REDWOOD
PEDIATRICS
An Affiliate of Children's Mercy

IMMUNIZATION GUIDE

This guide contains reliable and interesting information about diseases and the shots that prevent them. This information comes directly from professionals with advanced degrees in the science behind vaccines, treatment of the diseases prevented by vaccines, giving vaccines, and managing vaccine side effects. Use it to empower yourself with *reliable* information and gain the confidence you need to make the best decisions for your child.

The choice to immunize your child is very important. There is a lot of history behind immunizations and a lot to know. The modern environment of social media and online advertising means there are hundreds of readily available opinions on the topic of giving vaccines to kids. Sadly, many of these opinions come from people with *no education or experience* with shots or the diseases they prevent. Some opinions are misinformed but well meaning, while others are openly deceptive and are meant to sell a book, product, or advertising by inflaming emotions. Either way they are not reliable or qualified opinions and should *never* be used as a basis to make health decisions for your children.

Redwood's response to this unreliable information overload is to have a conversation with you about what's best for your child as an individual. To better equip you for that conversation, and help you make the best decisions for your child, we also created this immunization guide. The information below comes from *the most reliable source:* people who know your child, who have medical degrees specific to children and the immune system, and who have your child's best interest in mind. And unlike online sources or advice from friends, we take 100% responsibility for the advice we give, dealing with the consequences of our advice no matter what happens. Think about that difference for a moment: a podcast or well-intentioned but unqualified friend has nothing to lose in giving you advice. On the other hand, our job description includes taking 100% responsibility for the advice we give. Our professional reputation, careers and livelihoods all depend on doing it right. We are deeply committed to giving the right advice on all topics related to a child's health and survival. While others giving advice may care for your child, they have very little at stake personally if they give out inaccurate advice. Our Redwood providers have much at stake. We hope this reassures you greatly.

The importance of vaccinating kids is like using car seats: its about protecting your child from unplanned and serious danger. We drive carefully with our kids in the car - but because we can't control everything on the road, we use car seats to protect our precious kids from unexpected auto accidents. The same thing is true with germs: we recommend you take every precaution to minimize germ exposure, but you can't control everything. Unfortunately, everyone gets sick, and sometimes those illnesses are very serious. We use immunizations to protect our kids from unexpected but serious infections. Car seats and shots are similar in other ways as well: both are very safe, both have their annoyances, and both save lives. Just like car accidents, the outcomes of serious infections vary greatly: sometimes kids have only minor problems and heal quickly. Other times, infections

cause problems you can't fully recover from, such as paralysis, loss of arms or legs, or damage to the body causing deafness, blindness, or seizures. Sadly, both car accidents and infections can be deadly, the outcome we all fear the most.

The success of vaccines applies across all races and people groups, in all parts of the world, and is well documented historically - before any modern pharmaceutical companies even existed. What many people don't realize is that infections kill far more children than car accidents, war, famine, guns, and cancer. In the developing world, parents travel long distances and stand in line to vaccinate their kids: they have seen firsthand the kinds of outbreaks that we have largely forgotten in America. When it comes to surviving the first 5 years of childhood, getting immunized is as important as drinking clean (safe) water. After age 5, the benefits of vaccination continue: children who are immunized remain protected from the worst infections. This means they live longer, take fewer medicines, have better lungs and hearing and balance, see fewer doctors, and have fewer chronic medical conditions as adults.

We know you want to make the best and safest decisions for your child. Redwood is right there with you. Redwood highly recommends shots for all the serious germs we see in North America for all patients healthy enough to get shots. Below are some helpful definitions to make medical words easier to understand. After that is The Germ List, which has information on germs that occur in our part of the world and the shots used to protect against them.

DEFINITIONS

INNATE IMMUNE SYSTEM: The simple half of our immune system that is always there. Like castle walls and a moat, it is simple. It stops many germ invaders, but not all of them.

ADAPTIVE IMMUNE SYSTEM: The adjustable half of our immune system. Like a team of detectives and spies, the adaptive immune system investigates the germs that make it past the innate immune system. It then custom-builds antibodies, and like a librarian, it keeps track of all the germs it has ever seen, ready to fight them off again when they come back.

ANTIBODY: An antibody is what immune cells make to protect our body against a certain germ. We make antibodies in 2 ways:

1. After we get sick from a germ invading our body (much more dangerous) or
2. After we get a shot (much safer)

Antibodies float around in the body after they are made and keep us safe from getting the same germ again. Even if the germ does manage to invade us and make us sick, antibodies take away much of the infection's strength, making the symptoms much milder and the infection much safer. Some antibodies are easy to make, like sticking 2 Lego's together. Others are harder, like building a fancy Lego castle. Since all germs are different from each other, all antibodies are different too.

ANTIGEN: An antigen is the part of a germ that our body uses to make an antibody. Like a cast fitting over elbows or knees, antibodies are made to fit perfectly over germ body parts. Once attached, antibodies stop germs from working and help destroy them, ending an infection. Shots have antigens in them that match the shape of the real germ antigen. Once the immune system sees an antigen, it makes antibodies that work against the real germ, preventing illness without ever getting an infection. This concept works so well it has changed history and saved hundreds of millions of lives.

BOOSTER: A booster is a repeated dose of a shot. Each dose of a shot helps the body make longer-lasting antibodies. Babies' immune cells don't work full strength against germs and are not coordinated enough to make long-lasting antibodies. These 2 reasons combine to mean babies need shots the most and need more boosters than older kids in order to be protected.

DROPLET SPREAD: Refers to a germ that spreads from one person to another through small drops of spit or snot. Droplet spread is highly contagious. An example: one sneeze from a sick person in a supermarket launches thousands and thousands of droplets into the air. If the sneeze is uncovered, the large droplets (a few hundred) are visible when wet but become invisible when dry. The droplets fall onto all of the food items within about 10 feet of the starting point of the sneeze. Any of these food items touched over the next few hours can spread the illness to anyone who touches them. The small droplets (many thousands per sneeze) are invisible and are so small they float on air currents instead of falling down. Over the next few hours, they spread and spread across many aisles of the supermarket on air currents. Anyone who breathes this air can catch the infection. Often, we get sick by walking through an empty supermarket aisle, touching nothing, but breathing air that someone else coughed or sneezed in 10 minutes earlier.

AIRBORNE SPREAD: Refers to a germ that spreads from person to person through airborne virus particles. These particles do not need a sneeze or cough to spread them, and are MUCH smaller than droplets. Airborne spread is far more contagious than droplet spread. One person can infect dozens of people in a public building just by breathing. There is often no sign of illness at the time of this spread. This is one reason viral infections are so widespread and common.

FECAL-ORAL SPREAD: Germs spread after a person goes #2 (stools) and then fails to wash all germs off their hands. They then cook or serve food. When the food is eaten, the germ spreads to whoever eats it.

VECTOR: A person or object who spreads a germ but never gets sick. An example: "Jane" goes to work, where a sick co-worker sneezes, causing germ droplets to settle onto Jane's shirt. Later, Jane picks up her baby from daycare and hugs him, accidentally pressing his mouth on her shirt right where the droplets landed. Jane doesn't get germs on her mouth and doesn't get sick. Her baby gets germs in his mouth and he gets sick. Jane is a vector: she spread the germ but never got sick from it.

TIMING: With shots, timing matters. You buckle your baby into a car seat before you drive, not after you get to your destination. The same is true for shots. Like car seats, the prevention step must happen before the danger to be helpful. Germs affect people of different ages in different ways. Many germs are mild in adults but life-threatening when babies catch them. Other germs are harmless to babies but become serious threats with age.

Doctors recommend shots at specific times to protect babies and children when they need it most. Because every germ is different, every shot has a different schedule.

PRIME IMMUNE SYSTEM FUNCTION: Like everything else, immune cells work better and better as we age. Young babies have limited immune cell function, so they catch germs easier and fight germs off slower. By age 9 years, kids immune systems develop much higher capability than at earlier ages.

THE GERM LIST

For photos of patients affected by the following conditions, click HERE then click on "Learn More" under the desired germ title, and then on "Photos" near the bottom right of the page.
WARNING: These photos contain graphic content and are not recommended for children

Diphtheria, Tetanus, acellular Pertussis (DTaP): this shot protects children from all 3 illnesses that threaten breathing. Diphtheria causes severe throat swelling, Tetanus causes muscles all over the body to lock down, including the jaw, leaving children unable to eat or drink for days or weeks. Pertussis causes coughing that lasts 100 days. Pertussis (also known as Whooping Cough) also causes breathing to completely stop in babies with no warning. All 3 diseases are spread through droplets from coughing or sneezing. If given individually, these shots are too weak to get the immune systems attention. given all together, they get enough attention for the body to make immunity. Babies should get these shots as soon as the immune system is mature enough to make antibodies from the shot, which is age 2 months. Long-term antibodies are hard to make against these germs. Boosters are needed 4 times by kindergarten, another at age 11 years, and every ten years after for the rest of our lives.

Haemophilus Influenza (Hib): This germ is the second-most common cause of brain, lung, ear and bloodstream infections in young children. It also causes a severe throat infection that can be deadly due to swelling. **Its name is close to the influenza virus but it is not related.** Like Pneumococcus (below), it is a less serious and common cause of sinus infections in adults, so babies get exposed often. Also like Pneumococcus, it causes severe brain damage when the brain is infected. It is droplet-spread. Kids under 6 should get this shot as soon as they can make antibodies from the shot (age 2 months). A series of 3 more boosters by age 5 gives lifetime protection.

Hepatitis A (HepA): This liver infection causes severe diarrhea, vomiting and jaundice that lasts 2-4 weeks. It is worst in older kids, where liver damage puts almost half of patients in the hospital. It spreads by fecal-oral transmission. We all *think* we wash our hands enough after we poop, but this germ is proof that there is always room for improvement. Since this shot came out 30 years ago, Hep A cases are down 95%. Still, every year hundreds of people in the US die from this illness, and thousands more catch it. Kids should get this shot at 12 months old, when solid foods become a bigger part of their diet. A booster 6-12 months later gives lifetime protection.

Hepatitis B (Hep B): Hep B is the most serious of the 5 viruses that infect the liver. If patients survive the sudden and intense start to the infection, a life-long infection follows, often leading to liver failure and liver transplant. Adults catch Hepatitis B through sexual or other body fluid contact, sharing needles, or through infected blood

transfusions. Children under 9 years old have a less mature immune system and can catch Hepatitis B more easily. *At this age, kids can catch Hep B the same way they catch a common cold virus: random bad luck.* They don't have any high-risk exposures but still get the infection. This deadly or life-altering permanent infection occurs in hundreds to thousands of kids each year. Doctors recommend this shot to save children from this risk, which is impossible to predict. Babies can also catch Hepatitis B from their mother during childbirth and through breast feeding. Thankfully, the Hepatitis B shot is very effective. It is a super-simple antibody for the body to build, so easy that even newborn babies can make effective antibodies and gain immunity from the shot. A 3-shot series provides life-time protection, and is best started soon after birth and completed by age 6 months.

HPV (Gardasil): HPV stands for Human Papilloma Virus. This germ has over 100 strains. HPV causes warts and lumps to form. It can cause everything from common warts to growths in the throat, anus and cervix that become cancerous over time. Once exposed, the infection can last for decades. It is spread by person-to-person touch or by person-surface-person touch. HPV can live and spread for 24 hours on a surface. When an infected person touches the lock coming out of a bathroom stall, that lock can become a vector and can spread the germ to everyone else who touches the same bathroom stall lock for an entire day. This germ is so common that virtually everyone on earth will be exposed to it during their lifetime. Kids should get this shot as soon as the immune system can make good immunity to it, which is age 9 years. Girls should get this shot before they ever need to use tampons, as even tampon use or other sanitary activities may spread the germ to the cervix. Kids should also get this shot *before* they might ever have sex, because in addition to all the other ways it can spread, it can spread sexually as well. Since the HPV shot came out 20 years ago, HPV cervix infections are down 88%.

Influenza (Flulaval): The flu is a highly contagious droplet and airborne-spread virus. It sweeps through yearly from mid-autumn to mid-spring. Each season, 3 or 4 strains cause the infections. Two strains are "regulars" that are the same each year, and each year we get 1 or 2 random surprise strains from the "grab bag" of dozens. In kids 5 and above, the infection causes high fever, very runny nose and muscle aches. In babies it is more serious, because it commonly moves into the stomach (causing vomiting), and the lungs. The infection fills the lungs with fluid and causes low oxygen levels or respiratory shock. **Because of this lung and stomach involvement, kids under age 5 are MUCH more likely to need a hospital if they get the flu.**

The younger the child, the higher their risks of serious problems if they catch the flu. Unfortunately, antibodies to the flu are hard to make-they have a complicated shape that babies can't do right until age 6 months. Flu antibodies also are more fragile. Most antibodies we make last years or even our whole life. Flu antibodies are different- they last only 6-9 months for most people (this is one reason we need a flu shot once a year). The first time a person under age 9 makes flu antibodies, they only last in the body for 1 month. Thankfully, after a single booster (1 month after the 1st shot), babies and kids under age 9 make antibodies that last longer (6-9 months like adults). **SPECIAL NOTE:** Because babies under 6 months don't benefit from getting the flu shot, the best way to keep them safe is to have everyone they live with get a flu shot. We call this "cocooning". Since flu is airborne spread, babies catch the flu most commonly from people they live with, since they share air with those people at home the most.

Measles, Mumps, Rubella, Chickenpox (MMRV): All of these germs cause a high fever. Mumps causes severe face swelling and can infect the testicles, leaving boys unable to have children. The most serious concern with these germs is when they spread to the brain. This leads to permanent seizures, deafness and paralysis for such patients. These germs are HIGHLY contagious and are airborne-spread or droplet-spread. After these shots were widely used, seizure and deafness rates went way down in the US. This shot should be given at age 1 year. An age 5 booster gives lifetime protection.

Meningococcus A,C,W,Y (Menveo, Bexsero): This germ is super aggressive and infects the brain and spinal cord. It causes permanent brain damage for those who survive, but more than 1 in 10 die from it, even with ideal medical care. Meningococcus is spread by droplets and is contagious enough to cause large outbreaks. Teens and young adults are most vulnerable, especially those who attend bigger schools, dorms or military barracks. Since the shot became standard in 2005, cases are down about 65%. Kids should get the shot before they go to school with teenagers, at age 11. A booster at age 16 provides protection into early adulthood. For overseas travel, a booster every 5 years is needed for ongoing protection.

Meningococcus B (Bexsero): This germ causes the same sudden and terrible problems as Meningococcus A,C,W,Y. Because these strains have different shapes on their outsides, we need both shots to be protected from both germs. Until 2023 Meningococcus B was more common overseas, but it now makes up half of North American meningitis cases in teens and young adults. It is droplet-spread and causes large outbreaks. One difference in this strain: Meningococcus B affect older teens than Meningococcus A,C,W,Y, so the first dose is best given at age 16, with 1 booster dose providing protection into early adulthood. For overseas travel, a booster every 2-3 years is needed for ongoing protection.

Pneumococcus (PCV20): This is the Big Bad Wolf of the germ world for kids under age 5. Pneumococcus is the most common cause of brain, lung, ear and bloodstream infections in young children. It is less serious in adults but far more common: it causes most sinus infections in adults. It is spread through droplets. Pneumococcus infections of the brain are almost always fatal without hospital-grade intensive care. Even with the best intensive care available, most babies who survive meningitis have permanent brain damage (deafness, paralyzed body parts, and seizures). Kids under 6 should get this shot as soon as they can make antibodies from the shot (age 2 months). 3 more boosters by age 12 months gives protection until age 65, when one final booster is recommended.

Polio (IPV): This germ is spread from person to person through poor hand washing or droplets. It is very contagious. Polio infects nerves, including the brain and spinal cord. Once infected, the parts of the body those nerves control become paralyzed and will never work again; the damage polio causes is permanent. Sometimes it is mild, but often it is severe. There is no cure for polio. Once a person catches polio, they can spread it to others for the rest of their lives. This means a person who comes here from an area of the world where polio is active (or a person from here travels there, then returns) can spread polio here for decades. The world is closer than ever to eradicating polio, but it isn't gone yet. Everyone should be protected as early possible from polio because it is so contagious, has no cure, and causes severe and permanent damage. Protection starts at age 2 months; 3 more boosters by age 5 give lifetime protection.

Rotavirus (Rotarix): Rotavirus causes rip-roaring vomiting and diarrhea. It is very uncomfortable for adults, and severe or deadly in young children. Babies with Rota often vomit 15-20 times a day and have diarrhea 20+ times a day, all at the same time. This causes severe dehydration and leads to long hospital stays where babies are kept alive through IV hydration, so they don't go into dehydration shock. There is no cure for rotavirus, and it is extremely contagious through body fluid contact. The germ can survive on surfaces for months and on a person's hands for 4 hours. The Rotavirus vaccine is a liquid that babies swallow, so no poke is needed.

Babies should get it as soon as they can make good antibodies from it (age 2 months). The Rotavirus vaccine has a short window of time where it works: the first dose must be given before age 4 months. A single booster (second dose) before age 8 months completes protection.

RSV (Beyfortus): RSV is a regular "cold" germ (droplet spread) in older kids and adults. It is much more serious in babies. It moves to the lungs in many babies and causes thick mucus to clog up the airways, leading to dehydration, low oxygen levels and respiratory shock. RSV is the most common cause of hospital stays for babies every winter. Beyfortus is different than other shots because it has pre-formed antibodies. With this shot, the patient does not need to make antibodies, they show up like a gift and go right to work protecting the baby. This means it can be given soon after birth. The younger the baby, the more aggressive this germ is. Babies born during RSV season (October – March), should get the shot by day 7 of life. After turning 1, RSV is less serious, so most babies only need 1 shot.

Tetanus, Diphtheria, Pertussis (TDaP): This shot is the same as DTaP, but the ingredients are re-balanced for older kids & adults. Of the two, **D**TaP is stronger and perfect for little kids because their younger (and weaker) immune systems won't even notice the **T**DaP shot. Older kids with strong immune systems handle the gentler version better, so at age 7+, **T**DaP is best.