Podcast Intro and Vaccine Overview

Hi, you're listening to the Baby Manual Podcast, the podcast that helps you feel confident as a new parent. I'm your host, a pediatrician and mom, and the author of the baby manual, Dr.

Carol Keim. Hello, and welcome to episode 13 of the Baby Manual Podcast. We're going to talk all about vaccines today. I'm going tell you how vaccines work, how they're created, the four different types of vaccines, some common myths and misconceptions.

Then I'll go through the specific childhood vaccines that we give and tell about the diseases that they prevent and the total number of vaccine that your child will get in childhood.

And then we'll finish up with some side effects and how to treat them. So how vaccines work? Well, the purpose of a vaccine is to trigger an immune response and to do it faster and with less harm than the original disease.

So the immune system is kind of like a team of superheroes and they're fighting off these infections from bacteria, viruses, fungi, parasites, those types of things.

And if they can't fight them fast enough, Those pathogens will multiply and then they cause the symptoms of the disease once they reach a certain threshold.

How Vaccines Work

So vaccines are giving your superhero team an idea of what they're trying to fight off so that they can recognize it as soon as that stuff gets into the body and then fight it off quicker and easier than if you had never been exposed to it before.

In order to make a vaccine, you have to meet some certain criteria of the disease itself. So the vaccine has to work, meaning you need to be able to develop immunity to the specific pathogen.

Things like RSV or hand, foot and mouth disease are diseases that we can catch multiple times and you don't become immune to it. And so that's why we don' have a vaccines for things like that.

whereas something like chickenpox, you know, get it once and you're immune to it. So that's a pretty easy straightforward one. You know you get the vaccine and then you won't get chicken pox.

Also the vaccines has to be able to produce faster than the pathogen can mutate. Things like common cold or HIV virus, the human immunodeficiency virus.

Those are viruses that mutate too quickly to develop a vaccine for them. The flu virus, you know, mutates pretty quickly, but about once a year, and so that's why we do annual flu vaccines or flu boosters to have immunity to that.

And the vaccine has to be cost effective to produce, meaning it has be cheaper to make the vaccines than to treat the disease itself. So there's four main types of vaccines.

There are inactivated ones, which are killed pathogens. They're alive attenuated vaccines, Which are weakened pathogens, there are toxoid vaccines which Are just a piece of the pathogen.

And then there is the new mRNA vaccines so we'll go through all those real quick. Inactivated vaccines are the most common ones and those are things where they take the bacteria or the virus and then they kill it and put it into the vaccine itself.

So the body gets to sort of practice on dummies. It's like when you're training for martial arts and you are hitting a bag, it's that sort idea. They get used to practicing against these villains and they can fight them off quicker when they actually do come in.

Even though these vaccines are killed and they cannot cause the diseases that they're preventing, they can sometimes mimic the symptoms. And that's kind of the idea, right?

When these diseases get into your body, that cause these symptoms, and so as your is fighting off something that looks like it, it's going to look like you may have some of symptoms of that disease.

Vaccine Types Explained

We'll go through more specifics later, but a lot of times that look's like body soreness, low-grade fevers, things like that. Examples of some inactivated vaccines that we use, the polio shot that give in the US is a killed vaccine.

The HPV vaccine, Haemophilus influenza B, pneumococcus and meningitis vaccines, and also hepatitis A and B vaccines. Those are all killed vaccines Live attenuated vaccines are made from bacteria and viruses that have been exposed to some chemicals that weaken them.

So it's sort of like giving your superhero team some villains that has been beat up and they just get to kind of finish it off. Since they are fighting off the actual villains, they cause a really strong immune response, but some people who have weakened immune systems, like if you have HIV or if your taking steroids or immune suppressing medications, that can actually decrease your body's ability to fight these off.

And so people who are immune compromised need to check with their doctors about whether it's safe to receive live attenuated vaccines. Some examples of these are the oral polio vaccine, which is given around the world but not in the US anymore, the MMR or measles, mumps and rubella, and the chickenpox vaccine.

Also the rotavirus vaccine is live-attenuated. Toxoid vaccines are made from just a part of the pathogen. And so those are for things like if you have a villain that's carrying around a vial of poison, it's like giving them the poisoned sample so that they can then build up a resistance to it and know how to recognize it, and fight it.

In the US, we have the DTaP as a toxoid vaccine. So that diphtheria, tetanus and pertussis. It's just small pieces of those bacteria that are in the vaccine so we can recognize those pieces and then fight them off.

And then there's the mRNA vaccines, which are the newest type. And mRNA is kind of like a copy of instructions, like, a pattern. So it's sort of giving a sewing pattern to your body's immune system.

Then they get to print it out. They make those dummies out of the pattern, and then your buddy fights them off so they can recognize that disease and kill it.

Some of COVID vaccines are like that now. So misconceptions and myths that I hear a lot, I have a of parents that are concerned about vaccinating their children and that's really common these days, especially with the internet and you hear some really horrible stories and it can be really scary.

So here are some of the major talking points that I've heard about. Aluminum in the vaccines.

Common Vaccine Myths and Misconceptions

There's a lot of fear that the aluminum could be dangerous to babies, but actually the amount of aluminum that's in vaccines is very, very low. In fact, babies actually consume aluminum.

And aluminum is in breast milk, it's formula. The total amount aluminum in that vaccines for the first six months of life is four and a half milligrams.

formula-fed babies will eat about 38 milligrams, and soy formula babies, will have about 114 milligrams of aluminum. And those levels are all actually safe, but 4.4 mg is the total amount from that primary series, so it's very low.

Consuming aluminum versus having it injected in a vaccine looks exactly the same to your body. So it is a very small amount, it won't hurt your baby. It's put in the vaccines to trigger more of an immune response.

Antigens. So the number of antigens in the vaccine, and antigen is something that causes an immune response. Babies are exposed to trillions of antigans in their first couple of years of life.

And the amount that they get in vaccines is about 150 antigans, so it's not that many. It's actually a lot less than when I was a kid in 80s. Those vaccines were more antogenic and more likely to cause side effects.

So they've really distilled them down and gotten it just to the point where these vaccines are effective without causing major side effects. And so the number of antigens in them is definitely safe.

I hear people saying they're so little, their little immune systems can't handle it, but actually they can. Their immune system are well able to recognize these antigans and fight them off.

So we give the vaccines at the ages we gave them because we know that they are safe for babies of that age. Autism, I know we all know by now that autism is not caused by vaccines.

There was that study that was done in England that showed a potential link. But as we know, that has been disproven and there have been many, many studies since then showing that there is no relationship between autism and vaccines The one sort of coincidental thing is that autism is usually diagnosed somewhere between 15 and 24 months of age, and that's when we're giving that secondary series of vaccines.

And so it's understandable that some parents think they're related, but autism There's some fear about whether the vaccines are actually going to cause long-term protection or not.

And they do. We have tests and studies that show that. So we can look for the antibodies to these diseases, and we show a person has immunity. Now, some people don't seroconvert, meaning they dont create antibodies, to that disease.

But that depends on that person's immune system and not on the vaccine. That person probably would also not have become immune even if they got the actual disease There are some different diseases that we test for if you're going into a high-risk field, like in the medical community, to make sure that you are immune.

So things like hepatitis and meningitis, they make that sure you have those vaccines and MMR and that have the antibodies to show that are protected. And if not, you'll typically get a booster of that and then get retested again later.

There used to be mercury in vaccines. I hear a lot of fear about that. We don't do that anymore. So there was a preservative called thimerosal that we used, and they haven't used that since the mid-80s, except in the adult flu vaccine.

And so childhood vaccines do not contain mercury. They do have thimerasal in them anymore There's concern about it being a weird or unnatural exposure that if you're getting it through your skin, it's somehow different than if got it naturally, like through mucus membranes, through nose and your mouth.

That's not true at all. Once the disease gets into your bloodstream or the pieces of pathogens in the vaccine get in there, It looks just like it would if it got in any other way.

So it works just as well as if he got the actual disease, but actually a little bit better because less symptoms and less severity of disease. One thing that really bothers me is when parents say that they think doctors get paid to

vaccinate children, we do not get pay for that.

Really, if anything, it's actually decreasing our business. We're putting ourselves out of a job because we're preventing these diseases that used to be so, so common.

So please don't perpetuate that myth. Doctors don' get to push vaccines. Also, it also really bothers me when parents threaten their children with vaccines, when they say things like, sit down and be quiet, or the doctor is going to give you a shot.

Vaccines are not a punishment. They're not something that children get for behaving badly. There's for preventing diseases. So if you want to talk to your child about vaccines before the appointment, you can let them know, we're doing this to keep you healthy.

We're, not doing, this as a, punishment we are, doing to hurt you. For the specific vaccines we give in the US, the hepatitis B vaccine is given at 0, 2, and 6 months, so we get that first dose within the first few days of life and then 2 months and six months.

Hepatitis is a viral infection that can be passed through blood from mom to baby, either through the placenta or during delivery from being exposed to mom's blood.

And the reason we give it at birth is because some women are exposed to hepatitis B during their pregnancy and they don't know it. Some of them will end up testing positive later, and some of might just have it and not be testing at the time that they were tested.

So we do give that routinely to all babies to prevent that because 90% of babies who are born to a mom with hepatitus B will develop chronic hepatite B infection.

Routine Childhood Vaccine Schedule

It's a very high risk. and of those who develop chronic infection, many of them will get liver cancer later in life. So actually, Hep B was the first anti-cancer vaccine, which is kind of cool.

The DTaP, or diphtheria tetanus and pertussis, is given at two, four, six, and 15 months and four years of life, so that's five doses before kindergarten.

And then the Tdap, or tetanus diphtheria pertussis, is given at age 11 and then every 10 years. So the Dtap has more diptheria component in it and the tdab has a more tetans component.

These are all bacterial infections. Diphthira causes a really bad sore throat with really swollen tonsils. And there can be so much swelling that it can actually close off your baby's airway and make them stop breathing.

So that's why we have that vaccine. We haven't seen diphtheria in many decades in the US, but it's in environment and has the potential to come back at any time.

Tetanus is a bacteria that causes spores, and the spore is living in the soil in dirt and can get into a wound. Now, tetanuse is an anaerobic infection, meaning it has to be a deep wound that then kind of closes over at the top.

So any kind penetrating dirty wound can cause it. Things like dog and cat bites are one of the most common sources of tetanaus in U. S., but then also things like nails or thumb tacks.

can introduce those spores into your baby's body. Tetanus is not killed by normal antibiotics, and so we have to prevent it. If a baby is exposed, or really, if any person is expose to tetanuse and they're not fully vaccinated against it, we can give them two shots at that time.

We give him a DTaP or Tdap, depending on the age. And then we give the tetanaus immune globulin, which is

pooled antibodies, monoclonal antibodies against tetanas.

and that is one of the treatments for it, but it is definitely better to prevent tetanus than to get it. Pertussis is another name for whooping cough, and whoeping cough is something that causes babies less than a year to stop breathing.

They cough cough and then their muscles tire out and they just stop. I've had babies like this in residency and it's horrifying. You have to run into the room.

It seems like every few minutes, you know, over and over again throughout the day because they've stopped breathing. And you just need to wake them up, maybe give them a little oxygen.

for the acute phase and then sometimes even longer they can have cough after that. So that is a big deal and antibiotics don't make it go away faster.

Pertussis needs to be prevented as well and I recommend that everybody who's going to around your baby in the first year of life needs be current on their Tdap vaccines, meaning they have to have a TDap within the past 10 years and it has to that pertusses component in it.

The polio vaccine we give at two, four, and six months and four years, so four doses total. And polios, a virus that attacks nerves. It causes cold symptoms, but then also some nerve paralysis.

We don't really know which nerve it's going to affect. it depends on the person. So in some people it can cause things like leg paralysis, like limping.

Um, it cause loss of the use of an arm or a hand. But the worst case is when it affects the diaphragm and causes them to stop breathing. If you remember those pictures of the iron lung from way back in the day, those are for people who have polio that can't breathe anymore, and it's just making them breathe.

It's the machine that causes him to breathe, but there's no specific treatment for poli and does not get better that paralysis does go away. So that is one that needs to be prevented as well.

The Hib vaccine, HIB stands for Haemophilus influenza B, which is actually a bacterial infection. It sounds like influenza virus, but it's not. So Haimophillus Influenza, that vaccine is given at 2, 4, and 6 months and then again between 12 and 18 months.

Hib is an infection that affects kids less than five years of age and especially those less then one year of aged and it causes severe infections like sepsis, pneumonia and meningitis and also epiglottitis where the epilottis swells up and can block off the airway and cause baby to stop breathing.

PCV is the pneumococcal vaccine. We give that at two, four, and six months, in 12 to 18 months. So four doses altogether. And PCP stands for Pneumocockle Conjugate Vaccine.

Pnumacoccus is another name for strep pneumoniae or streptococus pneumonia, which is a kind of streps that gets into your bloodstream. It also causes things like meningitis, sepsis, pneumonia.

Our PCV vaccine has 13 strains of strepinit right now and that may change over the years. They've been adding strains in as new strains start to arise and cause these infections.

The rotavirus vaccine is given at 2, 4, and 6 months and cannot be given after 8 months of age or is not indicated the age out of it if they're older than that.

Rotavirus is a viral infection that causes severe diarrhea and dehydration in babies and used to kill a lot of babies. We did have a baby like this that I've seen in residency as well, and it's a scary disease.

I'm talking like 12 episodes of diarrhea in the first hour. By the time this baby got from the ER up to our floor to be admitted, it looked like a raisin.

It was so dehydrated. So rotavirus I really love that we have a vaccine for it. It's an oral vaccine, so it's given by mouth and the babies drink it, they seem to love the taste of it so yeah, this is a great one.

Hepatitis A vaccine. That's giving at 12 and 18 months and hepatitis a is the type of food poisoning. So I highly recommend this if you're going traveling or if eat out at restaurants a lot.

There's no specific treatment for hepatitus A if they get it it just supports It causes things like vomiting, diarrhea, and jaundice. And really all you can do is IV fluids and wait it out.

So the vaccine will prevent that. The MMR vaccine is given at age one and four years and that contains measles, mumps and rubella. Measles is something that causes a high fever and a rash in children, but can also cause encephalitis, which is an inflammation of the brain and can cause brain damage and hearing loss and coma and death.

So it can be really serious and it's very contagious. Mumps is a virus that causes parotitis, which is an inflammation of the salivary glands. So the sides of your cheeks get really swollen and painful.

And that in itself is not a big deal. But in boys who get mumps, they get orchitis. Orchitis is inflammation in the testicles. The problem with that is that some of time it affects both testicle And in those cases, those boys can actually become sterile, so they won't be able to have children later in life.

So that's why that one's a pretty big deal. And I have seen patients with mumps. I went to medical school in the Czech Republic, and there was a couple year period where they didn't vaccinate with the MMR.

It wasn't recommended routinely. We had a handful of patients that were all between the ages of 22 and 25 with this. Yeah, it's really unpleasant and potentially dangerous.

And then rubella is one that's actually a pretty mild disease. It just causes a fever and a rash and cold. But if a mom is pregnant and she gets rubella, then she is at risk of having a miscarriage or birth defects or other serious problems with the baby.

So we actually originally developed the rubella vaccine to be given to children so that their moms don't get it when they're pregnant with their next baby The chickenpox vaccine or varicella zoster vaccine is given at age one in four years and chicken pox causes cold symptoms and a fever and rash that is itchy and painful.

And then in adults, it can cause shingles. So the chicken Pox virus actually can go into your nerves and hide there. Then it comes out along one nerve as shingle later in life in times of stress.

And varicella or chickenpox in pregnancy can cause also miscarriages and birth defects. So that's one that we primarily created the vaccine, again, to protect those unborn babies that are relatives of the children that were vaccinating.

But it is a pretty unpleasant disease to have. I had chicken pox as a kid. The meningitis vaccine, or MCV, is given at age 11 and 16 years. And sorry, I'm going all the way up through childhood.

These are some of the later ones. But the meningitis vaccine has four strains in it, meningitus A, C, W, and Y. and these are viruses that cause inflammation of tissues around the brain.

And it can actually be fatal pretty quickly. So that's one that we do at age 11 and 16, right before they're going into middle school and then during high school to protect them through high-school and college.

Because that is when the school systems, you know, elementary schools, there's a whole bunch of them. And then

there is sort of a couple of elementary school that will feed into a middle- school, and a few middle schools that feed in to a high School typically.

they were having larger and larger crowds of children. And so we're protecting them from this when they're in the large crowds because meningitis is highly contagious.

The HPV vaccine is two doses. We give it at 11 years of age. And the human papillomavirus is a virus that causes things like warts and dysplasia or a change of cells.

Vaccine Side Effects and Aftercare

That can cause things, like cancers. So there are hundreds of strains of HPP, but the vaccine that we have right now only has the top nine in it that are causing things.

vocal cord nodules and genital warts and also cancers of the mouth, throat, anus, cervix in girls and penis in boys. The flu vaccine is recommended annually for everyone and the COVID vaccine recommendations are still evolving at the time of this recording, but those are some other vaccines that are recommended routinely.

And then just a few vaccines are available but we don't give routinely are meningitis B and pneumococcal polysaccharide vaccine. We give those to children who are immune compromised.

The pneumococcal polysaccharide is like the PCV vaccine, but it has 23 strains of strep in it, and it's a little bit less antigenic than the PCB. So it doesn't cause as much of an immune reaction, so that's why we don't give that one routinely to kids.

The vaccines for dengue, typhoid, Japanese encephalitis, yellow fever, rabies, some others. These are sometimes recommended when you're traveling to areas where these diseases are endemic.

So for those listening in other countries, you may have those recommended routinely to you. For the US, if you are traveling outside to another country, You can always go to the CDC website and type in CDC and the country youre going to and it will give you the recommendation of all the travel vaccines that you should get before going there.

For the total number of vaccines, there are 21 to 23 total shots that your baby will get by the time that they're 18 years old. So in the first 18 of life, so it's not that many, and then potentially 18 flu and or COVID vaccines in there.

At birth, they get one, at two months, They get two or three shots plus the oral vaccine, which is Rota. at four months they are going to get 2 shots and 1 oral vaccines.

At six months, they're going to get one or two combos plus the PCV, so two or three shots plus an oral vaccine. From six-months onward, your child will probably get an annual flu vaccine and then potentially a COVID vaccine, and boosters once those recommendations come out.

At age 12 to 18 months, they get a total of five to seven vaccines, depending on whether you're doing combos or not. And then at age four to six years, the get two combo vaccines.

At ages 11, They get four shots. and at ages 16, The get one. So yeah, that's a totale of nine shots and three oral vaccines in the first year. A total five or seven shots from ages one to two.

Two shots at age four to six, four shots age 11, and one at 16. All right, so some common vaccine reactions that I see. The hepatitis B vaccine that we give at birth usually doesn't cause any reaction at all, but sometimes we see a little redness and swelling with it.

From two to six months, those shots that were giving, we sometimes see large local reaction, which is rediness and swelling. It can be warm to the touch and it can't be as much as their entire thigh and still be considered a normal

large, local, reaction.

Sometimes they get low grade fevers with that. And for the local reactions, you can just do a cool compress. You can use like a wet washcloth and put that on there.

And, or you could do some ibuprofen or acetaminophen for that. The ibipropen and acetaminephin are also used to treat the low-grade fevers. At 12 to 18 months and the four to six years, typically we'll see just muscle soreness.

Sometimes the MMR and chickenpox cause fevers because those are live attenuated vaccines. And sometimes they can cause high fevors, even as high as 103 to 105. So that is pretty high.

That's over 40 Celsius. Now, the varicella zoster vaccine sometimes causes a rash, like a little local chicken pox rash usually around the site of the injection.

Sometimes it can be on their trunk as well. And then other vaccines that we give at those ages like the DTaP, those can cause those large local reactions again.

So that's that redness and swelling and maybe a lump in their skin that you can feel. At age 11, when we're given their shots, they typically just have muscle soreness.

And the Tdap and meningitis vaccines can cause that local reaction again, the redness and swelling. The HPV vaccine is associated with fainting. I think that's partly because it is a painful vaccine to get.

It's one that stings more than the others. Also, we are giving it to teenagers. Teenagers are notoriously dehydrated and more likely to faint with vaccines and with pain.

That is something that happens and we just watch them for 20 minutes in the office, typically after the HPV vaccine, to make sure they're not going to faint.

At age 16, they are getting that meningitis vaccine. So again, just a local reaction from that. And then with the Tdap boosters as an adult, you know, that's like you get muscle soreness from them.

The flu and COVID vaccines do cause flu-like symptoms. And again, those are not able to cause disease, but they do mimic disease in your body. So you feel kind of like you have the flu, like some body aches, a low grade fever, just kind feeling crummy.

You can treat those again with Tylenol, or sorry, acetaminophen or ibuprofen. Acetaminophene is called paracetamol outside the US. And those are the most common things I see with vaccines.

Now, it is not normal to have a body rash after a vaccine, other than that chicken pox, you can get a little mild body rush. But if your baby is breaking out in a rash, after our vaccine all over their body, that could be a sign of an allergy.

Also vomiting after vaccine is no considered normal. That's another sign I don't recommend pre-medicating your children before vaccines. A lot of parents ask me, should I give them a dose of acetaminophen or ibuprofen before the visit?

And the answer is no, you really shouldn't. Most children do really well with vaccines and don t even need it at all. And those could potentially decrease your body's ability to create a good enough immune response to become immune to those things.

Ibupropane is an NSAID or non-steroidal anti-inflammatory drug, so it is suppressing your immune potentially make the vaccine less effective. So I'd say if your child is really miserable, if they really need the medicine, absolutely give it to them.

That is totally fine. But also, you don't need to give to everybody.

Closing Remarks and Next Episode Preview

Lastly, If your children does have an adverse reaction to a vaccine, anything unusual, things like they're outside of the common side effects that I have mentioned, You can go on to the VAERS, which is the Vaccine Adverse Event Reporting System, or VAERS.

Now, the VAERS is kind of like Yelp for vaccines. So when you're reading through that, if you see other people's experiences, those are all things to take into consideration.

But also keep in mind that the people who are writing these are just like anyone can write a report on there, just for YELP or a Google review. Take it about as seriously as you would those kind reviews.

All right, so that was our whirlwind tour of all the vaccines that we give in all of childhood. I know I took you guys way past the babyhood stage, but yeah, I hope this helps.

Thanks for listening and make sure you subscribe if you haven't already because next time we're going to talk about infant development. What's normal, what's not, how to boost your baby's development and how play with them for the first year of life to help them develop.

And remember that all of this information is in my book, The Baby Manual. So if want to see it all written out in one place, you can go to Amazon and get your own copy today.

Thank you for listening to the Baby Manual podcast. Please hit that subscribe button below so you don't miss the new episodes when they come out. I would also love it if you could leave me a review.

If you'd like to buy a copy of the baby manual, it's on Amazon and Kindle. The author, Dr. Carol Keim, and that's spelled K-E-I-M. You can also follow me on YouTube, TikTok, Instagram, or Facebook to get some quick baby tips that will make you feel like an expert.

Thanks for