Immunization updates

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What are Vaccines?

- Vaccines help protect us against serious diseases. (chicken pox/measles/meningitis/cancer)
- There are several different types of vaccines, each designed to teach your immune system how to fight off the infection by sensitizing or exposing the immune system to some aspect of the germ
- Vaccines are like giving your body all the answers to the test before you take the exam. This allows it to know exactly how to respond if it encounters the germ in the future.

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History of Vaccines

- Vaccine development began in the 18th century with smallpox

VACCINE	YEAR DEVELOPED
Cholera	1885
Rabies	1885
Typhoid	1896
Diphtheria	1923
Yellow fever	1936
Pertussis	1939
Influenza	1945
Polio	1960
Measles	1963
Mumps	1967
Rubella	1969
Hepatitis B	1986
Hepatitis A	1995
Chickenpox	1996
Human papillomavirus	2006

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Vaccines Save Lives

- Community Immunity- offers protection to just more than the individual who is vaccinated.
- Coverage Threshold- minimum % of individual's immune to the disease needed to prevent an outbreak.

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VPD	Vaccination Rate Needed for Herd Immunity
Measles	92-94%
Pertussis	92-94%
Diphtheria	83-85%
Rubella	83-85%
Mumps	75-86%
Influenza	30-75%

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MMWR Morb Mortal Wkly Rep. 2017 Nov 3; 66(43): 1171–1177

Types of Vaccines

Live-Attenuated Vaccine:

- Live Attenuated- use a weakened or “attenuated” form of the germ.
- Because they are so similar to the natural infection, they create a very strong immune response with only 1-2 doses for lifetime protection.
- Have limitations for those with immunocompromise.

Examples

- MMR
- Varicella
- Rotavirus
- Smallpox
- Yellowfever

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Types of Vaccines

Inactivated Vaccines

- Inactivated vaccines use the killed version of the germ.
- Not as protective as live-attenuated, therefore takes multiple doses (boosters) for better protection.

Examples

- Hep A
- Flu (shot only)
- IPV

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Types of Vaccines

- Polysaccharide/Subunit/Recombinant/Conjugate
  - Use specific pieces of the germ such as a protein, sugar, or capsid (casing around the germ).
  - They can also be used on almost everyone, including people with weakened immune systems.

    - Examples: Hib, Hep B, HPV,

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Types of Vaccines

Toxoid Vaccine

- Use a toxin made by the germ to produce immune response and not the germ itself.
- Does require booster shots for ongoing protection

Examples

- Diphtheria
- Tetanus

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Types of Vaccines

Messenger RNA (mRNA)

- mRNA vaccines make proteins that trigger an immune response.
- Benefits include short manufacturing time.

Example:

- COVID-19 (Pfizer/Moderna)

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Types of Vaccines:

Viral Vector Vaccine

- Use a modified version of a different virus (such as adeno virus) to deliver instructions to our cells.

Examples

- COVID-19 (J&J)

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Vaccine Components

- Antigens/Adjuvents- Provide Immunity
- Preservatives/Stabilizers-keep vaccines safe and long lasting
- Antibiotics/Cell Culture materials- used to help produce the vaccine

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Vaccine Safety

20-100 HEALTHY VOLUNTEERS

Is this vaccine safe?

Does this vaccine seem to work?

Are there serious side effects?

How is dose related to side effects?

SEVERAL HUNDRED VOLUNTEERS

What are the most common short-term side effects?

How are the volunteers' immune systems responding to the vaccine?

HUNDREDS OF THOUSANDS OF VOLUNTEERS

How do people who get the vaccine and people who do not compare?

Is the vaccine safe?

Is the vaccine effective?

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Vaccine requirements

- The Advisory Committee on Immunization Practices (ACIP) makes recommendations for vaccines and timing to protect everyone from diseases.
- States and politicians make their own decisions on which vaccines are required for daycare and school entry so each state requirement may be different

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Vaccine Myths

- Myth #1- Vaccines Cause Autism
  - FACT: NO link between autism and any vaccine.
- Myth #2- It's better to spread out vaccines
  - FACT: Spreading out vaccines leaves kids unprotected and at risk for disease.

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National vaccine rates

- Diphtheria, Tetanus, Pertussis (4+ doses DTP, DT, or DTaP): 80.7%
- Polio (3+ doses): 92.6%
- Measles, Mumps, Rubella (MMR) (1+ doses): 90.8%
- Haemophilus influenzae type b (Hib) (primary series + booster dose): 79.6%
- Hepatitis B (Hep B) (3+ doses): 90.6%
- Chickenpox (Varicella) (1+ doses): 90.2%
- Pneumococcal conjugate vaccine (PCV) (4+ doses): 81.0%
- Combined 7-vaccine series: 68.3%

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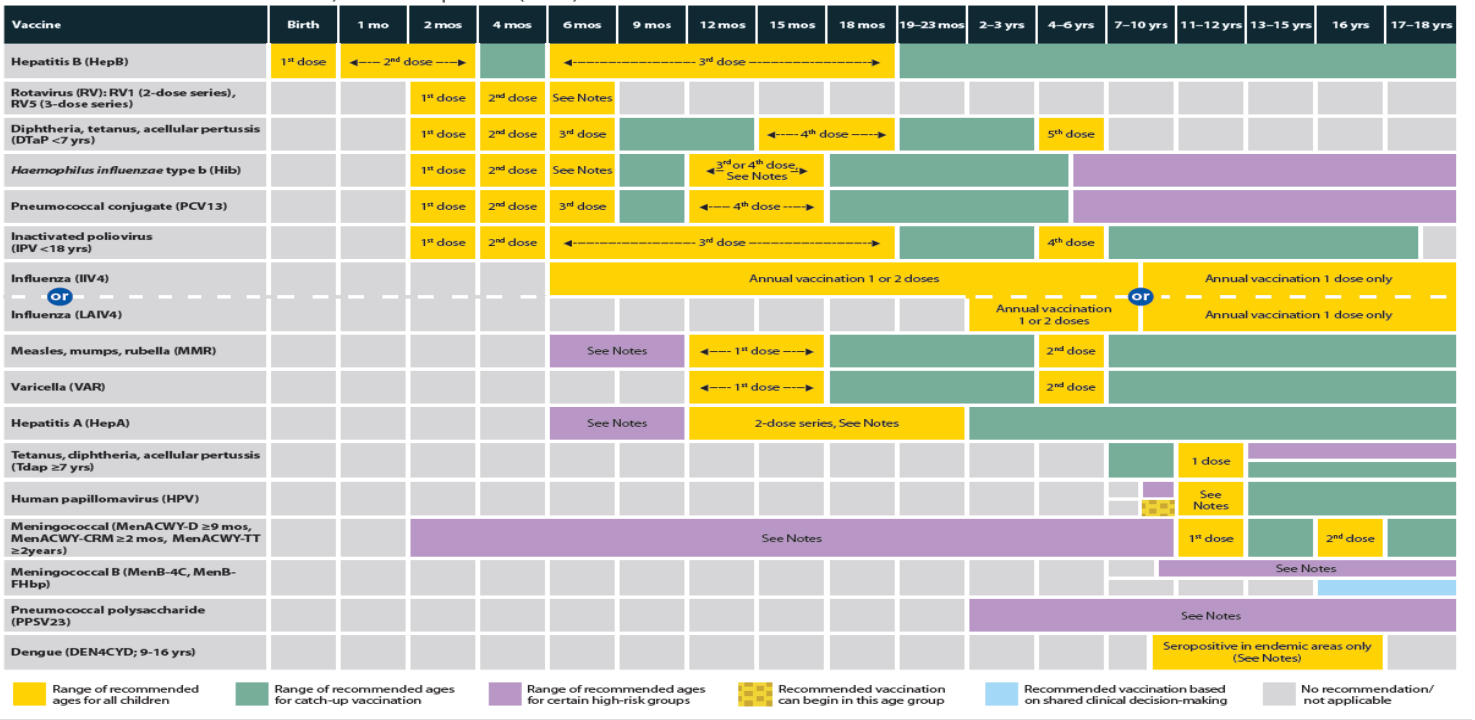
Source: Health, United States, 2019, table 31 pdf icon[PDF – 9.8 MB] (data are for 2015)

Vaccine schedule

Table 1 Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States, 2022

These recommendations must be read with the notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the green bars.
To determine minimum intervals between doses, see the catch-up schedule (Table 2).



Vaccine schedule

- https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html
- Most up to date schedule

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Infant vaccines

- Hepatitis B (HepB)
- Pneumococcal conjugate vaccine (PCV)
- Haemophilus influenzae type b (Hib)
- DTAP
- IPV
- Rotavirus

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Hepatitis B

- Can cause lifelong infection, leading to liver damage and even cancer
- 1 out of 4 children with chronic Hep B develop liver damage and cancer

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Prevnar 13

- Before vaccine in the US, 700 cases meningitis, 13,000 blood infections, 5 million OM, and 200 deaths annually
- Since vaccine, severe pneumococcal disease in children has decreased by 88%.

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Haemophilus influenzae type b (Hib)

- Before vaccine, it was leading cause of bacterial meningitis in kids < 5 years. About 20,000 kids under 5 got HIB annually and 3-6% died
- Since vaccine, 99% decrease in invasive disease

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DTAP

- Pertussis can lead to pneumonia, seizures and even death- most deaths are in babies < 3 months of age
- Diphtheria can lead to breathing problems, paralysis and heart failure
- Tetanus- causes lock jaw, stiffness of jaw that makes opening mouth and swallowing difficult, kills 15% of people who contract

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Polio

- Polio can cause permanent paralysis
- In 1950s, paralyzed 15,000 annually

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Rotavirus

- Before vaccine, all children had at least 1 episode of rotavirus infection by 5th birthday
- Severe vomiting and diarrhea

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Combination vaccines

- Pediarix- DTAP/IPV/HepB
- Pentacel-DTAP/IPV/HiB
- Vaxelis-DTAP/IPV/HepB/Hib

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Influenza vaccine

- Changes annually
- Must be 6 months old to receive and first year, needs to have 2 doses, at least 4 weeks apart

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1 year vaccines

- Hepatitis A vaccine
- MMR
- Varicella
- Boosters of DTAP, HIB and PCV

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Hepatitis A

- Causes severe liver disease
- Spread by contact with feces of those infected, also from contaminated food, water

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MMR

- Measles
- Mumps
- Rubella

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Varicella

- Very contagious rash
- Before vaccine 11,000 people hospitalized annually and 100 deaths

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4 year vaccines

- MMR-V
- DTAP/IPV

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HPV

- Prevents HPV which is leading cause of genital warts in both males and females
- HPV which is known to cause cervical cancer, vaginal cancer and throat cancer
- 80% of people will have HPV at some point in their lives

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11 year vaccines

- Meningococcal
- TDAP

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16 year vaccines

- Meningococcal booster

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Meningococcal B vaccine

- Bexsero
- Trumenba

COVID

	Pfizer	Moderna	J&J/Jansen
4 years and under	NO	NO	NO
5-11 years	Yes- 2 doses 21 days apart	NO	NO
12-17 years	Yes- 2 doses 21 days apart	NO	NO
18 years and above	Yes-2 doses 21 days apart	Yes- 2 doses 28 days apart	Yes but ….

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COVID boosters

	Who should get a booster	When to get a booster	Which booster can you get
Pfizer	Everyone 12 years and older	At least 5 months after completing your primary COVID-19 vaccination series	• Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines) are preferred in most* situations • Teens 12–17 years old may only get a Pfizer-BioNTech COVID-19 vaccine booster
Moderna	Adults 18 years and older	At least 5 months after completing your primary COVID-19 vaccination series	Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines) are preferred in most* situations
Johnson and Johnson/Jansen	Adults 18 years and older	At least 2 months after receiving your J&J/Janssen COVID-19	Pfizer-BioNTech or Moderna (mRNA COVID-19 vaccines) are

Take home points

- Vaccines are SAFE and side effects are expected.
- Hepatitis A and B- must be 6 months between 1st and final
- MMR will not count toward vaccination unless given > 1 year
- TDAP/Meningococcal must be given after 11th birthday
- COVID vaccine is rapidly changing

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Vaccines Save Lives!

Vaccines are very important. They save lives. We need to continue educating people on the importance and that side effects are normal, not unexpected reactions.

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Ways to get more involved with vaccines

- Hospital immunization committee
- MidAmerican Immunization Coalition
- Missouri Immunization Coalition
- Immunize Kansas Coalition

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Resources

https://www.vaccines.gov/basics/vaccine_ingredients/index.html

https://www.cdc.gov/vaccines/schedules/hcp/imz/child-adolescent.html

Vaccines | NIH: National Institute of Allergy and Infectious Diseases

Autism and Vaccines | Vaccine Safety | CDC

https://www.cdc.gov/nchs/fastats/immunize.htm

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Conclusion

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