Vaccination Hesitancy

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Benefit/Risk Communication Challenges

- Time
- Complicated science
- Disease versus vaccine
- Emotions (fear, anxiety) can be driving conversation

Benefit/Risk Communication Challenges

- Variable languages
- Variable backgrounds
- Mind-made-up mentalities
- Information resource challenges leads to misinformation

Enhancing Vaccine Communication

- Recognize the challenges
  - Meet them where they are
- Share the goal of informed decision-making in partnership
- Engage in a dialogue with trust and open understanding
- Individualize the message and methods of communication

Benefit and Risk Communication Strategies

Tell real stories of children/adults who have suffered from vaccine preventable diseases

Benefit and Risk Communication Strategies

- Opportunities for questions should be provided before each vaccination
- Vaccine Information Statements (VISs)
  - must be provided before each dose of vaccine
  - public and private providers
  - available in multiple languages

MEASLES MUMPS & RUBELLA VACCINES

WHAT YOU NEED TO KNOW

1 Why get vaccinated?

Measles, mumps, and rubella are serious diseases.

Measles
- Measles virus causes rash, cough, runny nose, eye irritation, and fever.
- It can lead to ear infection, pneumonia, seizures (jerking and staring), brain damage, and death.

Mumps
- Mumps virus causes fever, headache, and swollen glands.
- It can lead to deafness, meningitis (infection of the brain and spinal cord covering), painful swelling of the testicles or ovaries, and, rarely, death.

Rubella (German Measles)
- Rubella virus causes rash, mild fever, and arthritis (mostly in women).
- If a woman gets rubella while she is pregnant, she could have a miscarriage or her baby could be born with serious birth defects.

You or your child could catch these diseases by being around someone who has them. They spread from person to person through the air.

Measles, mumps, and rubella (MMR) vaccine can prevent these diseases.

Most children who get their MMR shots will not get these diseases. Many more children would get them if we stopped vaccinating.

2 Who should get MMR vaccine and when?

Children should get 2 doses of MMR vaccine:

✓ The first at **12-15 months of age**
✓ and the second at **4-6 years of age**.

These are the recommended ages. But children can get the second dose at any age, as long as it is at least 28 days after the first dose.

Some **adults** should also get MMR vaccine: Generally, anyone 18 years of age or older, who was born after 1956, should get at least one dose of MMR vaccine, unless they can show that they have had either the vaccines or the diseases.

Ask your doctor or nurse for more information.

MMR vaccine may be given at the same time as other vaccines.

3 Some people should not get MMR vaccine or should wait

- People should not get MMR vaccine who have ever had a life-threatening allergic reaction to **gelatin**, the antibiotic **neomycin**, or **a previous dose of MMR vaccine**.
- People who are moderately or severely ill at the time the shot is scheduled should usually wait until they recover before getting MMR vaccine.
- Pregnant women should wait to get MMR vaccine until after they have given birth. Women should avoid getting pregnant for 4 weeks after getting MMR vaccine.
- Some people should check with their doctor about whether they should get MMR vaccine, including anyone who:
  - Has HIV/AIDS, or another disease that affects the immune system
  - Is being treated with drugs that affect the immune system, such as steroids, for 2 weeks or longer.
  - Has any kind of cancer
  - Is taking cancer treatment with x-rays or drugs
  - Has ever had a low platelet count (a blood disorder)

Over . . .

Vaccine Safety

There is no 100% safe vaccine

- ALL vaccines have adverse reactions
- Most adverse reactions are minor
- Rare adverse reactions (notably anaphylaxis) can be fatal

Importance of Vaccine Safety

- Public confidence in vaccine safety is critical
- Decreases in disease risks and increased attention on vaccine risks
- Low tolerance for vaccine risks
  - Higher standard of safety is expected
  - Vaccinees generally healthy (vs. ill for drugs)
  - Lower risk tolerance = need to search for rare reactions

Vaccine Safety: General Principles

For a vaccine to be used, the benefit of the vaccine (protection from disease) must outweigh the risk from the vaccine (adverse reaction)

We accept the fact that adverse reactions are going to occur but make every attempt to minimize that risk

Prelicensure Vaccine Safety Studies

Laboratory

– Clarification of immune response and important antigens

Animals

- Immunogenicity, correlates of protection, challenge studies

Humans

– Clinical trials of increasing size to determine dose, safety, efficacy

Prelicensure Human Studies

- Phases I (10's of participants), II (100's of participants), III (1000's of participants) trials
- Common reactions are identified
- Vaccines are tested in thousands of persons before being licensed and allowed on the market
- Poorly detected reactions:
  - Rare
  - Delayed onset
  - Subpopulations

Postlicensure Surveillance

- Identify rare reactions
- Monitor increases in known reactions
- Identify risk factors for reactions
- Identify vaccine lots with increased rates of reactions
- Identify signals

Postlicensure Vaccine Safety Activities

- Phase IV Trials
  - ~10,000 participants
  - better but still limited
- CDC postlicensure safety programs

CDC Activities

- Manage the Vaccine Adverse Event Reporting System (VAERS) with FDA
- Vaccine Safety Datalink
- Clinical Immunization Safety Assessment (CISA) Centers
- The Brighton Collaboration

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VAERS

- Passive surveillance system
- Joint CDC/FDA management
- Population based
- 10,000 reports a year

VAERS

Detects

- new or rare events
- increases in rates of known reactions
- patient risk factors

We encourage VAERS reporting – www.vaers.hhs.gov

Additional studies required to confirm VAERS “signals”

Not all reports of adverse events are causally related to vaccine

Elements Needed To Assess Causation of Vaccine Adverse Events

	Disease	No disease
Vaccine	a	b
No vaccine	c	d

Risk in "vaccine" group = a /a + b
Risk in "no vaccine" group c/ c + d

If the rate in "vaccine" group is higher than the rate in the "no vaccine" group then vaccines may be the cause

Did the Vaccine Cause the Disease?

- Nationwide surveillance reveals 171 children who developed Autism Spectrum Disorder (ASD) after MMR vaccine
- 19 unvaccinated children developed ASD
- Did MMR increase the risk of ASD?

Did the Vaccine Cause the Disease?

3.8 million children born each year

90% (3.42 mil) receive MMR, 10% (380k) do not

171 children with ASD / 3.42 million

19 children with ASD / 380,000

If the rate in “vaccine” group is higher than the rate in the “no vaccine” group then vaccines may be the cause

Elements Needed To Assess Causation of Vaccine Adverse Events

	ASD	No ASD
Vaccine	171	3,419,829
No vaccine	19	379,981

Risk in "vaccine" group =171/ 3,420,000

Risk in "no vaccine" group 19/380,000

Relative Risk = 1 (Vaccines are not the cause)

VAERS ONLY Gives You:

	Disease	No disease
Vaccine	a	b
No vaccine	c	d

Risk in "vaccine" group = a /a + b
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Vaccine Safety Datalink (VSD)

- Large linked database
- "Active surveillance"
  - 8 Managed Care Organizations
  - 3% of the U.S. population
- Powerful tool for evaluating vaccine safety concerns and hypotheses
- Provides information on all 4 "cells" (vaccine and disease, vaccine and no disease, no vaccine and disease, no vaccine and no disease)

Clinical Immunization Safety Assessment (CISA) Network

- Improve understanding of vaccine safety issues at individual level
- Evaluate individuals who experience adverse health events
- Gain better understanding of events
- Develop protocols for healthcare providers

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The Brighton Collaboration

- A global collaboration
- Determines case definitions for adverse reactions
- Used in safety research

Brighton Terms

- Hypotonic hyporesponsive episode
- Intussusception
- Nodule
- Fever
- Generalized seizure
- Persistent crying
- Bell's Palsy
- Cellulitis
- Swelling
- Rash
- Induration
- Local reaction
- Encephalitis
- Myelitis
- Acute Disseminated Encephalomyelitis
- Anaphylaxis
- Thrombocytopenia
- SIDS
- Fatigue
- Aseptic meningitis

Recent (and Ongoing) Vaccine Safety Concerns by the Public

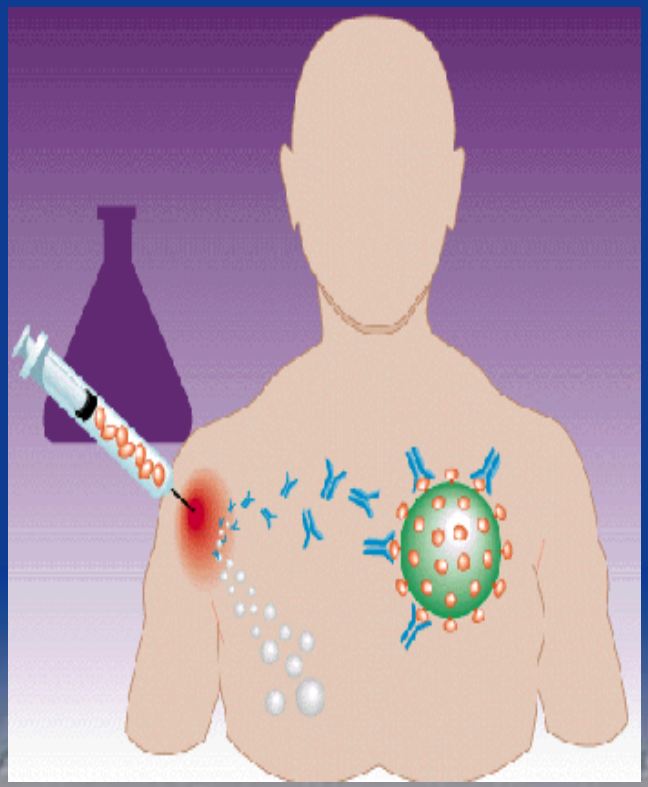
- Immune system overload
- Measles vaccine and autism
- Thimerosal and autism/neurologic injury
- Syncope
- Adverse reactions to HPV vaccine
- Adverse reactions to MCV4 vaccine

Immune System Overload

- Data overall suggest that two vaccines given simultaneously can be as immunogenic and safe compared with an arbitrary interval between the doses
- As many as NINE vaccine doses could potentially be given at one visit
- What about simultaneous administration of multiple vaccine doses?

Simultaneous Vaccination – Multiple Vaccines

Biological mechanism of immune system capacity



- Antibody level (10 ng/mL) a proxy for seroprotection
- Certain number of B cells required within one week to provide that level (N = 1000)
- Rate at which B cells divide (every 16 hours) mean that one B cell clone is sufficient for each vaccine epitope (one B cell clone per epitope can accomplish this in one week)
- 100 epitopes per vaccine
- Need 100 B cells to provide protection in one mL of blood

Simultaneous Vaccination – Multiple Vaccines

Since we have 10,000,000 B cells / mL of blood

We only need 100 cells / single vaccine response

We have immune capacity to generate a response to 100,000 vaccines, if needed

Offit, Paul, et. Al. Vaccine Safety, Vaccines 5th ed. 2008

Immune Overload

- B lymphocytes are specific to each antigen therefore no “immune system overload”
- Even premature babies have the immune capacity to respond to inactivated vaccines
- When they are 60 days old, even in an NICU, babies are started on their immunization series

Aluminum

- A concern by Robert Sears
- Many inactivated vaccines contain aluminum adjuvants
- Aluminum can be toxic to preterm infants and renal dialysis patients

Aluminum

- Exposure to preterm and renal patients is via IV fluids
- Aluminum content in vaccines is small – 4 mg by 6 months of age
- By contrast: 10-30 mg from milk ingestion
- Aluminum is a common component of many foods (baked goods, cheese)

Thimerosal (ethylmercury) in Vaccines

- Preservatives used in vaccines to reduce bacterial growth in multidose vials
- Thimerosal is a preservative used in many biologic products (including vaccines) since the 1930s
- Thimerosal is 50% ethylmercury by weight

All Mercury is Not the Same

Methylmercury

Neurotoxic

Found in fish – environmental contaminant

Ethylmercury

Used in thimerosal

Methylmercury Reference Values

Agency	Value
Environmental Protection Agency	0.1 ug/kg/day (Rfd)
World Health Organization	3.3 ug/kg/week

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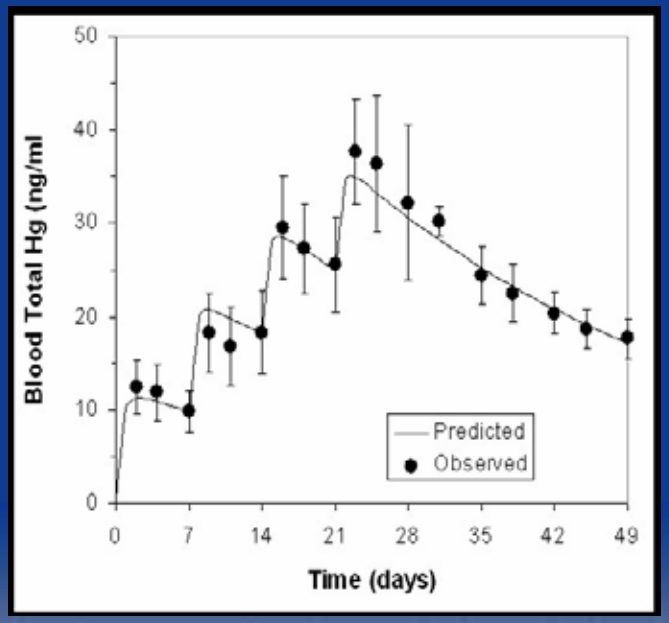
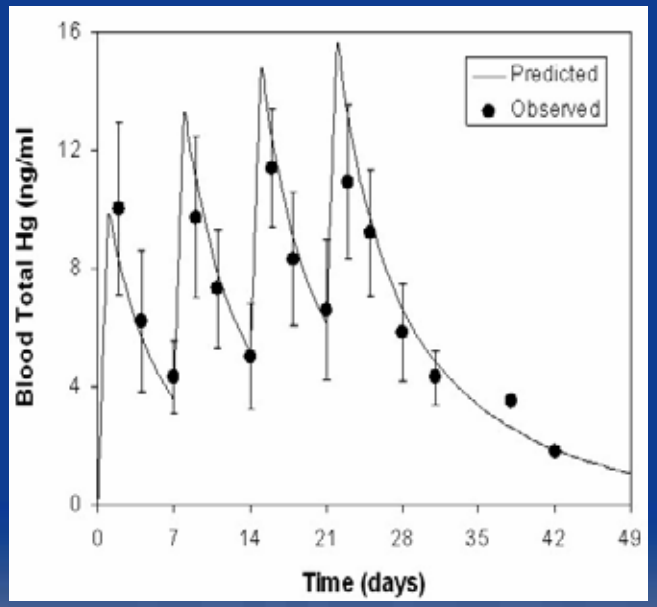
Predicted And Observed Mean Blood Total Mercury Concentration After 4 Weekly Oral Doses





Burbacher et al. Comparison of Blood and Brain Mercury Levels in Infant Monkeys Exposed to Methylmercury or Vaccines Containing Thimerosal. EHP 2005;113(4).

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Half Life of Total Mercury (Hg) Washout of Infant Monkeys Given Methyl Mercury Orally or Thimerosal (Ethyl Mercury) Intramuscularly †

Infant Monkeys – 4 doses of 20 µg/Kg at days 0, 7, 14, 21

T1/2	Methyl Hg	Ethyl Hg
Blood	59.5 days ± 24.1	24.2 days± 7.4
Brain	19.1days ± 5.1	6.9 days ± 1.7

Brain concentrations of thimerosal exposed ~3 fold lower than methyl mercury exposed

† Burbacher TM et al in Environmental Health Perspectives, doi:10.1289/ehp.7712 (available at http://dx.doi.org) – Online 21 April 2005

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Thimerosal and Autism

- Cohort study: 14,000 children in UK
- Exposure was determined by time since vaccination
- Outcomes collected through parental questionnaires

Heron J, Golding J, Pediatrics 2004

Thimerosal and Autism

- No association between dose of thimerosal and speech, behavior at 3 months, 6 months of age
- Association between dose of thimerosal at 3 months of age and poor prosocial behavior, not observed at 6 months of age
- Authors concluded that early exposure to thimerosal had no deleterious effect on neurologic or psychologic outcomes

Heron J, Golding J, Pediatrics 2004

Thimerosal and Autism

- Retrospective cohort study
- 124,170 infants born from 1992 to 1999
- 2 HMOs in Vaccine Safety Datalink
- Database contained vaccination history and neurodevelopment outcomes data

Verstraten T, Davis B, DeStefano F et. Al. Pediatrics, 2003

Thimerosal and Autism

- Initial association found between cumulative thimerosal exposure and language delay in one of the HMOs
- Compared children who visited HMO different numbers of times
- Potential for ascertainment bias
- Follow up study in different HMO found no association when comparing thimerosal-containing versus thimerosal-free vaccines

Another Thimerosal Study Showing No Association with Autism

Case-control study conducted in 3 managed care organizations

256 children with autism spectrum disorder (ASD), 752 without ASD

Case and control children had similar cumulative exposure to ethylmercury

Exposure to ethylmercury from thimerosal-containing immunizations during pregnancy or in the first 20 months was not associated with an increased risk of any ASD

Syncope

Vasovagal reaction

Can occur after vaccination or any other anxiety provoking activity

Syncope

- Since 2001, 666 reports of syncope reported to VAERS
- 80% of reports occur in the first 15 minutes of vaccination
- Increasing reports since 2005, coincident with vaccines recommended for adolescents

Syncope and Head Injury

Concerning public health issue is head injury following syncope

76% of VAERS reports of head injury following syncope occur in adolescents

Syncope and CDCs General Recommendations

Adolescents and adults should be seated during vaccination

Consider a 15 minute waiting period following vaccination of adolescents

Summary

- Many vaccine communication challenges exist in the practice setting today
- Determine the origin of concerns
- Address concerns with effective risk:benefit communication strategies
- Underscore safety is top priority for us all
- Safety monitoring is ongoing
- Utilize creative strategies to communicate efficiently such as group classes, taped phone messages, reliable resources brochures, parent-to-parent sessions

Questions

nipinfo@cdc.gov

1-800-CDC-INFO

www.cdc.gov/vaccines

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