Vaccine Preventable Diseases

Session 2

Susan Sullivan RN-BC, MS

Communicable Disease Branch

North Carolina Public Health

nc department of health and human services

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  - Varicella
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- Bacterial Vaccine Preventable Diseases
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- VPDs in NC EDSS

Learning Objectives

- Locate control measures for less commonly seen VPDs
- Identify appropriate clinical specimens for VPD testing
- List key data elements for reporting VPDs in NC EDSS

Using VPD Resources

- Read case definition for each disease
- Review relevant chapters
  - CDC Pink Book
  - CDC VPD Surveillance Manual
- Refer to NC SLPH Guide to Services
- Check for CDC MMWR for recent VPD updates
- Epi on call 24/7: 919-733-3419

Vaccine Preventable Diseases

VARICELLA

Varicella Reporting

- Single cases - not reportable in NC EDSS
- Still warrant public health response to
  - Prevent an outbreak
  - Protect high risk contacts

- Outbreaks (≥5 cases) - report to CD Branch

- Refer to CDC Varicella Outbreak Manual

Varicella

Highly infectious febrile rash illness; mild prodrome

Progressive rash

- Starts on head, chest, back; spreads to extremities
- Highest concentration on chest and back
- Maculopapular lesions, vesicles, and crusts present at same time

Complications – bacterial skin infections, sepsis, pneumonia, CNS (encephalitis, cerebellar ataxia), Reye syndrome, death

Immunocompromised and neonates at higher risk of severe disease

Varicella Epidemiology

Causative agent: varicella-zoster virus (VZV)

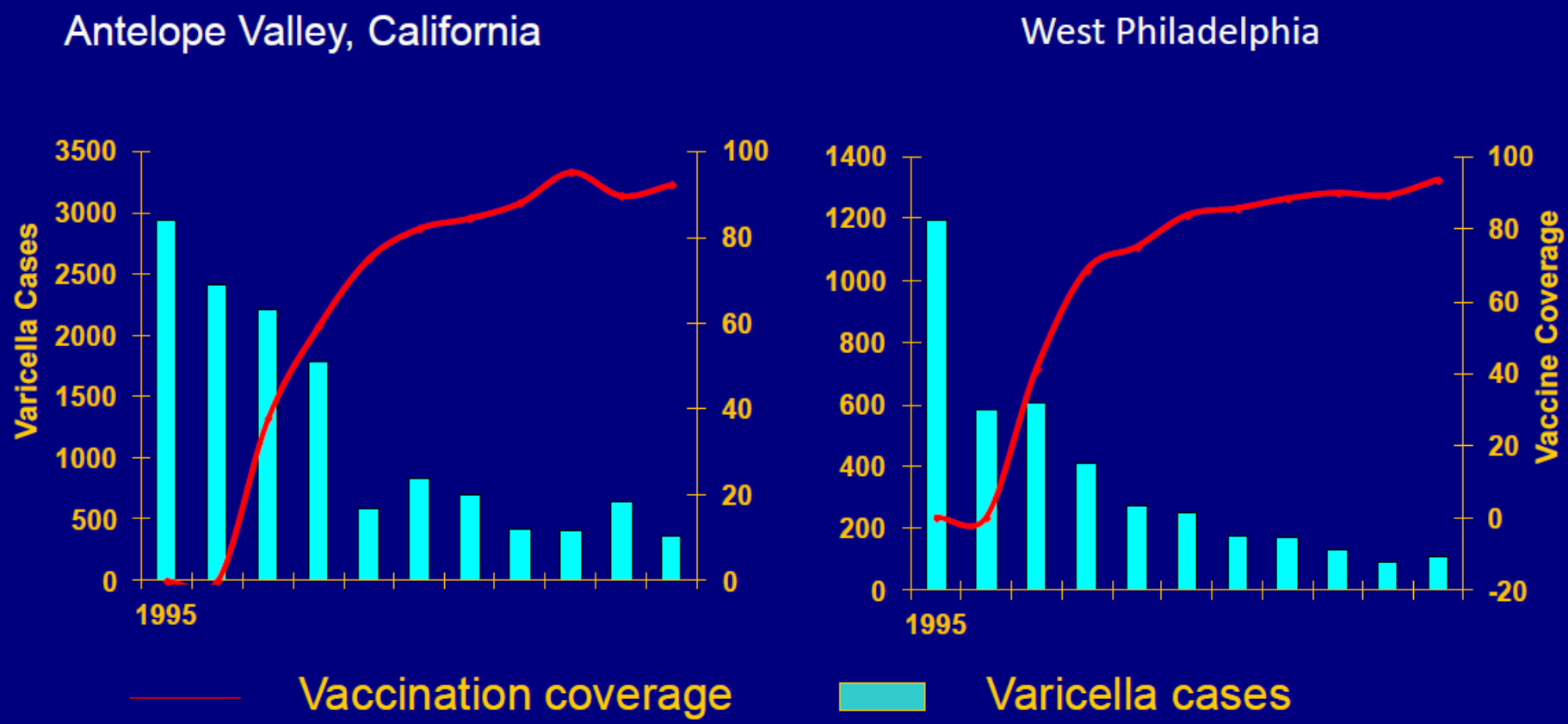
- *Primary*: chickenpox
- *Recurrent*: shingles

Mode of transmission: airborne, direct contact with secretions, lesion fluid

Incubation period: 14-16 days (range 10-21)

Infectious period: 1-2 days prior to rash until crusting

Varicella Cases and 1-Dose Vaccine Coverage
Varicella Active Surveillance Project Sites, 1995-2005



90% decline in varicella incidence in both sites

Guris *J Infect Dis* 2008

Breakthrough Varicella Infection

Varicella-Containing Vaccines

Vaccine	Use and Efficacy
Varicella vaccine (Varivax®)	• Approved for persons 12 months and older • 70-90% effective against any varicella disease
Measles/mumps/rubella/ varicella vaccine (Proquad®)	• Approved for persons 12 months through 12 years • Efficacy inferred from that of MMR vaccine and varicella vaccine
Herpes zoster vaccine (Zostavax®)	• Recommended for adults 60 years of age and older • 51% reduction in shingles risk; 67% reduction in post-herpetic neuralgia

Varicella Testing

Test	Purpose	Specimen	Lab

Tissue culture/DFA	Disease Confirmation	• Vesicular fluid-lesion
		• Biopsy tissue
			• SLPH
			  • Culture: 4 wks
			  • DFA: 1-2 days

PCR	Disease Confirmation/Strain Differentiation	• Vesicular swabs • Lesion scrapings • Scabs-crusted lesions • Biopsy tissue, CSF	• CDC VPD Reference Lab; reliable, fast
Serology-IgG	Varicella Immunity/Disease Confirmation	• Serum	• SLPH-7 day turn around; • Routine testing following vaccination not recommended

Evidence of Varicella Immunity

Criteria	Comments
Documentation of age-appropriate vaccination	o Preschool children aged ≥12 months: 1 dose o School aged children, adolescents, adults: 2 doses
Lab evidence of immunity or disease confirmation	o Commercial assays may yield false negative results
U.S. born before 1980	o Not sufficient evidence for healthcare personnel, pregnant women or immunocompromised persons
Clinician diagnosis of disease or history of disease	o Assess mild, atypical disease for lab-confirmed epi link or perform lab work for confirmation
History of clinician diagnosed herpes zoster	

Varicella Treatment

- Antivirals not considered clinically beneficial for otherwise healthy children
- Consider use for otherwise healthy persons at risk for moderate-severe varicella
- If treating, start early for maximum benefit

Varicella Control Measures

Control Measure	Indication
Vaccination	*Post Exposure Prophylaxis (PEP):* within 3-5 days *Outbreak Control:* 2 dose vaccination policy *Postpartum:* upon completion of pregnancy if non-immune
Antivirals (acyclovir)	*PEP:* persons at increased risk for moderate-severe disease; *Treatment:* Secondary cases in same household as infected child
VZ Immune globulin VariZIG®	*PEP:* for exposed persons at high risk of severe disease w/o evidence of immunity and ineligible for vaccine: administer up to 10 days after exposure
Isolation	*Active Disease:* until rash is crusted. Vaccinated person: no new lesions for 24 hours. Healthcare: airborne, contact precautions
Quarantine	*Unvaccinated, non-immune:* School exclusion-until 21 days after rash onset in last case. Healthcare exclusion-furlough from days 8 to 21 after exposure

Vaccine Preventable Diseases

MEASLES, MUMPS AND RUBELLA

Measles

- Prodrome
  - High fever
  - Cough, coryza, conjunctivitis
- Koplik spots
  - Blue-white spots on buccal mucosa
- Maculopapular Rash
  - Begins at hairline, involves face and neck
  - Spreads down and out
  - Fades in order it appeared

Complications

- Mostly in children <5 and adults 20+
- Severe complications can occur

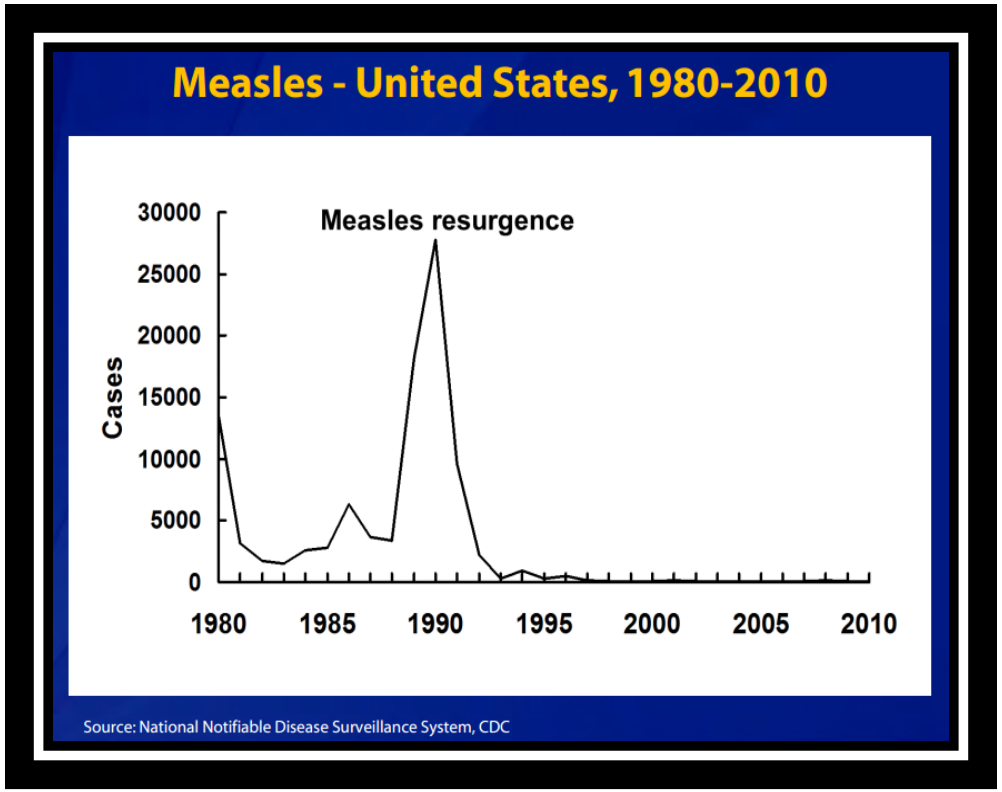
Photo: CDC Public Health Image Library

Measles Epidemiology

Endemic transmission no longer occurs in U.S.

Rapid identification of travel-related cases is key to prevent spread

NC 2013 outbreak:
23 cases, 30 isolation orders, >1000 exposures, 2200 local public health hours



Measles Testing

Test	Specimen	Comments
Measles virus isolation‡	Throat*, NP swab, urine	CDC VPD Reference Lab/SLPH *Collect within 3 days of rash onset
Measles virus-specific PCR‡	Throat*, NP swab, urine	CDC VPD Reference Lab/SLPH-2 days *Collect within 3 days of rash onset
IgM antibody‡	Serology	SLPH: 3 day turnaround Collect ASAP & >72 h after rash onset
IgG antibody‡	Paired sera	SLPH: 7 day turn around Collect ASAP and 14-30 days after acute Look for seroconversion‡ or significant rise in measles IgG antibody‡

‡ Not explained by MMR vaccination during the previous 6–45 days

Measles Control Measures

Control Measure	Indication
MMR Vaccine (PEP)	▪ Eligible contacts-Administer within 72 hours of initial exposure ▪ Monitor for signs/ symptoms for at least 1 incubation period ▪ Except for healthcare-persons may return to work if vaccinated within 72 hours of initial exposure
Immune globulin (PEP)	▪ Contacts ineligible for vaccine-Administer within 6 days of exposure ▪ Monitor for signs/ symptoms for at least 1 incubation period
Isolation	▪ Case patients should be isolated for 4 days post rash onset (day 0) Healthcare setting-use airborne precautions
Quarantine	▪ Exposed unvaccinated, non-immune persons should be excluded from affected facility until 21 days after rash onset in last case

Mumps

Acute viral illness

Prodrome

- Myalgia, malaise, low-grade fever, anorexia, headache

Manifestations

- Up to 20%: Asymptomatic
- 30-40%: Parotitis
- 40-50%: Non-specific, respiratory

Complications

- Aseptic meningitis (50-60%)
- Symptomatic meningitis (up to 15%)
- Orchitis (up to 50% post pubertal males)
- 1 death per year (1980 – 1999)

Mumps Lab Testing

Test	Specimen	Comments
PCR	Fluid-parotid duct swab, salivary gland, CSF, throat	SLPH: 1-3 days; Collect within 3 days of parotitis/meningitis onset Refer to SLPH Guide for details
Mumps virus culture	Fluid-parotid duct swab, salivary gland, CSF, throat	SLPH: 3 weeks; Confirmed by IF, PCR Refer to SLPH Guide for details
IgM capture serology	Serology	Available at most commercial labs Unvaccinated: Collect after 3 days from onset Vaccinated: IgM response may be transient or absent
IgG serology	Acute/convalescent sera	SLPH: Paired sera- conversion from (-) to (+) Unvaccinated: rapid long lasting rise Vaccinated: elevated result in acute sera may prevent detection of 4 fold titer rise

Mumps Control Measures

Control Measure	Indication
MMR Vaccine	Not indicated for PEP Vaccinate those without evidence of immunity
Immune globulin (IG)	Not indicated for PEP
Isolation	Case-patient: isolate/ exclude for 5 days after parotitis onset Healthcare setting: use droplet and standard precautions
Quarantine	Exposed non-immune contacts- *Healthcare setting*: exclude from 12th day after 1st unprotected exposure through 25th day after last exposure *School setting*: exclude until 26th day after onset in last case

Rubella

- Prodrome
  - Low-grade fever
  - Malaise
  - Lymphadenopathy
  - Upper respiratory symptoms
- Maculopapular Rash
  - Begins on face
  - Progresses from head to foot
  - Can be itchy
- Other symptoms
  - Arthralgia & arthritis in adults
- Complications
  - Not common
  - Mostly seen in adults

Photo: CDC Public Health Image Library

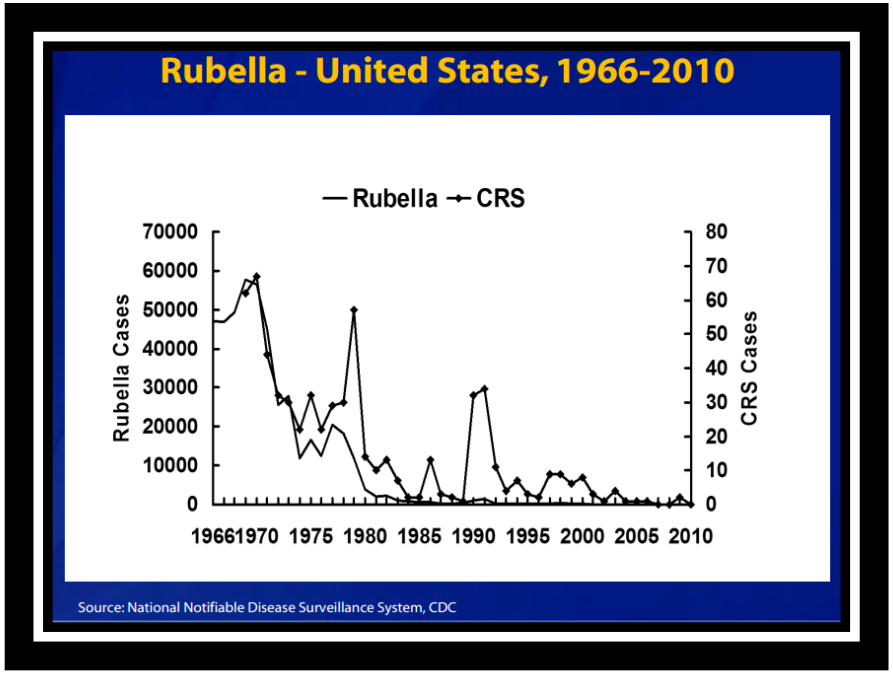
Congenital Rubella Syndrome

Infection early in pregnancy is most severe

- Up to 85% infected in 1st trimester will be affected
- Defects rare after 20th week of gestation

Various congenital defects

- Deafness, eye defects
- Cardiac, neurological abnormalities



Prevention of CRS is main objective of the rubella vaccination program

Rubella Testing

Test	Specimen	Comments
Rubella virus detection-PCR	Nasal, throat, urine, blood, CSF	CDC VPD Reference Lab /SLPH-2 days; Best results from throat swabs; maximum viral shedding up to day 4 after rash onset
IgM capture EIA	Serology	SLPH-2 days; May not be detectable before day 5 after rash onset; false + likely due to low incidence
IgG	Paired sera	SLPH-2 days; Acute: within 7-10 days of illness onset Convalescent: 2-3 weeks after acute

Rubella Control Measures

Control Measure	Indication
MMR vaccine	Not recommended; may give to non-immune contacts but post exposure vaccination has not been shown to prevent rubella
IG	Not recommended
Isolation	Cases should be isolated for 7 days after rash onset.
Quarantine	*Healthcare setting*: Exclude non-immune for 7 days after exposure and continuing through either 23 days after last exposure or 7 days after rash appears. Exclude exposed healthcare personnel who are vaccinated as part of control measures from direct patient care for 23 days after the last exposure to rubella. *School setting*: Exclude until 23 days after the onset of rash of the last reported case-patient in the outbreak setting.

Disease Facts Summary – Measles, Mumps, Rubella

	Measles	Mumps	Rubella
Transmission	Airborne	Respiratory droplets	Respiratory droplets
Incubation Period	14 days Range: 7-21 days	16-18 days Range: 12-25 days	17 days Range: 12-23 days
Infectious Period	4 days before to 4 days after rash onset	2 days before to 5 days after parotitis onset	7 days before to 7 days after rash onset
Communicability	Highly contagious	Moderately contagious	Moderately contagious
Exposure	Sharing same airspace (up to 2 hours after case present)	Contact within 3 feet	Any direct contact

MMR Vaccine

- Live, attenuated vaccine
- 2 dose series
  - 12-15 months
  - 4-6 years
- Effectiveness
  - Measles 95-99%
  - Mumps 81-91%
  - Rubella 94-100%
- Lifelong immunity

Photo: Immunization Action Coalition

Vaccine Preventable Diseases

POLIO

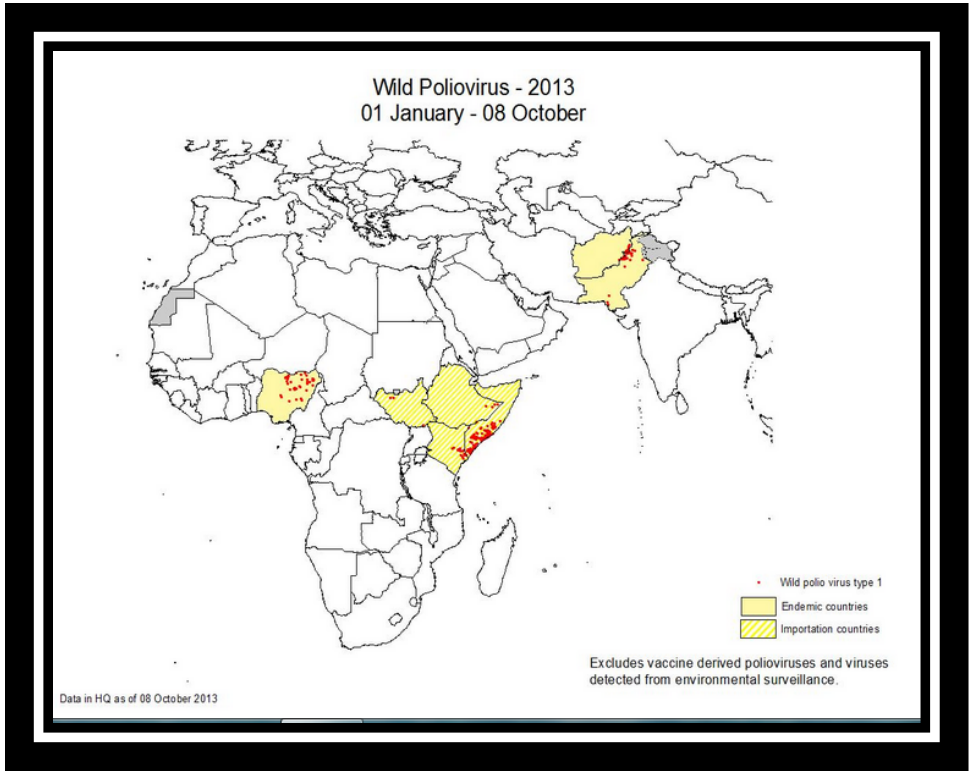
Polio

1979-last U.S. case

In U.S.-4 dose IPV immunization schedule

Endemic in Pakistan, Afghanistan, Nigeria

Potential for importation remains



Polio Testing

Test	Specimen	Comments
Culture	Stool, pharyngeal swab, CSF	SLPH- 3 weeks turnaround; at least 2 stool specimens obtained 24 hours apart within 14 days after onset
Intratypic differentiation	Isolate from culture	CDC Reference Lab
Serology	Paired sera	3 weeks apart

Vaccine Preventable Diseases

DIPHTHERIA AND TETANUS

Diphtheria

Respiratory disease

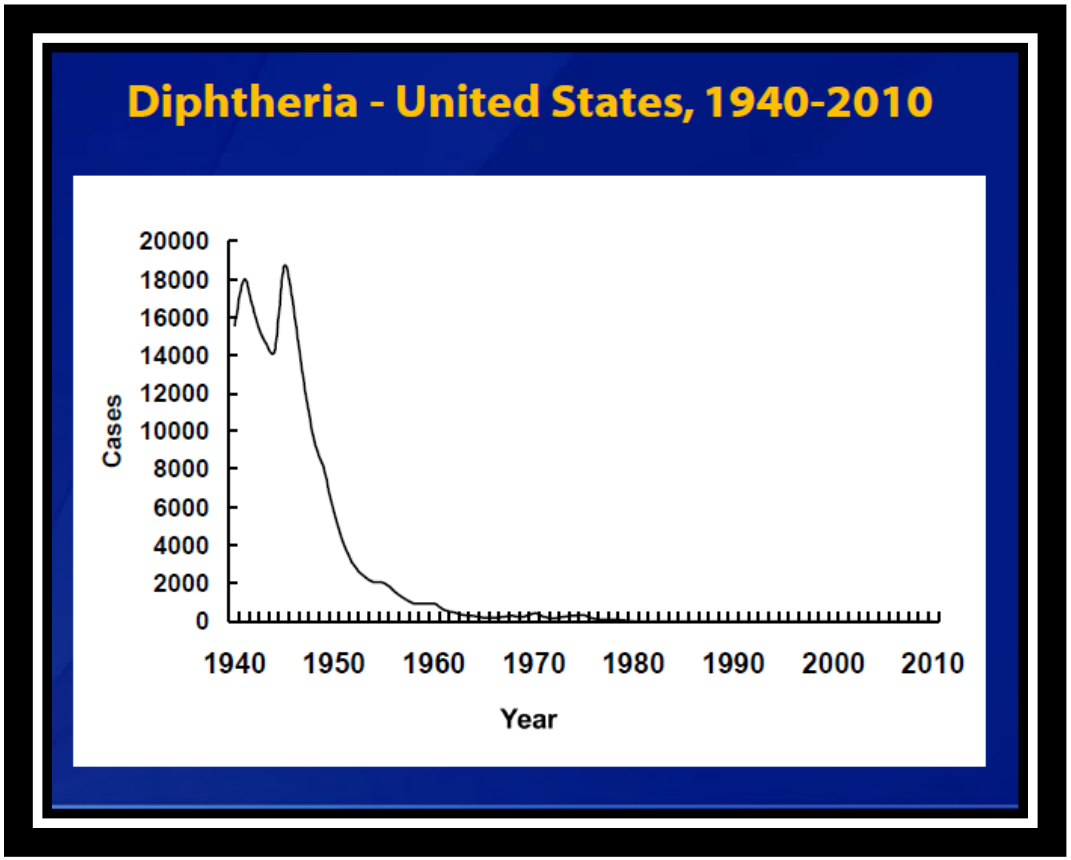
- Sore throat, malaise, low grade fever
- Pseudomembrane over tonsils, pharynx, larynx
- Inflammation of cervical lymph nodes Soft tissue swelling

Complications

- Most attributable to toxin
- Myocarditis, neuritis
- Extent of local disease determines severity
- Death in 5%-10%

Diphtheria Epidemiology

- Less than 5 U.S. cases in past 10 years
- Ongoing circulation of toxigenic *C. diphtheriae*
- Human carriers-reservoir; usually asymptomatic



Diphtheria Testing

Test	Specimen	Comments
Culture	Nose, throat, membrane swab	Call CD Branch/ SLPH prior to sending; special media required containing tellurite; send 2 swabs Thrush, other diseases can mimic signs of diphtheria; perform routine culture initially
Toxigenicity testing	Isolate from culture	CDC VPD lab via SLPH
PCR	Nose, throat, membrane swab	CDC VPD lab via SLPH

Treatment and Control Measures

- Diphtheria Antitoxin (DAT) – Investigational New Drug (IND) protocol *PLUS*
- Parenteral antibiotics until patient can swallow
- Age-appropriate vaccination (DTaP, Tdap)
- Contact investigation- test, treat, vaccinate, monitor

Photo courtesy Doreen Stangel, State of Alaska Immunization Program

Alaskan Iditarod

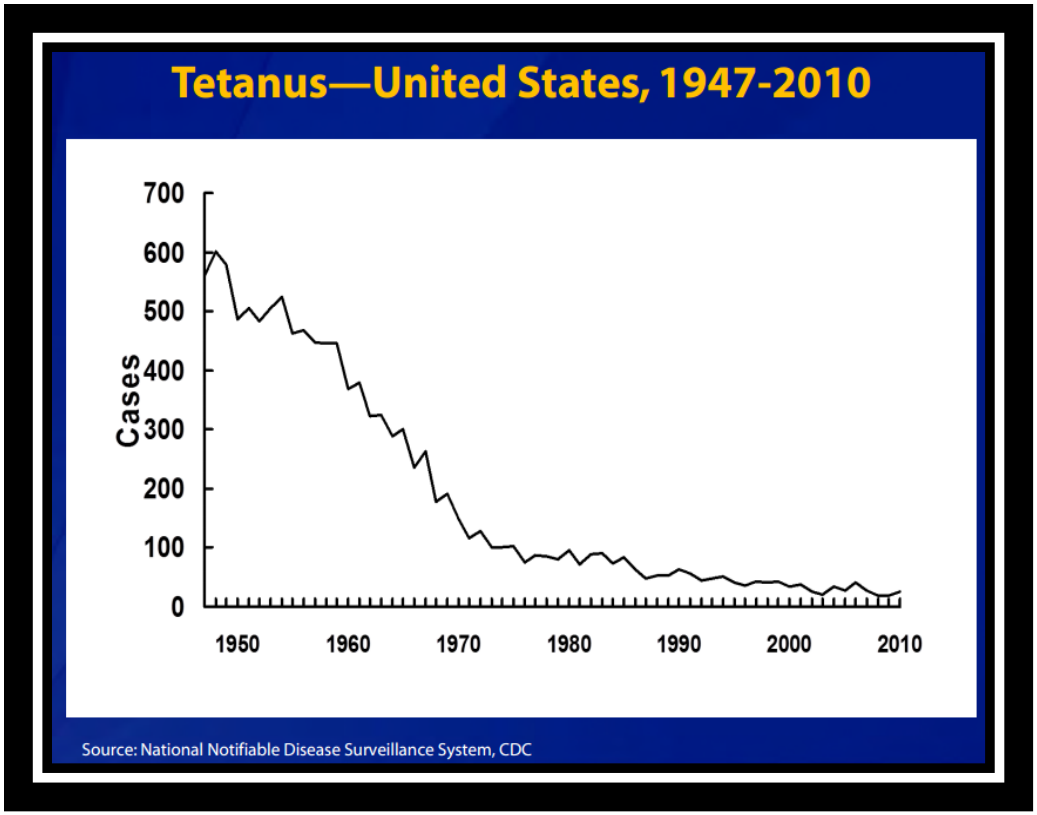
Tetanus

Generalized tetanus:

- trismus (lockjaw), difficulty swallowing, muscle rigidity, spasms

Spasms continue for 3-4 weeks

Complete recovery may take months



Tetanus Testing and Treatment

- Diagnosis is clinical; no confirmatory lab tests
- Immediate treatment with tetanus toxoid and tetanus immune globulin (TIG) may decrease disease severity
- Requires hospitalization, emergency care

VPD Testing Approval

Except for pertussis, all suspect or probable cases of vaccine preventable diseases must be reported to the Communicable Disease Branch at (919) 733-3419 for prior approval of laboratory testing.

Key VPD Data for NC EDSS

Package	Vaccine Preventable Disease Data Elements
Administrative	Initial source and date of report to public health, county of residence, investigation trail
Clinical	Symptom onset date, all case definition symptom data, treatment, hospitalization, outcome
Lab	Specimen date, type, result, ordering provider, facility
Risk History	Exposure information, travel history, knowledge of other symptomatic contacts, epidemiological links
Vaccination	Shot history dates, reason for refusal

CDC Resources

CDC Pink Book – http://www.cdc.gov/vaccines/pubs/pinkbook/index.html

CDC VPD Surveillance Manual - http://www.cdc.gov/vaccines/pubs/surv-manual/index.html

ACIP Recommendations - http://www.cdc.gov/vaccines/hcp/acip-recs/index.html

CDC References

- CDC Yellow Book- http://wwwnc.cdc.gov/travel/page/yellowbook-home-2014

- CDC Varicella Outbreak Manual- http://www.cdc.gov/chickenpox/outbreaks/control-investigation.html

NC Resources

- Case definitions – http://epi.publichealth.nc.gov/cd/lhds/manuals/cd/case_defs.html
- NC SCOPE Guide to Services - http://slph.state.nc.us/doc/administration/SCOPE-2013.pdf
- NC SCOPE Index to Services - http://slph.state.nc.us/doc/administration/SCOPE-2013-Index.pdf