Healthy Arizona
WORKSITES
A PUBLIC HEALTH INITIATIVE

HEALTHY ARIZONA WORKSITES PROGRAM (HAWP) PRESENTS:

VACCINE PREVENTABLE DISEASES

Presented by:

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Vaccine-Preventable Diseases

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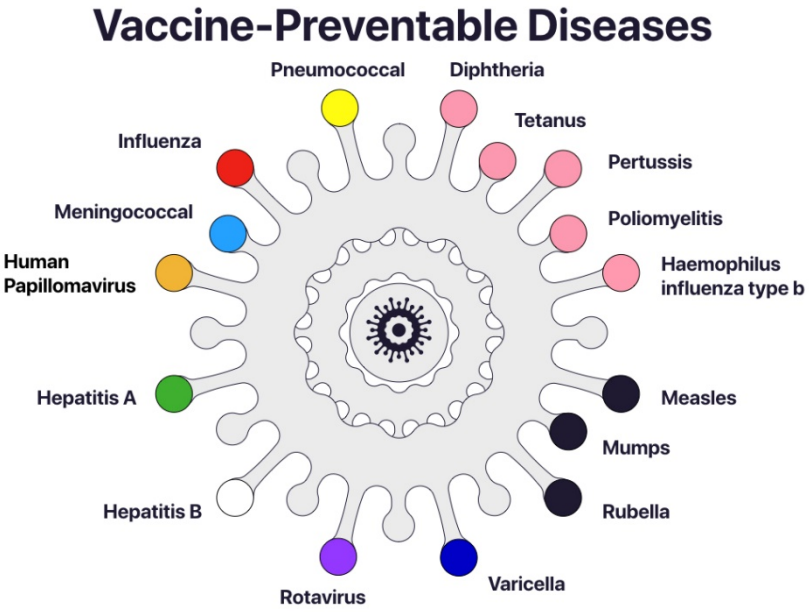
Overview

- Objectives:
  - Discuss vaccine preventable disease in **nonpregnant adults**
- Target audience: nonpregnant adults
- Will **not address childhood or travel** immunization in this presentation
- Conflict of interests: none



Types of immunizations

Most vaccinations induce the development of antibodies in the recipient- response expected to be durable.

- **Active immunization**: *stimulates* a primary *immune response* (usually by inducing B-cell proliferation, antibody response, and T-cell sensitization). If an individual is subsequently exposed to the pathogen against which the vaccine is directed, the exposure results in a secondary response that includes increased proliferation of B cells and formation of antibodies.

  The secondary response protects the individual from developing disease, ideally for life.
  - Some vaccines require boosters (regular revaccination) to sustain protection due to decreased ability to produce the active antibodies overtime.
  - Can be derived from **whole killed bacteria, live attenuated bacteria or viruses, or antigenic subunits** of organisms.
  - Also can be toxoids - bacterial **toxins modified to render them nontoxic** but induce the formation of antitoxin antibody. If the host is exposed to the bacterial toxin after immunization, the antitoxin antibody binds to the bacterial toxin, thereby preventing toxin-mediated disease.

- **Passive immunization:** *administration of antibodies* against the specific agent (as intramuscular immune globulin derived from pooled human serum or antitoxin derived from serum harvested from immunized animals).
  - **short-term** protection.
  - typically **used in immunocompromised** patients who are unable to produce an effective immune response with active immunization.
  - occasionally used for health care workers, pregnant women, and international travelers.
  - **not routinely recommended for healthy adults** (majority of adults are capable of producing a durable immune response through active immunization).

Basic principles of administration

- **Vaccine co-administration** — Most **can be administered simultaneously** at different sites without compromising efficacy.
  - pneumococcal and influenza vaccine co-administration safe.
  - not compromise efficacy of either vaccine.

- Limitations of co-administration of vaccines:
  - Live virus vaccines should either
    - administered same day.
    - subsequent immunization delayed 1 month to avoid the theoretical concern that the immune response to one or both might be impaired.

- Immune globulins (already formed Ab from other people plasma) should <u>not</u> be administered along with live virus vaccines.
  - passively administered antibodies can interfere with vaccine response (does <u>not</u> apply to inactivated vaccines or oral polio and yellow fever vaccines).

Basic principles of administration (continued)

- Try to adhere to the recommended schedule
- Not necessary to restart the series of any vaccine when interval between doses is prolonged.
- Subsequent immunizations -continue on the originally recommended schedule.

Contraindications

- True **contraindications =rare**
  - severe hypersensitivity reactions: anaphylaxis and severe neurologic complications.
  - live virus vaccines to immunocompromised patients

- The following are **NOT contraindications:**
  - Current/recent mild illness, with/without low grade fever
  - Current/recent antibiotic therapy
  - Previous mild to moderate local tenderness, redness, swelling, or **fever less than 40.5ºC (104.9F)** after any vaccination
  - Personal history of allergies to other medications (except neomycin for MMR)
  - *Egg allergy*
  - Family history of adverse reactions to immunization

Hepatitis

- Hepatitis = inflammation of the liver

Viral Hepatitis

Virus	Transmission Routes	Vaccine	Cure
A	Fecal/Oral	Yes	Recovery from illness results in lifelong immunity
B	Blood to blood & sexual contact	Yes	No cure (treatment available)
C	Blood to blood	No	Curable (8-12 week treatment)

Hepatitis A

- **Hepatitis A**
  - Viral infection- developing countries
  - Most common preventable infection acquired by **travelers**
  - Transmission**: fecal, oral, food, sex**
  - HAV infection
    - usually self-limited, treatment =supportive care.
    - 85% recover by 3 months.
    - fulminant hepatic failure -rare but could lead to liver transplantation.

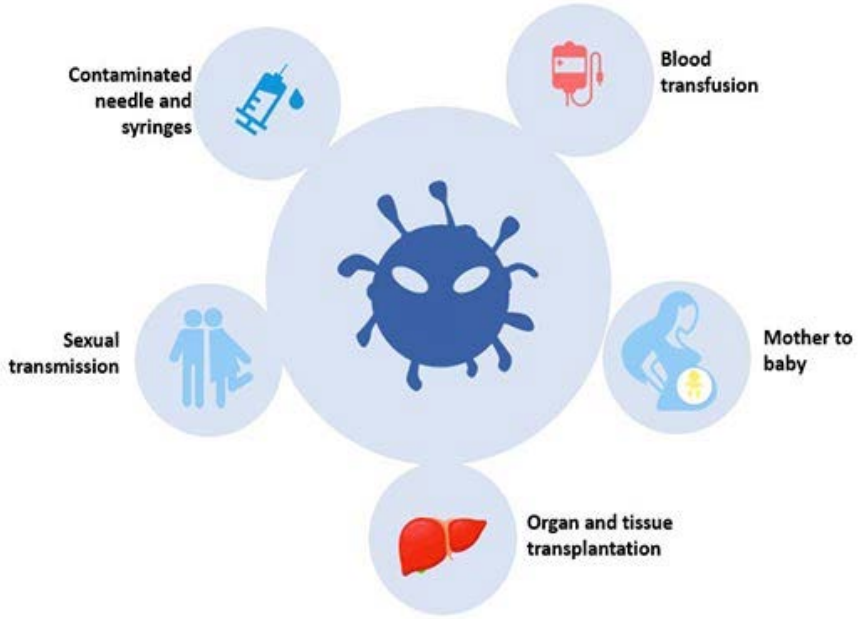
Hepatitis A (continued)

- HAV Vaccination
  - available US 1995-> since infection declined by 95%
  - 2006: recommended for **all children at 1 year**
  - traveling /working in countries with high/ intermediate rates of HAV
  - MSM, DU, chronic liver disease, HIV, homelessness
  - **Anyone wishing to obtain immunity**

- HAVRIX and VAQTA (US)- single-antigen inactivated **(not live**)- 2 dose vaccine.
- **Ab present** in **adults >95% at > 20 years** post vaccination.
- Adverse reactions: fever, injection-site reaction, rash, and headache.

Hepatitis B

- Hepatitis B
  - 2 billion individuals with hepatitis B virus (HBV) infection worldwide
  - transmission
    - **mother-child**
    - **unprotected sex**
    - **IVDU, needle stick,**
    - **Transplant**
  - Infection
    - liver failure from acute HBV>1%
    - chronic HBV infection <5%



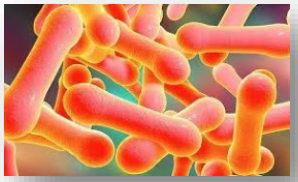
Hepatitis B (continued) and Hepatitis C

- Hepatitis B vaccine- **Universal newborn** vaccination recommended in most countries.
- Also HCW, IVDU, MSM, HIV, Hepatitis C infected patients
- Vaccine - **not live**
  - Recombivax HB (10 mcg HBsAg/mL)/Engerix-B (20 mcg HBsAg/mL)- 3 doses/6 months
  - Heplisav-B (20 mcg HBsAg/0.5 mL) 2 doses 1 month apart
  - Adverse reactions: soreness at site of injection, low-grade fever, malaise, headache, joint pain, and myalgia
- **Hepatitis C – no vaccine** at this time

Tdap - 3 in 1

- **Tetanus:**
  - toxin from *Clostridium tetani bacteria*- found in the soil.
  - Disease:
    - intense, painful muscle spasms-mouth muscles to generalized
    - clinical tetanus 4-6 weeks course
    - 2001 -2016: 462 cases in US (1,000,000 cases in resource-limited countries/year)

- **Diphtheria**:
  - bacteria *Corynebacterium diphtheriae*.
  - Disease:
    - respiratory disease, airway obstruction
    - Skin disease
    - asymptomatic carrier



- **Pertussis**="whooping cough,“:
  - highly contagious *Bordetella pertussis bacteria*
  - Disease:
    - respiratory illness
    - seizures in infants

Tdap

- Diphtheria-tetanus-acellular pertussis - **3 diseases in 1** vaccination, **not live**
- Routinely recommended in children- single booster at 11- 12-year-olds
- Td(tetanus toxoid) or Tdap **every 10-year** throughout life due to weaning immunity
- Adverse reactions: Severe allergic reaction (anaphylaxis) – rare. Encephalopathy – rare, within 7 days

Hib Vaccine

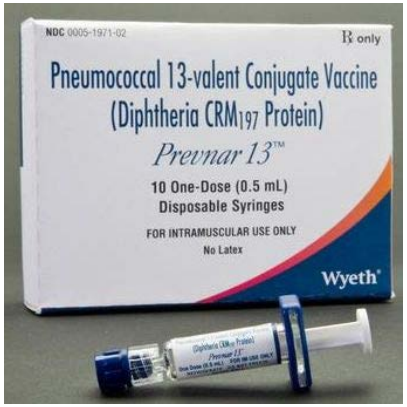
- *Haemophilus influenzae* serotype b (Hib)
  - Kids- > once the most common cause of bacterial meningitis, epiglottitis
  - Adults -> pneumonia
  - 2000 - 2015: worldwide cases in kids <5 years- declined from >8 million to 340,000 due to vaccination

Hib Vaccine (continued)

- Hib Vaccine:
  - recommended **all infants**
  - Stem cell transplant recipients post Transplant
  - **Asplenic** patients if not immunized
  - Vaccine **Not live**
  - Vaccine efficacy ≥95% against invasive Hib disease (2 or 3 doses)
  - **Adverse effects** : fever, irritability- infrequent, local reactions (pain, redness, and/or swelling at the injection site)

Pneumococcal

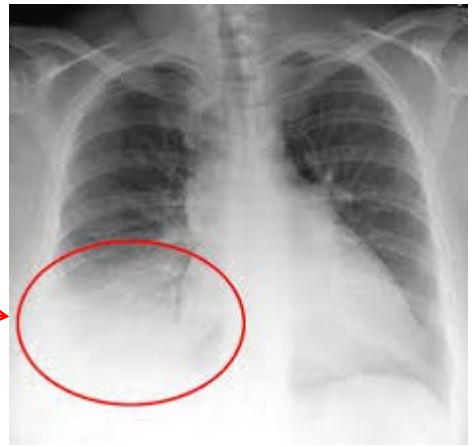
- Disease:
  - Second most common cause of vaccine preventable death in the US
  - Major clinical syndromes include:
    - Pneumonia
    - Bacteremia
    - Meningitis



Pneumococcal Pneumonia

- Estimated 175,000 hospitalizations in U.S.
- Up to 36% of adult-community acquired pneumonia and 50% of hospital acquired pneumonia
- Common complication (bacterial) of influenza and measles
- Case fatality rate 5-7%, much higher in elderly

Pneumonia of the right middle lobe



Pneumococcal Bacteremia

- >50,000 cases/ year in the United States
- Rates higher among elderly and very young infants
- Case-fatality rate ~20%; up to 60% among the elderly

Septi Chek Blood Culture Bottles

Pneumococcal Meningitis

- Estimated 3,000 – 6,000 cases per year in the United States
- Case-fatality rate ~30%, up to 80% in the elderly
- Neurologic sequelae common among survivors
- Increased risk in persons with cochlear implant

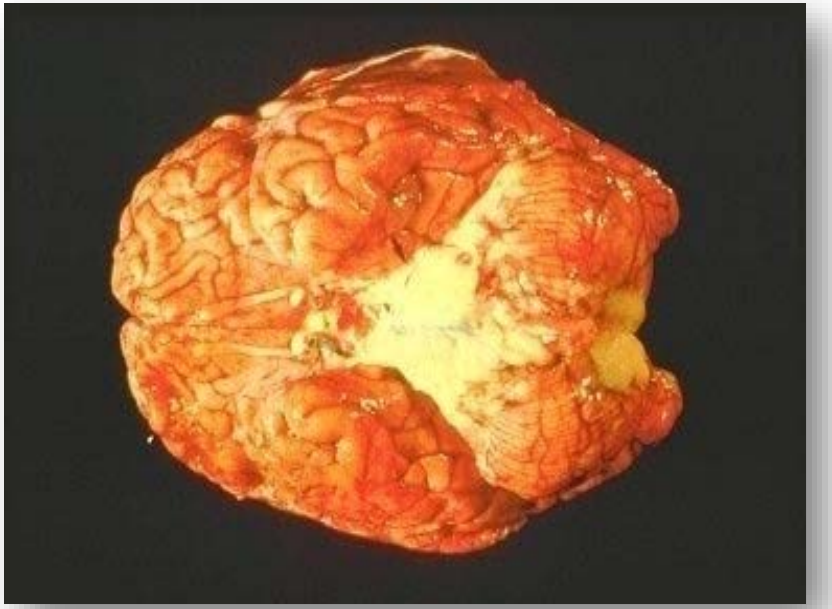


Photo courtesy of CDC

2 kinds of pneumococcal **vaccines**

- Pneumococcal conjugate or **PCV13**
  - 2011 study in The Netherlands: approximately 85,000 **adults >65** years - PCV13 protected **3 in 4** of those vaccinated against **invasive** pneumococcal disease caused by vaccine serotypes. PCV13 also protected 45 in 100 vaccinated against pneumococcal pneumonia caused by vaccine serotypes.

  Recommended:

  - All children <2 years old.
  - People >2 years with certain medical conditions.
  - Adults >=65 years also can discuss and decide, with their clinician, to get PCV13.

WANTED

The following are at HIGH RISK for PNEUMOCCAL DISEASE:

- Those ≥ 65 Years of age
- Persons 19-64 years with asthma or smokes cigarettes
- Persons 19-64 with chronic illnesses

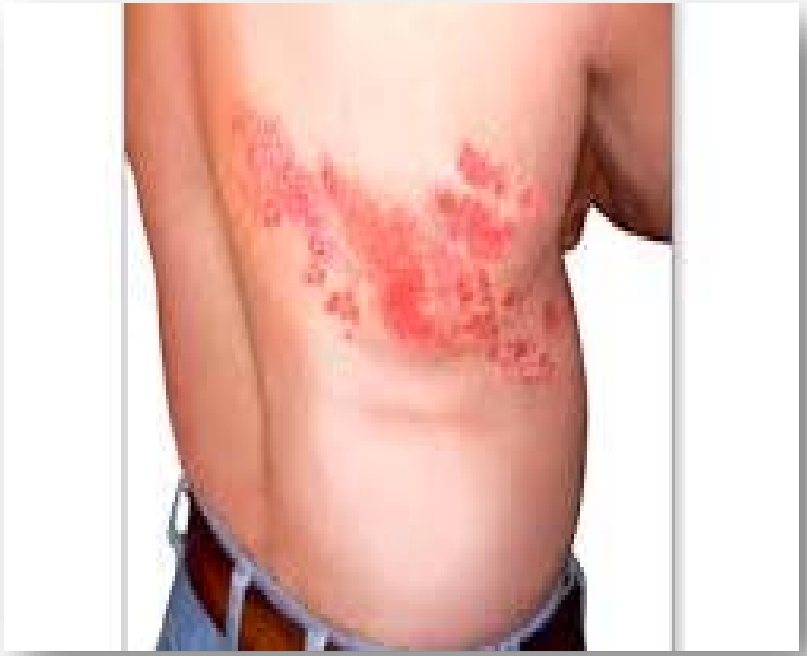
REWARD

Considerations for Shared Clinical Decision-Making for PCV13 Use among Adults 65 Years or Older (continued)

- Pneumococcal polysaccharide or **PPSV23**
  - PPSV23 protects between 50 - 85 in 100 adults with healthy immune systems **against invasive** disease caused by vaccine serotypes.
  - Recommended:
    - All adults 65 years or older.
    - People 2 -64 years old with certain medical conditions.
    - Adults 19 -64 years old who smoke cigarettes.

Shingles

- Shingles results from the **reactivation of the varicella-zoster virus** (VZV).
- Approximately **30%** of all people who have been infected with **chickenpox** will later develop herpes zoster, commonly known as zoster or shingles.
- Approximately 1 million people annually develop this disease



Shingles - Risk Factors

- Shingles occurs when chickenpox virus reactivates (approximately 30% of population).
- It is not well understood why this happens in some people and not others.

- 2 major risk factors (recommended for these groups)
  - AGE >50
  - Immunosuppression (esp. T-cell immunity).

Shingles - Symptoms

- Rash (usually associated with pain/itching tingling)with blisters that scab after 3 to 5 days- usually occur in a band on one side of the body, or clustered on one side of the face.
- The rash usually clears within 2 to 4 weeks.
- Less common : fever, headache, chills, and upset stomach

Shingles - Complications

- 1/5 develop severe **persistent pain** after the rash clears up, a situation called **postherpetic neuralgia (PHN)**. Age is a major risk factor.
- The skin may be unusually sensitive to touch and to changes in temperature. **PHN can last for months, or even years.**
- Very rarely, shingles can lead to pneumonia, hearing problems, blindness, scarring, brain inflammation (encephalitis), or death.

Zoster (Shingles) Vaccine

- CDC: all older adults are at risk for zoster.
- There is no way to predict who will develop it as more than **99%** people **born before 1980 have had chicken pox**

1 million new cases per year, approximately 40% to 50% occur in those ≥60 years of age.

- By 85 years of age, approximately 50% of individuals will have had an episode of shingles.

Vaccines

2 types Zostavax (ZVL) (no longer sold in US, live) and **Shingrix** (RZV- **not live**)

- In clinical trials RZV **reduced the occurrence** of shingles **by 97%** among people 50 years and older.
- A second study found that RZV reduced the occurrence of shingles by **90% among people 70 years** and older. RZV reduced the occurrence of shingles by 85% four years after vaccination.

Varicella vaccination

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Varicella (VAR)	2 doses (if born in 1980 or later)		2 doses	

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

Recommended vaccination based on shared clinical decision-making

No recommendation/ Not applicable

Varicella vaccination (live)

- **Routine vaccination**
  - **No evidence of immunity to varicella:** 2-dose series 4–8 weeks apart if previously did not receive varicella-containing vaccine (VAR or MMRV [measles-mumps-rubella-varicella vaccine] for children); if previously received 1 dose varicella-containing vaccine, 1 dose at least 4 weeks after first dose
  - Evidence of immunity: U.S.-born before 1980 (except for pregnant women and health care personnel [see below]), documentation of 2 doses varicella-containing vaccine at least 4 weeks apart, diagnosis or verification of history of varicella or herpes zoster by a health care provider, laboratory evidence of immunity or disease
- **Special situations**
  - **Pregnancy with no evidence of immunity to varicella**: VAR **contraindicated during pregnancy**; after pregnancy (before discharge from health care facility), 1 dose if previously received 1 dose varicella-containing vaccine or dose 1 of 2-dose series (dose 2: 4–8 weeks later) if previously did not receive any varicella-containing vaccine, regardless of whether U.S.-born before 1980
  - **Health care personnel with no evidence of immunity to varicella**: 1 dose if previously received 1 dose varicella-containing vaccine; 2-dose series 4–8 weeks apart if previously did not receive any varicella-containing vaccine, regardless of whether U.S.-born before 1980
  - **HIV infection with CD4 count ≥200 cells/µL with no evidence of immunity**: Vaccination may be considered (2 doses, administered 3 months apart); VAR contraindicated in HIV infection with CD4 count <200 cells/µL
  - **Severe immunocompromising conditions**: VAR **contraindicated**

Measles, mumps, and rubella vaccination

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Measles, mumps, rubella (MMR)	**1 or 2 doses depending on indication (if born in 1957 or later)**			

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

Recommended vaccination based on shared clinical decision-making

No recommendation/ Not applicable

MMR - Why get vaccinated?

- MMR vaccine can prevent measles, mumps, and rubella.
  - **MEASLES (M):** fever, cough, runny nose, and red, watery eyes, commonly followed by a rash that covers the whole body. It can lead to **seizures** (often associated with fever), ear infections, diarrhea, and pneumonia. Rarely, measles can cause brain damage or death.
  - **MUMPS (M)**: fever, headache, muscle aches, tiredness, loss of appetite, and swollen and tender salivary glands under the ears. It can lead to **deafness**, swelling of the brain and/or spinal cord covering, painful swelling of the testicles or ovaries, and, very rarely, death.
  - **RUBELLA (R):** fever, sore throat, rash, headache, and eye irritation. It can cause **arthritis** in up to half of teenage and adult women. If a woman gets rubella while she is pregnant, she could have a **miscarriage** or her baby could be born with **serious birth defects**.
- Most people who are vaccinated with MMR will be **protected for life.** Vaccines and high rates of vaccination have made these diseases much less common in the United States.

https://www.cdc.gov/vaccines/hcp/vis/vis-statements/mmr.html

Measles, mumps, and rubella vaccination **(live)**

- Routine vaccination
  - **No evidence of immunity to measles, mumps, or rubella:** 1 dose
  - **Evidence of immunity**: Born before **1957** (health care personnel, see below), **documentation** of receipt of MMR vaccine, laboratory evidence of **immunity** or disease (diagnosis of disease without laboratory confirmation is not evidence of immunity)

- Special situations
  - **Pregnancy with no** evidence of **immunity to rubella:** MMR **contraindicated** during pregnancy; after pregnancy (before discharge from health care facility), 1 dose
  - **Nonpregnant women of childbearing age with no evidence of immunity to rubella:** 1 dose
  - **HIV infection with CD4 count ≥200 cells/µL for at least 6 months and no evidence of immunity to measles, mumps, or rubella:** 2-dose series at least 4 weeks apart; MMR contraindicated if CD4 <200
  - **Severe immunocompromising conditions:** MMR **contraindicated**
  - **Students in postsecondary educational institutions, international travelers, and household or close, personal contacts of immunocompromised persons with no evidence of immunity to measles, mumps, or rubella:** 2-dose series at least 4 weeks apart if previously did not receive any doses of MMR or 1 dose if previously received 1 dose MMR

Measles, mumps, and rubella vaccination **(live)**

- **Health care personnel**:
  - **Born 1957 or later with no evidence of immunity to measles, mumps, or rubella:** 2-dose series at least 4 weeks apart for measles or mumps or at least 1 dose for rubella
  - **Born before 1957 with no evidence of immunity to measles, mumps, or rubella:** Consider 2-dose series at least 4 weeks apart for measles or mumps or 1 dose for rubella

MMR – Vaccine reaction risks

- Soreness, redness, or rash where the shot is given and rash all over the body can happen after MMR vaccine.
- Fever or swelling of the glands in the cheeks or neck sometimes.
- More serious reactions happen rarely: can include seizures (often associated with fever), temporary pain and stiffness in the joints (mostly in teenage or adult women), pneumonia, swelling of the brain and/or spinal cord covering, or temporary low platelet count which can cause unusual bleeding or bruising.
- In people with serious immune system problems, this vaccine may cause an infection which may be life-threatening. People with **serious immune system problems should not get MMR vaccine.**
- People sometimes faint after medical procedures, including vaccination. Tell your provider if you feel dizzy or have vision changes or ringing in the ears.
- As with any medicine, there is a very remote chance of a vaccine causing a severe allergic reaction, other serious injury, or death.

https://www.cdc.gov/vaccines/hcp/vis/vis-statements/mmr.html

HPV

- Human papillomavirus (HPV)=sexually transmitted pathogen that causes anogenital and oropharyngeal disease in males and females.
- Persistent infection causes cancers of the cervix
  - Types 16 and 18 cause:
    - 70% of all cervical cancers worldwide
    - 90% of anal cancers
    - Significant portion of oropharyngeal cancer, vulvar and vaginal cancer, and penile cancer
  - Types 31, 33, 45, 52, and 58 cause 20% of cervical cancers worldwide
  - Types 6 and 11 cause 90% of anogenital warts

HPV vaccines (**not live**)

- Gardasil - Quadrivalent - HPV types: 6, 11, 16, 18
- **Gardasil 9**- HPV types: 6, 11, 16, 18, 31, 33, 45, 52, 58
  - Non infectious recombinant vaccine prepared from the purified virus like particles of the major capsid (L1) protein of HPV types
- Cervarix - HPV types: 16, 18
  - prophylactic vaccines
- US: only the **9-valent vaccine** is approved for the prevention of cervical, vulvar, vaginal, anal, oropharyngeal and other head and neck cancers, anal precancerous and dysplastic lessons, and genital warts in males

Rationale

- Females: direct benefit by **protecting against cervical cancer**
  - US study suggested that vaccinating 12yr old girl would prevent annually
    - >200,00 HPV infections , 100,000 abnormal cervical cytology examinations, 3300 cervical cancer cases.
    - If high intakes of vaccine in females, it also provides herd immunity to males
- Males: direct benefit by **protecting against anal, penile cancer**

HPV - Indications and age range

- Advisory Committee on Immunization Practices (ACIP): males and females
  - 11-12 years, can be started at **9yrs** of age
  - 13-26yrs not been previously vaccinated or who have not completed vaccination
  - Adults >27yrs, catch up is NOT routinely recommended except
    - Individuals with no prior sexual experience or low number of sexual partners deemed to have a future risk of HPV exposure

HPV

Immunization Schedule

- 9-15yrs old: 2 doses 0 and 6-12 months
- >15yrs old or immunocompromised: 3 doses 0, 1-2 and 6months

Missed doses

- Vaccination series can be resumed without restarting the series.

HPV

- Seroconversion rate 93-100% in females and 99-100% in males
- Titers are higher in younger than older
  - females 9-15 year olds 2x higher than females 16-26 year olds

EFFICACY

- The efficacy of the 9-valent vaccine for preventing CIN2 or more severe diseases, VIN2 or 3 and VaIN2 or 3 was **97%** among the HPV naive population

DURATION OF PROTECTION

- Protection against cancer/neoplasia has been observed through **at least 10 year** following vaccination
- Persistent antibody levels have been reported up to 10yrs following vaccination.

Meningococcus

- 13 distinct meningococcal groups
  - Only **six groups** cause life threatening diseases: A, B, C, W-135, X, Y
- Disease:
  - Bacterial Meningitis : mortality 13%
  - Bacteremia

Meningococcus vaccine (not live)

- **Quadrivalent**: conjugate vaccines that contain capsular polysaccharide antigens from serogroups **A, C, Y and W** conjugated to diphtheria toxoid or CRM197. Elicit at T cell dependent memory response and a strong response at re-exposure compared to polysaccharide vaccines.
  - All individuals ages 11-18yrs old
  - <10 or >19 at increased risk
    - MenACWY-DT - Menactra – US approved in 2005
    - MenACWY-CRM - Menveo – US approved in 2010
  - Duration of protective antibodies appears to be good at **5yrs** after primary immunization

Meningococcus vaccine

- **High risk exposures**
  - Travelers to hyper endemic or epidemic region
  - Military recruits
  - Microbiologist
- High **risk for severe infections**
  - Asplenic patients
  - Individuals with complement deficiencies
  - Individuals treated with C5 inhibitors (eculizumab and ravulizaumab)
  - MSM

Meningococcus vaccine

- **Monovalent Serogroup B** vaccine is a recombinant protein vaccine.
  - ACIP - preference 16-18yrs old at time of quadrivalent booster
  - Individuals >10yrs old with high risk
  - Complement deficiencies
  - Receiving complement inhibitors (eculizumab and ravulizumab)
  - Asplenic patients
  - Microbiologists
  - Those at risk during outbreak

MenB-FHbp - Trumenba – US approved in 2014

MenB-4C - Bexsero – US approved in 2015

Meningococcus vaccine

- Both MenACWY and MenB vaccines produce an immune response
- MenACWY and MenB Vaccines does not provide protection to unvaccinated people through herd immunity
- Protection from MenACWY vaccines decrease within 5 yrs. The booster at 16yr old is critical to maintaining protection when the adolescent are at risk.
- Data suggest that MenB vaccines have decreased efficacy within 1-2 years after vaccination.

Flu

- Influenza virus: high rate of mutation, compromising the ability of immune system to protect against new variants.
- Therefore new vaccines are produced each year to match circulating viruses
- Decision to which antigens to include in the vaccine: based on global surveillance of influenza viruses circulating at the end for the prior influenza season

Influenza Vaccine (not live)

- Quadrivalent
  - 2 influenza A antigens and 2 influenza B antigens
- Trivalent
  - 2 influenza A antigens and 1 influenza B antigen

Influenza Vaccine - Efficacy

- Protective efficacy: determined by the closeness of ‘’fit’’ or "match" between the strains in the vaccine and viruses that circulate in the outbreak
- Efficacy of the 2019-2020 season
  - In both adults and children estimated at 45%
  - 37% of those who tested positive had been vaccinated
  - 55% of those who tested positive were NOT vaccinated

Influenza Vaccine – Why Vaccinate?

- Even when vaccine efficacy is suboptimal because of antigen mismatch, **reduction in influenza-related morbidity and mortality** can still be substantial.
- Vaccinations have been shown to reduce illness severity.
- Provides herd immunity.

Influenza Vaccine – Why Every Year?

- A randomized trial of influenza vaccination, showed that antibody titers decreased slowly over 18months- 2 x decrease in titer estimated to take >600days.
- A study has shown a significant 24% reduction in mortality and a 28% reduction during epidemics.
- Vaccination interruption was associated with a strong and significant increase in mortality risk. An effect that was reversed with restarting annual vaccination

COVID-19 Vaccination – Let's address the myths

- **mRNA vaccines**: give instructions to our cells to make **a harmless piece** of the "spike protein." The spike protein is found on the surface of the virus that causes COVID-19.
- Immune systems recognize the protein doesn't belong there and begin building an immune response and making antibodies
- mRNA vaccines **do not use live virus** that causes COVID-19- **cannot give you COVID**.
- mRNA vaccines **do not affect** or interact with our **DNA** in any way
- Our cells break down and get rid of the mRNA soon after it is finished using the instructions.

COVID-19 Vaccination (continued)

- **Viral vector vaccines**: modified version of a different virus (harmless virus, not COVID) to deliver instructions to our cells to make “spike protein”
- Immune systems recognize the protein doesn’t belong there and begin building an immune response and making antibodies
- **Cannot give someone COVID-19 or other infections**
- **Do not affect** or interact with our **DNA** in any way.

Available COVID-19 Vaccinations

- 3 approved vaccines in the United States:
  - 2 mRNA:
    - Pfizer BioNTech
    - Moderna
  - 1 viral vector:
    - Janssen Pharmaceuticals Companies of Johnson & Johnson

Pfizer Vaccine

- Pfizer BioNTech: 2 shots, 21 days apart
  - recommended for people **> 12 years**
  - **95% effective** at preventing laboratory-confirmed COVID-19 illness
  - Possible Side Effects
    - Injection site: Pain, Redness, Swelling
    - Whole body: Tiredness, Headache, Muscle pain, Chills, Fever, Nausea
  - Should NOT Get Vaccinated:
    - If you had **severe allergic reaction (anaphylaxis) or an immediate allergic reaction**, even if it was not severe **to any ingredient in an mRNA COVID-19 vaccine** (such as **polyethylene glycol)**
    - If you had **severe allergic reaction (anaphylaxis) or an immediate allergic reaction after getting the first dose of the vaccine**, you should not get a second dose of either of the mRNA COVID-19 vaccines.

Moderna Vaccine

- Moderna: 2 shots, one month (28 days) apart
  - recommended for people **> 18 years**
  - **94.1% effective** at preventing laboratory-confirmed COVID-19 illness
  - Possible Side Effects
    - Injection site: Pain, Redness, Swelling
    - Whole body: Tiredness, Headache, Muscle pain, Chills, Fever, Nausea
  - Should NOT Get Vaccinated:
    - If you had **severe allergic reaction (anaphylaxis) or an immediate allergic reaction**, even if it was not severe **to any ingredient in an mRNA COVID-19 vaccine** (such as **polyethylene glycol)**
    - If you had **severe allergic reaction (anaphylaxis) or an immediate allergic reaction after getting the first dose of the vaccine**, you should not get a second dose of either of the mRNA COVID-19 vaccines

Janssen by Johnson & Johnson

- Johnson & Johnson: 1 shot
  - recommended for people >18 years
  - 66.3% effective at preventing laboratory-confirmed COVID-19 illness
  - Possible Side Effects
    - Injection site: Pain, Redness, Swelling
    - Whole body: Tiredness, Headache, Muscle pain, Chills, Fever, Nausea
    - Reports of adverse events **suggest** an increased risk of a rare adverse event called thrombosis with thrombocytopenia syndrome (TTS). Nearly all reports of this serious condition, which involves **blood clots with low platelets**, have been in **adult women younger than 50** years old (7 events /1 million vaccinations among women 18-49 years old)
  - Should NOT Get Vaccinated:
    - **If you had a severe allergic reaction (anaphylaxis) or an immediate allergic reaction**—even if it was not severe—to any ingredient in the J&J/Janssen COVID-19 vaccine (such as **polysorbate**)

- As of April 23, 2021, thrombosis with thrombocytopenia syndrome (TTS)—blood clots with low platelets—has **not been linked to the Pfizer-BioNTech or Moderna COVID-19 vaccines after >210 million doses** administered.

COVID-19 Vaccines and Delta Variant – Why is it so dangerous?

- Preliminary evidence suggests vaccine effectiveness against **symptomatic** infection with Delta variant but lower than alpha.

- Unpublished data from England, Canada and Israel suggests that vaccine **effectiveness against severe disease and / or hospitalization remains high**.

- Delta variant is more transmissible- the extent to witch vaccination reduces transmission is uncertain- will need more time to acquire data.

- Efficacy may wane over time: Pfizer noted decreased from 96% up to 2 months post vaccination to 84% 4-6 months post vaccination.

COVID-19 Vaccines and Delta variant (continued)

Table 2. Vaccine effectiveness against symptomatic disease for Alpha and Delta variants

Vaccine Status	Vaccine Effectiveness	
	Alpha	Delta
Dose 1	49 (46 to 52)	35 (32 to 38)
Dose 2	89 (87 to 90)	79 (78 to 80)

Table 3. Vaccine effectiveness against hospitalisation for Alpha and Delta variants

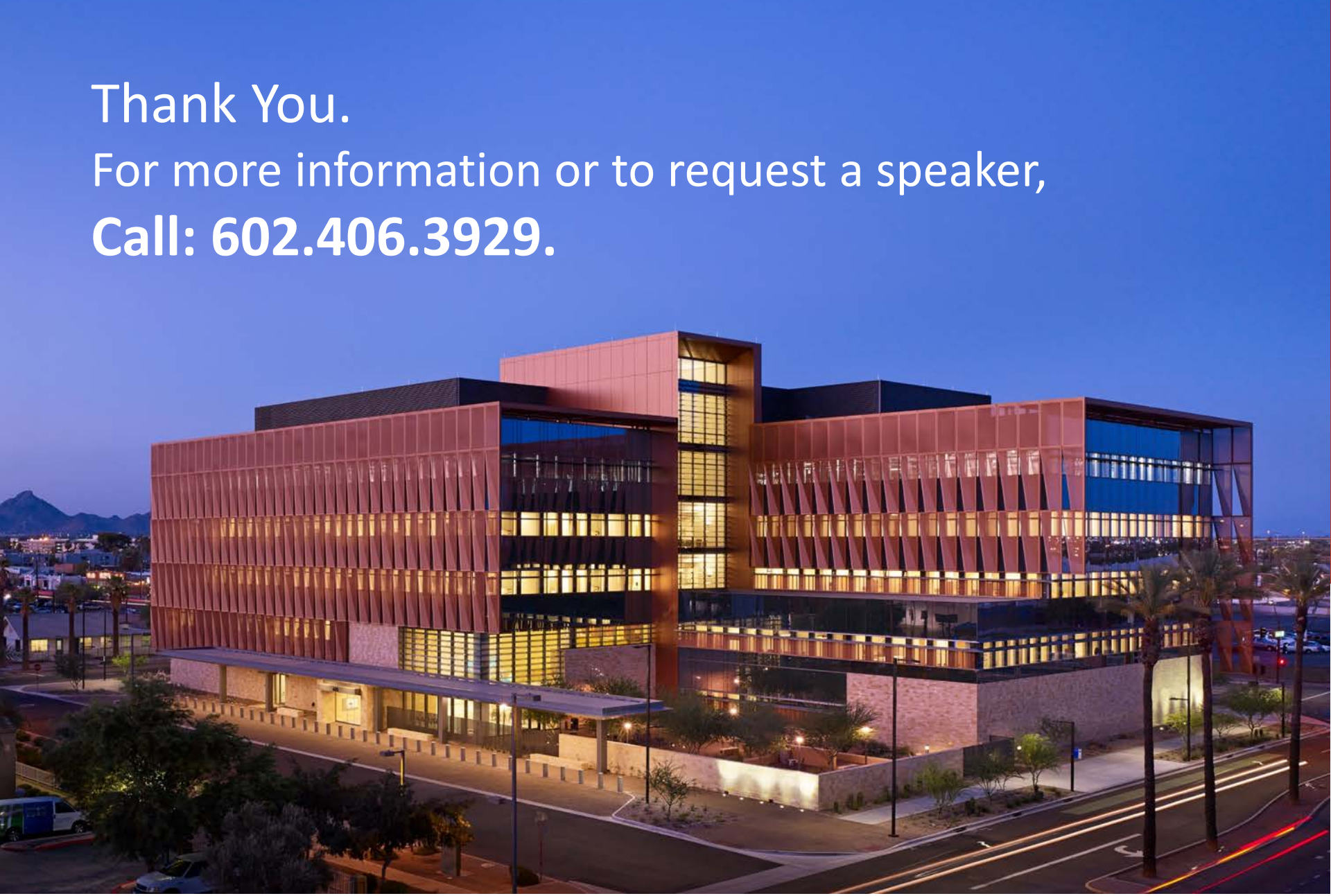
Vaccine Status	Vaccine Effectiveness	
	Alpha	Delta
Dose 1	78 (64 to 87)	80 (69 to 88)
Dose 2	93 (80 to 97)	96 (91 to 98)

COVID-19 vaccine surveillance report
Week 29- Public Health England
Pfizer and AstraZeneca vaccines

Thank You.

For more information or to request a speaker,

Call: 602.406.3929.



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