

What's in Vaccines?

The Purpose, Safety, and Science Behind Their Ingredients



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Disclosures

Kylie Hall, Maeve Williams and Lauren Dybsand have no relevant financial relationships with ineligible companies to disclose.

The core concepts, clinical themes, and structural outline of this presentation were entirely developed by the CIRE team. Generative AI tools were used as an editorial tool to assist with text generation, phrasing, and conciseness.

Objectives

- 1 Describe the role of different vaccine ingredients, such as adjuvants, stabilizers, and preservatives.
- 2 Recognize common misconceptions about vaccine ingredients, such as aluminum and thimerosal, using current evidence.
- 3 Discuss effective communication strategies to counsel patients about vaccine ingredients.

Vaccine Ingredients in the News

Aluminum salts emerge as likely target as health officials scrutinize childhood vaccines

The vaccine ingredient has long been a talking point for anti-vaccine activists. Health Secretary Robert F. Kennedy Jr. has made unsubstantiated claims that it is linked to allergies and autism.

Dec. 26, 2025, 4:00 AM CST

By Aria Bendix

 **NBC NEWS**

Fact check: Listed vaccine ingredients do not include weed killer

By Reuters

November 19, 2020 3:16 PM CST · Updated 1 min ago

 **Reuters**

CDC vaccine panel recommends avoiding thimerosal in flu vaccines

Lisa Schnirring, June 26, 2025

 **CIDRAP**
Center for Infectious Disease Research and Policy
UNIVERSITY OF MINNESOTA

November 19, 2025 | 2 min read

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RFK, Jr., Says Peanut Allergies May Be Tied to Aluminum in Vaccines and Pesticides. Here's What the Science Says

Strong evidence suggests that food allergies are caused by a lack of exposure to food allergens—not by exposure to toxins

BY TANYA LEWIS EDITED BY CLAIRE CAMERON

**SCIENTIFIC
AMERICAN**

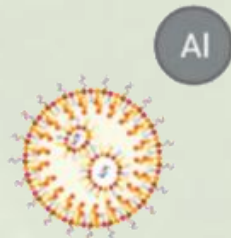


What ingredients are in vaccines?



Active ingredients

An antigen (or instructions to make one) that activates the immune system but doesn't cause the disease



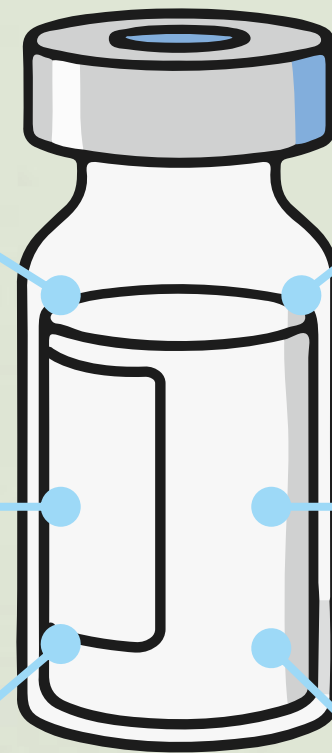
Adjuvant

Help in boosting the immune response to the vaccine
ex. aluminum salts



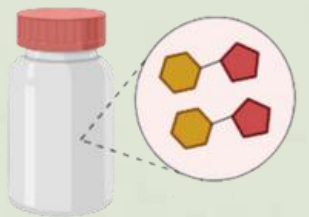
Antibiotics

Prevent contamination by bacteria during the vaccine manufacturing process
ex. neomycin



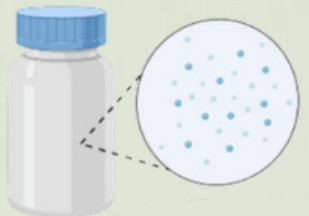
Stabilizers

Keep vaccine stable after manufacturing and maintain effectiveness during storage
ex. sugar, gelatin, polysorbate 80



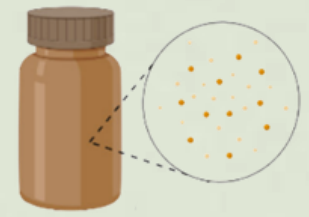
Preservatives

Prevent bacterial and fungal growth
ex. thimerosal*



Other trace components

Found in very small amounts after manufacturing
ex. formaldehyde, cell culture materials



*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

Vaccine Types and What They Tell Us About Ingredients

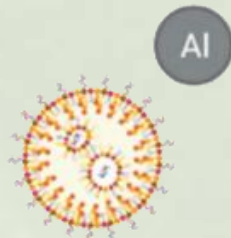
Type of Vaccine	How It's Made (Simplified)	What This Means for Ingredients You Might See
Live attenuated	Virus is grown in living cells (e.g., chicken eggs, human or monkey cells), then weakened, purified, and packaged	May include: residual cell proteins (egg, human, monkey), stabilizers (such as sugars, gelatin, or amino acids), and trace antibiotics used during production
Inactivated (killed)	Pathogen is grown in large quantities, then killed using heat, chemicals, or radiation; purified and packaged	May include: residual cell culture material, inactivation agents in trace amounts, adjuvants (to boost immune response), stabilizers, preservatives (esp. in multi-dose vials)
Subunit/ recombinant/ toxoid	Only part of the pathogen is made (often in yeast, bacteria, or insect cells), or toxin is inactivated; then purified and packaged	May include: residual proteins from production cells (yeast, bacterial), adjuvants (commonly aluminum salts), stabilizers, buffer salts
Genetic code (mRNA, viral vector)	Genetic instructions are manufactured (or inserted into a harmless vector), then packaged into delivery systems (e.g., lipid nanoparticles or viral shells)	May include: lipid nanoparticles (for mRNA), salts, sugars, buffering agents

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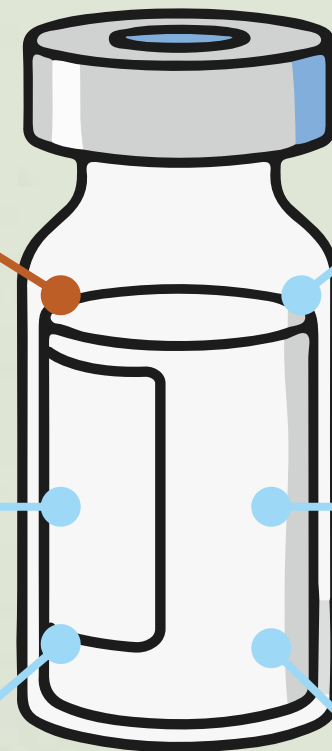
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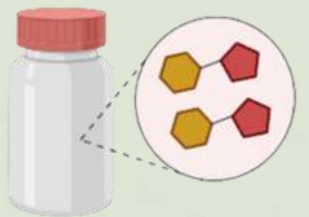
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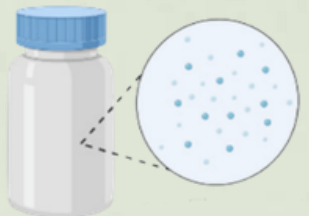
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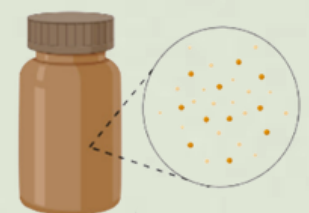
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*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

More Childhood Vaccines - But Fewer Antigens

Number of Immunogenic Proteins and Polysaccharides Contained in Vaccines Over the Past 100 Years

1900		1960		1980		2000		2026	
Vaccine	Protein	Vaccine	Protein/Sugar	Vaccine	Protein/Sugar	Vaccine	Protein/Sugar	Vaccine	Protein/Sugar
Smallpox	~200	Smallpox	~200	Diphtheria	1	Diphtheria	1	Diphtheria	1
TOTAL	~200	Diphtheria	1	Tetanus	1	Tetanus	1	Tetanus	1
		Tetanus	1	WC pertussis	~3000	Acellular pertussis	2-5	Acellular pertussis	2-5
		WC pertussis	~3000	Polio	15	Polio	15	Polio	15
		Polio	15	Measles	10	Measles	10	Measles	10
		TOTAL	~3217	Mumps	9	Mumps	9	Mumps	9
				Rubella	5	Rubella	5	Rubella	5
				TOTAL	~3041	Hib	2	Hib	2
						Varicella	69	Varicella	69
						Pneumococcus	8	Pneumococcus	16-21
						Hepatitis B	1	Hepatitis B	1
						TOTAL	123-126	Rotavirus	11-16
								Hepatitis A	4
								Influenza	11
								COVID-19	1
								TOTAL	158-171

Antigen exposure associated with childhood vaccines is like a drop in the ocean compared to the environmental exposure a child encounters every day.

WC = whole-cell

CHOP 2026

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Dangerous Chemicals?

- Glutamic Acid
- Phenylalanine
- Threonine
- Oleic Acid
- Phytosterols
- Tocopherol
- Ethyl Hexanoate
- Pentyl Acetate
- Ethene Gas

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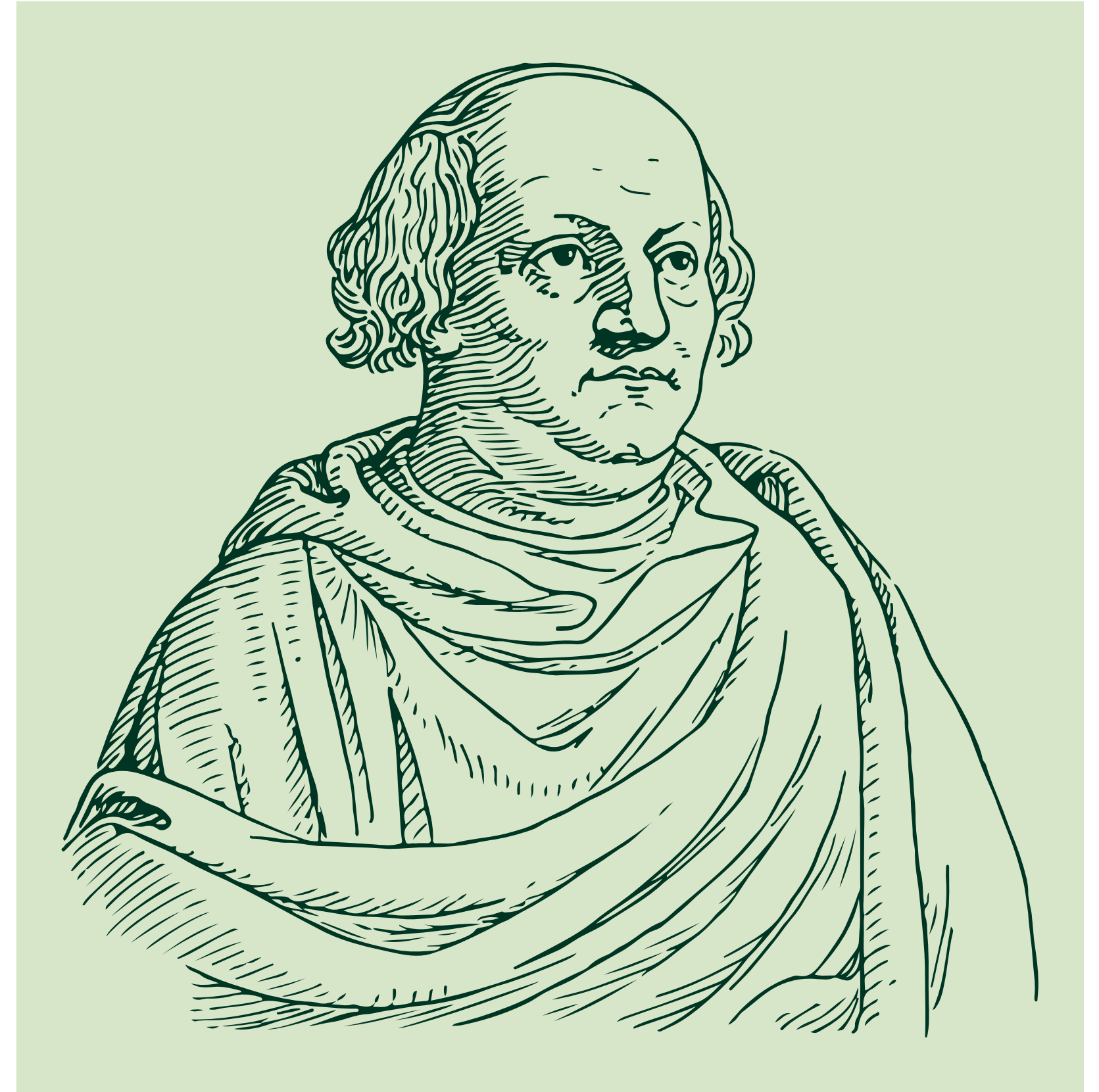
- **Sodium chloride** – better known as table salt
- **Sucrose** – that's just sugar
- **Monosodium phosphate** – a type of salt that helps keep the vaccine stable
- **Aluminum salts** – tiny amounts that boost your immune response, naturally found in food and water
- **Gelatin** – the same ingredient used to make gummy bears, used to keep the vaccine stable

Common Flaws in Anti-Vaccine Literature

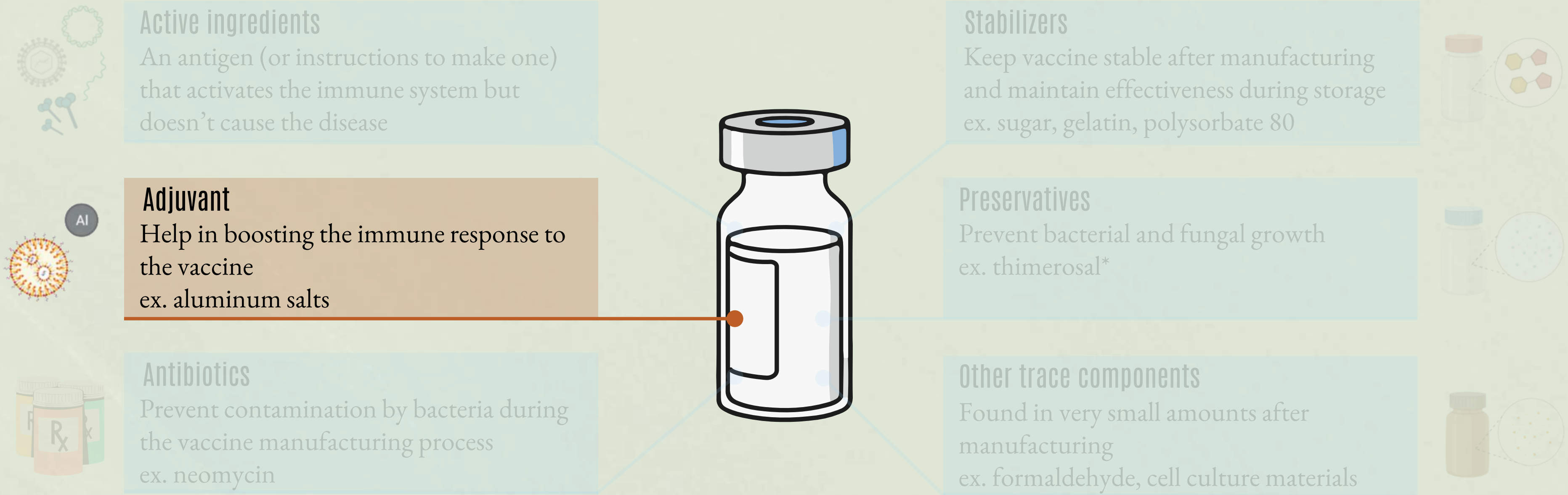
- Lack of basic understanding of chemistry and toxicology
- Inaccurate level of exposure reported
- Incorrect compound cited for “toxic” effects and limit
- Inaccurate claims of “toxin” present in all vaccines
- Failure to report “toxin” purpose
- Failure to differentiate acute vs. chronic exposure
- Inaccurate mode of entry referenced
- Fear of “unnatural” chemicals

”
The Dose
Makes the
Poison
“

-PARACELSUS, FATHER OF TOXICOLOGY



What ingredients are in vaccines?



*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

Which vaccines have adjuvants?

Vaccine	Adjuvant
MMR, Varicella, Rotavirus, Polio, Hib (ActHIB), MenACWY, mRNA COVID-19 vaccines*	None
Seasonal Influenza	None (MF59 for Fluad)
Hepatitis A and Hepatitis B	Aluminum (CpG1018 for Heplisav-B)
DTaP, Tdap	Aluminum
Hib (PedvaxHIB only)	Aluminum
Pneumococcal, MenB	Aluminum
HPV-9	Aluminum
Shingles and Arexvy (RSV)	AS01
COVID (Nuvaxovid)	Matrix-M

**mRNA vaccines do not contain a traditional adjuvant. The lipid nanoparticles (LNPs) protect the mRNA and help deliver it into cells. While LNPs can stimulate aspects of the innate immune system and contribute to the immune response, they are primarily considered a delivery system rather than a licensed adjuvant.

CDC, 2026

Aluminum

ADJUVANT

- Aluminum compounds have been used in vaccines since 1926.
- Many vaccine antigens cannot trigger adequate immune responses on their own.
- Aluminum salts in vaccines are used to boost the immune system's response to the vaccine.

Aluminum

Used in vaccines to stimulate a robust immune response



It is the 3rd most abundant element in Earth's crust (found in soil, water, air, plants, and food).

Most adults consume 7-9 milligrams of aluminum daily.



Aluminum has been safely used in various products for decades.

Hepatitis A & B vaccines

- 0.225 – 0.5 mg per dose

DTaP/Tdap vaccines

- 0.33 – 0.53 mg per dose

Hib vaccines

- 0.225 mg per dose

HPV vaccines

- 0.5 mg per dose

Pneumococcal vaccines

- 0.125 mg per dose

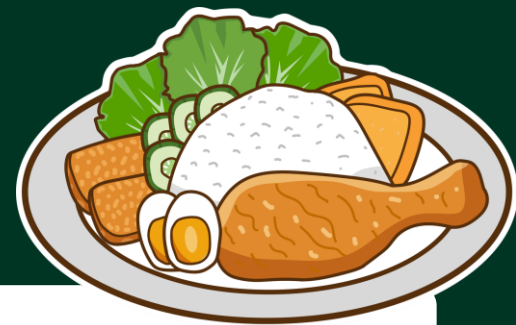
Meningococcal vaccines

- 0.25 – 0.52 mg per dose

Aluminum is NOT used in live vaccines like MMR, varicella, or rotavirus vaccines.

Aluminum from our diets far exceeds that from vaccines

DIETARY EXPOSURE



468-2,785 mg

lifetime aluminum
exposure from diet

2 years old: 3-18 mg

18 years old: 73-438 mg

19+ years old: 395-2,347 mg

VACCINE EXPOSURE



12 mg =

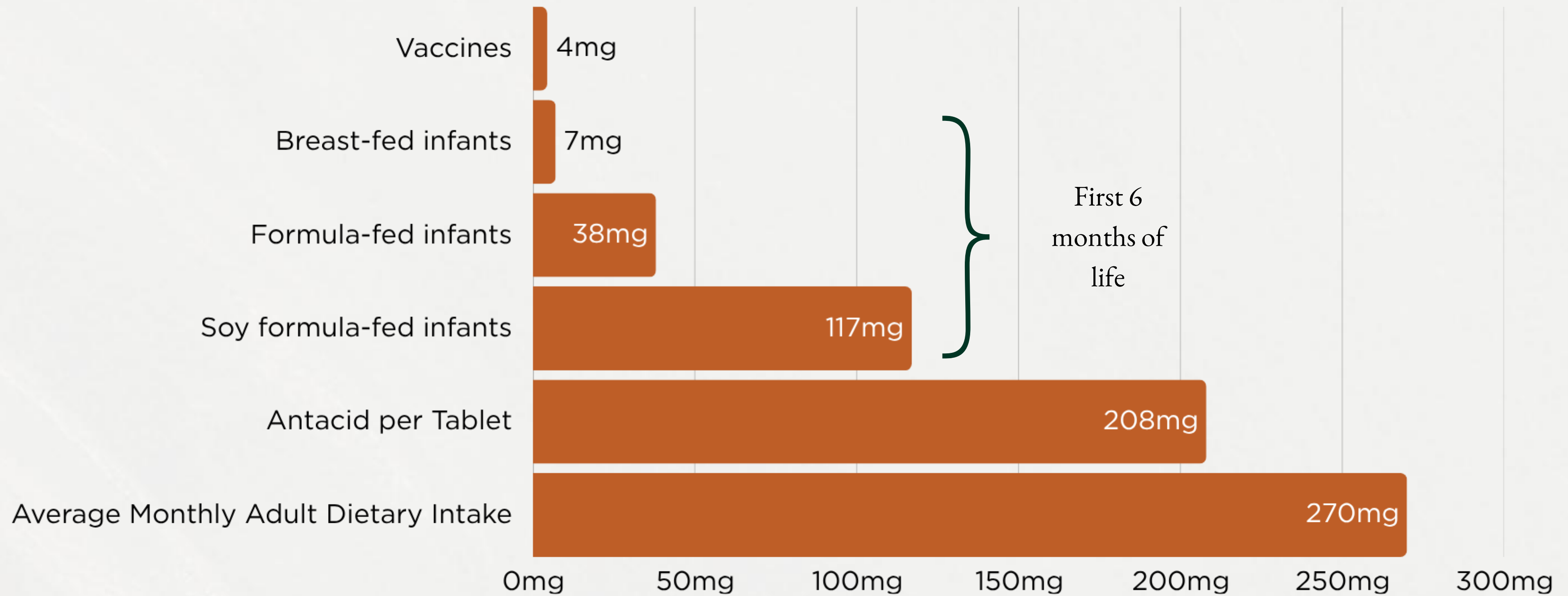
lifetime aluminum
exposure from vaccines

2 years old: 4.4 mg

18 years old: <8 mg

19+ years old: <5 mg

Aluminum in vaccines compared with other products



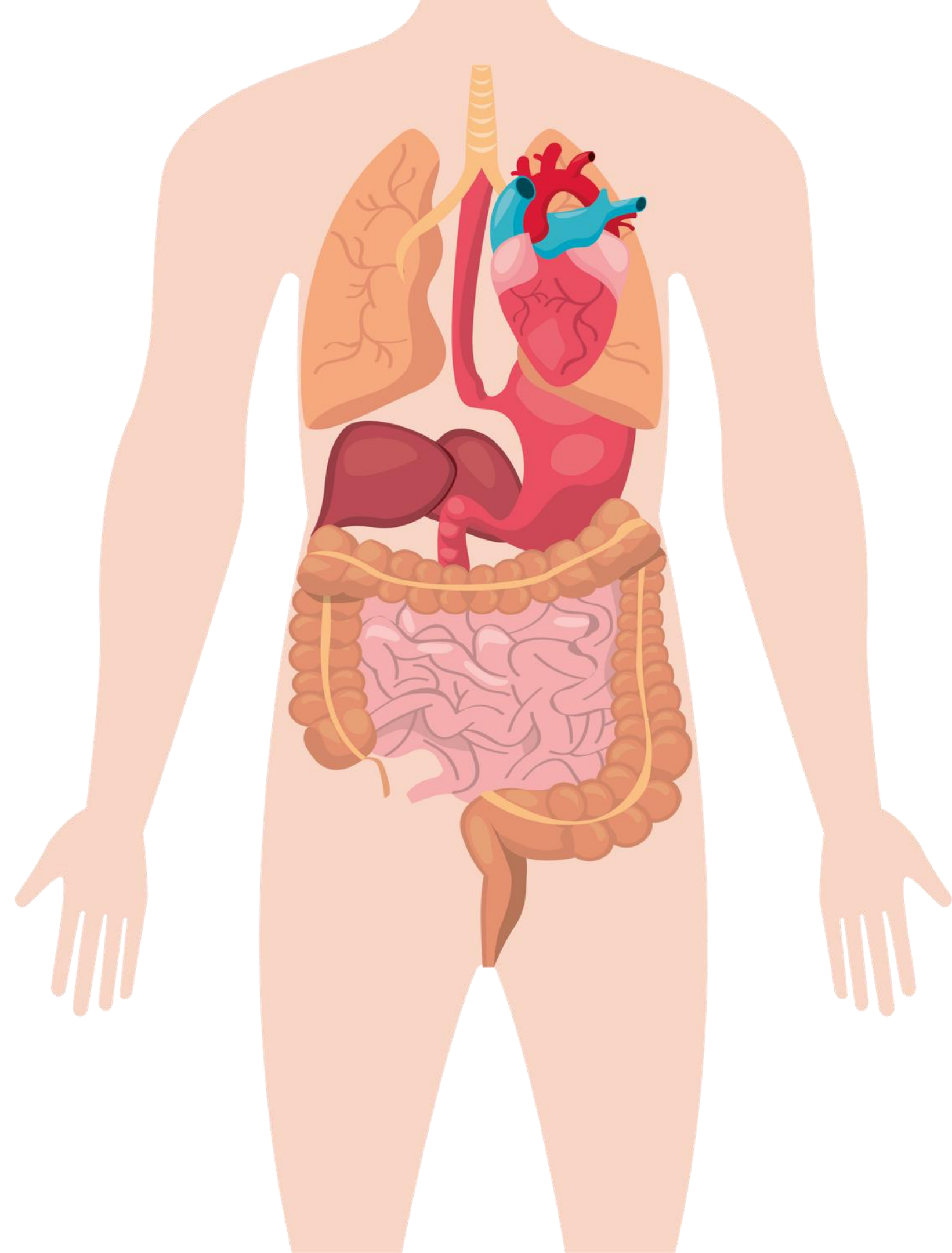
Note: 1 milligram (mg) = one-thousandth (1/1,000) of gram.
1 gram is the weight of 1/5 of a teaspoon of water.

CHOP, 2026; Steier et al, Unbiased Science, 2025, Moser 2026.

What about injection vs. ingestion?

Great question!

- <1% of dietary aluminum is absorbed
- Vaccine aluminum is released gradually after injection
- Aluminum provided through vaccination is small compared with dietary exposure
- Same elimination pathway: kidneys
- ~50–70% cleared in 24 hours; ~80% in 2 weeks



Aluminum-Adjuvanted Vaccines:

WHAT THE LATEST LARGE-SCALE STUDY SHOWS

Population: 1,224,176 children born in Denmark between 1997–2018, alive and residing in the country at age 2 years

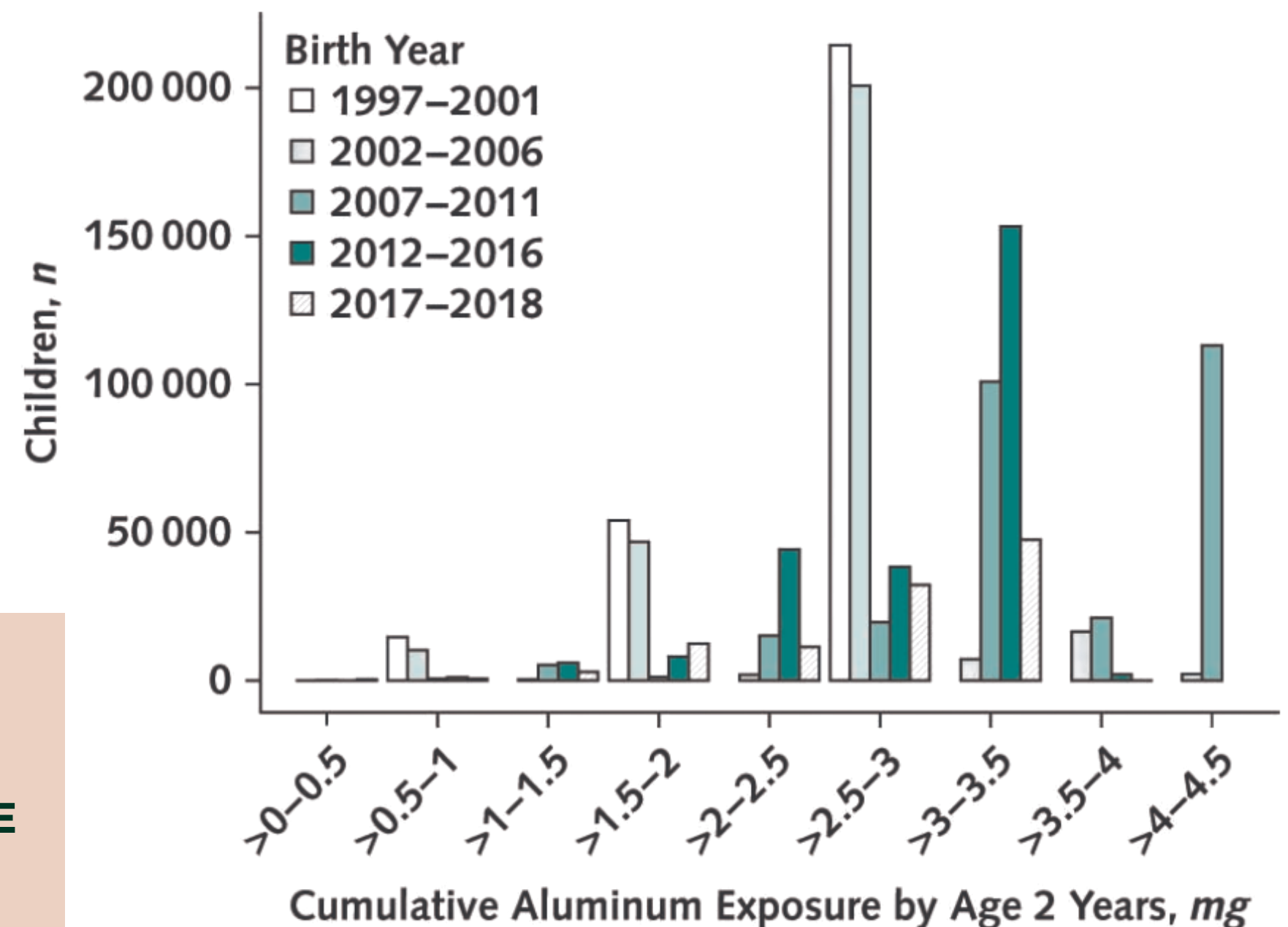
Exposure: Cumulative amount of aluminum (in mg) via vaccines during first 2 years of life

Outcomes: Incident diagnoses of 50 different chronic disorders, grouped into three main categories:

- Autoimmune disorders
- Atopic/allergic disorders
- Neurodevelopmental disorders (**including autism spectrum disorder and ADHD**)

NO EVIDENCE OF INCREASED RISK OF ANY OF THE STUDIED DISORDER CATEGORIES ASSOCIATED WITH HIGHER ALUMINUM EXPOSURE FROM VACCINES IN EARLY CHILDHOOD.

Early childhood vaccination with aluminum-adsorbed vaccines in Denmark, 1997-2020



How to Respond: Conversation Pearls for Aluminum

Patient Concern: “I'm worried about the aluminum in vaccines.”

AVOID:

There's aluminum in everything, so it's not a problem.

TRY INSTEAD:

I'm glad you brought that up. Aluminum has been used in some vaccines for decades to help the immune system build a stronger response. The amount is very small, and babies and children are exposed to more aluminum through food, formula, breast milk, water, and the environment than they receive from vaccines. What questions do you have about how it's used?

Patient Concern: “I've heard aluminum in vaccines can cause autism or developmental problems.”

AVOID:

That's been debunked.

TRY INSTEAD:

I can understand why that would be concerning. Researchers have carefully studied whether vaccine ingredients, including aluminum, are linked to autism or developmental conditions. What they've found is that the evidence does not show a link. What have you heard about that connection?

Knowledge Check: What is the primary purpose of an adjuvant in a vaccine?

- A. Prevent bacterial contamination
- B. Boost the immune response to the vaccine
- C. Keep the vaccine stable during storage
- D. Kill viruses during manufacturing

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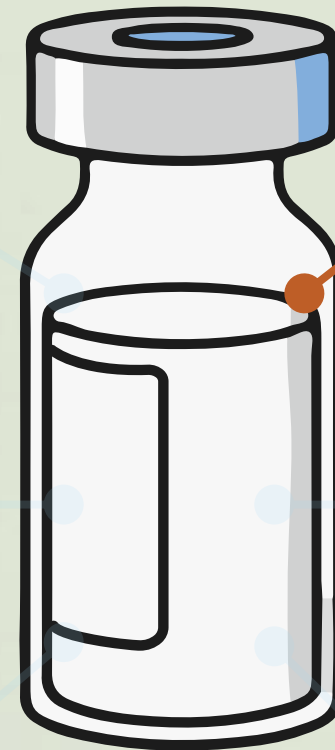
Adjuvant

Help in boosting the immune response to the vaccine
ex. aluminum salts



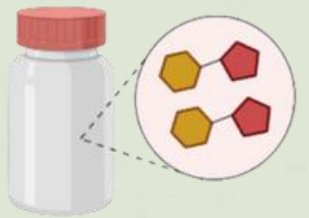
Antibiotics

Prevent contamination by bacteria during the vaccine manufacturing process
ex. neomycin



Stabilizers

Keep vaccine stable after manufacturing and maintain effectiveness during storage
ex. sugar, gelatin, polysorbate 80



Preservatives

Prevent bacterial and fungal growth
ex. thimerosal*



Other trace components

Found in very small amounts after manufacturing
ex. formaldehyde, cell culture materials



*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

Gelatin

STABILIZER

- Gelatin is a protein formed by boiling skin or connective tissue (usually porcine) and treating chemically.
- It is commonly found in foods like Jell-O, gummy candies, and marshmallows.
- It acts as a stabilizer, protecting the vaccine from damage during freeze-drying, storage, and transport.

Gelatin

Used to protect vaccines from adverse conditions during transport and delivery

- Most gelatin in vaccines is porcine in origin, aside from a rabies vaccine which uses gelatin of bovine origin.
- Gelatin is the most common identifiable cause of severe allergic reactions to vaccines.
- There's about 1 case of anaphylaxis to gelatin per 2 million doses administered.



Influenza vaccine (Flumist)

- 2 mg per dose

MMR vaccine

- 14.5 mg per dose

MMRV vaccine

- 11 mg per dose

Rabies vaccine

- ≤ 12 mg per dose

Typhoid oral vaccine

- Gelatin capsule

Varicella vaccine

- 8.9 – 12 mg per dose

Yellow fever vaccine

- Not specified

Can Muslims, Jews, or Seventh-Day Adventists receive vaccines that contain porcine gelatin?

Yes. Religious authorities from these faith traditions have generally determined that vaccines containing porcine gelatin are permissible.

Why?

- Most vaccines are not consumed as food.
- Vaccine gelatin is highly purified.
- Protecting health and preventing disease is prioritized.
- The benefits of vaccination outweigh dietary concerns.

***For some routine vaccines, alternative formulations without porcine gelatin are available; varicella vaccine is the primary exception.**

Polysorbate 80

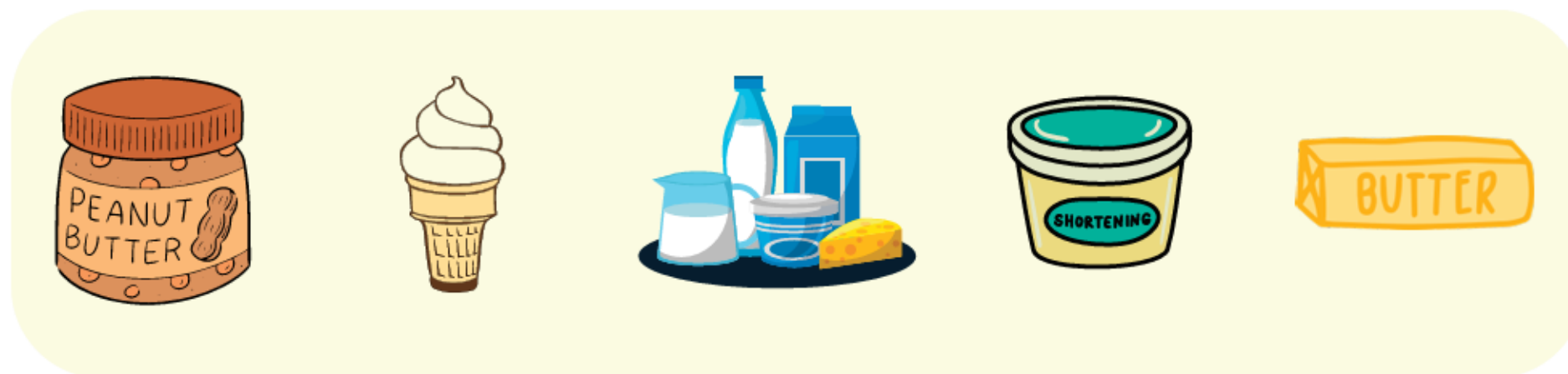
EMULSIFIER

- Polysorbate 80 is used in vaccines to help ingredients mix together and keep them from separating during storage.
- Polysorbate 80 is commonly found in lotions, makeup, shampoos and conditioners, medication, vitamins and supplements, and foods.

Polysorbate 80

Used to keep the vaccine stable after manufacturing and maintain its effectiveness during storage

- Polysorbate 80 is used as an emulsifier in ice cream to make it smooth and slow its melting.
- A typical serving of ice cream (1/2 cup) may contain about 170,000 micrograms (170 milligrams) of polysorbate 80.
- There is no evidence to suggest polysorbate 80 causes adverse health outcomes.



Note:

1 milligram (mg) = one-thousandth (1/1,000) of gram

1 microgram (mcg) = one-thousandth (1/1,000) of milligram

FDA, 2025; CHOP, 2025; Back to the Vax, 2023; Gadzinowski et al., The Pediatric Infectious Disease Journal, 2015

Hepatitis B vaccines

- 0.1 mg per dose

DTaP/Tdap vaccines

- $\leq 8.1 - 100$ mcg per dose

Hib vaccines (combination)

- < 8.1 mcg per dose

HPV vaccine

- 50 mcg per dose

Polio vaccines (combination)

- $\leq 8.1 - 100$ mcg per dose

Influenza vaccines

- ≤ 415 mcg – 1.175 mg per dose

Meningococcal vaccines

- 0.018 mg/dose

Pneumococcal vaccines

- 100 mcg/dose

RSV vaccines

- 0.08 – 0.18 mg per dose

Shingles vaccine

- 0.08 mg per dose

How to Respond: Conversation Pearls for Stabilizers

Patient Concern: “I avoid pork products for religious reasons. I heard this vaccine contains gelatin from pork, and I don’t think I should get it.”

AVOID:

Your religion allows it.

TRY INSTEAD:

I’m really glad you brought that up. Many of my patients have questions about pork products in vaccines because it raises religious concerns. I’d be happy to discuss what we know about pork gelatin in vaccines, how religious leaders have approached this issue, and whether alternative options might be available.

Knowledge Check: Which ingredient is primarily used to keep vaccines stable during storage?

A. Neomycin

B. Aluminum salts

C. Gelatin

D. Formaldehyde

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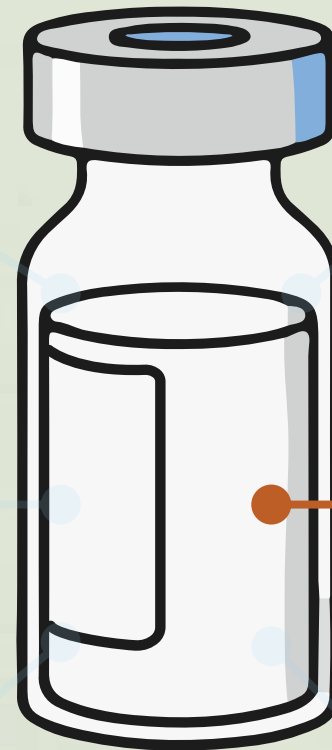
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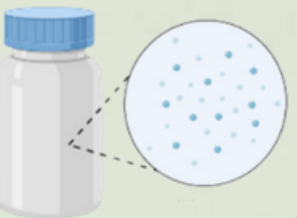
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*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

Thimerosal

PRESERVATIVE

- Thimerosal has been used as a preservative in many products, including vaccines, since the 1930s.
- The antimicrobial properties of thimerosal allow for it to prevent the growth of bacteria and fungi in multi-dose vaccine vials.
- All vaccines routinely recommended for children 6 years of age and younger in the U.S. are available in formulations that do not contain thimerosal.
- About 4% of U.S. flu vaccine supply is multi-dose vials.

Thimerosal

Ethylmercury-containing preservative used to prevent contamination with bacteria



Mercury is a natural element found in the earth's crust, air, soil, and water.



Ethylmercury

Ethylmercury (the type of mercury in some flu vaccines) is processed and eliminated from the body much quicker than methylmercury, making it less likely to accumulate and cause health problems.

Methylmercury

Methylmercury (the type of mercury in the environment) can be found in certain fish, which when consumed can accumulate in the body and potentially cause harm at high levels.



Thimerosal, as a preservative, is no longer contained in any childhood vaccine, with the exception of some formulations of the influenza vaccine.*

1 vaccine dose (0.5 mL)

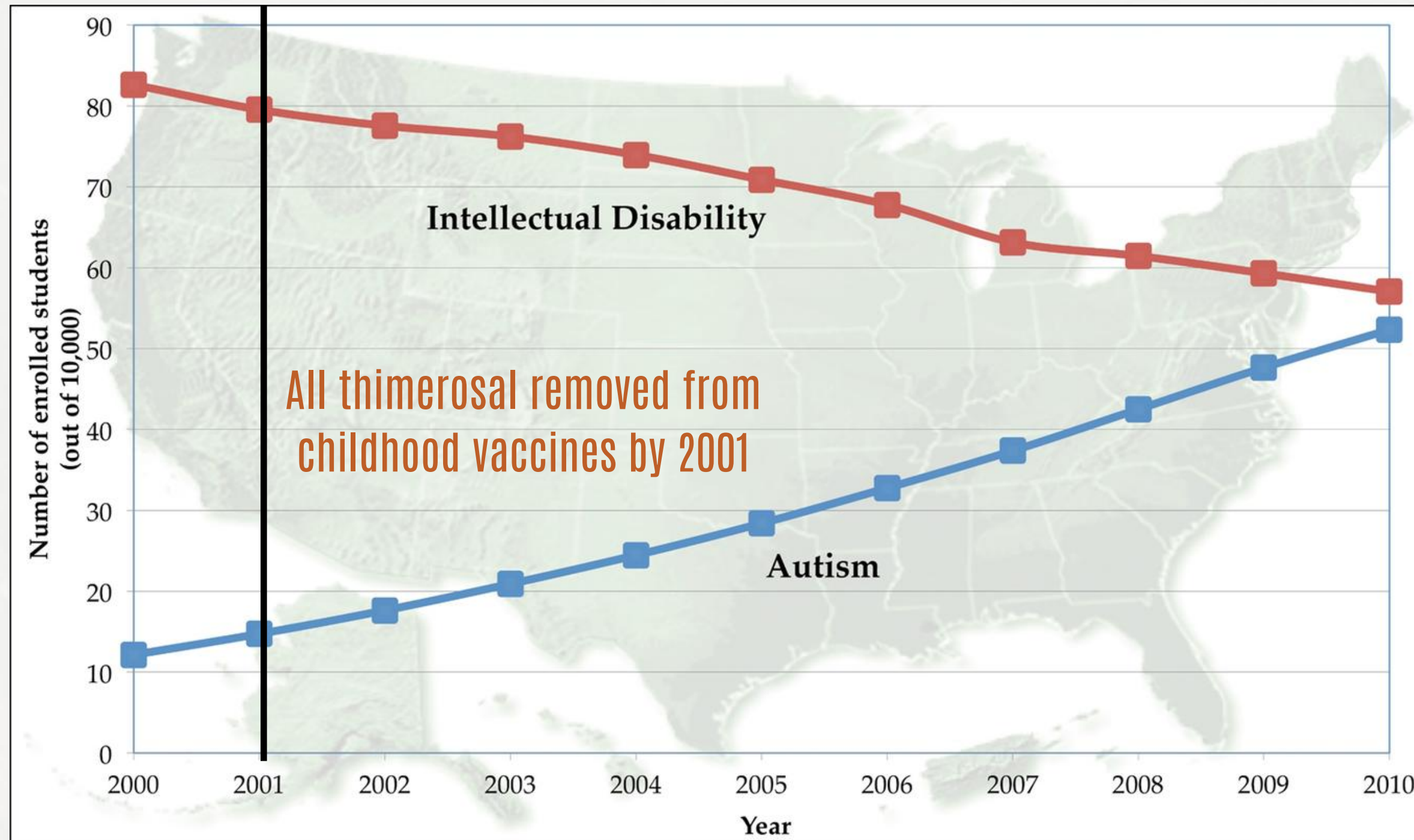
- ~25 mcg ethylmercury

1 can of tuna (3 oz)

- 30 mcg methylmercury

*While Kennedy's ACIP recommended removal of thimerosal from all flu vaccines in July 2025, a federal judge has stayed this decision, effectively nullifying the ban.

Autism Rates Did Not Decline After Thimerosal Removal



Autism prevalence has increased due to:

- Increased awareness
- Broader diagnostic criteria
- Improved screening tools & standardized screening processes

These factors lead to earlier detection and more diagnoses.

Causes of Autism

Research suggests ASD is caused by a complex combination of genetic and environmental factors.

**Genetics/
Genetic Conditions**

Parental Age

**Very Low Birth
Weight**

Extreme Prematurity

**Birth Oxygen
Deprivation**

**Viral Infections
During Pregnancy**

**Medications Taken
During Pregnancy**

**Prenatal Exposure
to Air Pollution or
Certain Pesticides**

**Maternal Obesity,
Diabetes, or
Immune System
Disorders**



Want more on this topic?

*The Real Science of
Vaccines & Autism*

<https://bit.ly/4evV1DR>

RFK Jr. & Thimerosal

THE HISTORY

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⋮

2005

RFK Jr. writes “Deadly Immunity” – an article arguing that thimerosal was linked to autism.

⋮

2014

RFK Jr. published *Thimerosal: Let the Science Speak: The Evidence Supporting the Immediate Removal of Mercury – a Known Neurotoxin – from Vaccines*.

⋮

2016

RFK Jr. partners with Eric Gladen, Lyn Redwood, and Laura Bono to launch the World Mercury Project (WMP), which was rebranded as Children’s Health Defense – a leading anti-vaccine advocacy group – in 2018.

RFK Jr. & Thimerosal

THE PRESENT

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⋮

JUNE 9, 2025

RFK Jr. abruptly fired all 17 members of the CDC's ACIP, replacing them with new appointees lacking the traditional qualifications for the panel.

⋮

JULY 23, 2025

HHS adopts ACIP recommendation to remove thimerosal from all U.S. influenza vaccines*, despite longstanding research indicating thimerosal in vaccines poses no safety concerns.

⋮

JANUARY 28, 2026

RFK Jr. said he would cancel all future support of the Global Alliance Vaccine Initiative (GAVI) until they phased out the use of vaccines containing thimerosal.

RFK Jr. & Thimerosal

THE PRESENT

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⋮

JUNE 2, 2026

U.S. Secretary of State Marco Rubio publicly states the U.S. may resume its funding of GAVI.

⋮

JUNE 8, 2026

GAVI announces that it will move to more quickly phase out thimerosal-containing vaccines to free up funding. About 14% of their vaccine supply contains thimerosal.

EXPERTS SAY:

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“There is no evidence that thimerosal has adverse neurological or neurodevelopmental adverse outcomes when used as a preservative in vaccines. This fact was definitively determined years ago, and the FDA, the CDC, and many academic institutions have excellent reviews of the safety of thimerosal-containing vaccines in children. Raising this topic now has only one purpose-- to sow distrust in vaccines in general and in the process to determine vaccine safety.”

James Campbell, MD, MS, FAAP
Member, AAP Committee on Infectious Diseases

How to Respond: Conversation Pearls for Thimerosal

Patient Concern: “I’ve heard vaccines contain thimerosal, and the mercury can be toxic. Should I be worried?”

AVOID:

The amount is so tiny; it can’t hurt you.

TRY INSTEAD:

That’s a common question. Thimerosal was removed from routine childhood vaccines in 2001, so your child is not receiving it in their recommended vaccines today. While some vaccines still contain thimerosal, it is a different form of mercury than the type found in fish or environmental exposures. Extensive research continues to show that thimerosal is safe, and I’d be happy to walk through any questions you have.

Patient Concern: “If thimerosal is safe, why is the government trying to remove it from vaccines?”

AVOID:

It’s just politics.

TRY INSTEAD:

I can see why that might seem confusing. Thimerosal was removed from nearly all routine childhood vaccines more than 25 years ago as a precautionary measure, even though there was no evidence it was causing harm. Current discussions about thimerosal involve policy decisions rather than new evidence showing it is unsafe. I’d be happy to explain what thimerosal is used for and what the research tells us about its safety.

What ingredients are in vaccines?



Active ingredients

An antigen (or instructions to make one) that activates the immune system but doesn't cause the disease



Adjuvant

Help in boosting the immune response to the vaccine
ex. aluminum salts



Antibiotics

Prevent contamination by bacteria during the vaccine manufacturing process
ex. neomycin



Stabilizers

Keep vaccine stable after manufacturing and maintain effectiveness during storage
ex. sugar, gelatin, polysorbate 80



Preservatives

Prevent bacterial and fungal growth
ex. thimerosal*



Other trace components

Found in very small amounts after manufacturing
ex. formaldehyde, cell culture materials



*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

Antibiotics

- Antibiotics are used to prevent bacterial contamination during manufacture.
- Most are removed during vaccine purification process, but trace quantities remain in some vaccines.
- Examples:
 - Neomycin
 - Polymyxin B
 - Streptomycin
 - Gentamicin

Which vaccines contain antibiotics?

Antibiotics are used to prevent bacterial contamination during vaccine manufacture.

MMR vaccines (per dose)

- Neomycin: 25 mcg

MMRV vaccines (per dose)

- Neomycin: 5 mcg to < 16 mcg

Varicella vaccines (per dose)

- Neomycin: Trace quantities

Meningococcal B vaccine (per dose)

- Kanamycin: < 0.01 mcg

Rabies vaccines (per dose)

- Neomycin: < 1 – ≤ 150 mcg
- Chlortetracycline: 0.2 mcg
- Amphotericin B: 0.02 mcg

Polio vaccines (per dose)

- Neomycin: 0.005 mcg
- Streptomycin: 0.2 mcg
- Polymyxin B: 0.025 mcg

DTaP-IPV vaccines (per dose)

- Neomycin: ≤ 0.000004 – 0.00005 mcg
- Polymyxin B: < 0.000004 – < 0.00001 mcg

DTaP-IPV-HepB vaccines (per dose)

- Neomycin: 0.00005 mcg
- Polymyxin B: < 0.00001 mcg

Hepatitis A & A/B vaccines (per dose)

- Neomycin: < 0.02 – < 0.04 mcg or < 10 ppb

Influenza vaccines (per dose)

Some flu vaccines contain no antibiotics and others contain one or more of the following:

- Neomycin: < 0.02 – 0.062 mcg
- Polymyxin B: < 11 mcg
- Kanamycin: < 0.03 mcg
- Gentamicin: < 0.15 mcg

Antibiotics most likely to cause severe allergic reactions (e.g., penicillin, cephalosporins, and sulfa drugs) are not contained in vaccines.

How to Respond: Conversation Pearls for Antibiotics

Patient Concern: "I'm worried my child could have an allergic reaction because there are antibiotics in vaccines."

AVOID:

It's just a tiny amount, so its not a concern.

TRY INSTEAD:

I can understand why you'd think about that. Some vaccines contain trace amounts of antibiotics, such as neomycin, to help keep bacteria from growing while the vaccine is being made. The antibiotics most likely to cause allergic reactions, like penicillin, aren't used in vaccines. Serious allergic reactions to vaccine antibiotics are very rare. Has your child ever had an allergic reaction to a medication or vaccine before?

What ingredients are in vaccines?

Active ingredients

An antigen (or instructions to make one) that activates the immune system but doesn't cause the disease



Adjuvant

Help in boosting the immune response to the vaccine
ex. aluminum salts



Antibiotics

Prevent contamination by bacteria during the vaccine manufacturing process
ex. neomycin



Stabilizers

Keep vaccine stable after manufacturing and maintain effectiveness during storage
ex. sugar, gelatin, polysorbate 80



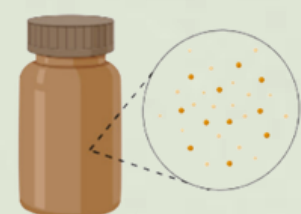
Preservatives

Prevent bacterial and fungal growth
ex. thimerosal*



Other trace components

Found in very small amounts after manufacturing
ex. formaldehyde, cell culture materials



*Since 2001, all vaccines routinely recommended for children 6 years of age and younger are thimerosal-free.

Formaldehyde

TRACE COMPONENT

- Formaldehyde is used to inactivate viruses and detoxify bacterial toxins during vaccine manufacturing.
- Aside from being naturally produced in the body, formaldehyde is used in building materials and household products.

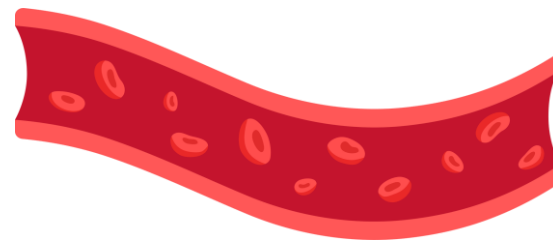
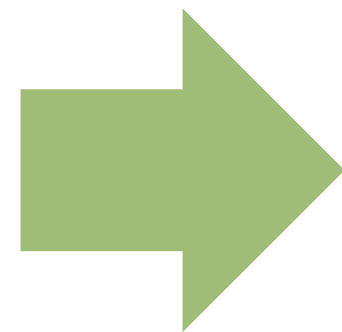
Formaldehyde

Used to safely inactivate viruses (like polio) or detoxify bacterial toxins (like tetanus or diphtheria)

- Formaldehyde is a byproduct of protein and DNA synthesis, so is **naturally produced in the body**.
- Infants have about **10–220X** the amount of formaldehyde circulating in their bloodstream than they would ever receive from a vaccine.



2-month-old
Weight: 5 kg
Blood volume: 85 ml/kg



Total quantity of
formaldehyde in infants
circulation: **1.1 mg**

Hepatitis A, B & A/B vaccines

- 0.0004 – $\leq$ 0.1 mg per dose

DTaP/Tdap/Td vaccines

- $\leq$ 0.005 – 0.1 mg per dose

Hib vaccines

- $<$ 0.005 mg per dose

Polio vaccines

- $\leq$ 0.02% per dose

Influenza vaccines*

- $<$ 0.005 – 0.1 mg per dose

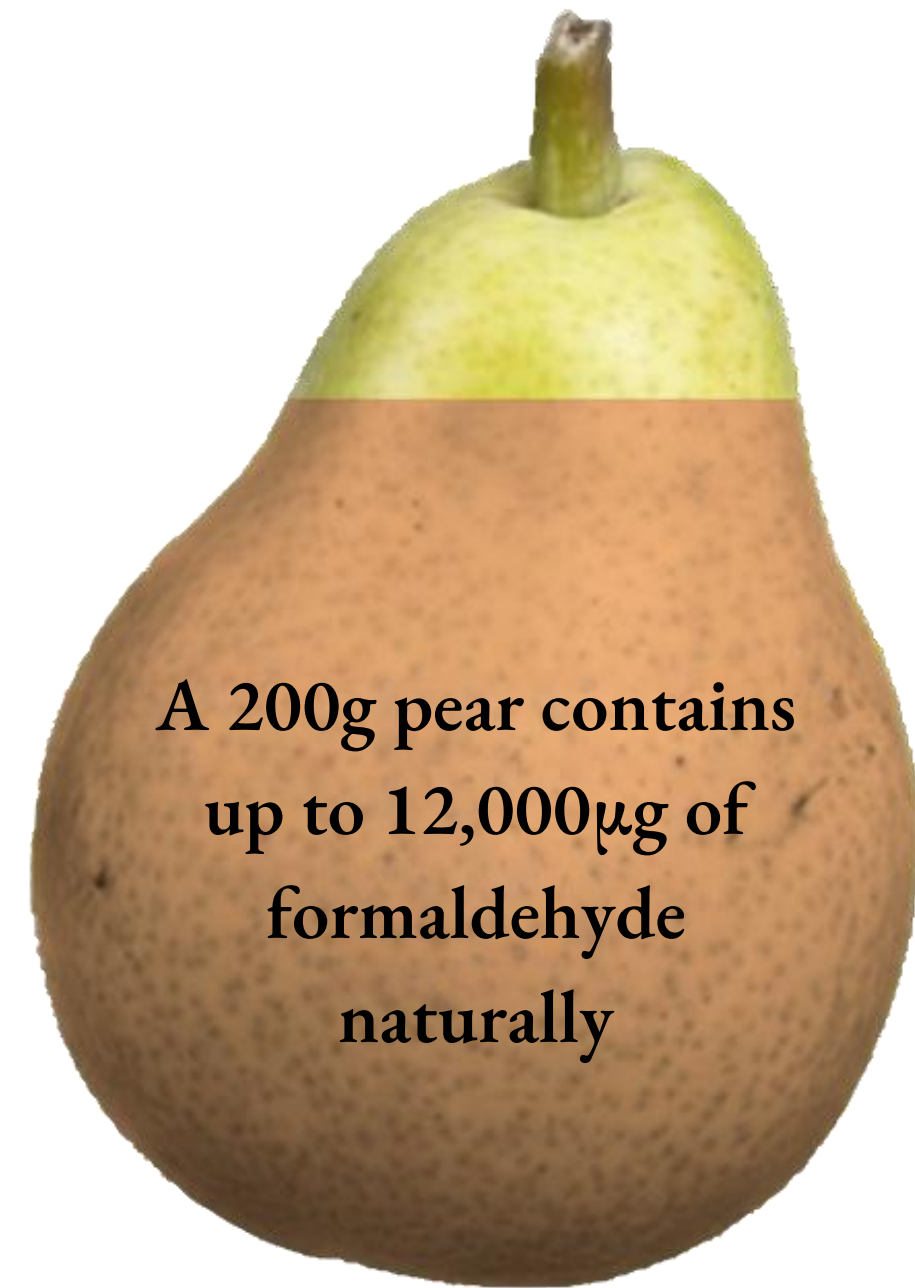
Meningococcal vaccines

- $<$ 0.0003 – $<$ 0.00266 mg per dose

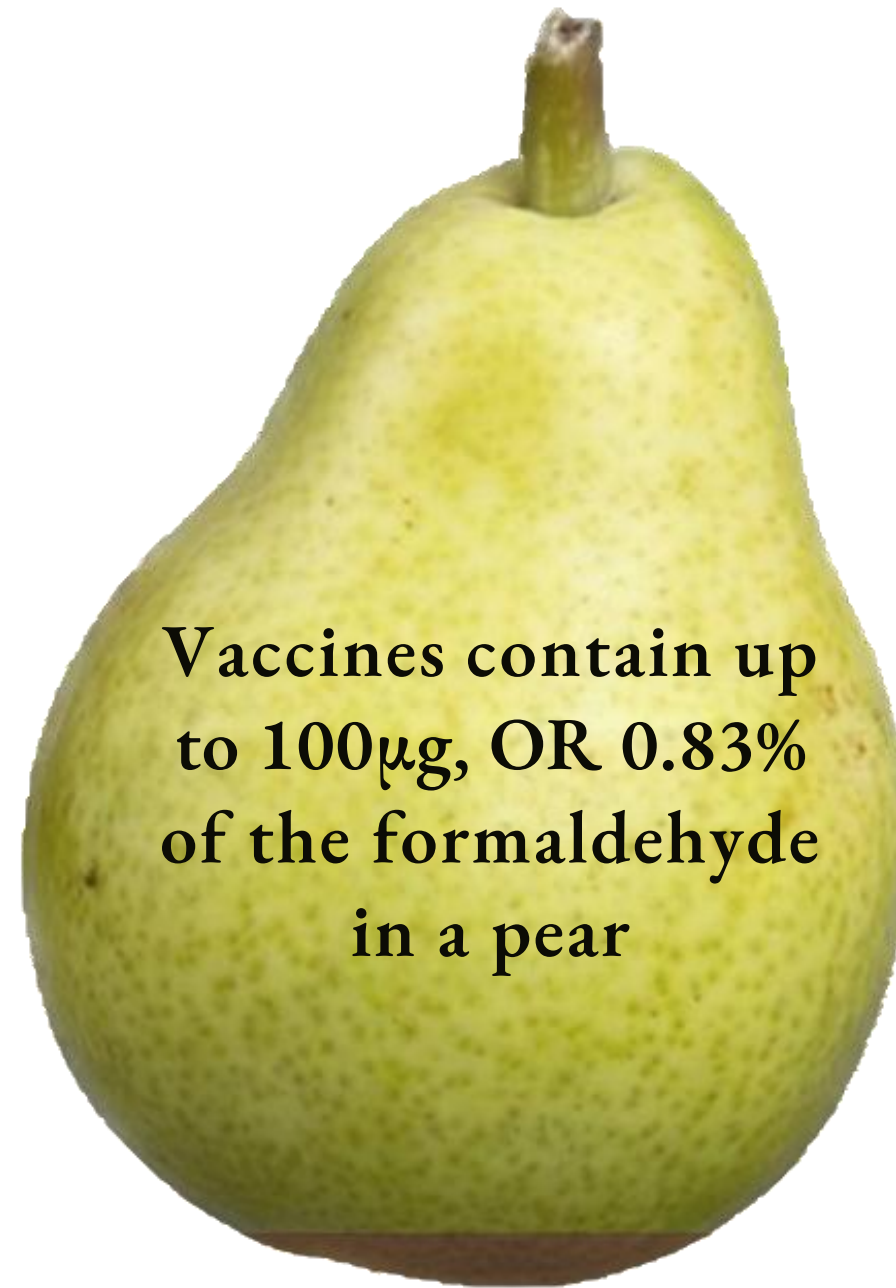
***Not all influenza vaccines contain formaldehyde.**

Formaldehyde

Used to safely inactivate viruses (like polio) or detoxify bacterial toxins (like tetanus or diphtheria)



A 200g pear contains
up to 12,000 μ g of
formaldehyde
naturally



Vaccines contain up
to 100 μ g, OR 0.83%
of the formaldehyde
in a pear

Hepatitis A, B & A/B vaccines

- 0.0004 – $\leq$ 0.1 mg per dose

DTaP/Tdap/Td vaccines

- $\leq$ 0.005 – 0.1 mg per dose

Hib vaccines

- $<$ 0.005 mg per dose

Polio vaccines

- $\leq$ 0.02% per dose

Influenza vaccines*

- $<$ 0.005 – 0.1 mg per dose

Meningococcal vaccines

- $<$ 0.0003 – $<$ 0.00266 mg per dose

***Not all influenza vaccines contain formaldehyde.**

How to Respond: Conversation Pearls for Formaldehyde

Patient Concern: “Formaldehyde causes cancer! Why would that be in a vaccine? That sounds dangerous.”

AVOID:

It's in such tiny amounts that it doesn't matter.

TRY INSTEAD:

I understand why that sounds concerning. Formaldehyde can be harmful at high levels, but it's also something our bodies naturally make in small amounts as part of normal processes. There's very little formaldehyde in these vaccines, and the tiny amount is lower than what's already in our body. I'm happy to answer any questions you have.

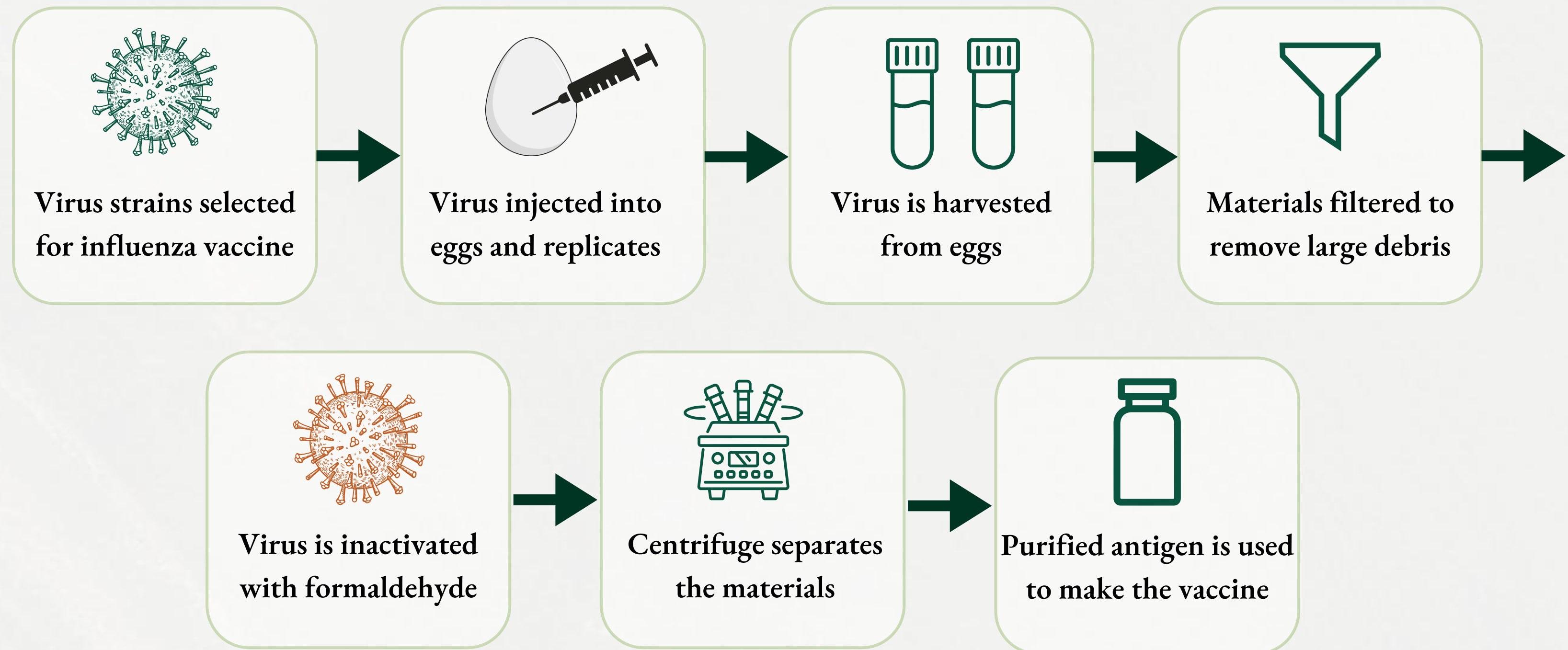
Residual Cell Material

TRACE COMPONENT

- Vaccine antigens must first be grown in cells or specialized growth media.
- Different vaccines use different production systems (e.g., eggs, yeast, bacteria, insect cells, or cultured mammalian cells).
- The antigen is then purified through multiple manufacturing steps.
- Tiny amounts of residual cell materials may remain, but only at trace levels.

Residual Cell Material

Example of how cellular material is removed from an influenza vaccine



What if my patient has an egg allergy?

People with egg allergy can receive any age-appropriate influenza vaccine, including egg-based and non-egg-based products.

- Some influenza vaccines are made using egg-based technology and may contain trace amounts of egg protein.
- This recommendation applies even for patients with a history of severe egg allergy.
- For patients who prefer to avoid egg-based vaccines, egg-free influenza vaccine options are available.
- No additional precautions are recommended beyond those used for any routine vaccination.
- Severe allergic reactions to influenza vaccines are rare.

Fetal Cells and Vaccines

- In their development and manufacturing, some vaccines have used cells originally isolated from fetal tissue, which is also known as fetal cells or fetal cell lines.
- Most fetal cell lines used in vaccine development were established from tissue obtained following elective terminations of pregnancy decades ago.
- Vaccines do not contain “parts of fetuses” or fetal cells, nor do they alter a vaccine recipient’s DNA.

Any vaccine that relies on historic fetal cell lines will not require nor solicit new abortions.

In what ways are fetal cells used in vaccine development and production?

DESIGN & DEVELOPMENT

Fetal cell lines can be used for conceptualization, introductory experiments, and to provide specification for how the vaccine will be constructed and produced.

PRODUCTION

Fetal cell lines can be used to manufacture the final vaccine or parts of the vaccine that will be given to people.

CONFIRMATORY LAB TESTS ON PRODUCTION

Fetal cell lines can be used to analyze the quality of the vaccine, including assessing nucleic acid or protein sequences, protein conformations, and antibody reactivity - among other aspects of the final vaccine product.

Why are fetal cells preferred over other cell types?

HUMAN CELLS

In order to grow a virus for a vaccine, it needs a cell to grow in. Some human viruses don't grow well in animal cells, requiring human cells to grow viruses in.

CELL LIFE

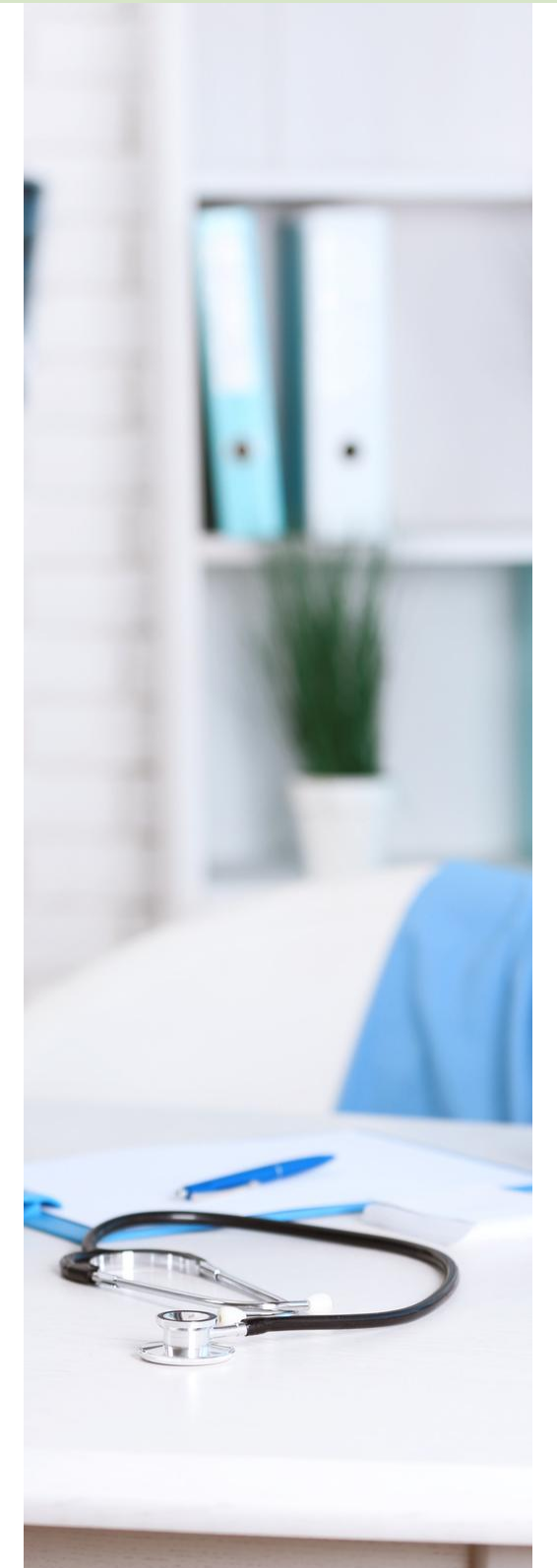
Almost all cells die after dividing a certain number of times – around 50 divisions. Because fetal cells have not divided as much as other cell types, they can be used longer.

STERILE

The cell line must be free of contamination with unwanted viruses. Fetal cells are isolated from a sterile environment (the womb), so the cells are less likely to be infected with other viruses.

STABILITY

Fetal cells can be maintained at low temperatures, allowing scientists to continue using cell lines from decades ago.



Major religious groups generally view the use of vaccines developed using fetal cell lines as **morally acceptable**, primarily because the potential for saving lives outweighs the remote connection to historical abortions.

Individuals should, when possible, use vaccines not developed with the use of these human cell strains. However, in the case where the only vaccine available against a particular disease was developed using this approach, **"one is morally free to use the vaccine regardless of its historical association with abortion."**

-National Catholic Bioethics Center (NCBC)

"Christians are not morally culpable if they use treatments and vaccines that were developed using such cells, even if the cells originated in aborted fetal tissue."

-Ethics & Religious Liberty Commission of the Southern Baptist Convention (ERLC)

Which currently available vaccines use fetal cells?

CHOP, 2026.

Used for Development/Proof of Concept

mRNA COVID-19 vaccines

Used to Grow Virus

Hepatitis A

Rubella

Rabies

Varicella



Want more on this topic?

Fetal Cells & Vaccines

<https://bit.ly/3SuTdCp>



How to Respond: Conversation Pearls for Residual Cell Materials

Patient Concern: “I’ve heard these vaccines contain fetal cells, and I’m uncomfortable receiving something connected to abortion.”

AVOID:

There aren’t any fetal cells in the vaccine, so you don’t need to worry about that.

TRY INSTEAD:

I understand that this can be a deeply personal concern. Some vaccines were developed using cell lines that originated from elective abortions many decades ago, but the vaccines themselves do not contain fetal cells. Many religious organizations, including the Catholic Church, have reviewed this issue and concluded that receiving these vaccines is morally acceptable because they help prevent disease. I’m happy to talk through any questions or concerns you have.

Patient Concern: “My child has an egg allergy. I’m worried they could have a serious reaction if the vaccine contains egg protein.”

AVOID:

The CDC says it is safe.

TRY INSTEAD:

That’s a common question. We know that people with egg allergies, even severe egg allergies, can safely receive influenza vaccines and are recommended to do so. If having an egg-free option would make you feel more comfortable, I’d be happy to help identify one that’s appropriate for your child.

Knowledge Check: Which of the following vaccine ingredients is considered a trace component that may remain after manufacturing?

- A. Antigen
- B. Formaldehyde
- C. Aluminum salts
- D. Gelatin

Knowledge Check: Which of the following vaccine ingredients is considered a trace component that may remain after manufacturing?

A. Antigen

B. Formaldehyde

C. Aluminum salts

D. Gelatin

mRNA Vaccine Ingredients

- Currently approved mRNA vaccines contain:
 - mRNA (active ingredient)
 - Lipid nanoparticles (delivery system)
 - Sugars (stabilizers)
 - Salts and buffers (maintain pH)

mRNA vaccines will not alter your DNA

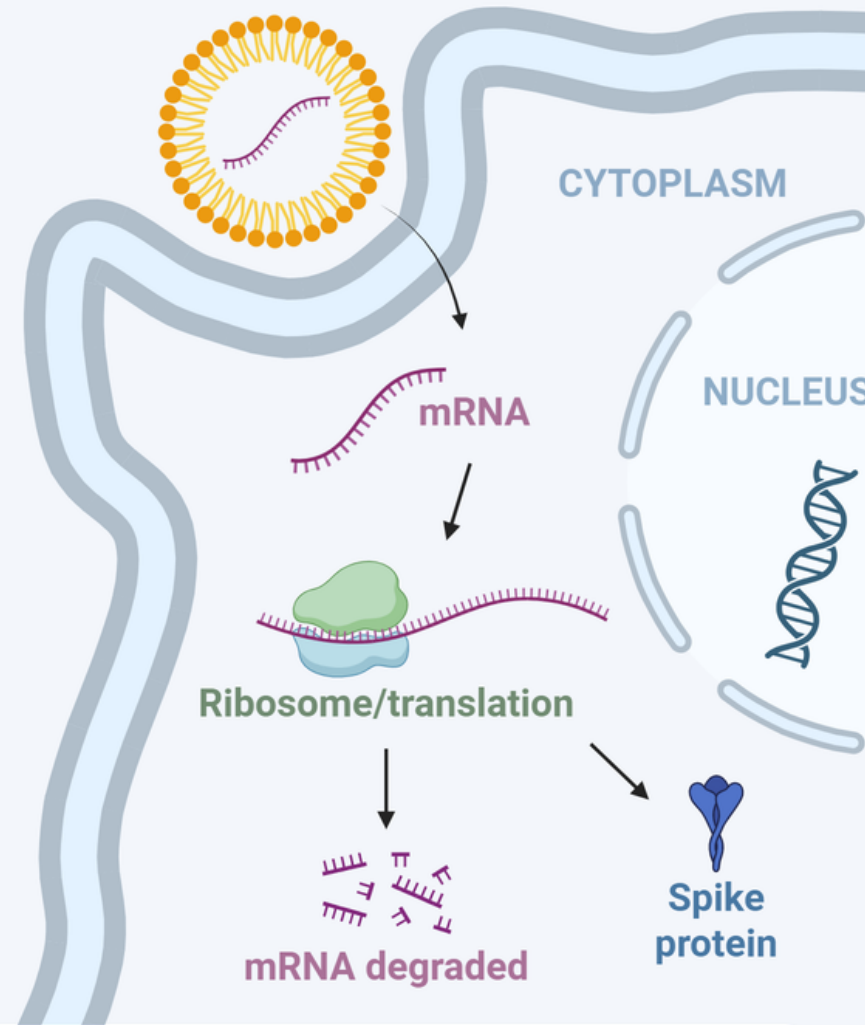
WHAT mRNA VACCINES DO

1 Lipid nanoparticle (LNP) delivers mRNA into the cell.

2 mRNA is released into the cytoplasm.

3 Ribosomes read the mRNA and produce spike protein.

4 mRNA is naturally degraded after protein is made.

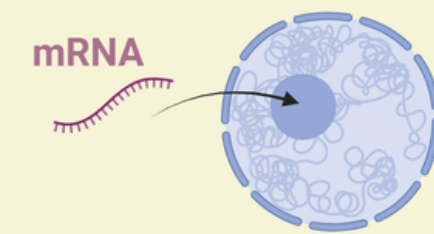


mRNA from vaccines never enters the nucleus or interacts with DNA, and is degraded by normal cellular processes.

WHAT WOULD BE REQUIRED TO ALTER DNA

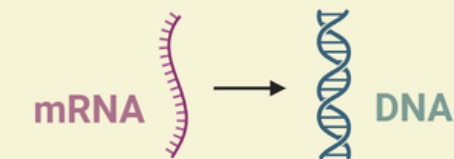
✗ **Nuclear entry would be required.**

Vaccine mRNA remains in the cytoplasm and lacks the **nuclear access signal** and transport mechanisms needed for entry into the nucleus, where genomic DNA is located.



✗ **RNA would have to be converted into DNA.**

This requires the enzyme **reverse transcriptase**, which is not included in mRNA vaccines.



✗ **Newly formed DNA would have to integrate into the genome.**

This requires an enzyme such as **integrase**, which is also not present in mRNA vaccines. Without integration, genetic material cannot become part of a person's DNA.



mRNA vaccines do not contain nuclear access signals, reverse transcriptase, integrase, or any viral components needed for mRNA to alter your DNA. Therefore, it is impossible for an mRNA vaccine to change a person's DNA.

Lipid Nanoparticles (LNPs): What Are They?

mRNA vaccines use lipid nanoparticles to protect mRNA and help deliver it into cells.

- LNPs are tiny fat-based particles measured in nanometers.
- Because they are engineered at the nanoscale, they are considered a form of nanotechnology.
- Their purpose is to protect the mRNA and help it enter cells.
- They contain no electronics, sensors, microchips, or tracking devices.

(57)

ABSTRACT

A pharmaceutical composition which has a plurality of lipid nanoparticles that has a mean particle size of between 80 nm and 160 nm and contains a modified mRNA encoding a polypeptide. The lipid nanoparticles include a cationic lipid, a neutral lipid, a cholesterol, and a PEG lipid. The mRNA contains a 5'-cap, 5'-UTR, N1-methyl-pseudouridine, a 3'-UTR, and a poly-A region with at least 100 nucleotides.

Patent for Moderna's mRNA-based COVID-19 vaccine

Lipid nanoparticles are a delivery system—not a communication or tracking technology. They cannot interact with 5G networks or other wireless systems.

How do we know vaccine ingredients are safe?

- Vaccines follow a strict testing and manufacturing process to ensure all components are safe.
- Post-market surveillance continues to monitor vaccine safety after it's been approved, and any concerns are promptly investigated.

Vaccine Safety is a Top Priority



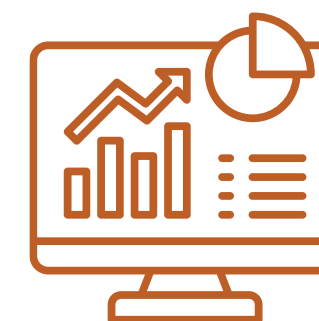
EXTENSIVELY STUDIED

Routine childhood vaccines are among the most extensively studied and continuously monitored medical products in use today.



HELD TO A HIGH STANDARD

Vaccines are recommended for healthy populations, so they are held to very high safety standards - tested in thousands during clinical trials - benefits must outweigh risk.

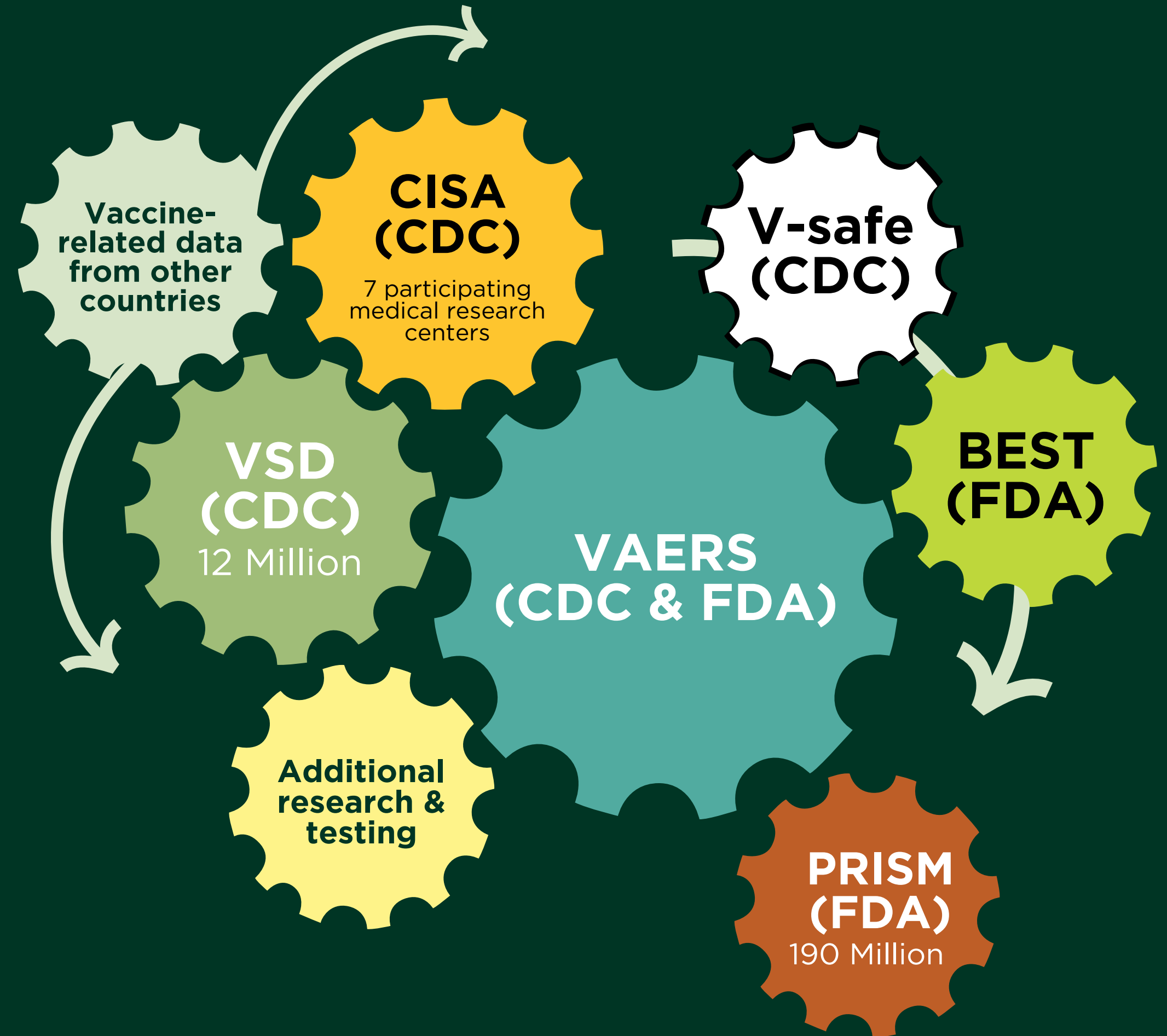


CONTINUOUSLY MONITORED

Vaccine safety monitoring continues after approval through large systems that analyze data from millions of vaccinated people to detect rare side effects and ensure vaccines remain safe.

Vaccine Safety Monitoring Systems

- Help detect rare side effects
- Track safety in different populations
- Ensure vaccines remain safe and that a vaccine's benefits continue to outweigh the risks



It's important to acknowledge that vaccine side effects exist.

- All meaningful medical interventions have some risk.
- Tolerance is low for vaccine-related complications since those that get the vaccines are young and healthy.
- Pre- and post-market surveillance helps to pick up rare side effects (1 per 100,000 or a million doses administered).



Serious complications are extremely rare.

Side effects from vaccines must be considered along with the potential complications from the diseases they prevent.

Recommending Vaccines

Start with presumption

Strong provider recommendations are correlated with increased vaccine acceptance versus participatory communication.

Presumptive
“Your child needs the MMR and varicella vaccines today. Any questions?”

VS

Participatory
“How do you feel about shots today?”



If there is
hesitancy...

Pivot to Motivational Interviewing

Motivational interviewing (MI) is a patient-centered, guiding communication style for enhancing a person's own motivation for health behavior change by exploring and resolving ambivalence.

- Open-ended questions
- Ask permission
- Reflect back
- Support autonomy
- Honor ambivalence



If the patient still
declines...

Focus on building trust

Maintain a healthy patient-provider relationship by respecting your patient's choice and focus on being a trusted resource.

“I completely respect your decision regarding the vaccine. While I strongly recommend it for your health, I understand it's a personal choice, and we can always revisit it at a future visit. In the meantime, let's focus on what's most important to you right now. What other concerns would you like to discuss today?”

LEVEL UP YOUR VACCINE KNOWLEDGE

Vaccine education made simple!

CIRE is offering free, self-paced modules delivering evidence-based vaccine education for current and future healthcare professionals.

Continuing education credits are available!

- ✓ Continuing Medical Education
- ✓ Certificate of Completion

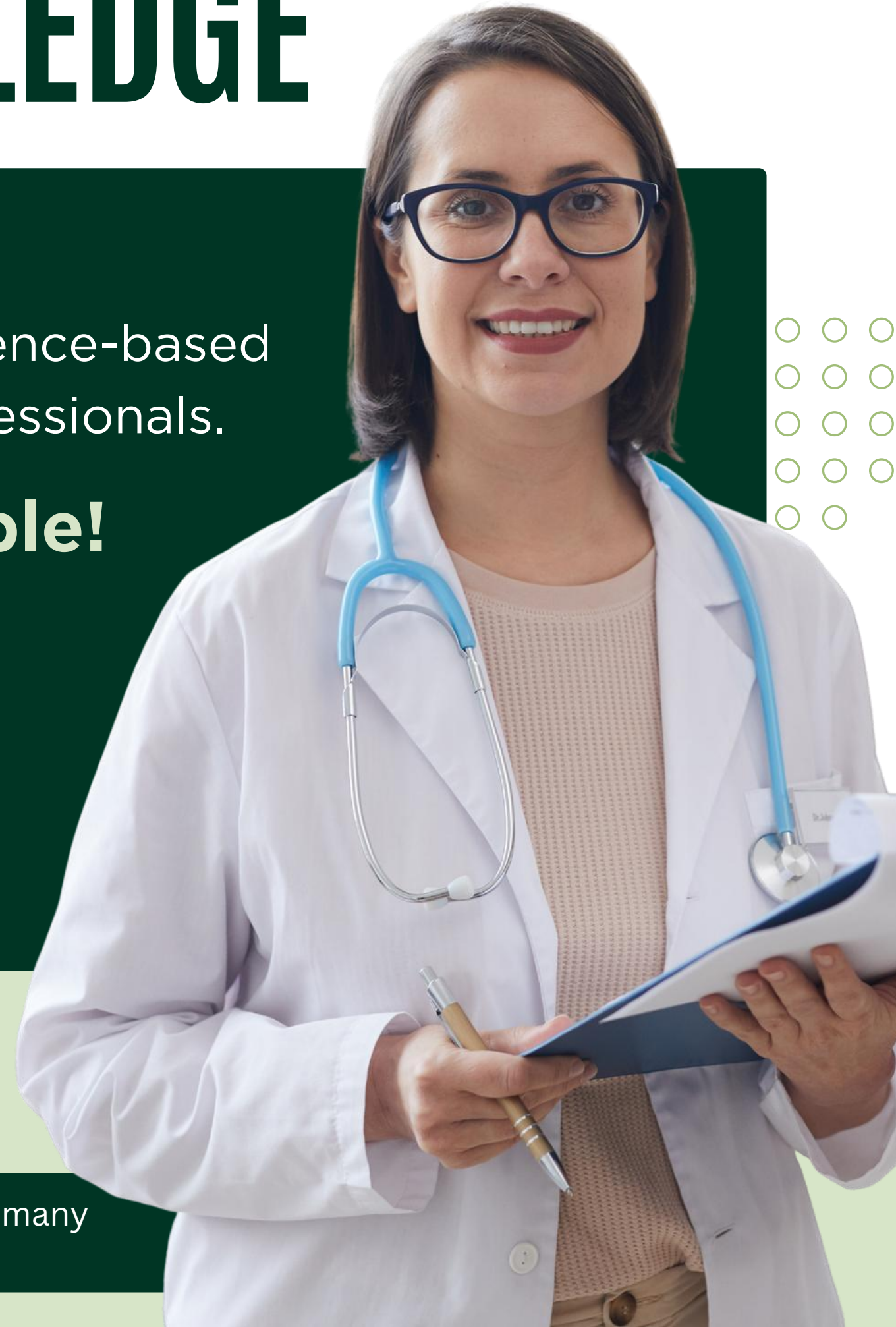
Scan the QR
code or visit
bit.ly/cirevaxmodules
to get started today.



Explore topics such as:

- Vaccine safety
- The immunization schedule
- Vaccines and pregnancy
- Vaccines and infertility
- Common concerns about vaccines
- Vaccines and autism
- Vaccination compared to natural immunity
- Successful immunization conversations

...and many
more!



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Questions?

THANK YOU FOR LISTENING

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