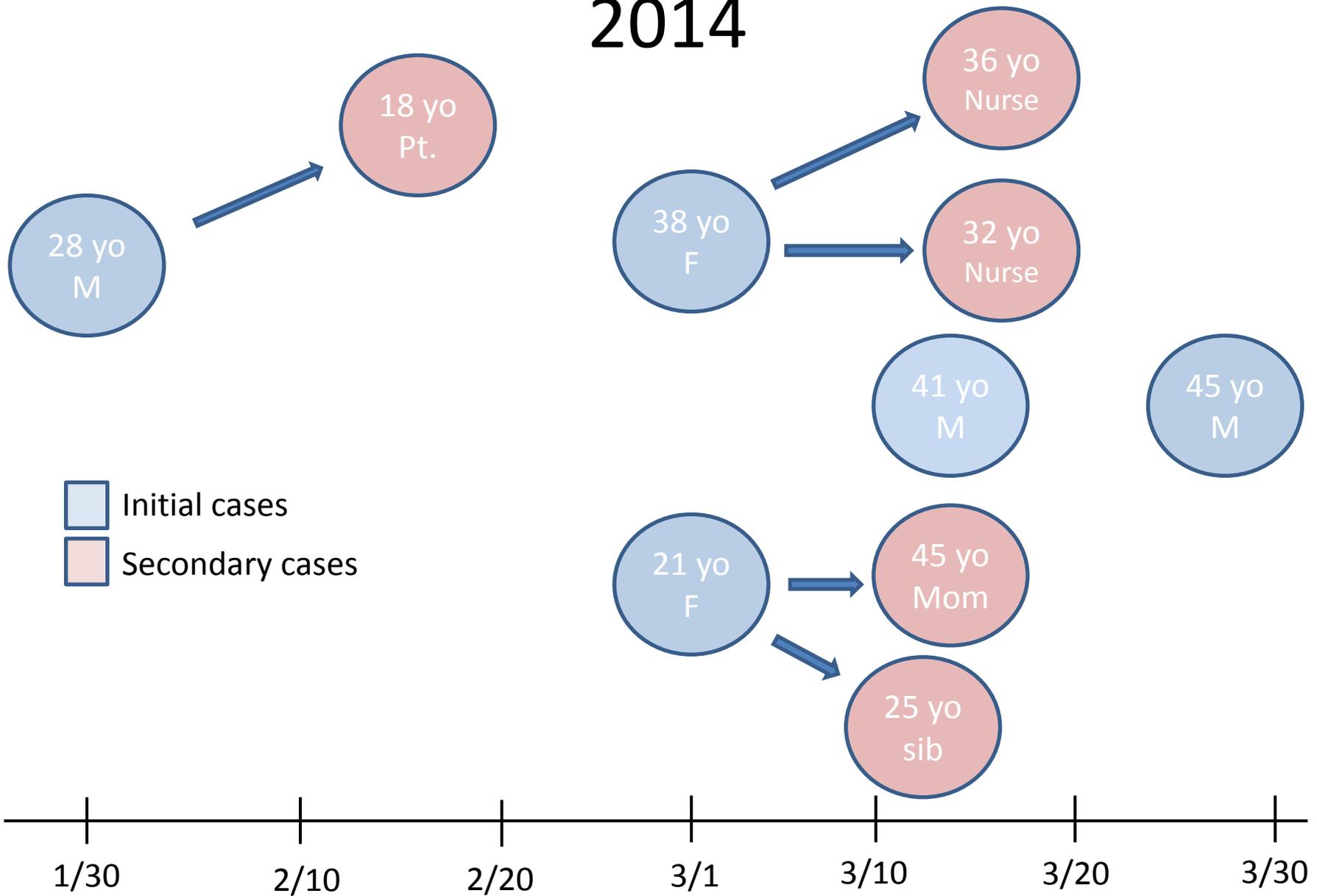
Measles Infection Control

- Airborne precautions necessary in clinical settings
- Facilities without negative pressure room can see patient:
 - Outside
 - At end of day
- N-95 masking recommended for healthcare workers
- Masking of measles case in facility is of uncertain benefit
 - Science would say that airborne virus not prevented from spread by mask
 - Significantly ill patients don't keep the mask on
 - Public health recommendation would still be to conduct a contact investigation
 - Masking case when going to and from isolation room is recommended

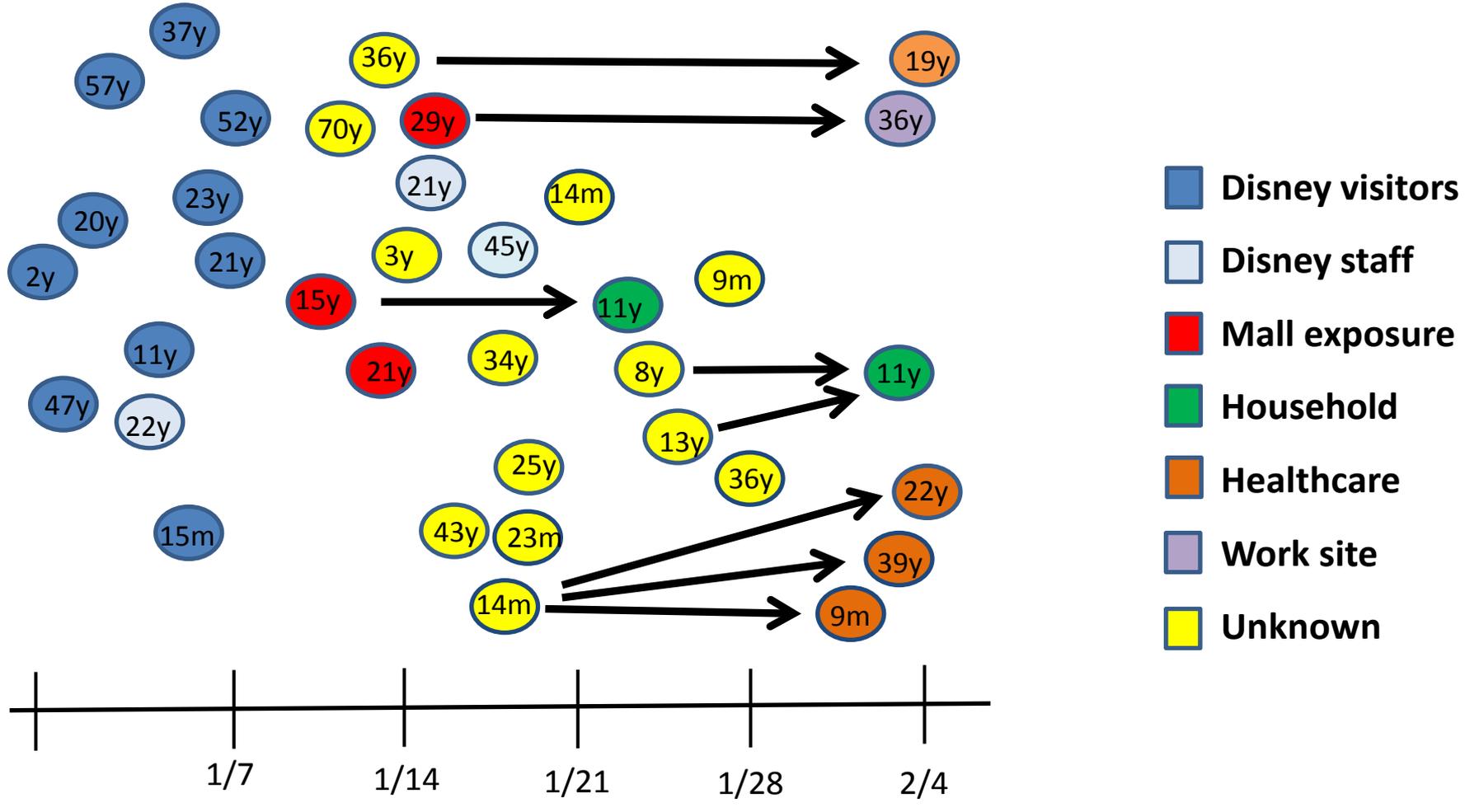
Measles Cluster 1, Orange County, 2014



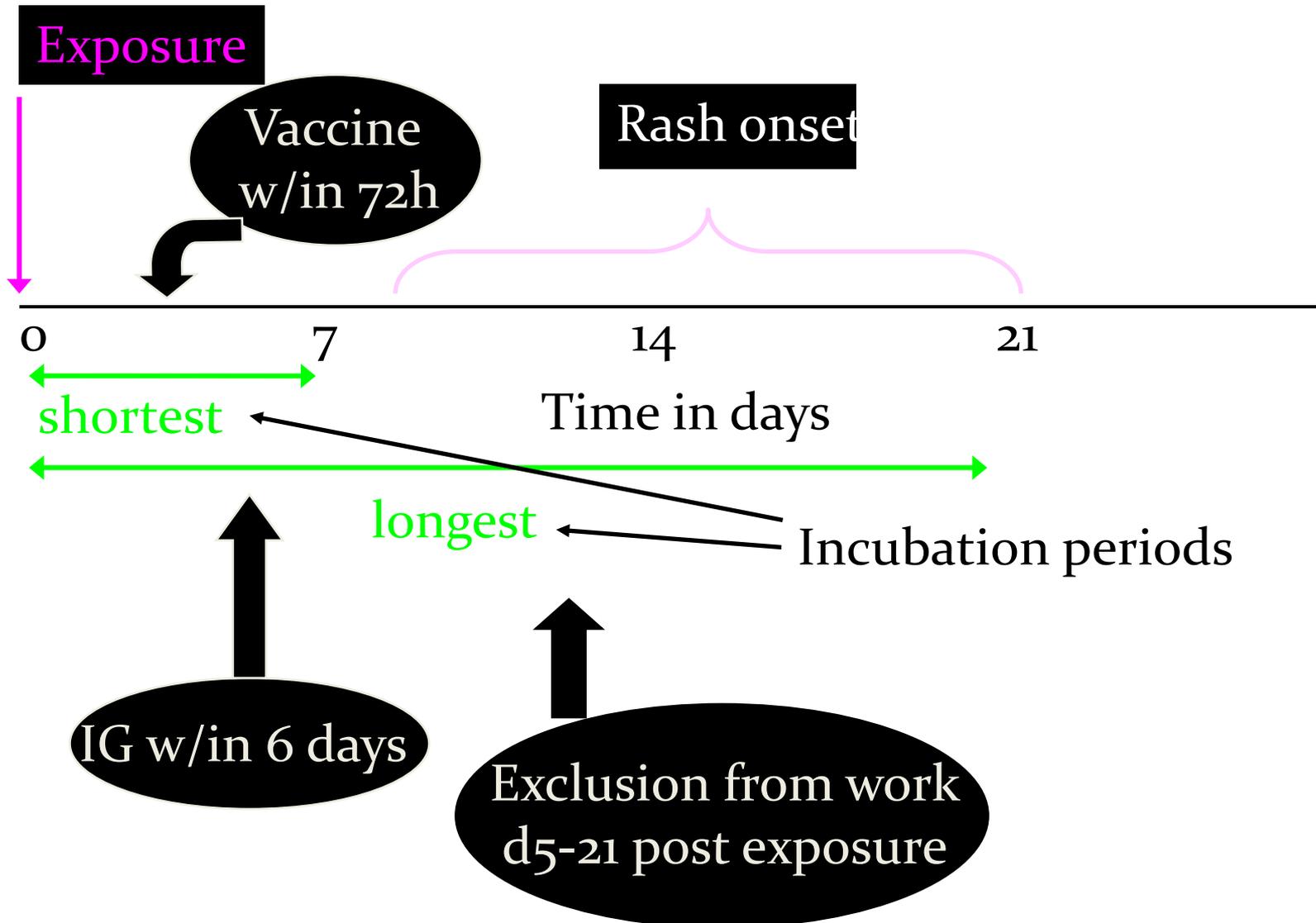
Measles Cluster 2, Orange County, 2014



Orange County Cases and Their Connections, 2015



Measles Follow Up of Exposed



Potential Exposure Venues

- Household
- Sharing the same airspace in:
 - Work
 - School/daycare
- Community exposures
 - Malls
 - Restaurants
 - Public transportation
 - Healthcare facility
 - Etc.

Number of Community Measles Exposures, 2015

- 1955 community contacts identified
- 1858 were healthcare facility contacts
 - These are significant underestimations
 - Approximately 20% of identified contacts cannot be reached
- 828 contacts attempted by OCHCA
 - Majority of non-high risk healthcare contacts in 2015 contacted by the facility

Healthcare Facility Transmission, 2014 and 2015

- 57 cases
- 91 healthcare facility exposure events
- >3000 patients and staff exposed
- 10 total transmissions
- 7 healthcare workers
 - 1 additional healthcare worker developed disease-likely patient exposure, though no source identified
- 3 patients

2014-2015 Healthcare Workers Developing Measles

Of 10 healthcare facility transmissions:

- 5 of 7 healthcare cases had a history of face-to-face exposure to case of measles
- 1 was custodial worker who cleaned room after patient left
- 1 was healthcare worker who denied face to face exposure to patient
- 3 were patients in same waiting room at same time as cases:
 - 9 month old
 - 18 yo with history of two MMRs
 - 19 yo with unknown immunization history

Healthcare Workers with Measles Clinical and Epidemiologic Features, 2014

Age (y)	Measles Immunity Prior to Exposure	Exposure	Illness Onset	Fever	Cough	Coryza	Rash	Days Considered infectious while asymptomatic	Days working during active symptoms	Number of patients exposed
32	IgG ⁺	3/3/2014	3/17/2014	Y	Y	N	3/18/14	3	0	0
36	IgG ⁺	3/3/2014	3/14/2014	Y	N	N	3/18/14	0	4	850
41	2 MMR	3/7/2014	3/18/2014	Y	N	N	3/20/14	2	2	26
37	4 MMR IgG ⁺	3/7/2014	3/16/2014	N	Y	N	3/20/14	0	4	72
40	Unknown vaccine history, IgG equivocal	3/7/2014	3/19/2014	Y	Y	Y	3/21/14	2	0	0

OCHCA Healthcare Facility Response, 2015

- Emphasize that facilities assure that exposed staff have evidence of immunity
- Exclude from days 5-21 exposed staff without proof of immunity
- Emphasize that staff with evidence of immunity still have a small risk of developing disease
- Facilities (in general) contacted low risk patients by phone or letter to inform them of exposure:
 - Over 1 year of age
 - Immunocompetent
 - Not pregnant
 - Not healthcare worker
- **OCHCA's response was predicated on a large outbreak**

OCPH Followed Up on High Risk Persons

- Under one year of age generally
 - Pediatric practices and area pediatric children's hospital followed up with this group with their exposures
- Pregnant women
- Immunocompromised
 - Immune globulin or IVIG given to these groups
- Health care workers

MMR Vaccination

- Recommended in two doses:
 - 12-15 months of age
 - 4-6 years of age
- 95% are immune after first dose
- 97-99% immune after second dose
- No need for “booster”
- No downside to extra dose of MMR

MMR Vaccination in an Outbreak: Variation Options

- Second dose can be given anytime 28 days after the first dose
 - Not formally recommended, though offered as an option for OC providers
- Vaccine can be given from 6-11 mos of age if travel or outbreak setting, though dose will need to be repeated
 - Seems that titers reached with revaccination are lower
 - Not recommended by OCHCA unless infants are traveling
- OCHCA's main emphases:
 - Vaccinate kids and vaccinate them on time!
 - MMR can be given to anyone who are not sure that they were vaccinated or had disease previously

Measles Immunity Recommendations for Health Care Workers

- Proof of immunity as evidenced by:
 - Two doses of MMR
 - Serologic measles IgG +
- Wear N-95 mask even if you think you are immune
- If you are exposed and develop respiratory illness, stop working and get tested

Summary Points

- Measles disease in Orange County was weighted toward unvaccinated cases
- Measles transmission was rare due to high immunization rates
- Healthcare providers who care for measles patients are at particular risk of disease



Acknowledgments

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