Masqueraders of Vaccine-Preventable Diseases

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2018 KidStrong Conference
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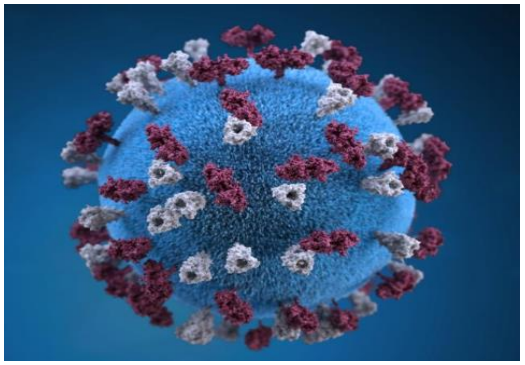

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BUREAU FOR PUBLIC HEALTH

Objectives

1. Review the epidemiology of selected vaccine-preventable diseases (VPDs)

2. Identify diseases that masquerade as VPDs and differentiate these diseases from selected VPDs

3. Apply lessons learned to the management of disease masqueraders and selected VPDs

Self-Assessment

1. **Which of the following diseases is NOT vaccine-preventable?**

   a. **Whooping Cough**
   b. **Strep throat**
   c. **Pneumococcal infection**
   d. **Meningococcal meningitis**
   e. **Chickenpox**

Self-Assessment (cont'd)

1. **Which of the following diseases is NOT vaccine-preventable?**

   a. **Whooping Cough**
   b. **Strep throat**
   c. **Pneumococcal infection**
   d. **Meningococcal meningitis**
   e. **Chickenpox**

Self-Assessment (cont'd)

2. **Which of the following vaccine-preventable diseases need to be reported IMMEDIATELY?**

   a. **Diphtheria**
   b. **Mumps**
   c. **Measles**
   d. **Polio**
   e. **Tetanus**

Self-Assessment (cont'd)

2. **Which of the following vaccine-preventable diseases need to be reported IMMEDIATELY?**

   a. **Diphtheria**
   b. **Mumps**
   c. **Measles**
   d. **Polio**
   e. **Tetanus**

VPD Surveillance

Surveillance: monitor, control and prevent disease

Disease Reporting: WV Reportable Disease Rule (64 CSR-7)

- Report **IMMEDIATELY** to local health department (LHD):
  Measles **Rubella**
- Report within **24 HOURS** to LHD:
  Diphtheria **Pertussis** **Invasive Meningococcal Disease**
  Tetanus **Polio** **Invasive *H. influenzae* Disease**
  Mumps **Hepatitis A** **Hepatitis B**
- Report within **1 WEEK** to LHD:
  Varicella - counts
  ***S. pneumoniae,* Invasive Disease**
  Influenza - counts, death of <18 years

Case 1

MUMPS

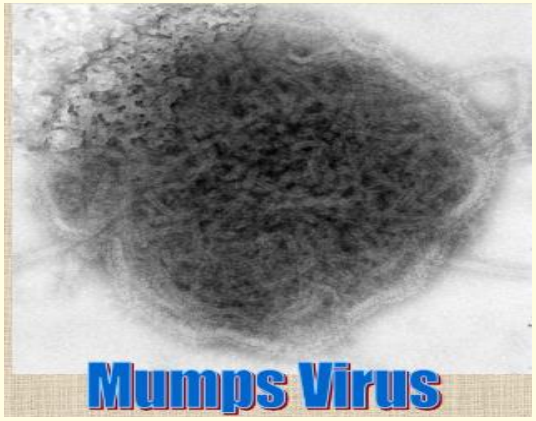
Parent: Joey (11 years) will not be in school today. He woke up with a sore throat and swelling on the left side of his face. He felt a bit warm but is really feeling tired. He'll be in school tomorrow for his test.

As a school nurse:

1. **What do you think is going on?**
2. **What would you do?**

Mumps

Etiology: Paramyxovirus, RNA virus



Reservoir: human, no carriers

Transmission:

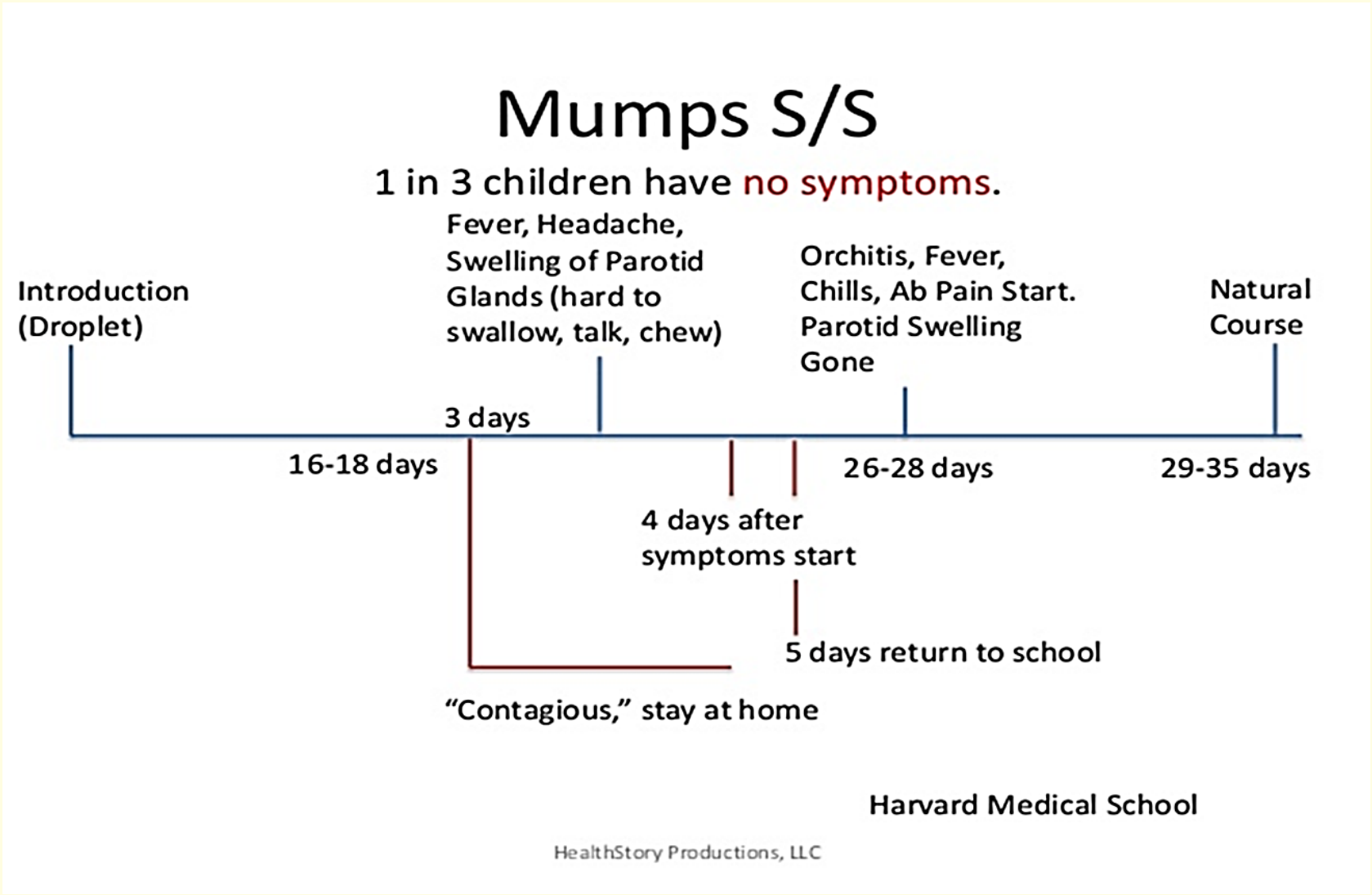
- Airborne
- Direct contact with droplet nuclei or saliva

Temporal pattern peak in late winter and spring

Communicability:

- Several days before and after onset of parotitis
- Asymptomatic infections may transmit

Mumps Clinical Course



Mumps Presentations

Signs and Symptoms:

- Nonspecific prodrome:
  - Myalgia
  - Malaise
  - Headache
  - Low-grade fever

- Parotitis in 9%-94%

Mumps Testing

Laboratory Testing:

A. Viral detection: rRT-PCR, culture

- Specimen sources
  - Swab of salivary gland, throat
  - Urine
  - CSF
- Timing: within 3 - 8 days of parotitis

B. Serology

- IgM - ASAP
- Paired IgG - ASAP then 2 weeks later

Mumps Epidemiology

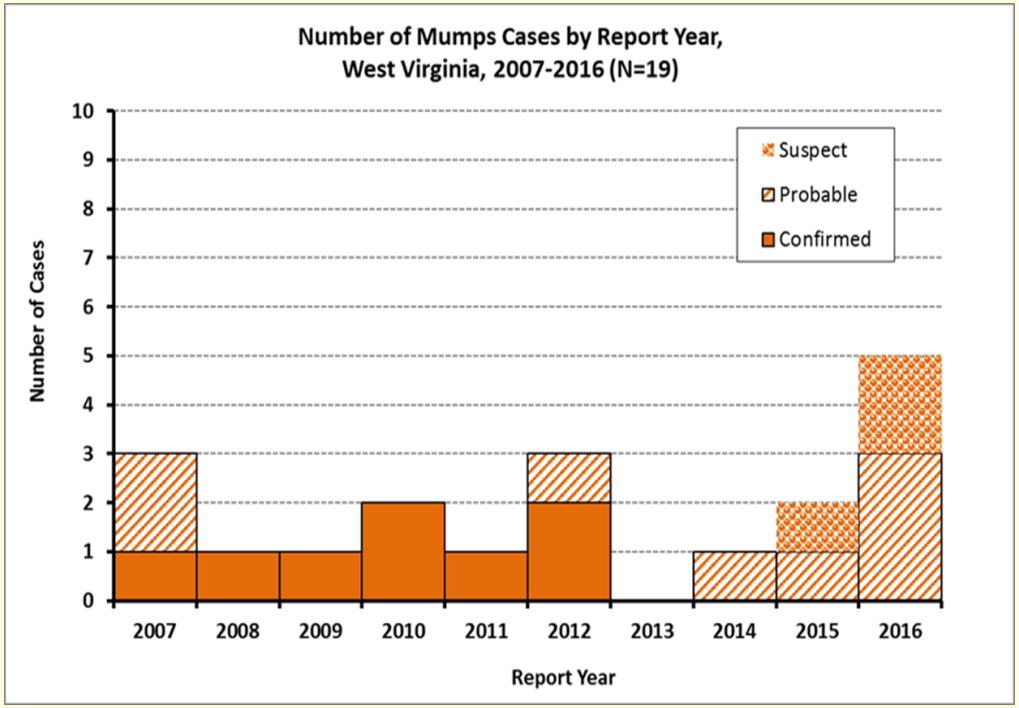
U.S. Mumps Outbreak:

2006:

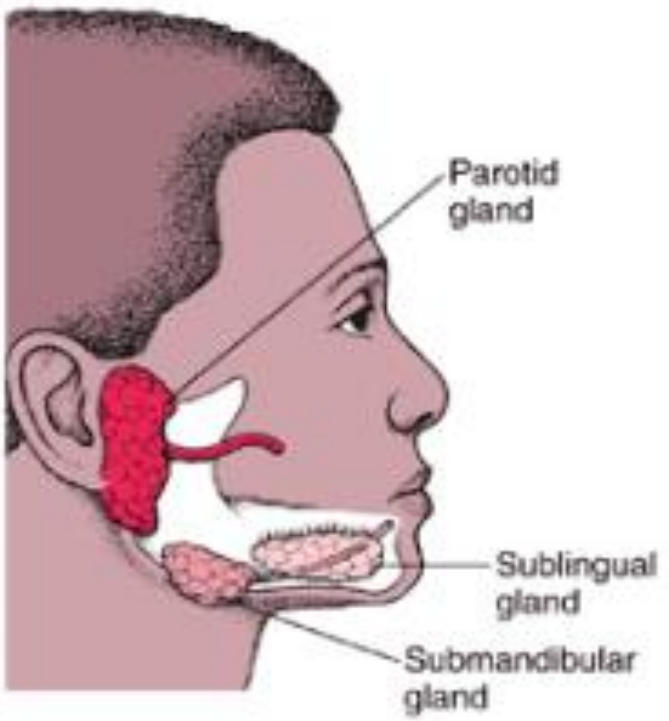
- Multi-state
- College students mostly in Midwest
- WV = 24 cases

2009-2010:

- Congregate settings



Parotitis Versus Lymphadenitis



From the Merck Manual Consumer Version, edited by Robert Porter. Copyright 2015 by Merck Sharp & Dohme Corp., a subsidiary of Merck & Co, Inc, Kenilworth, NJ. Available at merckmanuals.com. Accessed June 2015.

Mumps parotitis

- Pain and tenderness
- 1 or both salivary glands swollen
- Swollen tissue pushes ear up and out

Lymph node swelling

- Well-defined borders
- Behind the angle of jaw bone
- Lack of ear protrusion

Acute Parotitis

- **Viral pathologies**
  - Coxsackie virus
  - Influenza A virus
  - Parainfluenza virus
  - Cytomegalovirus
  - Adenovirus
  - Epstein-Barr virus
  - Varicella-zoster virus

Management

Supportive

- **Suppurative** (bacterial, especially Staphylococcus aureus) or recurrent parotitis

May need antibiotics

Influenza-Associated Parotitis

WEST VIRGINIA Department of Health & Human Resources BUREAU FOR PUBLIC HEALTH

Clinical Characteristics and Symptoms of Illness Among Cases and Controls, Multistate Investigation of Influenza-Associated Parotitis, U.S., 1 October 2014–31 March 2015

Characteristic	Cases (n = 50)		Controls (n = 124)		Odds Ratio [95% Confidence Interval][a]	*P* Value
	Respondents	n (%)	Respondents	n (%)		
Influenza-like illness[b]	49	25 (51)	122	109 (89)	0.15 [0.06, 0.35]	<.001
Self-report of testing for influenza	45	30 (67)	124	123 (99)	0.003 [<0.001, 0.05]	<.001
Self-report of testing for strep throat	43	18 (42)	113	50 (44)	0.8 [0.3, 1.7]	.53
Self-reported symptoms						
Fever/feverish[c]	49	32 (65)	122	115 (94)	0.1 [0.05, 0.4]	<.001
Chills	49	24 (49)	115	87 (76)	0.3 [0.2, 0.7]	.002
Muscle ache	47	18 (38)	119	83 (70)	0.3 [0.1, 0.6]	<.001
Headache	48	30 (63)	119	86 (72)	0.6 [0.3, 1.3]	.23
Cough	50	32 (64)	122	106 (87)	0.2 [0.1, 0.6]	.001
Wheezing	49	5 (10)	121	36 (30)	0.2 [0.07, 0.6]	.004
Shortness of breath	49	4 (8)	120	33 (28)	0.2 [0.05, 0.6]	.007
Sore throat/difficulty swallowing	49	27 (55)	121	79 (65)	0.6 [0.3, 1.2]	.17
Runny nose	46	23 (50)	121	75 (62)	0.6 [0.2, 1.2]	.12
Ear pain	48	19 (40)	119	26 (22)	2.3 [1.1, 4.8]	.03
Rash	49	5 (10)	122	10 (8)	0.9 [0.2, 3.4]	.87
Facial swelling	50	34 (68)	122	2 (2)	41.7 [10.0, 174.6]	<.001
Gland swelling	50	36 (72)	113	29 (26)	5.9 [2.7, 13.0]	<.001
Tongue swelling[d]	47	1 (2)	121	4 (3)	…	…
Discomfort with acidic foods	40	4 (10)	92	8 (9)	1.1 [0.2, 4.7]	.95

[a]Odds ratios (ORs), 95% confidence intervals, and *P* values from conditional logistic regression. Reference group for OR is absence of symptom or condition.

[b]Influenza-like illness defined as fever (≥100°F) or feeling feverish and cough and/or sore throat.

[c]Temperature ≥100°F or self-report of feeling feverish.

https://academic.oup.com/cid/advance-article-abstract/doi/10.1093/cid/ciy136/4957003

Case 1

Parent: Joey (11 years) will not be in school today. He woke up with a sore throat and swelling on the left side of his face. He felt a bit warm but is really feeling tired. He'll be in school tomorrow for his test.

As a school nurse:

1. **What do you think is going on?**

Mumps versus other viral parotitis

2. **What would you do?**

Public Health Management of Mumps - 1

- Report suspect or confirmed case of mumps
- Isolate/exclude child for 5 days from onset of parotitis
- Standard and droplet precautions until 5 days after onset of parotitis

Public Health Management of Mumps - 2

- Notify the school
- Educate the public
- Identify and monitor contacts (household, school) – document age-appropriate vaccination
- Exposed children in outbreak setting:
  - Vaccinate
  - If not vaccinated, exclude for 26 days after onset of parotitis from the last person

Case 1

Parent: Joey (11 years) will not be in school today. He woke up with a sore throat and swelling on the left side of his face. He felt a bit warm but is really feeling tired. He'll be in school tomorrow for his test.

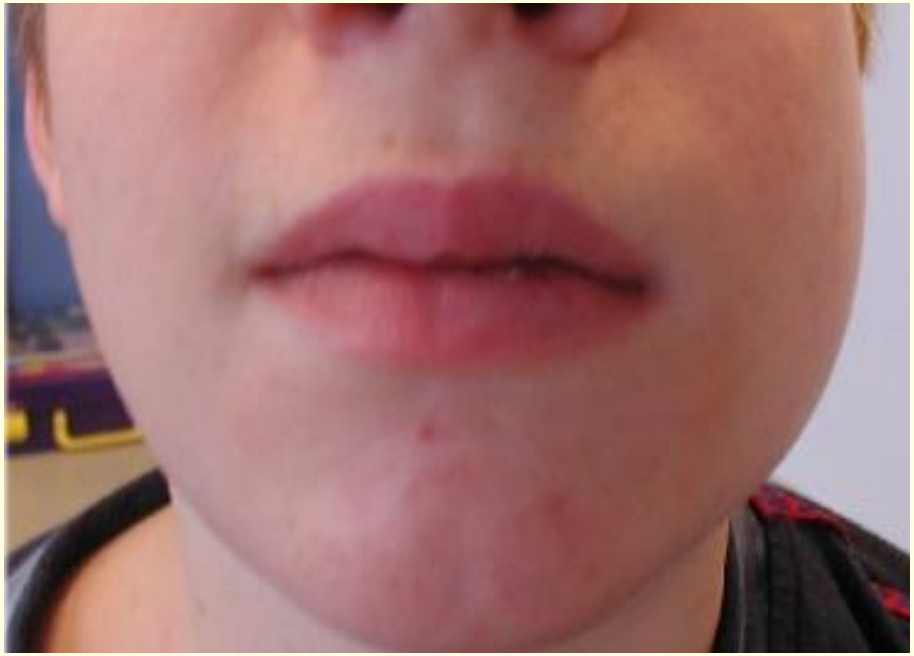
As a school nurse:

1. **What do you think is going on?**

Mumps versus other viral parotitis

2. **What would you do?**

Recommend he see a doctor
Notify LHD



Influenza

INFLUENZA (FLU)

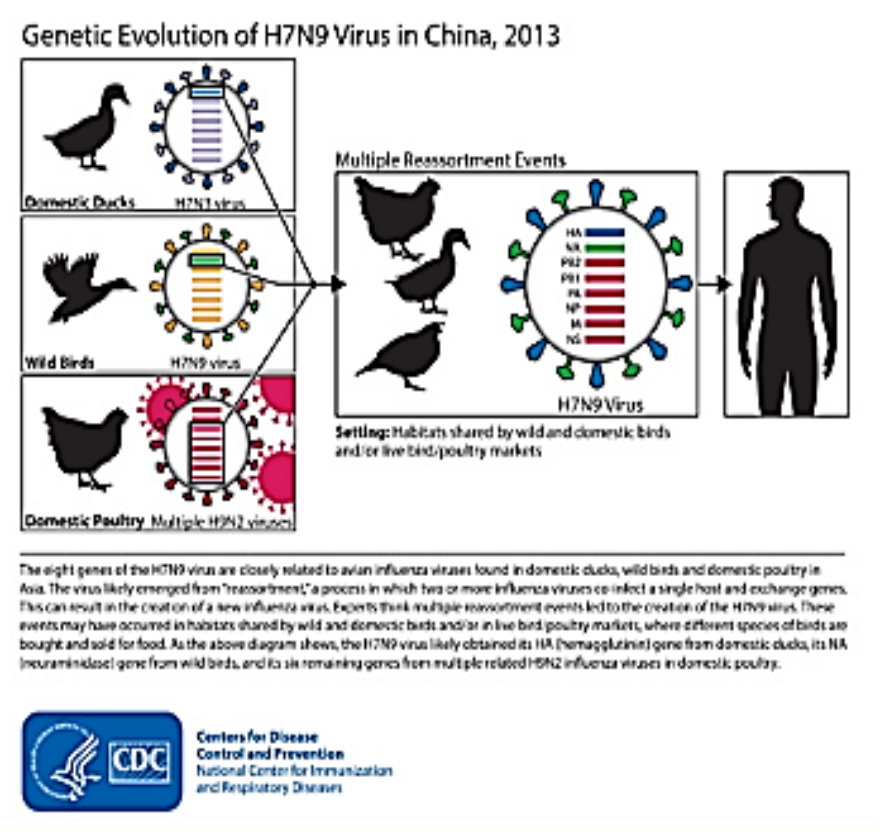
Etiology: Orthomyxovirus, 3 types (A, B, C)

Reservoir: Animals

Transmission:

- Droplet
- Indirect transfer
- Airborne

Communicability: 24 hours before symptom onset to 1 week after symptom onset



Influenza Clinical Course

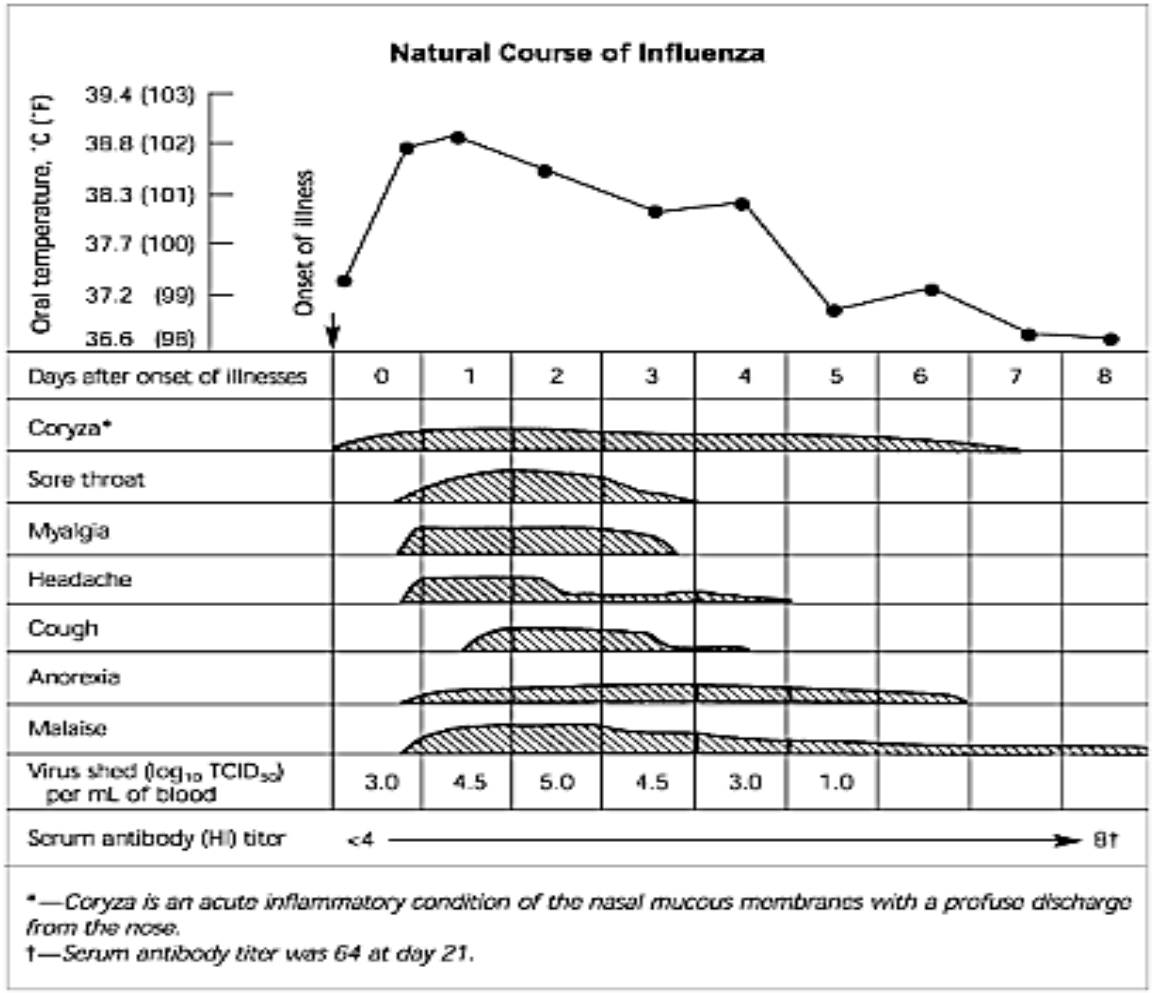


FIGURE 1.

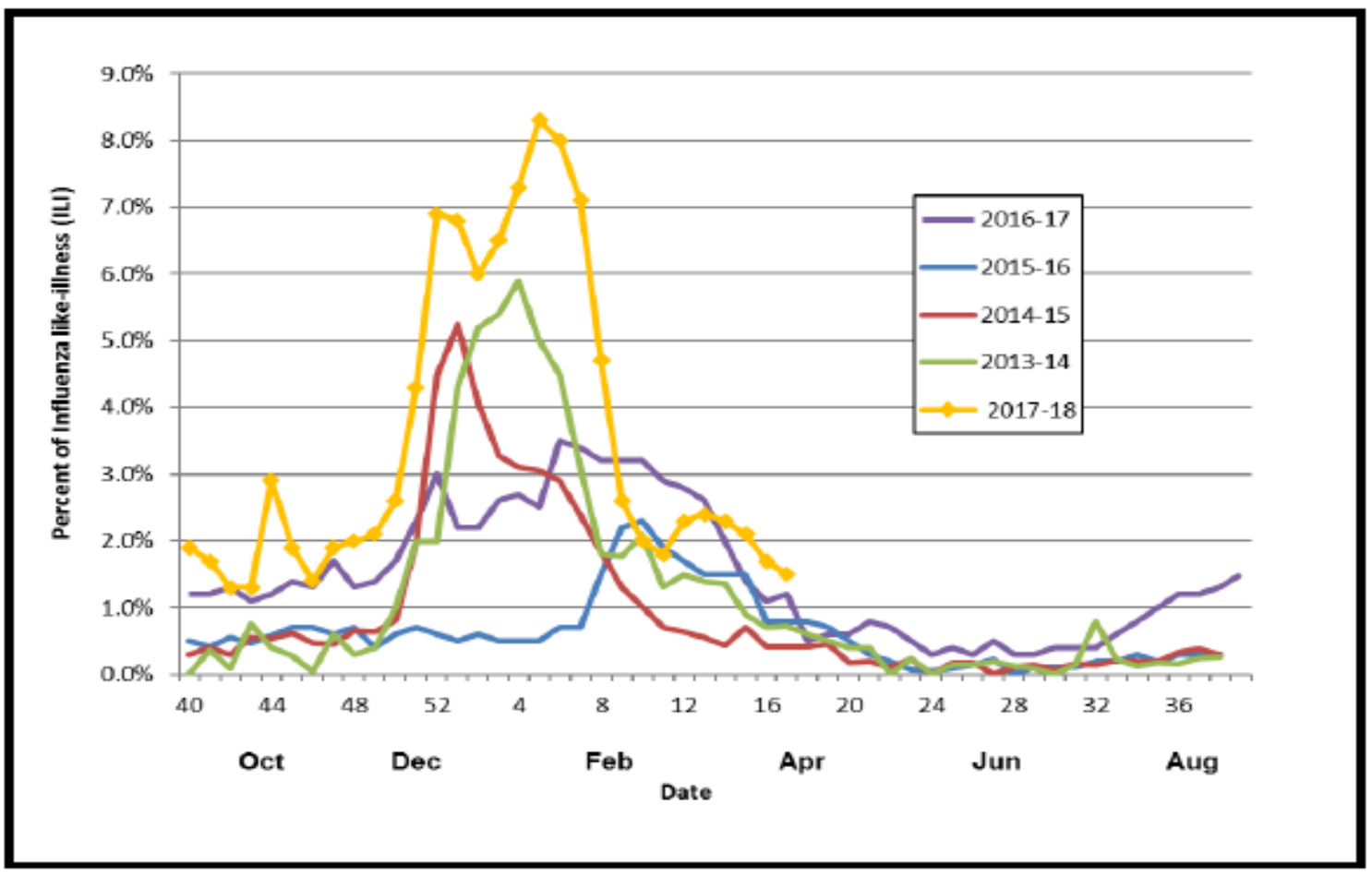
Clinical characteristics of naturally occurring influenza A in an otherwise healthy 28-year-old male patient. ($TCID_{50}$ = median tissue culture infective dose; HI = hemagglutination inhibition)

Adapted from Dolin R. Influenza: current concepts. Am Fam Physician 1976;14(3):74.

Am Fam Physician. 2003 Jan 1;67(1):111-118.

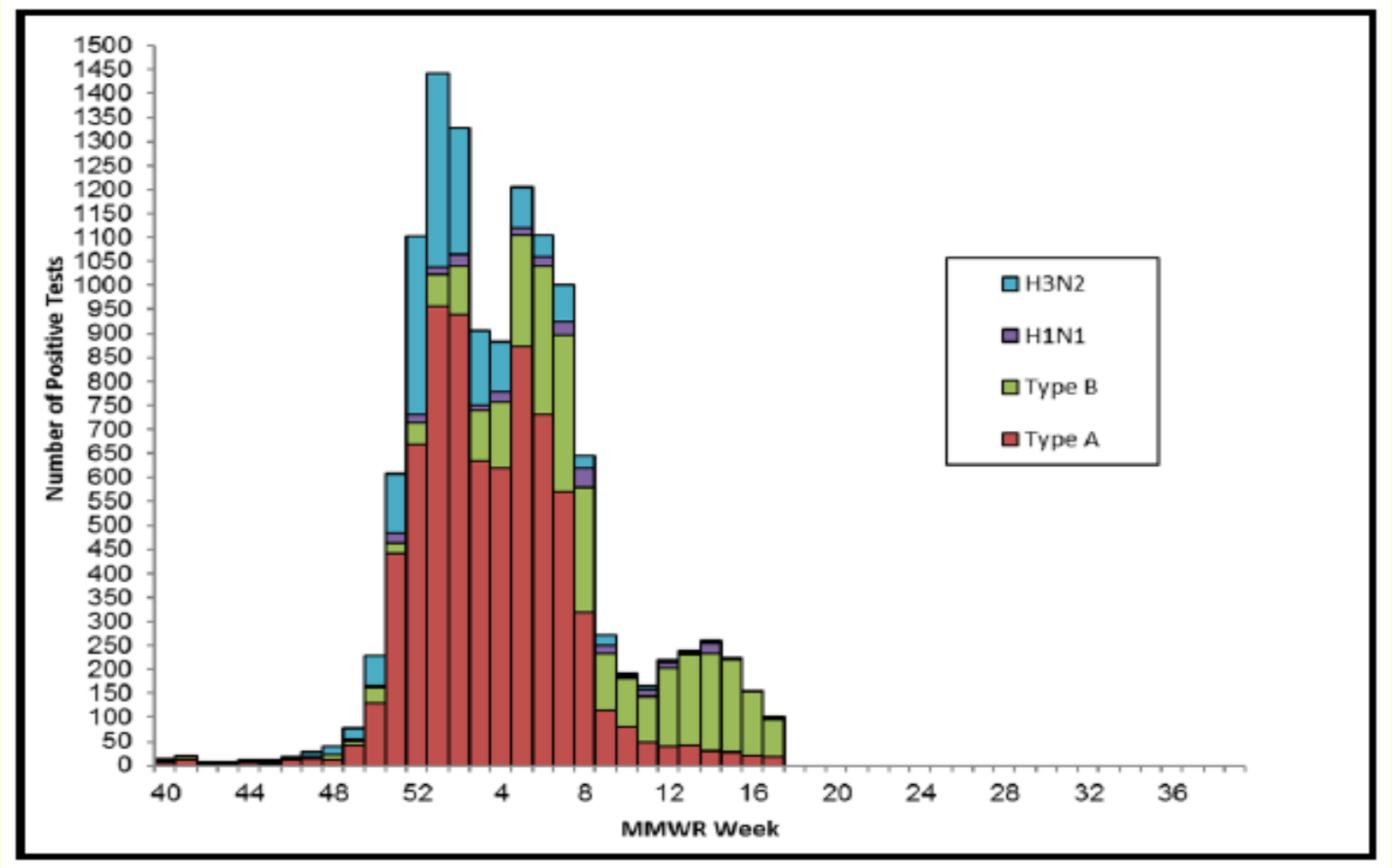
Influenza Epidemiology

WV ILI Cases During Influenza Seasons, 2013 - 2018



Influenza Epidemiology (cont'd)

Influenza Test Results, WV, 2017 - 2018



Public Health Management of Influenza

- Report to LHD:
  - Weekly, number of cases – sporadic
  - Immediately, report cases – outbreak

- **Standard and droplet precautions**

- Outbreak at school:
  - Establish baseline absenteeism rate
  - Determine current/ongoing absenteeism rate
  - Notify school, educate students and personnel

Influenza Versus Common Cold

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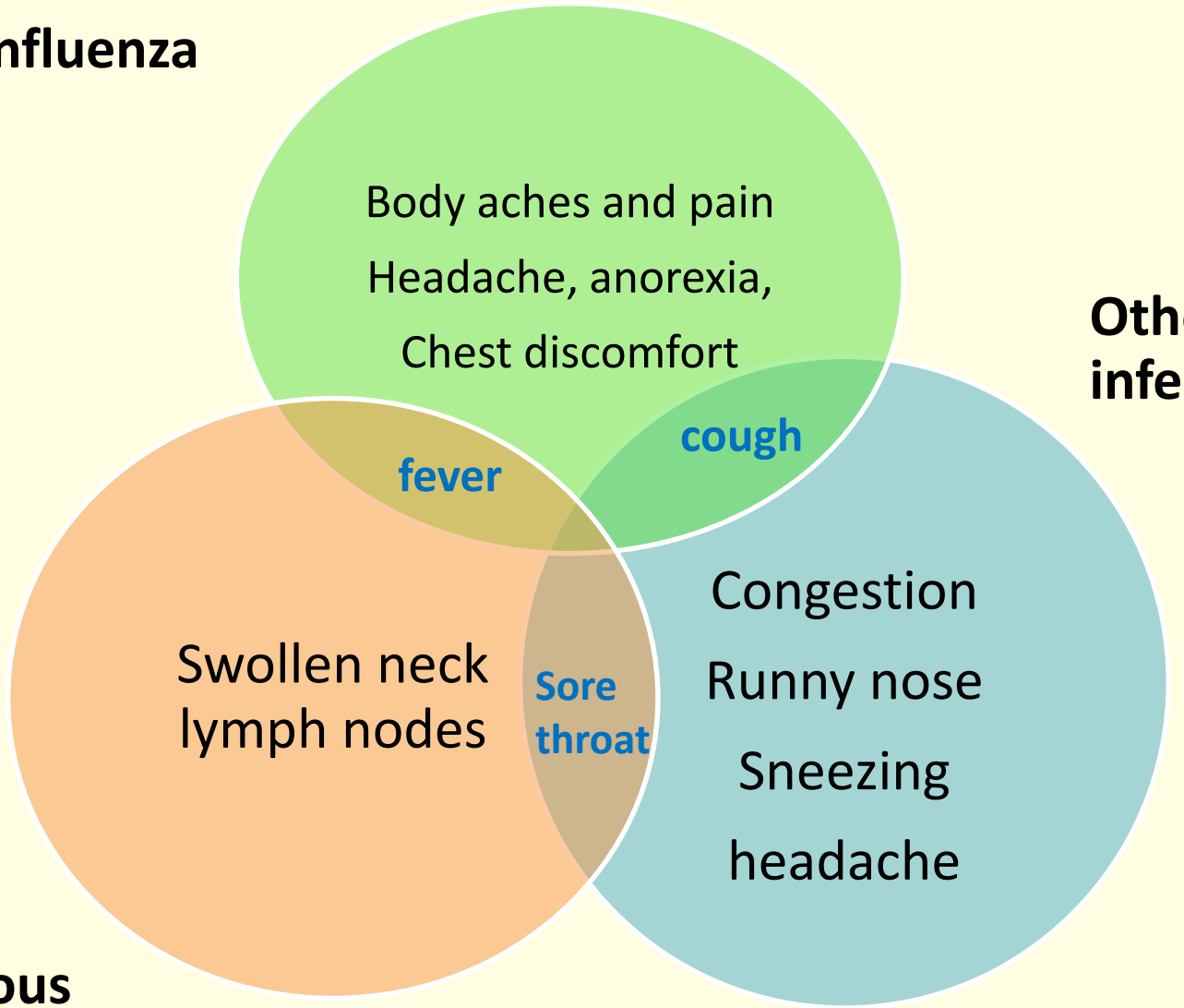
Comparison of Influenza and the Common Cold

FEATURES	INFLUENZA	COMMON COLD
Onset*	Abrupt	More gradual
Fever*	Common: 37.7°C to 40.0°C (100°F to 104° F)	Uncommon or only 0.5°C (1° F) increase
Myalgia*	Severe, common	Uncommon
Arthralgia	Severe, common	Uncommon
Anorexia	Common	Uncommon
Headache	Severe, common	Mild, uncommon
Cough (dry)*	Common, severe	Mild to moderate
Malaise	Severe	Mild
Fatigue, weakness	More common than with the common cold; lasts 2 to 3 weeks	Very mild, short lasting
Chest discomfort	Common, severe	Mild to moderate
Stuffy nose	Occasional	Common
Sneezing	Occasional	Common
Sore throat	Occasional	Common

*—*Clusters of more severe or common features may be more likely to predict influenza. Information from references 1 and 2.*

https://www.aafp.org/afp/2003/0101/p111.html

Influenza Differential Diagnosis



http://contemporaryclinic.pharmacytimes.com/journals/issue/2015/2015-vol1-n3/influenza-differential-diagnosis-and-treatment/P-1

Streptococcal Pharyngitis ("Strep Throat")

Etiology: Group A Streptococcus

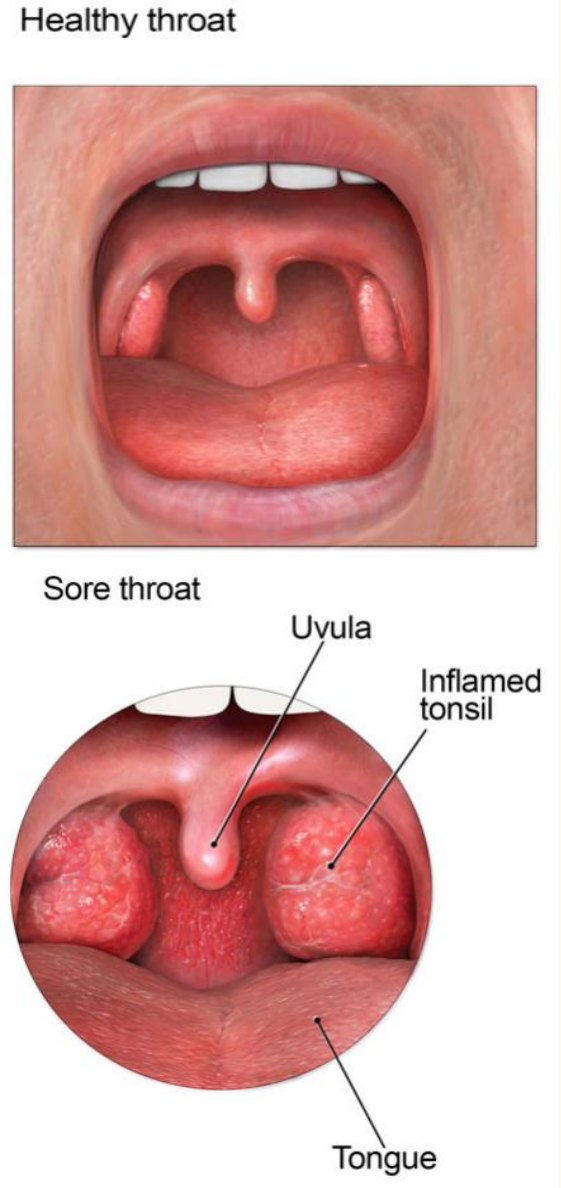
Transmission:

Contact with respiratory secretions

Clinical Presentation:

- Fever
- Cervical lymph node swelling
- Tonsils red and swollen
- Headache
- Vomiting

Treatment: Antibiotics



Measles

RUBEOLA (MEASLES)

Etiology: Paramyxovirus, RNA virus

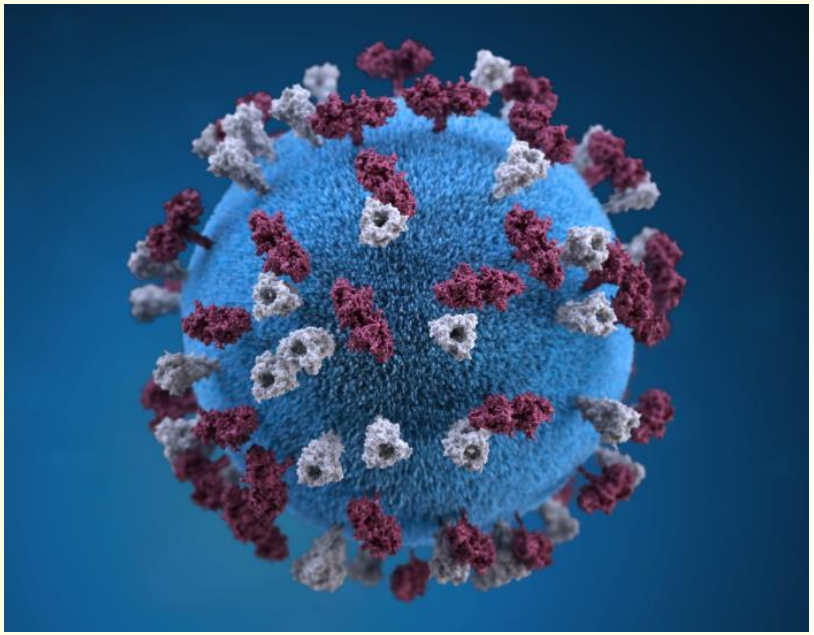
Reservoir: Human, no carriers

Transmission:

- Respiratory route - airborne

Communicability:

- 4 days before to 4 days after rash onset



Measles virus particle studded with glycoprotein tubercles. Source: CDC

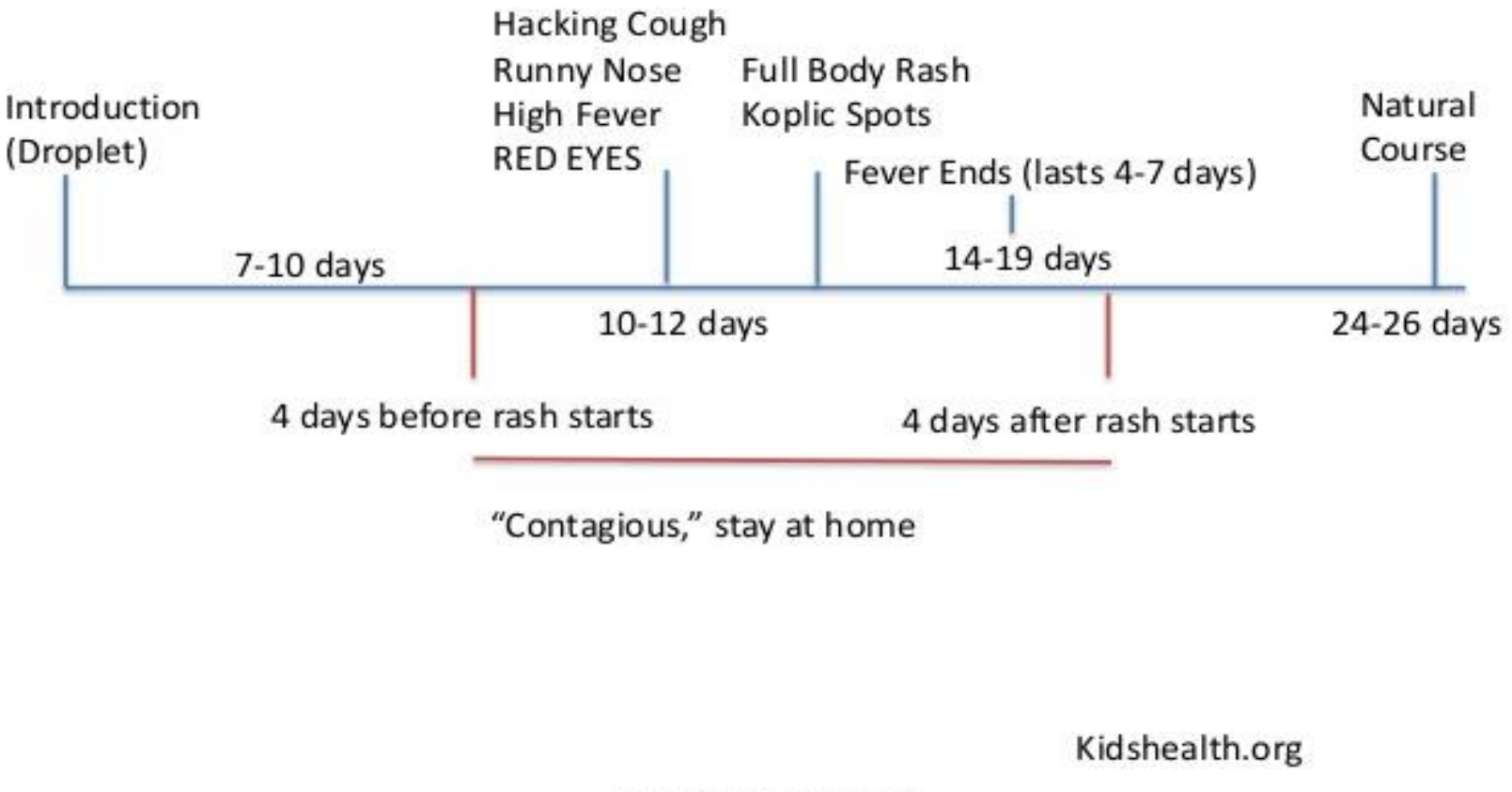
Case 2

10 year old child was in class when the teacher notices the child's face as 'flushed' and sends the child to the clinic. On examination, you found that she has low grade fever, was not feeling well, and has a bright red rash starting to develop on her face.

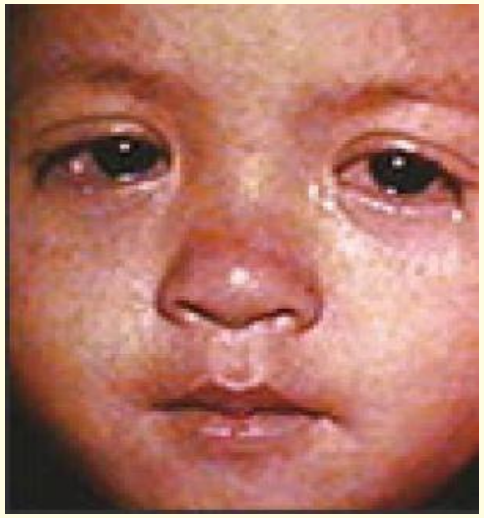
1. What is possibly causing this?

2. Next steps?

Measles Clinical Course



Measles

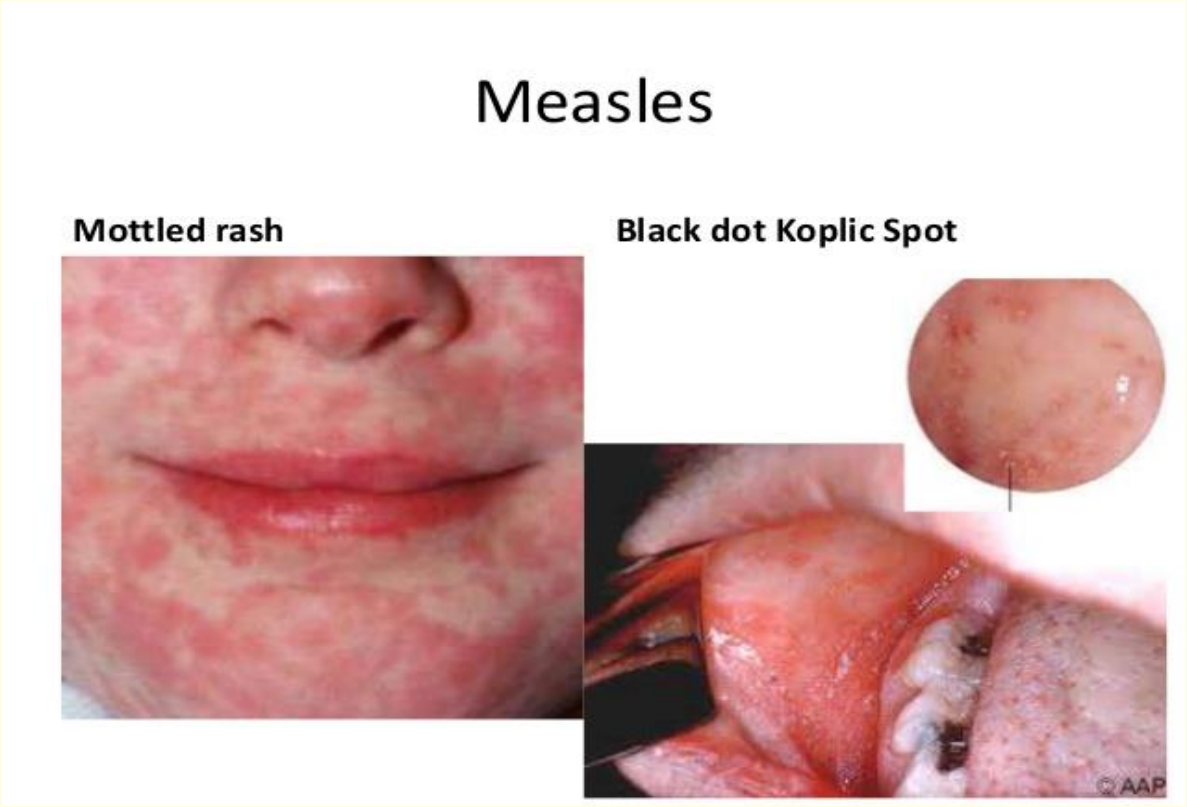


Rash:

- Maculopapular → confluence → peel, fades
- Starts at hairline → trunk → hands, feet

Prodrome (3 C's):

- Cough
- Coryza
- Conjunctivitis



Measles (cont'd)

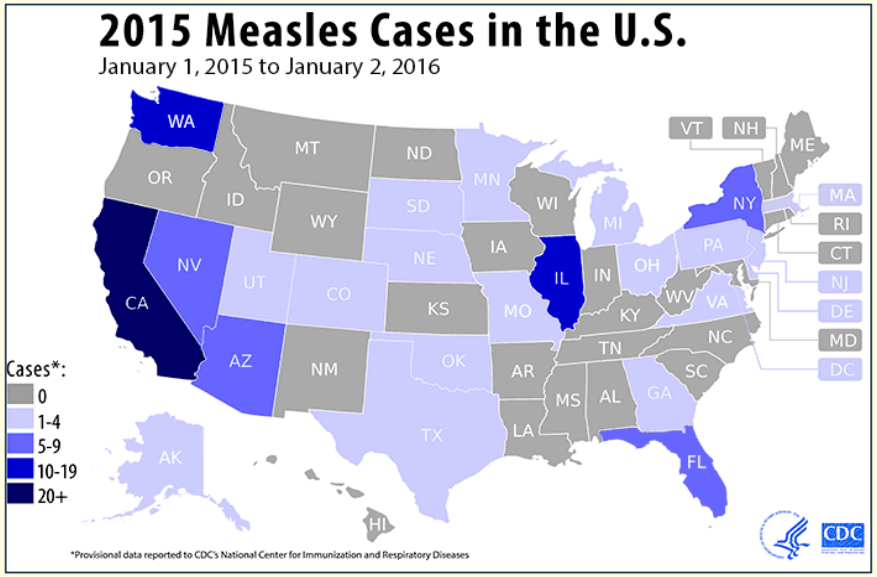
Complications:

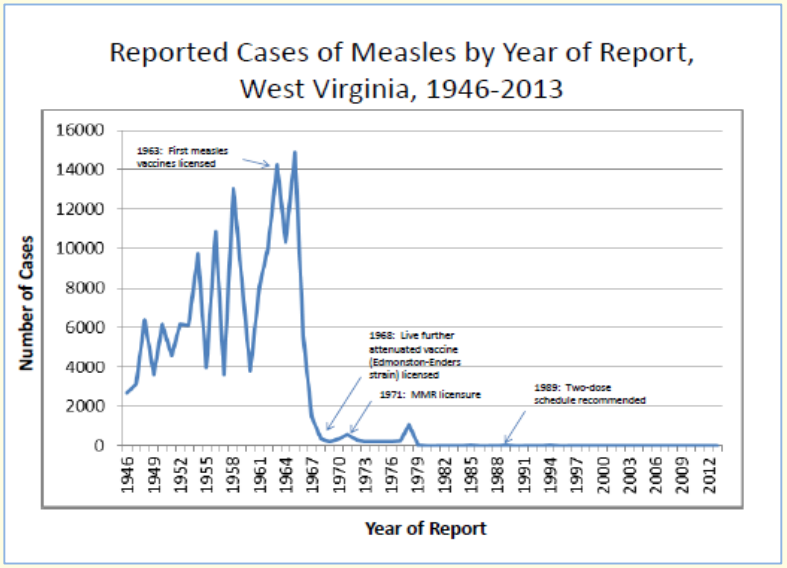
- Otitis media
- Pneumonia
- Acute encephalitis
- Seizures, neurologic damage
- Death
- SSPE
- Pregnant women – premature labor, abortion

Laboratory Testing:

- Viral detection: rRT-PCR, culture
- Serology

Measles Epidemiology





WV: No cases of measles since 2009

Public Health Management of Measles - 1

- Immediately report suspect or confirmed case
  - 1 case of measles is an OUTBREAK!
- Isolate/exclude sick child for 4 days from onset of rash
- Standard and airborne transmission precautions until 4 days after onset of rash
- Inform health care provider (HCP) ahead of time if you are sending a suspect case of measles, so HCP can prepare and advise

Public Health Management of Measles - 2

- Notify the school
- Educate the public
- Identify contacts - household, school
- Develop list and monitor contacts
- Exposed children in outbreak setting:
  - Vaccinate
  - If not vaccinated, exclude for 21 days after onset of rash from the last person

Erythema Infectiousum

Etiology: Human Parvovirus B19

Transmission:

- Respiratory secretions
- Transplacental

Clinical Presentation:

- Fever, headache
- Tired, muscle aches
- Strawberry tongue, tonsillitis

Rash:

- ‘Slapped cheek’ rash
- Rash followed by lacelike appearing rash

Roseola Infantum

Etiology: Herpesvirus 6

Clinical Presentation:

- Generally well
- Seizures (10%) due to high fever

Transmission:

- Respiratory secretions

Rash:

- High fever for 3 days then defervesce, then rash appears
- Morbilliform
- Spreads to neck and trunk

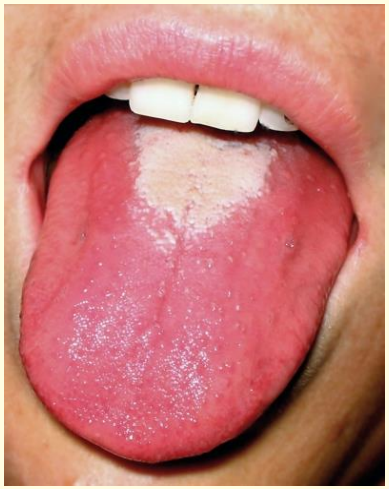
Scarlet Fever

Etiology:

Group A Streptococcus

Transmission:

Respiratory secretions



Clinical Presentation:

- Toxic (headache, nausea, vomiting)
- High fever
- Strawberry tongue, tonsillitis

Rash:

- Sandpaper feel
- Bright red skin in creases of the underarm, elbow, and groin

Treatment: Antibiotic

Enteroviral Infection

Etiology: Enterovirus, Coxsackie virus

Clinical Presentation: Respiratory or GI manifestations

Rash: Scattered, macule or maculopapular, rash appears during or after fever

Treatment: Supportive

Hand-foot-and-mouth disease (HFMD)

Kawasaki Disease

Etiology: unknown

Clinical Presentation:

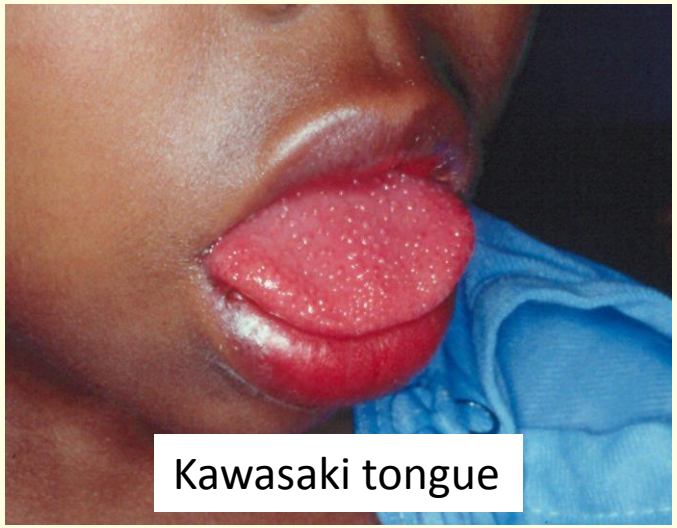
- High fever
- Measles-like rash
- Skin peeling
- Swollen hands, feet, and cervical lymph nodes

Complications:

- Coronary disease, aneurysms

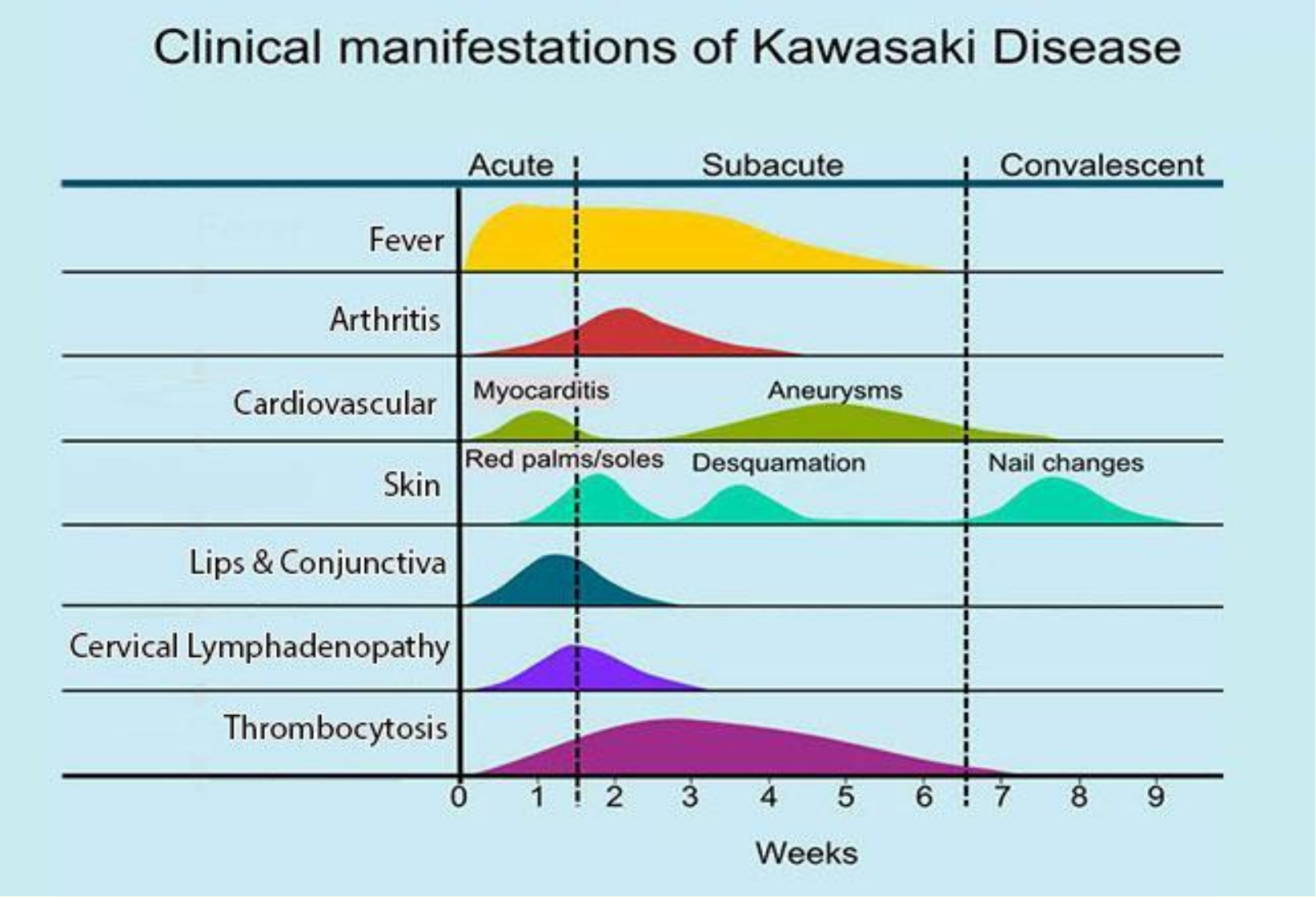
Treatment:

- IVIG
- Aspirin


Kawasaki tongue


Kawasaki rash

Kawasaki Disease



Case 2

10 year old child was in class when the teacher notices the child's face as 'flushed' and sends the child to the clinic. On examination, you found that she has low grade fever, was not feeling well, and has a bright red rash starting to develop on her face.

1. What is possibly causing this?

Parvovirus

2. Next steps?

Manage accordingly

Varicella

VARICELLA (CHICKENPOX)

Etiology: VZV (Human herpesvirus 3)

Reservoir: Humans

Transmission:

- Direct contact with VZV lesions
- Airborne

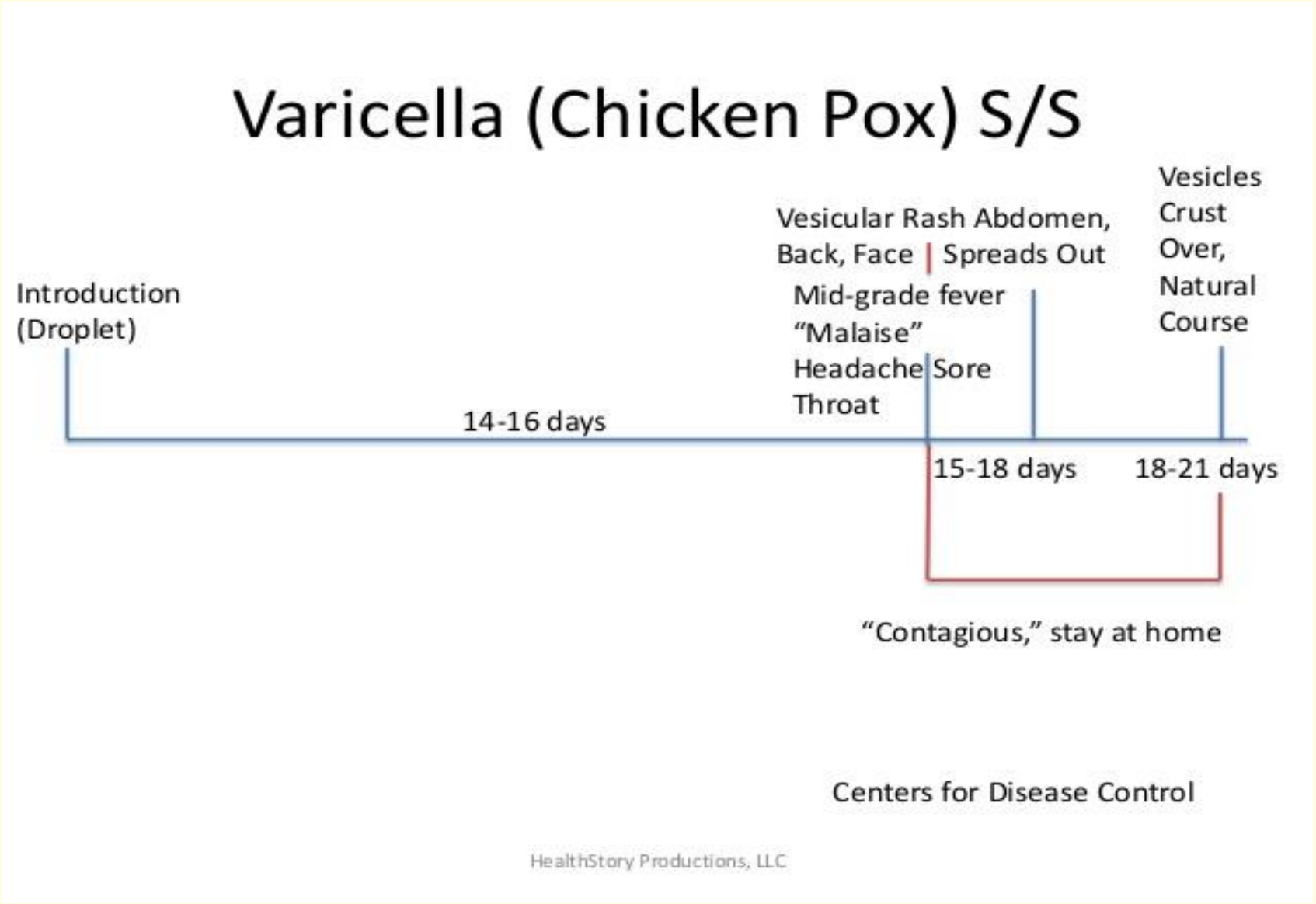
Communicability:

- 1 - 2 days before rash onset until all lesions have crusted

Treatment: Supportive

Electron micrograph of a varicella (chickenpox) virus. Source: CDC

Varicella Clinical Presentation



Varicella in Unvaccinated

Clinical Manifestations:

- Small red bumps → small fluid-filled sacs → scabs
- Crops of vesicles - several days
- Rash (mouth, ears, genitals)
- Itchy
- Fever, runny nose and cough

varicella lesions in various stages
Source: http://www.vaccineinformation.org/photos/variaap001.jpg

Complications:

- Bacterial infections
- Pneumonia
- Central Nervous System
- Reye syndrome

Breakthrough Varicella

Breakthrough varicella:

Infection in a vaccinated person

Clinical Manifestations:

- Mild
- Low/no fever
- Fewer lesions
- Maculopapular rash
- Contagious

Source: CDC

Diagnosing Breakthrough Varicella

https://www.cdc.gov/chickenpox/downloads/varicella-and-breakthrough-varicella.pdf

Diagnosing Breakthrough Varicella (cont'd)


Poison Ivy


Folliculitis


Insect Bites


Herpes Simplex


Breakthrough Varicella


Scabies

https://www.cdc.gov/chickenpox/downloads/varicella-and-breakthrough-varicella.pdf

“Hot Tub” Folliculitis

Etiology:

Pseudomonas aeruginosa

Clinical Presentation:

- Itchy red rash
- Resemble acne
- Rash→ dark nodules
- Sore throat, earache, headache

Hot tub folliculitis

Transmission: Direct contact

Treatment: Supportive, topical antibiotics

Molluscum Contagiosum

Etiology: Molluscum contagiosum virus

Clinical Presentation:

- Small, raised, firm
- Umbilicated papules
- Pink or flesh-colored
- Anywhere in body

Transmission: Person-person, autoinoculation

Treatment: May not be necessary

Varicella PCR Testing

Advantages:

- Preferred test for diagnosing varicella
- Easily implemented
- Less invasive than drawing blood
- Reliable

Technique:

- Collect within 5 days of rash onset
- Obtain samples from vesicles and crusts, but can also obtain from papule or macule by rubbing lesion
- Samples from $\geq$ 2 lesions

Source: Philadelphia Department of Public Health
https://www.cdc.gov/chickenpox/downloads/varicella-and-breakthrough-varicella.pdf

Varicella Serologic Testing

IgM Testing

- False negatives, poor specificity
- Timing of collection

IgG Acute and Convalescent Titers

- Required second office visit

Source: Philadelphia Department of Public Health
https://www.cdc.gov/chickenpox/downloads/varicella-and-breakthrough-varicella.pdf

Public Health Management of Varicella

- Report to HD:
  - Weekly, number of cases – sporadic
  - Immediately, report cases – outbreak (≥ 3 cases)
- Exclude infected until all lesions have crusted
- Standard and respiratory precautions
- Ventilate room
- Obtain evidence of immunity – vaccinate susceptible individuals

Varicella Vaccine Effectiveness (VE)

Two-dose Varicella VE in Rash Severity in Outbreaks of Varicella Among Public School Students

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VE against ALL varicella

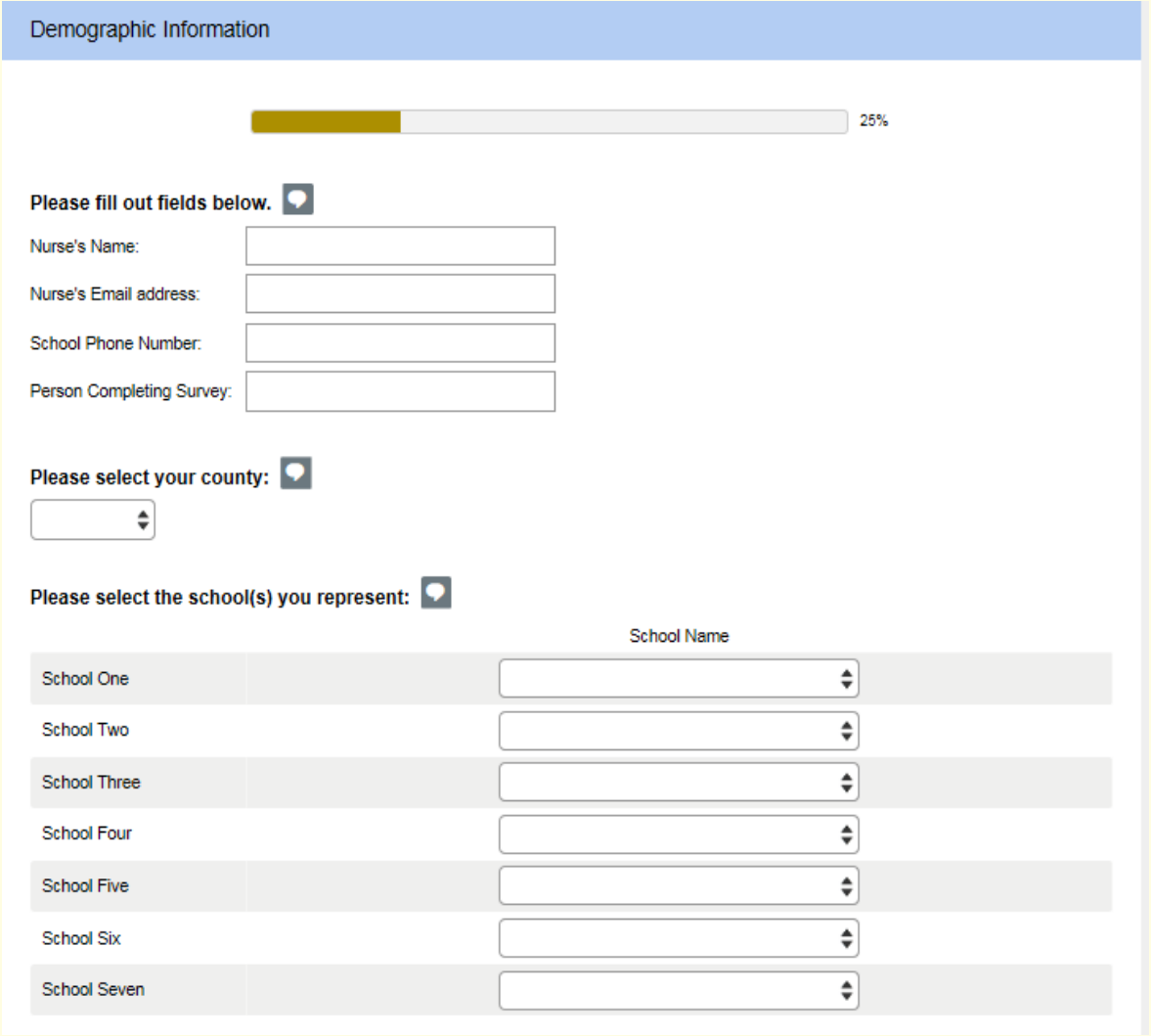
Varicella vaccine	VE	95% Confidence Interval	
One-dose	83.2%	69.2%	90.8%
Two-dose	93.9%	86.9%	97.1%
2 doses vs. 1-dose	63.6%	32.6%	80.3%

VE in preventing moderate/severe varicella

Varicella vaccine	VE	95% Confidence Interval	
One-dose	88.2%	72.7%	94.9%
Two-dose	97.5%	91.6%	99.2%
2 doses vs. 1-dose	78.6%	40.9%	92.3%

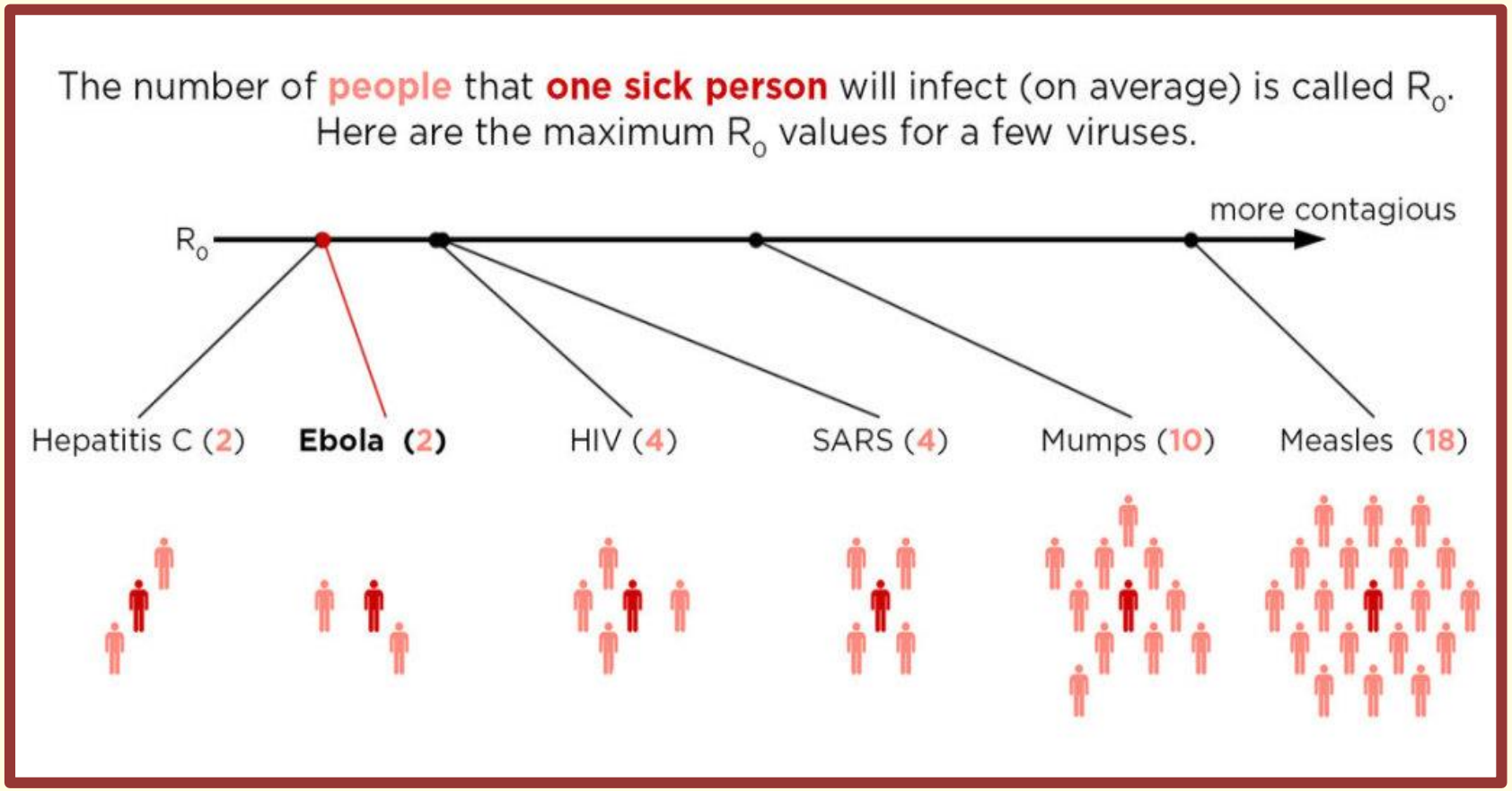
Enhanced Varicella Outbreak Surveillance

- All public schools in WV
- During the school year
- Report varicella cases monthly including zero cases



Conclusion

- Diagnosis of VPD can be challenging
- Report suspected cases of VPD



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