

# Tweens, Teens and Young Adults: Vaccines for a Healthy Future

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# Financial Disclosures

- Dr. Miran Song, faculty for this CE activity, has no relevant financial relationship(s) with ineligible companies to disclose.
- None of the planners for this activity have relevant financial relationships to disclose with ineligible companies.
- The Arizona Alliance for Community Health Centers is accredited by the Arizona Medical Association to provide medical education for physicians.
- The Arizona Alliance for Community Health Centers designated the 2026 Arizona Immunization Conference educational activity for a maximum of 11 hours AMA PRA Category 1 Credits Physicians should only claim credit commensurate with the extent of their participation in the activity.
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I have no disclosures to  
make.

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# Objectives:

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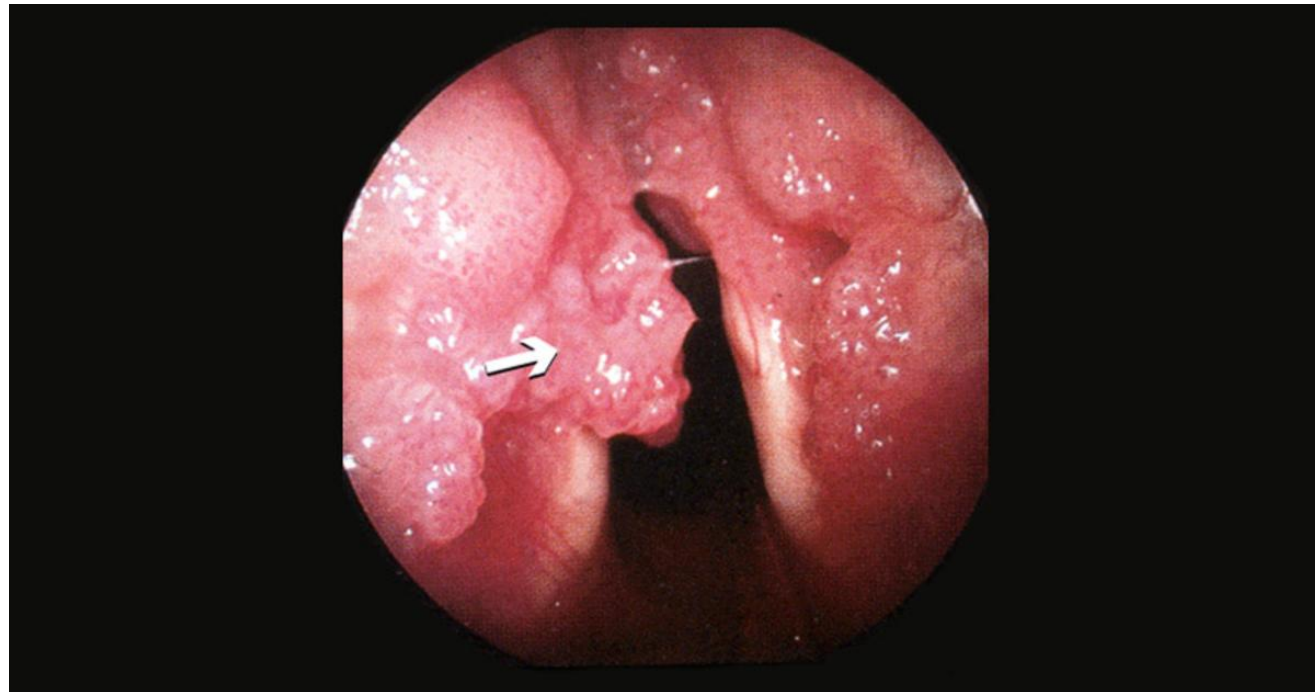
- How to recognize vaccine preventable diseases that affect children 9-year-olds and up.
- Treatment and prognosis of vaccine preventable diseases
- Review the recommended vaccines for children in this age group
- How to decrease vaccine hesitancy

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- [https://www.instagram.com/reel/DUaC\\_iEgQ4G/](https://www.instagram.com/reel/DUaC_iEgQ4G/)

# Human Papillomavirus (HPV)

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- Double stranded DNA virus
- Lesions in trachea to lungs



# Recurrent Respiratory Papillomatosis

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- Most common benign neoplasm of larynx in children
- 2<sup>nd</sup> most common cause of chronic hoarseness
- Typically diagnosed between 2-4 years of age with delay in diagnosis 1 year after symptoms onset
- Juvenile Form – diffuse, aggressive, resistant to treatment
- Presents with hoarseness, stridor, cough, dysphagia
- 15,000 new cases diagnosed/yr in US
- 15,000 surgical procedures at a cost of \$100 million/yr

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- >90% caused by HPV low risk types 6 and 11
  - High risk types 16, 18, 31, and 33 can be associated with RRP especially in more aggressive cases or those that undergo malignant transformation

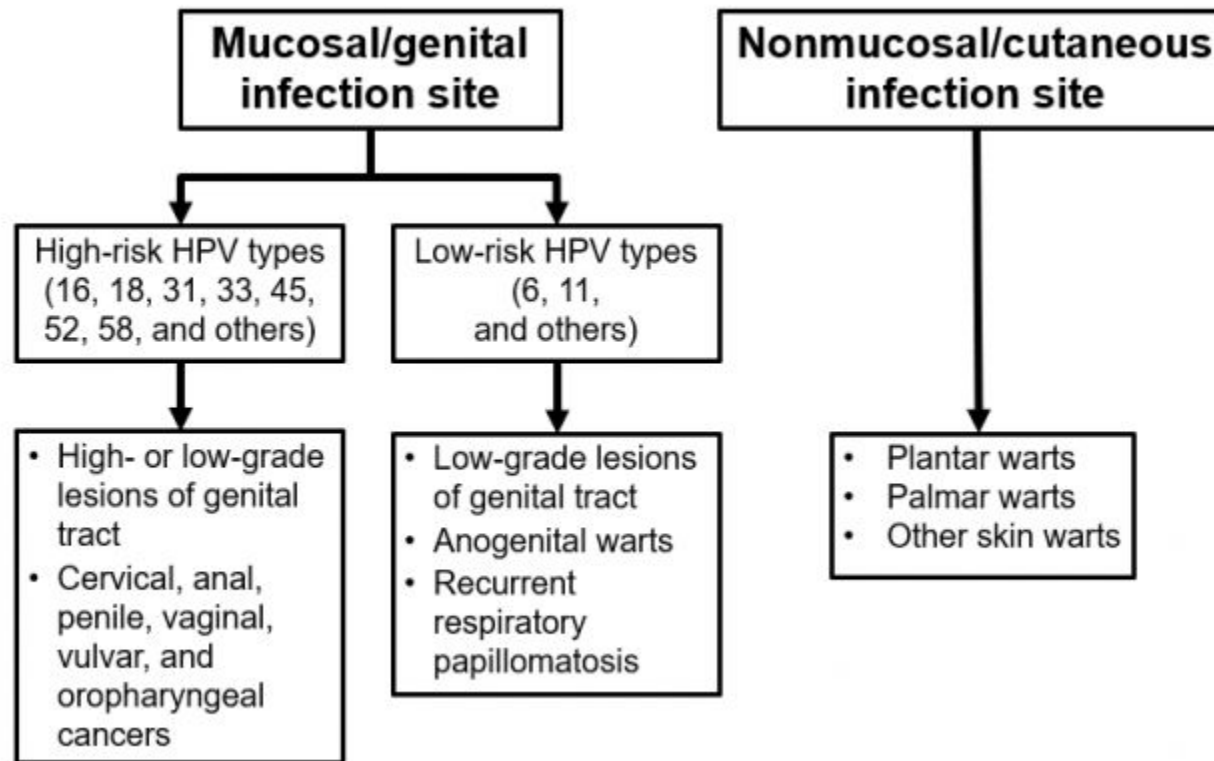
# Treatment

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- Laser
- Microdebrider
- Cryoablation
- Antiviral medication (injected into lesion, acyclovir – less effective, mab – limits tumor growth)
- Immunotherapy (injection, Adults only, ~\$460,000, 42% did not need surgery 24 months out)

# Types of HPV

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# HPV cause $>90\%$ cervical CA, anal CA



# Prevention: Human Papillomavirus 9-valent Vaccine - Females

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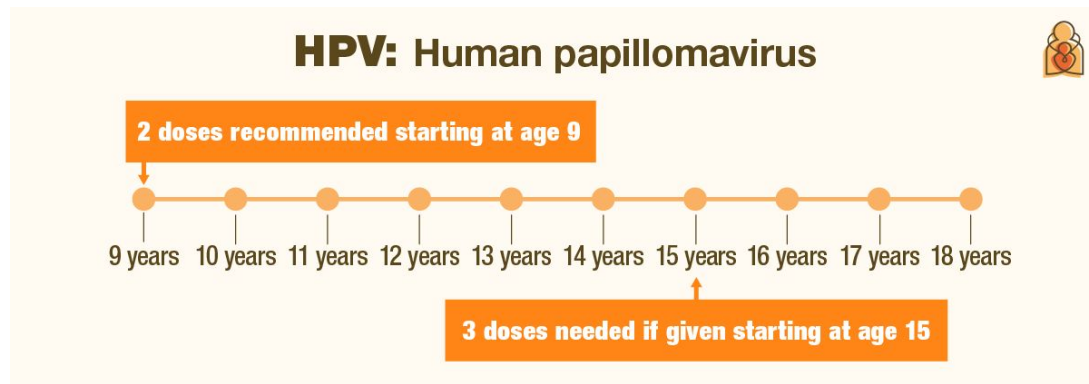
- 9 through 45 years of age for the prevention of :
- cervical, vulvar, vaginal, anal, oropharyngeal and other head and neck **cancers** caused by HPV Types 16, 18, 31, 33, 45, 52, and 58.
- cervical, vulvar, vaginal, and anal **precancerous or dysplastic** lesions caused by HPV Types 6, 11, 16, 18, 31, 33, 45, 52, and 58.
- **genital warts** caused by HPV Types 6 and 11.

# Human Papillomavirus 9-valent Vaccine: Males

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- 9 through 45 years of age for the prevention of:
- anal, oropharyngeal and other head and neck **cancers** caused by HPV Types 16, 18, 31, 33, 45, 52, and 58.
- anal **precancerous or dysplastic** lesions caused by HPV Types 6, 11, 16, 18, 31, 33, 45, 52, and 58.
- **genital warts** caused by HPV Types 6 and 11.

# Prevention: HPV Vaccine



- Age 9–14 years at initial vaccination: **2**-dose series at 0, 6–12 months (minimum interval: 5 months; repeat dose if administered too soon)
- Age 15 years or older at initial vaccination: **3**-dose series at 0, 1–2 months, 6 months (minimum intervals: dose 1 to dose 2 = 4 weeks; dose 2 to dose 3 = 12 weeks; dose 1 to dose 3 = 5 months; repeat dose if administered too soon)

# HPV Vaccine Effectiveness(VE)

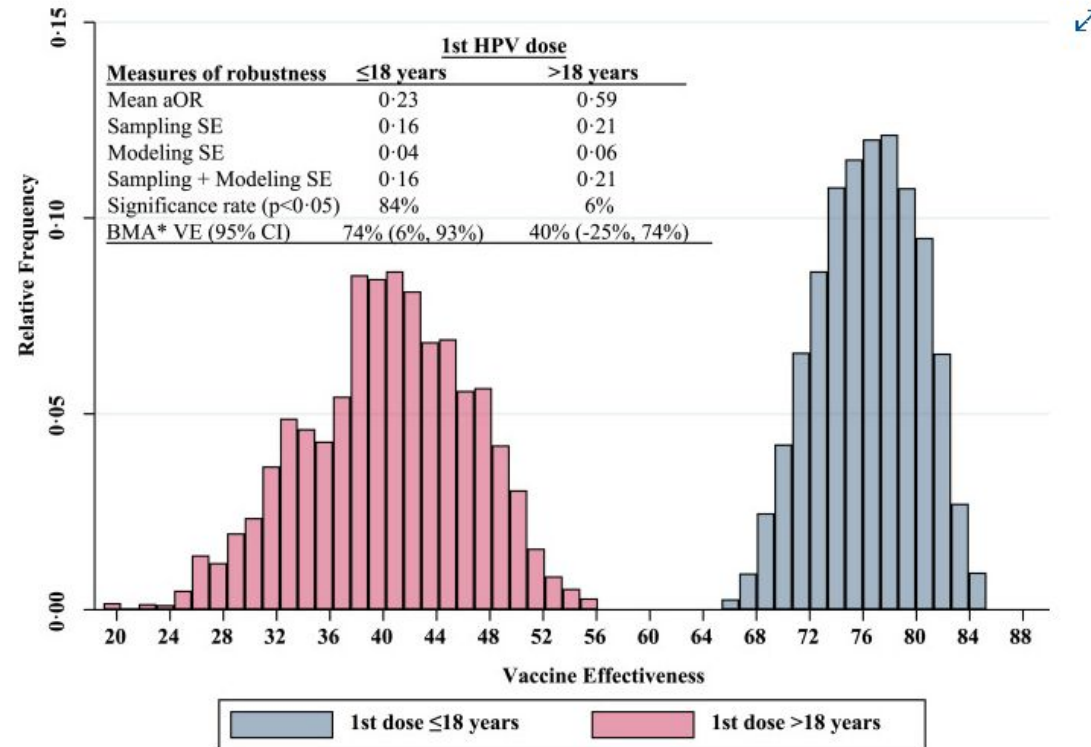
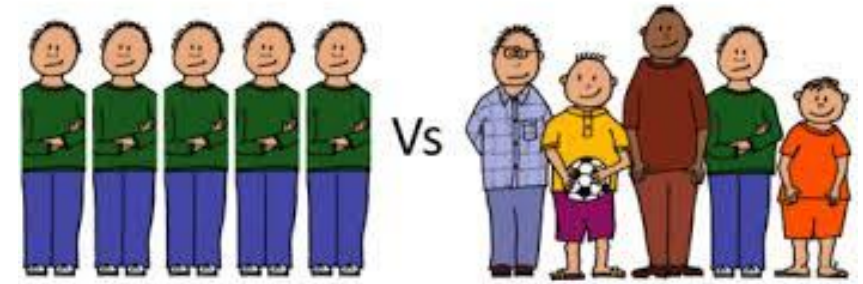


Figure viewer

Fig. 3 Modeling distribution of vaccine effectiveness by age of immunization, N = 8192 models. aOR = adjusted odds ratio; VE = vaccine effectiveness; SE = standard error; Significance rate = the percentage of models that report a statistically significant VE. \*BMA = Bayesian model averaging. Only includes models that had a Posterior Model Probability  $\geq 0.01$ . Relative Frequency refers to the proportion of models that support a specific VE estimate within the ensemble of models considered.

# Vaccine Efficacy



## Vaccine Efficacy (Clinical Trials)

- **Setting:** Controlled environment (e.g., Phase 3 clinical trials).
- **Population:** Strict, often randomized, and controlled groups.
- **Purpose:** Determines if a vaccine *can* work.
- **Measurement:** Percentage reduction in disease among vaccinated individuals

If a vaccine has an efficacy of 80 percent:



It does not mean that the vaccine will only work 80% of the time.

It does mean that in a vaccinated population, 80% fewer people will contract the disease when they come in contact with the virus.



# Vaccine Effectiveness (V



## Vaccine Effectiveness (Real World)

- **Setting:** Real-world scenarios (e.g., general population, public health settings).
- **Population:** Broad, diverse, includes different ages and health conditions.
- **Purpose:** Determines how well a vaccine *does* work in practice.
- **Factors Influencing:** Vaccine storage, delivery, population health, and behavior.

In essence, **efficacy** indicates the maximum potential performance in an ideal setting, while **effectiveness** shows the actual, practical performance in the real world.

# Herd Immunity vs Herd Effect

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- “herd immunity” : threshold of immunity in the population that provides complete protection against sustained transmission
- “herd effects” have been used to refer to the indirect effects of vaccination without a complete cessation of transmission.
  - For example, HPV vaccination with 20% coverage can achieve some degree of herd effects (e.g., reductions in HPV prevalence in unvaccinated persons),<sup>4</sup> although this level of vaccination coverage is not enough to achieve full herd immunity in which there is no sustained transmission in the population.



# Because you never know what kids will do...

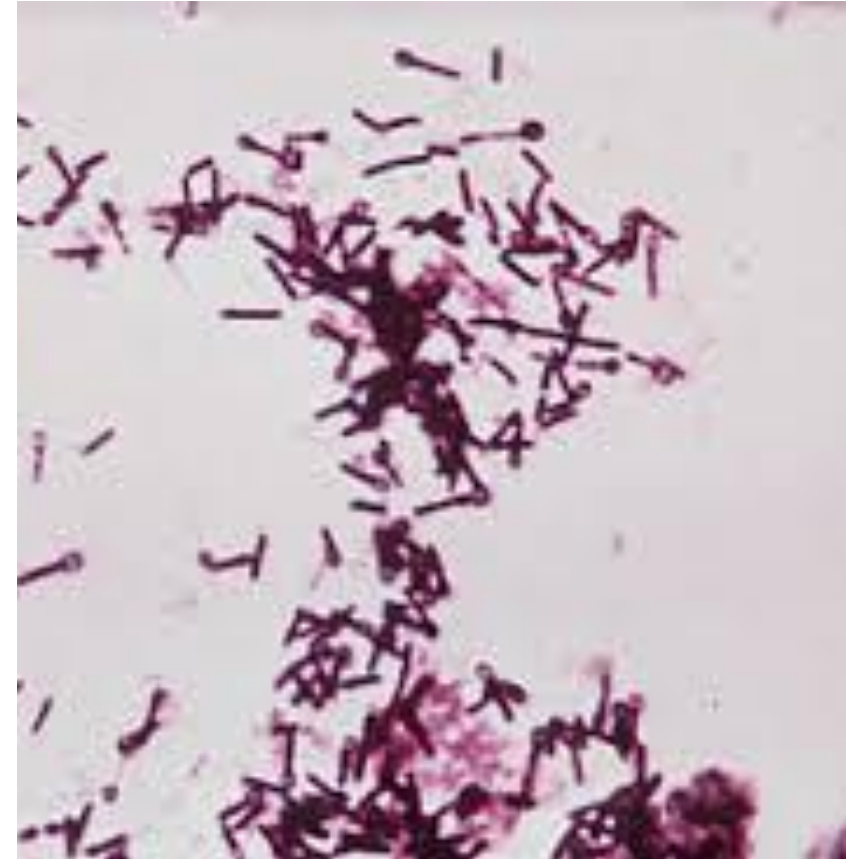
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# Tetanus

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- Caused by exotoxin produced by bacterium *Clostridium tetani*
- Forms spores that are found in soil and intestines and feces of some animals. Spores geminate into bacteria once in the wound.
- Toxin blocks inhibitory neurotransmitters. Unchecked excitatory neurotransmitters cause muscle spasms.
- Rusty nails? Found outside, can be “dirty” and are pointy
- 4 Types
  - Generalized
  - Localized
  - Cephalic
  - Neonatal



# Generalized Tetanus: Symptom progression

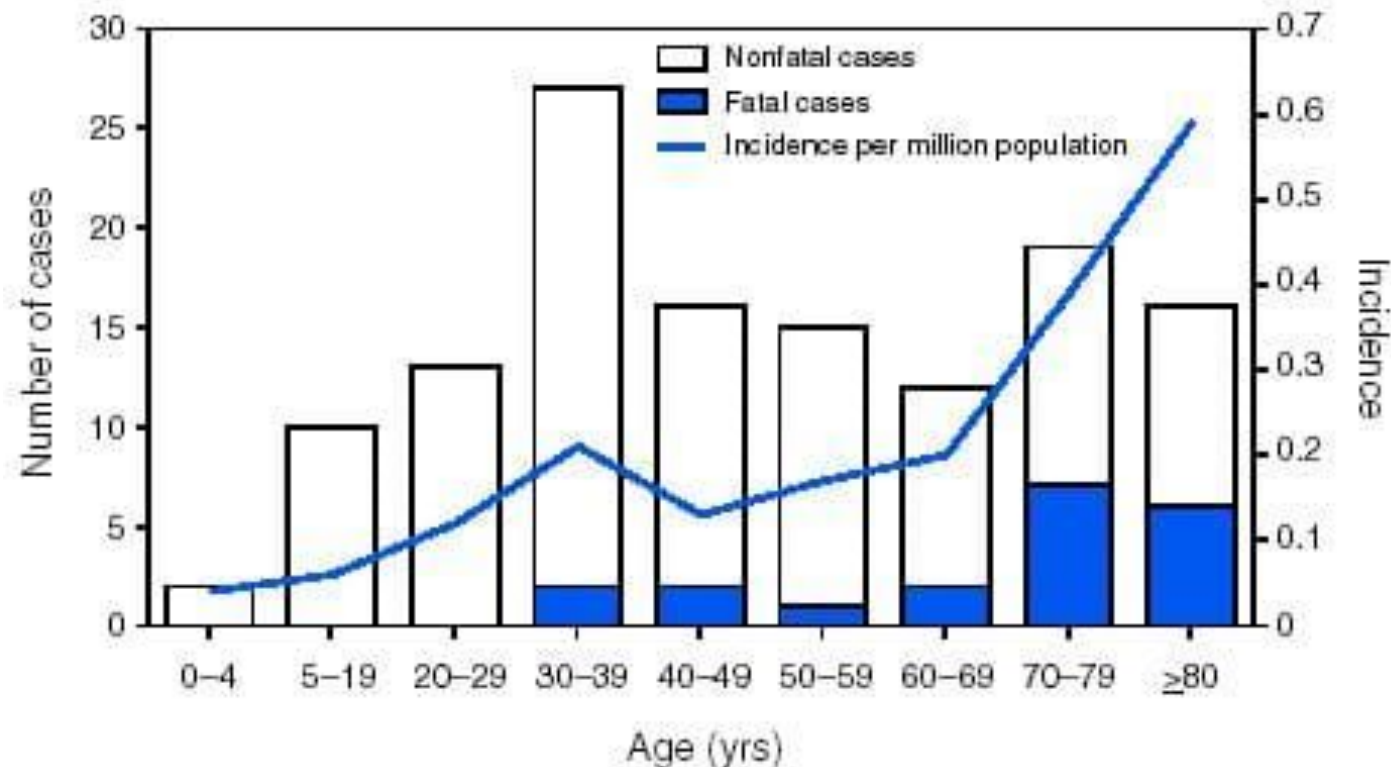
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- Spasms and stiffness in the jaw muscles - Trismus(lock jaw), risus sardonicus
- Stiffness of the neck muscles
- Difficulty in swallowing
- Stiffness of abdominal muscles
- Painful body spasms lasting for several minutes which are typically triggered by minor occurrences, such as a draft, loud noise, physical touch or light.
- Autonomic dysfunction or hypersympathetic activity
  - Fever
  - Sweating
  - Elevated blood pressure
  - Rapid heart rate



# Prognosis

- Mortality in the United States is 7% for individuals who had previously received at least 1 dose of tetanus vaccine versus 31% of those who were unvaccinated.



# Localized Tetanus- Rare

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- Confined to the area of injury
- Usually in partially immune people
- Can progress into the generalized form of the disease
- Localized tetanus resulting from injury to the face or scalp can evolve into cephalic tetanus involving the cranial nerve musculature



over dorsum of hand with flexion of fingers



on after treatment with tetanus immunoglobulin

# Cephalic Tetanus – Rarest form

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- Restricted to the cranial nerves
- Highly associated with facial injuries
- Can occur with infections (such as otitis media) or dental work in the head and neck region.
- Left facial paralysis
- Right facial spasm

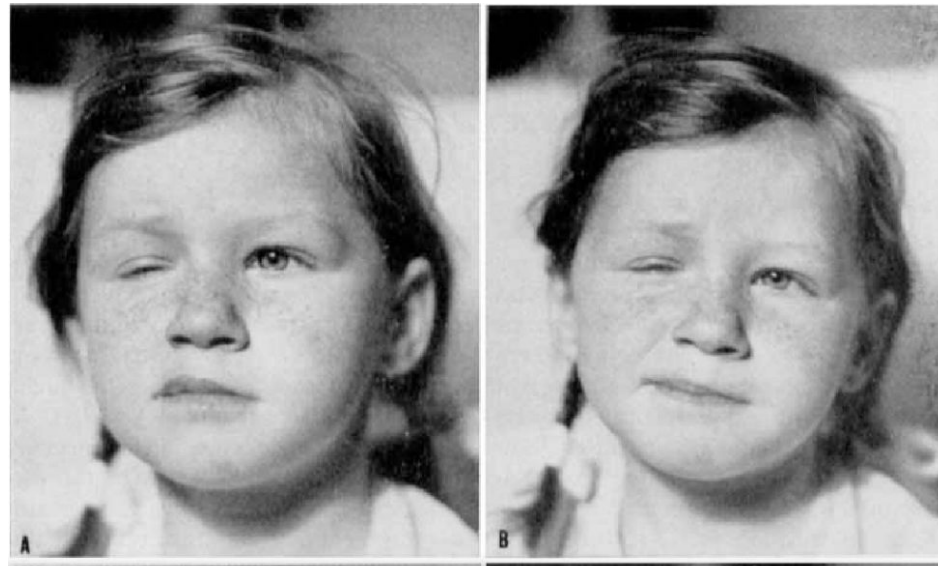


FIG. 1. Significant neurologic findings noted upon hospital admission: A, left facial paralysis. B, right facial spasm. C, trismus. D, left abducens paralysis.

# Neonatal Tetanus

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- Affects infants under 28 days old.
- Primarily contracted by babies born to mothers who were either unvaccinated or under vaccinated.
- Risk factors - nonsterile instruments used to cut the umbilical cord, dirty materials cover the stump, or when delivery occurs in unsanitary conditions.
- Affected infants may exhibit stiffness and muscle spasms, hindering their ability to suckle or cry
- Case-fatality rate of untreated neonatal tetanus is close to 100%



# Treatment

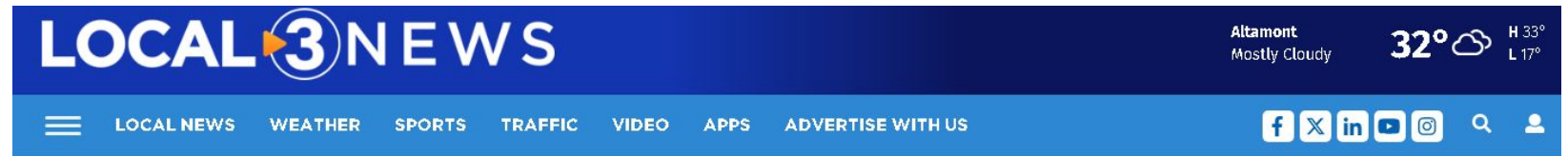
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- Halt toxin production
  - Debride wound
  - Antibiotic – Metronidazole, PCN- G
- Neutralization of unbound toxin
  - IM Human Tetanus Immunoglobulin
- Control muscle spasms
  - Benzodiazepine
    - Paralyzing agent – Vecuronium
- Limit sensory stimuli – triggers spasms
  - Ear plugs, eye mask, limit visitors, etc...
- Manage autonomic dysfunction
  - Magnesium sulfate, Beta blocker
- Vaccinate when stabilized – No immunity!!

2017

Parents chose not to vaccinate. 6yr old cut his head while on the family farm. Wound was cleaned and sutured at home. 6 days later presented with symptoms of tetanus

- Ventilated x 44 days
- Hospitalized x 57 days
- Rehab x 17 days
- Received 1 tetanus vaccine while hospitalized.
- Parents declined further vaccines



## Unvaccinated boy nearly died from tetanus; cost of care was almost \$1 million

Mar 9, 2019 Updated Mar 23, 2022



▶ LOCAL 3 WEATHER



# Good News, Bad News

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- In 1948, when the tetanus vaccine was first combined with diphtheria and pertussis, 601 cases of tetanus were reported in the U.S. In recent years, that has dropped to about 15 to 28 annual cases.
- In 2024, however, there were 32 cases. In 2025, there were at least 37 confirmed cases, the most in over a decade.
- Why? Drop in the vaccination rate combined with a rise in climate change-related natural disasters that can increase the risk by causing injuries and spreading bacteria(urban flooding).



# Prevention: Tdap vaccination - Tetanus, diphtheria, pertussis

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- Age 11–12 years: 1 dose Tdap
  - If had 5-dose series (3-dose primary series at age 2, 4, and 6 months, followed by booster doses at ages 15–18 months and 4–6 years).
- Pregnancy: 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27–36.
- Note: Tdap may be administered regardless of the interval since the last tetanus and diphtheria toxoid-containing vaccine(Td).

# Wound Management



- Persons age 7 years or older with history of 3 or more doses of tetanus toxoid-containing vaccine:
  - For clean and minor wounds, administer Tdap or Td if more than 10 years since last dose of tetanus toxoid-containing vaccine; for all other wounds, administer Tdap or Td if more than 5 years since last dose of tetanus toxoid-containing vaccine.
  - Tdap is preferred for persons age 11 years or older who have not previously received Tdap or whose Tdap history is unknown
    - Age 7–9 years who receive Tdap should receive the adolescent Tdap booster dose at age 11–12 years.
    - Age 10 years who receive Tdap do not need the adolescent Tdap booster dose at age 11–12 years



# Respiratory Diphtheria

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- Caused by toxin producing *Corynebacterium diphtheria*, gram positive rod that infects the respiratory tract or skin
- Person to person contact via direct contact or droplets.
  - Transmission via raw milk has been reported
- Complications
  - Myocarditis
  - Neuritis –paralysis of eyes, limbs, diaphragm
- Mortality without treatment 5-10% (Up to 20% in children < 5 yrs old)



# Respiratory Diphtheria

## Symptoms

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- Sore throat
- Difficulty breathing
- Low fever
- Husky voice
- Inspiratory stridor
- Enlarged lymph nodes in the neck(bull neck)
- Increased heart rate
- Runny nose



# Hallmark

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- Pseudomembrane is a thick, gray-green or blackish coating that forms over the throat, tonsils, or nasal mucosa
- Composed of necrotic host cells, fibrin, bacteria, and leukocytes.
- Tough membrane is strongly adherent and can cause severe airway obstruction, bleeding upon removal, and fatal suffocations if it extends into the trachea



# Treatment



- Halt toxin-mediated damage
  - Diphtheria Antitoxin (DAT) IV or IM.
  - Antibiotic Therapy: 14-day course of IV penicillin G or IM procaine penicillin G or oral/IV erythromycin.
- Airway Management
  - Close monitoring for respiratory obstruction; intubation or tracheostomy may be required.
- Isolation: Patients remain in strict isolation until two consecutive cultures (nose/throat), taken 24 hours apart after antibiotic completion, are negative



# A Vaccine Win

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- 100,000-200,000 cases and 13,000-15,000 deaths reported annually in 1920s before vaccine
- Cases gradually declined after vaccines introduced in 1940s; cases rapidly declined after **universal** vaccination program introduction in late 1940
- From 1996 to 2018, 14 cases and 1 death reported in the United States
  - 63-year-old male returning to the United States from a country with endemic diphtheria disease.



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- <https://youtu.be/S3oZrMGDMMw>
  - <https://youtu.be/S3oZrMGDMMw?t=18>

# Bordetella Pertussis: Whooping Cough

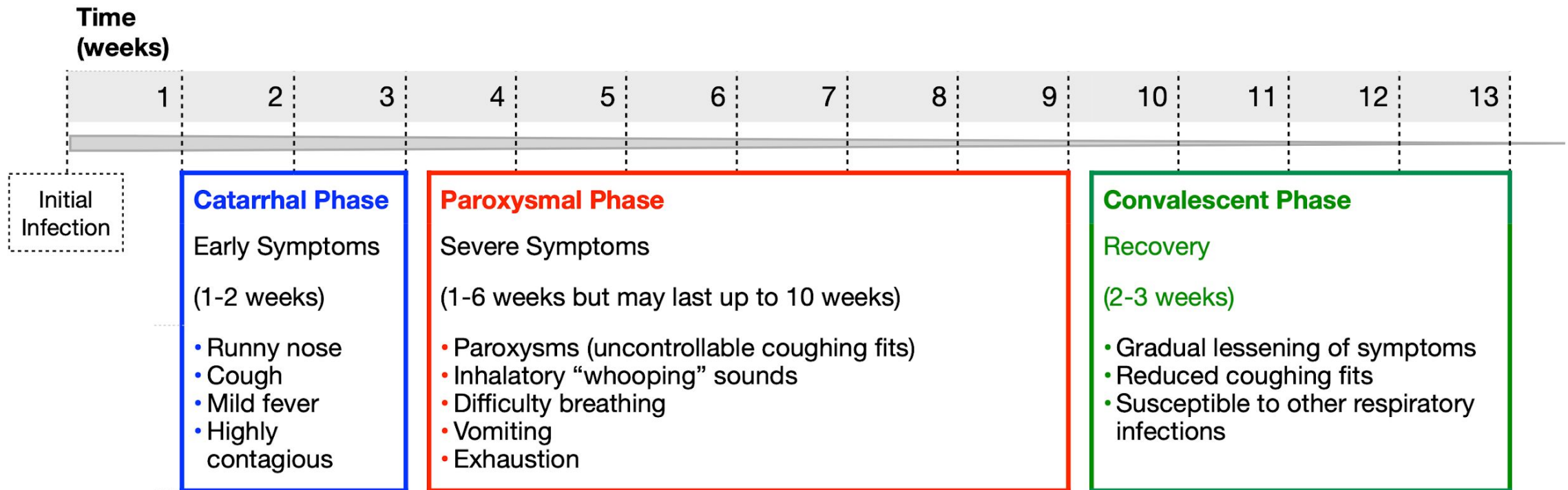
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- Gram negative coccoid or ovoid rod
- Transmission is usually person to person through respiratory droplets or contact with airborne droplets
- Highly contagious can infect 8 out of 10 unvaccinated people exposed to the bacteria



# Disease Symptom Progression



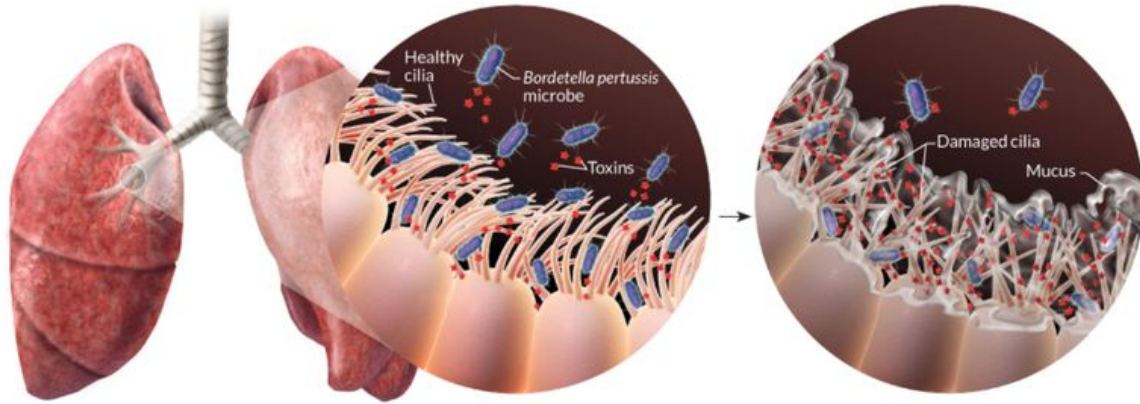
Recurrent apnea - major symptom in infants especially under 4 months

- up to 67% of infants who are hospitalized for pertussis suffer from apnea

Immunity but not for life

# “100 Day Cough”

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# Pertussis Treatmen t and Prophylaxi s

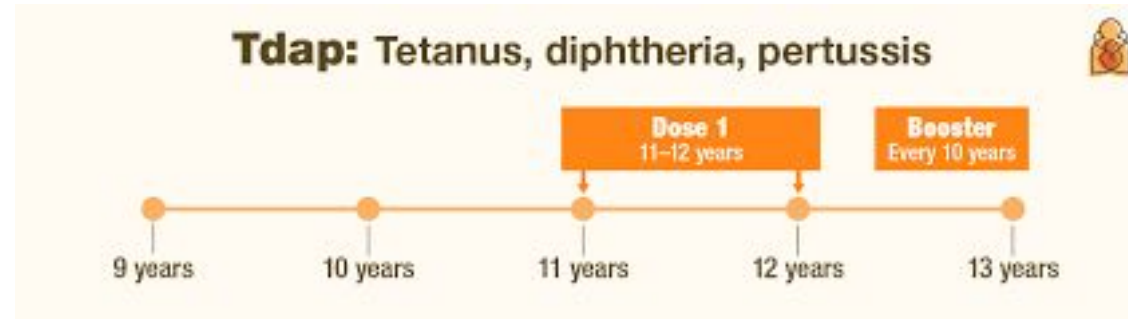
TABLE 4. Recommended antimicrobial treatment and postexposure prophylaxis for pertussis, by age group

Age group	Primary agents			Alternate agent*
	Azithromycin	Erythromycin	Clarithromycin	TMP-SMZ
<1 month	Recommended agent. 10 mg/kg per day in a single dose for 5 days (only limited safety data available.)	Not preferred. Erythromycin is associated with infantile hypertrophic pyloric stenosis. Use if azithromycin is unavailable; 40–50 mg/kg per day in 4 divided doses for 14 days	Not recommended (safety data unavailable)	Contraindicated for infants aged <2 months (risk for kernicterus)
1–5 months	10 mg/kg per day in a single dose for 5 days	40–50 mg/kg per day in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses for 7 days	Contraindicated at age <2 months. For infants aged ≥2 months, TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Infants (aged ≥6 months) and children	10 mg/kg in a single dose on day 1 then 5 mg/kg per day (maximum: 500 mg) on days 2–5	40–50 mg/kg per day (maximum: 2 g per day) in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses (maximum: 1 g per day) for 7 days	TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Adults	500 mg in a single dose on day 1 then 250 mg per day on days 2–5	2 g per day in 4 divided doses for 14 days	1 g per day in 2 divided doses for 7 days	TMP 320 mg per day, SMZ 1,600 mg per day in 2 divided doses for 14 days

\* Trimethoprim sulfamethoxazole (TMP–SMZ) can be used as an alternative agent to macrolides in patients aged ≥2 months who are allergic to macrolides, who cannot tolerate macrolides, or who are infected with a rare macrolide-resistant strain of *Bordetella pertussis*.

- Same regime
- Goal is to eradicate B pertussis from nasopharynx and stop transmission
- Treatment within first 1-2 weeks before paroxysmal cough occurs may lessen symptoms
- Treatment later in illness will not alter the course or prevent transmission

# Prevention: Tdap Vaccine



**Routine Booster:** A single dose of Tdap is recommended at age 11–12 years.

**Catch-up Vaccination:** Children aged 7–10 who are not fully immunized, or those 11 and older who missed the dose, should receive a Tdap booster.

**Types of Vaccine:** While children under 7 receive DTaP, children 7 years and older should receive Tdap.

**Pregnancy:** Pregnant women should receive Tdap during each pregnancy, preferably between 27 and 36 weeks gestation.

Tdap can be administered regardless of the interval since the last tetanus-diphtheria (Td) shot.

# Vaccine Efficacy

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## Children (DTaP)

- **Within one year** of the fifth dose, the vaccine is about **98%** effective.
- **Five years after** the fifth dose, the effectiveness drops to about **71%**.
- Studies have shown that the risk of contracting pertussis increases substantially as more time passes from the last DTaP dose.

## Adolescents and Adults (Tdap)

The Tdap vaccine, a booster with **reduced antigen content**, is recommended for adolescents and adults.

- **In the first year** after vaccination, the Tdap vaccine protects about **73%** of adolescents.
- **Four years after** the vaccination, protection falls to approximately **34%**.

# Herd Immunity

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- To achieve herd immunity for pertussis, 92-94% of the population needs to be vaccinated.
- The vaccination rate for kindergartners in 2024–2025 was 92.1%. Teens were at 91.3 %, putting the U.S. just under the lower threshold for herd immunity.
- In 2024 there were more than 35,000 cases of whooping cough in the U.S. In 2023 there were approximately 7,000.



# Neisseria Meningitidis

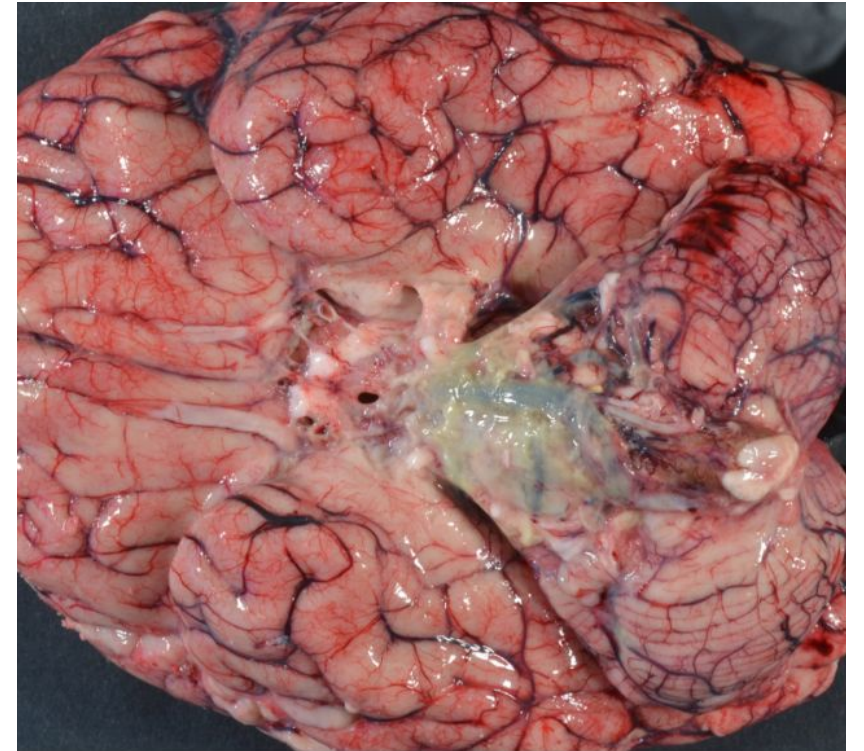


- Gram negative, encapsulated diplococcus bacteria
- Up to 10% of the general population carries the bacteria in their nose and throat without experiencing clinical symptoms.
  - Risk factors for meningococcal carriage include adolescence and young adulthood, male sex, living in a communal setting, exposure to cigarette smoke, and frequent attendance at social events
- Transmission occurs through respiratory droplets and requires sustained close contact with the infected person or direct contact with the throat or nasal secretions
- Serotypes A, B, C, W, X, and Y responsible for most infections (B,C, Y most common in US and Europe)

# Meningococcal Disease

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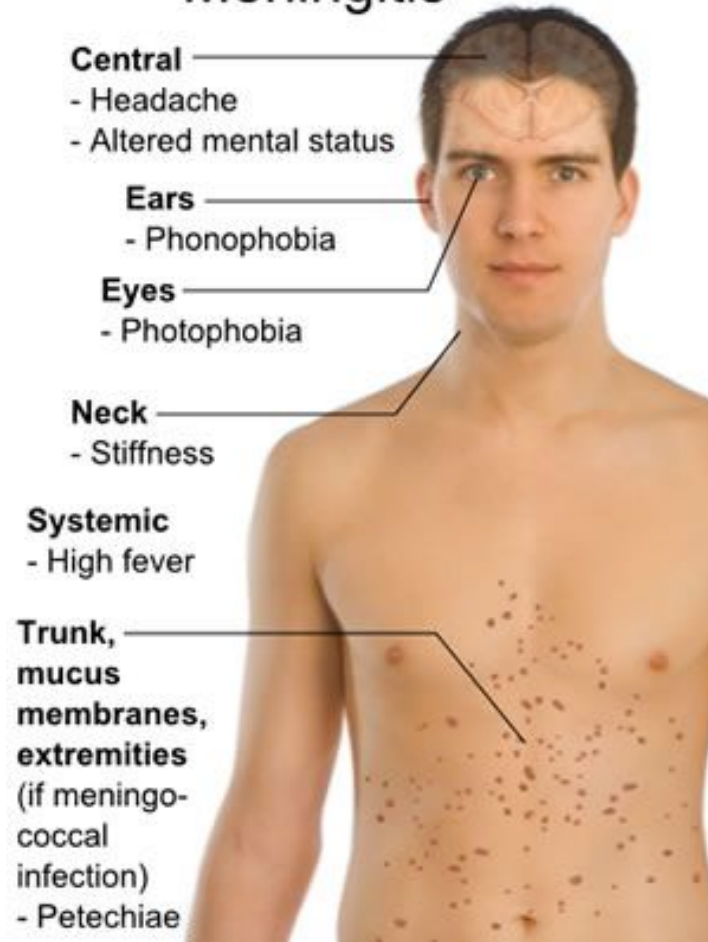
- Inflammation of the meninges
- Can cause meningococemia (bloodstream infection), pneumonia, septic arthritis, pericarditis, and urethritis.
- Nasopharyngeal colonization to bloodstream invasion (meningococemia) and potentially meningitis can occur in 12-24 hrs.
- Mortality rate varies from ~10% to 14% among patients who receive treatment and can reach up to 50% among patients who do not receive treatment



bacterial meningitis demonstrating purulent exudate along the basilar meninges. (Image courtesy of Chambers/University of Washington).

# Symptoms

## Symptoms of Meningitis



Infants may also display:

- Poor feeding
- High pitched cry
- Inconsolable
- Bulging fontanelle



# Long Term Sequelae

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- Even with treatment, long-term complications can still occur in 11% to 19% of survivors
- Chronic pain, skin scarring, limb amputation, and neurological impairments, ranging from hearing loss and visual impairments to impaired motor function.
- Up to 1/3 of survivors of meningococcal disease experience psychological disorders, such as PTSD, anxiety, and depression
- Other complications may include prolonged ventilator support, tracheostomy care, feeding tube care, prolonged physical and occupational rehabilitation, critical illness polyneuropathy and myopathy, and secondary infections and skin ulceration.

# Prophylaxis

## Chemoprophylaxis regimens for protection against meningococcal disease after an exposure<sup>1-4)</sup>

Drug	Age group	Dose	Duration and route of administration	Comments
<b>Preferred regimens</b>				
Rifampin	Infants age <1 month	5 mg/kg/ <b>dose</b> every 12 hours	2 days (4 doses) of oral therapy	<ul style="list-style-type: none"> <li>Rifampin is associated with significant drug interactions (eg, oral contraceptives, certain anticoagulants).*</li> </ul>
	Infants and children age ≥1 month	10 mg/kg/ <b>dose</b> (maximum: 600 mg) every 12 hours	2 days (4 doses) of oral therapy	
	Adults <sup>¶</sup>	600 mg every 12 hours	2 days (4 doses) of oral therapy	
Ciprofloxacin	Infants and children age ≥1 month	20 mg/kg (maximum 500 mg) <sup>Δ</sup>	Single oral dose	<ul style="list-style-type: none"> <li>In the United States, the CDC states that an alternative agent should be used if 2 or more ciprofloxacin-resistant meningococcal disease cases that account for ≥20% of all cases are reported in a local catchment area during a 12-month period.</li> <li>Ciprofloxacin should be avoided during pregnancy.</li> </ul>
	Adults	500 mg	Single oral dose	
Ceftriaxone	Children age <15 years	125 mg	Single IM dose	<ul style="list-style-type: none"> <li>Preferred agent in pregnancy.</li> </ul>
	Adults and adolescents age ≥15 years	250 mg	Single IM dose	
<b>Alternative regimen</b> (eg, if rifampin or ceftriaxone cannot be used in the setting of ciprofloxacin-resistant <i>Neisseria meningitidis</i> exposure)				
Azithromycin	Infants and children	10 mg/kg (maximum 500 mg)	Single oral dose	<ul style="list-style-type: none"> <li>Although azithromycin has activity against meningococcus, it has not been well studied for this indication.</li> </ul>
	Adults	500 mg	Single oral dose	

CDC: Center for Disease Control and Prevention; IM: intramuscular.

\* For additional information on drug interactions, refer to the [drug interaction program](#) within UpToDate.

<sup>¶</sup> The decision to use rifampin during pregnancy must be determined on a case-by-case basis. CDC guidelines state that rifampin should be avoided for chemoprophylaxis in pregnancy. The drug is teratogenic in laboratory animals, and there have been rare reports of postnatal hemorrhages in the infant and mother when administered during the last few weeks of pregnancy. However, rifampin is routinely used for treatment of other infections during pregnancy (eg, tuberculosis).

<sup>Δ</sup> Although systemic fluoroquinolones are not routinely used as a first-line agent in children less than 18 years of age, it is reasonable to use a

# Prophylaxis

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- Close contact with patients infected may become infected and develop symptoms within 14 days of exposure.
- Close contact refers to the proximity to the patient for more than 4 hours within the past 7 days.
  - family members, roommates, military recruits, and individuals in daycare centers. Individuals exposed to infected patients' oral secretions (through kissing), respiratory secretions (during intubation or endotracheal suctioning), or who had prolonged proximity to an infected person on a long flight are also at risk.
- Antimicrobial chemoprophylaxis of exposed contacts should be initiated as soon as possible. Due to its high efficacy, chemoprophylaxis should be strongly considered for patients who may have had questionable close contact with an infected person

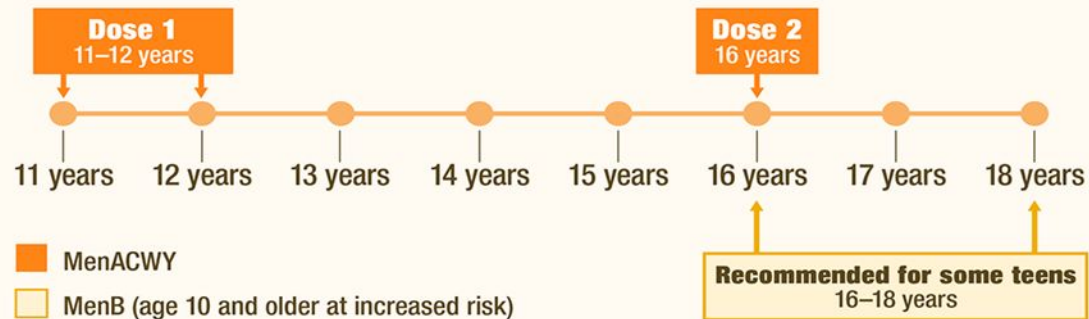
# Treatment- Meningococcal Meningitis

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- Preferred treatment for is a third-generation cephalosporin (ceftriaxone or cefotaxime(if available)).
- High-dose penicillin G is an alternative low-cost option. Documented susceptibility of the isolate to penicillin since beta-lactamase-producing *N. meningitidis* isolates have been reported
- Patients treated with penicillin should receive antimicrobial chemoprophylaxis to eradicate nasopharyngeal carriage prior to discharge(only 3<sup>rd</sup> generation cephalosporin eradicates np colonization)
- Duration of treatment is 5 to 7 days.

# Prevention: Meningococcal Vaccine(ACWY)

## Meningococcal vaccines\*



\*MenABCWY vaccine may be used in place of separate injections of MenACWY and MenB vaccine at the same visit.

Table 3. **MenACWY Vaccine**

VACCINE NAME	DOSE & AGE OF ADMINISTRATION	DOSE & AGE (INFANTS & CHILDREN) WITH SPECIFIC DIAGNOSIS
<b>MenACWY-CRM, Menveo</b>	<b>2 doses</b> 11-12 years (first dose) 16-years (second dose)	4-dose series* Minimum age first dose: <b>2 months</b>
<b>MenACWY-D, Menactra</b>	<b>2 doses</b>	2-dose series* Minimum age first dose: <b>9 months</b>
<b>MenACWY-TT, MenQuadfi</b>	<b>2 doses</b>	2-dose series* Minimum age first dose: <b>24 months</b>
<b>Menveo, Menactra; MenQuadfi</b>	<b>1 dose</b> First-year college student living in residential housing <i>not previously vaccinated at 16 years old or military recruits</i>	

\*See specific information on the CDC immunization schedule for meningococcal serogroup A, C, W, Y vaccination at <https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html#note-mening>

# High Risk Groups

- Anatomic or functional asplenia(including sickle cell disease)
- HIV, AIDS
- Persistent complement component deficiencies
- Complement inhibitor use (eg, eculizumab, ravulizumab)
- Work in a microbiology laboratory involving routine exposure to isolates of *Neisseria meningitidis*
- Military recruitment
- Travel to or residence in endemic areas
- First year of residence in a college dormitory if students are  $\leq 21$  years and have not already received a dose on or after their 16th birthday

- MenQuadfi – 6 weeks
- Menveo -2 months
- Menactra -9 months



# Meningococcal B Vaccine

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- **Bexsero** is a 2-dose series (at 0, 1–6 months)
- **Trumenba** is typically a 2-dose series (at 0, 6 months) for healthy individuals, or a 3-dose series (0, 1–2, 6 months) for high-risk or outbreak
- CDC recommends based on "shared clinical decision-making" rather than universal routine recommendation. Both AAP and CDC recommend for high-risk groups or during an outbreak.



# And as if right on cue...March 2026

- Outbreak linked to Club Chemistry nightclub in Kent, Canterbury
- 20 cases with 2 deaths. All hospitalized
- UKHSA administers 2,500 antibiotic doses in Kent
- Targeted MenB vaccination program initiated

## UK races to contain meningitis outbreak in Kent after two deaths

By Paul Sandle

March 18, 2026 3:48 AM MDT · Updated March 18, 2026



[1/9] People queue to receive vaccinations at the Sports centre on the University of Kent campus, following an outbreak of meningitis cases in Kent, in Canterbury, Britain, March 18, 2026. REUTERS/Chris J. Ratcliffe [Purchase Licensing](#)



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- **Meningococcal ABCWY (MenABCWY)(Penmenvay)** combines protection from MenACWY and MenB into one shot. If available, it can be used in place of separate injections of MenACWY and MenB if both vaccines are recommended at the same visit for children age 10 years or older

# Vaccine Effectiveness MenACWY (Menactra/Menveo)

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- Overall VE of a single dose of MenACWY-D against meningococcal disease caused by serogroups C, Y, or W was 69%.
- Among adolescents with no underlying condition, VE was 71%
- Serogroup C VE was 77%
- Serogroup Y VE was 51%
- Serogroup W VE could not be calculated because of low sample size.
- VE was 79% in the first year after vaccination, 69% at 1 to <3 years, and 61% 3 to <8 years after vaccination.

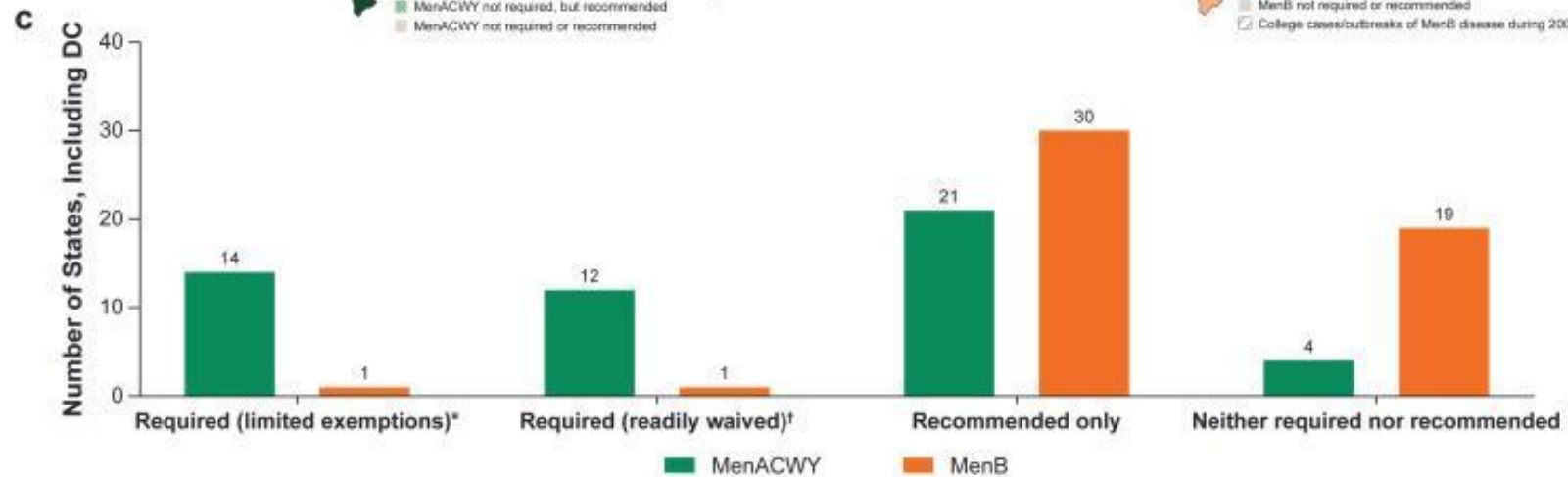
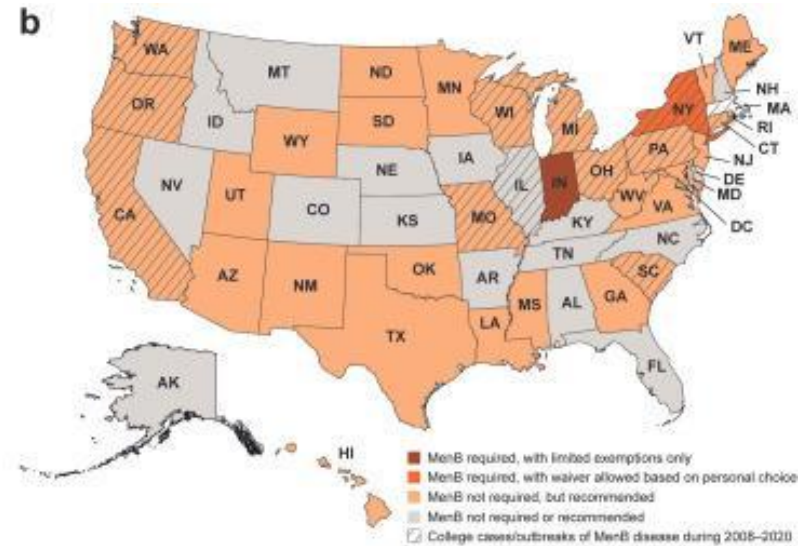
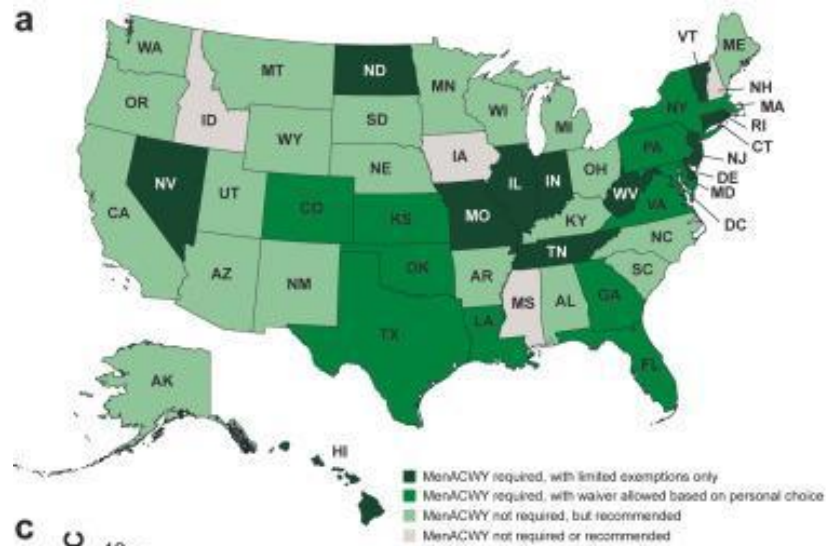
# Vaccine Effectiveness MenB

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- VE after full series was 76%
- Two doses of MenB-4C vaccine were 33–40% effective against gonorrhoea!



# College/University May Require



# How to improve vaccination acceptance?

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Google

danger of vaccines

Google

benefits of vaccines

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# What is the concern? Where are you getting your information from?



# Medical Harm

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- Vaccine ingredients, Ingredients injected vs ingested, number of vaccines “overwhelming the immune system”
- DESCRIPTION **BOOSTRIX** (Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine, Adsorbed) is a noninfectious, sterile, vaccine for intramuscular administration. It contains tetanus toxoid, diphtheria toxoid, and pertussis antigens (inactivated pertussis toxin [PT] and formaldehyde-treated FHA and PRN). The antigens are the same as those in INFANRIX, but BOOSTRIX is formulated with reduced quantities of these antigens. Tetanus toxin is produced by growing *Clostridium tetani* (*C. tetani*) in a modified Latham medium derived from bovine casein. The diphtheria toxin is produced by growing *Corynebacterium diphtheriae* (*C. diphtheriae*) in Fenton medium containing a bovine extract. The bovine materials used in these extracts are sourced from countries which the United States Department of Agriculture (USDA) has determined neither have nor are at risk of bovine spongiform encephalopathy (BSE). Both toxins are detoxified with formaldehyde, concentrated by ultrafiltration, and purified by precipitation, dialysis, and sterile filtration. The acellular pertussis antigens (PT, FHA, and PRN) are isolated from *Bordetella pertussis* (*B. pertussis*) culture grown in modified Stainer-Scholte liquid medium. PT and FHA are isolated from the fermentation 18 broth; PRN is extracted from the cells by heat treatment and flocculation. The antigens are purified in successive chromatographic and precipitation steps. PT is detoxified using glutaraldehyde and formaldehyde. FHA and PRN are treated with formaldehyde. Each antigen is individually adsorbed onto aluminum hydroxide. Each 0.5-mL dose is formulated to contain 5 Lf of tetanus toxoid, 2.5 Lf of diphtheria toxoid, 8 mcg of inactivated PT, 8 mcg of FHA, and 2.5 mcg of PRN (69 kiloDalton outer membrane protein). Tetanus and diphtheria toxoid potency is determined by measuring the amount of neutralizing antitoxin in previously immunized guinea pigs. The potency of the acellular pertussis components (inactivated PT and formaldehyde-treated FHA and PRN) is determined by enzyme-linked immunosorbent assay (ELISA) on sera from previously immunized mice. Each 0.5-mL dose contains aluminum hydroxide as adjuvant (formulated to contain 0.3 mg aluminum) and 4.4 mg of sodium chloride. The aluminum content is measured by assay. Each dose also contains ≤100 mcg of residual formaldehyde and ≤100 mcg of polysorbate 80 (Tween 80).

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Concerned about formaldehyde in vaccines? Consider the pear...



The amount of formaldehyde in a vaccine is so tiny that it doesn't even affect the naturally occurring levels of formaldehyde in a child's blood.

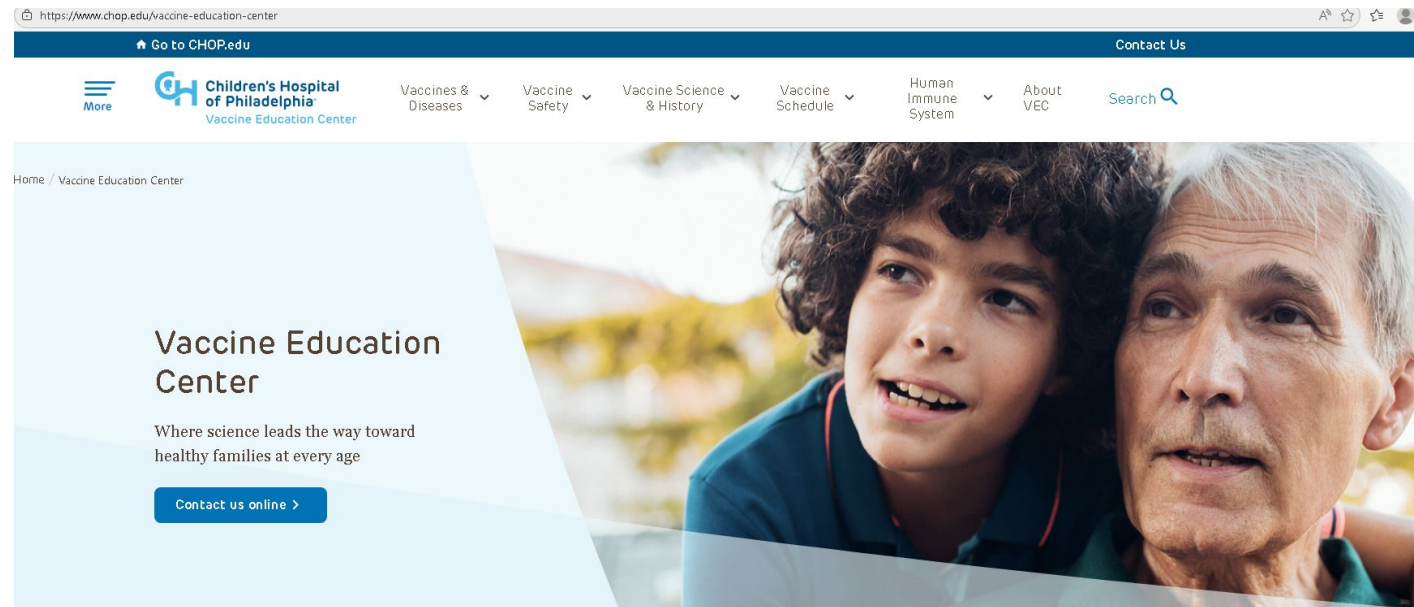
Source: <http://www1.com/food/CH20>



# Effectively answer questions

Learn how to answer some of parents' most common questions about vaccination.

Be prepared to answer parents' questions succinctly, accurately using terms that they understand.



# CHOP Vaccine Education Center

<https://www.chop.edu/vaccine-education-center>



## Vaccine Safety

× Close Menu

### Vaccine Safety References

#### Vaccine Ingredients

Types of Vaccine Ingredients

Ingredients by Vaccine

Aluminum

Antibiotics

Corn & Peanut Oils

DNA

Egg Products

Fetal Cells

Formaldehyde

Gelatin

Human Proteins

Polysorbate 80

SV40

Thimerosal

#### Vaccines and Other Conditions

ADHD

Arthritis

Asthma or Allergies

Autism

ASIA

Diabetes

GBS

Mad-Cow

Multiple Sclerosis

Shaken Baby Syndrome

SIDS

#### Other Vaccine Safety Concerns

Are Vaccines Safe?

Dosing Safety

Fever & Vaccines

Blood-brain Barrier & Vaccines

Antibody-dependent  
Enhancement (ADE)

# Vaccine ingredients: Aluminum

Aluminum in vaccines

Aluminum in other substances

Injection vs. ingestion of aluminum

Health effects of aluminum

References

Aluminum is the third most abundant element after oxygen and silicon, and it is the most abundant metal, making up almost 9 percent of the earth's crust. Aluminum is found in plants, soil, water and air. Most plants have low quantities of aluminum, but a few are known to be aluminum accumulators, including some types of tea plants, grasses and orchids.

Aluminum is used extensively in various ways:

- Aluminum can be found in food-related products including pots and pans; storage containers, such as beverage cans; and foil.
- Aluminum is found in numerous foods and beverages including fruits and vegetables, beer and wine, seasonings, flour, cereals, nuts, dairy products, baby formulas, and honey. Typically, adults ingest 7 to 9 milligrams of aluminum per day.
- Aluminum is used for manufacturing of airplanes, siding, roofing materials, paints, pigments, fuels and cigarette filters.
- Aluminum is found in health products including antacids, buffered aspirin, antiperspirants and



Aluminum Infographic

View larger image:

[English](#) | [Spanish](#)

# Aluminum in vaccines

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	Aluminum Quantity
HPV Vaccine	0.5 mg
Tdap	0.33-0.39 mg/dose
Meningococcal ABCWY	0.25-0.5mg/dose
Meningococcal B	0.25-0.52 mg/dose
Breast Milk	0.04mg/L
Infant formula	0.225mg/L

# Natural Infection vs Immunization



It is true that natural infection almost always causes better immunity than vaccines. Whereas immunity from disease often follows a single natural infection, immunity from vaccines usually occurs only after several doses. **However, the difference between vaccination and natural infection is the price paid for immunity – pneumonia, birth defects, intellectual disability, death.**

Of interest, a few vaccines induce a better immune response than natural infection:

- [Human papillomavirus \(HPV\) vaccine](#) — The high purity of the specific protein in the vaccine leads to a better immune response than natural infection.
- [Tetanus vaccine](#) — The toxin made by tetanus is so potent that the amount that causes disease is actually lower than the amount needed to induce a long-term immune response. This is why people with tetanus disease are still recommended to get the vaccine.

# Freedom of choice, right not to vaccinate, civil liberty

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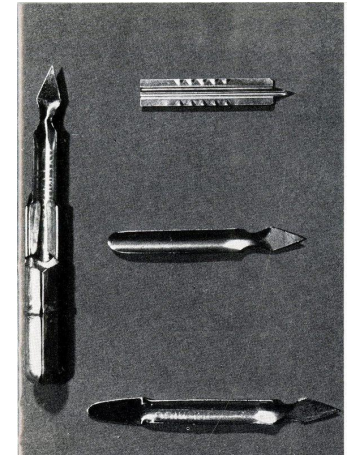


# Anti-Vaccination League Britain 1800s

- Edward Jenner was largely responsible for introducing vaccination to the medical community, and widespread vaccination began in the early 1800s
- Vaccination acts passed between 1840 and 1853 made vaccination **compulsory** in Britain, and almost immediately anti-vaccination leagues challenged the law as a violation of civil liberty
- In 1898 the vaccination law was amended to allow exemption for parents, based on conscience, which introduced the concept of “conscientious objector” into English law
- Anti-vaccination groups have continued into the 21st century and are highly visible on the internet, presenting arguments remarkably similar to those of the 19th century



In this cartoon, vaccination was depicted as a diseased cow-like monster being fed children



Jenner Trust



# Provide personal examples

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Providing personal examples of how you support vaccinations for your family members shows you believe they are important and safe.

Share how you recommended vaccines for your own children, grandchildren, and other family members. Sharing your personal experience may make parents more comfortable in their decision to vaccinate their child.

# Bundle your recommendation

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Bundle your recommendation for all adolescent vaccines.

“Now that your child is 11, they need three vaccines to help protect against meningitis, HPV cancers, and whooping cough. Do you have any questions about these vaccines?”

# Ensure a consistent message

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Your office staff should receive training on how to successfully communicate with parents and patients about vaccination. Starting with the front office, make sure that everyone is on the same page when it comes to proper vaccination practices, recommendations, and how to answer parents' questions.



# Use every opportunity to vaccinate

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Establish a policy to check patients' immunization status at every visit and always recommend and administer vaccines your patients need.

Call to remind families about getting vaccines if they fall behind or need follow-up doses to complete the series.

# The Challenges of vaccination on the Navajo Nation: Tuba City



- Area the size of West Virginia
- 45% of children <18 yrs live below poverty level(double US rate)
- 40-50% of homes have no fixed internet access
- 75% of roads are unpaved, dirt roads



# Accessibility, Availability

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- **Every visit:** acute, sick, ER (flu), hospitalization, and of course WCC
- **School based** mass flu clinics with routine vaccines available
  - School registration form with list of potential vaccines, flu VIS, QR codes for VIS of other vaccines. Courtesy call (can also email/mail VIS and document given)
- **Public Health Clinic** – no appointment needed

## Vaccines

- Adult vaccines including RSV, tetanus, shingles, MMR, Td, Hep A, Hep B, HPV, and Tdap
- 6 months and older vaccines including flu (seasonal) and COVID (year-round)

Sexual Health Care including STI testing and treatment, birth control, and pregnancy testing

Health Screenings including diabetes, cholesterol, blood pressure, and TB testing

## Walk-In Hours

Monday – Friday

8:00 am – 11:00 am

### Routine Childhood Immunization Consent

Parent/Guardian: Please answer the questions below if you want your child to receive the routine childhood vaccines that he/she is due to receive. This may include:

- a) 4-year-old vaccines: Measles/Varicella, Tetanus/Diphtheria/Pertussis/Polio
- b) 11-year-old vaccines: Meningitis, HPV, Tetanus/Diphtheria/Pertussis

1. Has your child ever had an allergic reaction to any Vaccine?  Yes  No

If yes, which vaccine and what was the reaction? \_\_\_\_\_

\_\_\_\_\_

Your child may receive the routine childhood vaccines that are indicated based on his/her age and vaccine history at TORHCC and the Arizona state vaccine registry.

Yes, please give my child the routine vaccines he/she is due to receive

OR

I do not want my child to receive any routine childhood vaccines at school

I have been given a copy and have read the information in the Vaccine Information Statement for the above vaccines (included in school registration packet).

\_\_\_\_\_  
Print Student Name

\_\_\_\_\_  
Student Date of Birth

\_\_\_\_\_  
Signature of Parent/Guardian ONLY

\_\_\_\_\_  
Current Phone Number

\_\_\_\_\_  
Date and Time

*In case further information needed*



**Please attach copy of guardianship paperwork to this form**

## Navajo Nation surpasses New York state for the highest Covid-19 infection rate in the US



By Hollie Silverman, Konstantin Toropin, Sara Sidner and Leslie Perrot, CNN

3 min read · Updated 5:55 PM EDT, Mon May 18, 2020

The Navajo Nation implemented a robust COVID-19 response characterized by strict, extended lockdowns and mask mandates to protect its population, ultimately achieving a vaccination rate of 72% among eligible residents. The effort included massive community-driven initiatives for food/water distribution, COVID-19 Navajo and Hopi Families Relief Fund fundraising and utilizing traditional knowledge for



# Incredible Sense of Community

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- Long history of community involvement – During covid entire staff mobilized, Public Health Nurses, Hopi Naming Ceremony, soccer, T ball, Girls Scouts
- Strong Pediatric practice – Teen Clinics, specialty clinics: Cardiology, Pulmonology, Genetics, SCIDS, SCAN...Long term Pediatricians 30+ yrs!!



# And of course, the Flea Market Food!

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# Questions?

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# Continuing Education

If you would like to claim CE Credits:

**A QR Code will be displayed in  
the MAIN HALL  
at the end of the day**

**The following CE credits are available:**

CMEs for Physicians (Doctors, NPs, PAs)

CE Contact Hours for Nurses (RNs, LPNs)

CMEs for Medical Assistants

Certified Health Education Specialists CEs  
(CHES)

Social Worker CEs (National Association of  
Social Workers)

Pharmacy Continuing Education

