

Vaccine Myths

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Learning Objectives

- At the completion of this activity, participants will be able to:
 - Describe some of the most **common** vaccine myths
 - Relate **how** one should respond to a vaccine myth
 - List a variety of helpful **resources** in responding to vaccine myths



Vaccines Do Not Cause Autism

- Vaccines do not cause autism
- A myth emerged that the MMR vaccine caused **autism**
 - The claim originated with a fraudulent medical study
 - Dozens of studies since have shown no association
- The MMR vaccine does not cause autism
- No vaccine has been shown to cause autism



Dozens of Studies Show the MMR Vaccine Does Not Cause Autism

- From countries from all over the world
- Various types of methodology
 - Mayo Clinic did two of those studies
- No associations found
 - Onset
 - Severity
 - Complications including gastrointestinal disease
- IOM, WHO, AMA, AAP all concur: No connection



Mayo Clinic Studies Show the MMR Vaccines Do Not Cause Autism

- One Mayo Clinic study examined Minnesota rates
 - Examined the rate of MMR vaccine uptake in MN children year after year
 - The uptake of one dose starting in the 1960s
 - The update of a second dose starting in the 1990s
 - Examined the rate of autism diagnoses in MN children year after year
 - Found no correlation between MMR vaccine doses and autism diagnoses
 - Instead found correlation of autism diagnosis
 - With improved diagnostic rules for diagnosing autism
 - With federal laws requiring schools provide services for those with it



Cause(s) of Autism

- Twin studies indicate congenital and genetic
- Of note some examples with congenital injury
 - Thalidomide
 - Congenital rubella infection of mother
- Symptoms manifest long before 12 months old
- Accelerated diagnosis strongly correlated in US with timing of
 - New diagnostic criteria
 - Federal law requiring schools to provide assistance



Multiple Vaccines Can Be Given at Once without Harm

- Multiple vaccines can be given at once without harm
- A myth has emerged that **too many vaccines** at once is unsafe
 - But no studies show a condition of “vaccine overload”
 - The FDA requires vaccines are studied along with the other vaccines due
 - To show that each vaccine together is just as safe as alone
 - To show that each vaccine works just as well as alone
- Spacing out the vaccines cause more harm and anxiety
- Spacing out the vaccines cause delays and leave people at risk
- All the vaccines due can be given at the same time

Infant Immune Systems

- Stronger than you might think
- Biggest antigen exposure in life occurs with first feeding
- Capacity to respond to 10,000 vaccines at once
- If all the vaccines due over the first two years were given at once,
 - Would use less than 0.1% infant's immune capacity
- Not even sure this is limit
 - System manages countless bacteria, viruses each day



Immune Systems Can Fail to See Vaccines

- What we know versus what is feared
 - Immune system can refuse to “see” a vaccine
 - Result is that antigen is discarded without impact
 - When a second MMR given too soon after first
 - Or when MMR or VAR given before 12 months
 - Doesn’t overwhelm, just fails to impress
 - Same problem with polysaccharide antigens
 - PPSV23 and infants less than 2 years of age
 - Same problem with COVID and influenza vaccines given before 6 months



Multiple Vaccines Can Be Given Together

- Pre-licensure studies
 - Test vaccine at age to be given
 - Test vaccine with other vaccines due at that age
- US FDA requires
 - Proof of both effectiveness and safety
 - Proof that other vaccines still work just as well
- Some vaccines fail the tests
 - Live vaccines either simultaneous or 28 days apart
 - PCV15 before PPSV23 and widely separated



Vaccines Are Still Necessary Despite the Absence of Disease

- We still should vaccinate even when the disease is not around
- A myth has emerged that results from the availability heuristic
 - We don't need to vaccinate if we are not seeing cases of that disease
 - The absence supposedly testifies to the vaccine's **lack of necessity**
- But the germs that cause those diseases are still around
 - Tetanus resides in the soil and is ever present
 - Measles is just a plane ride away
 - Most influenza and COVID goes undiagnosed
 - Adolescents and adults with pertussis don't have whooping cough



The Reality

- Vaccinations' success own worst enemy
 - As vaccines work to reduce disease, individuals...
 - No longer read or hear about the disease
 - Continue to hear about vaccines and various myths
 - Begin to question if vaccines still *necessary*
 - Begin to question if diseases they prevent really *that* bad



Herd Immunity and Vaccination

- Herd immunity helps
 - Protects those with weakened immune systems
 - Protects those who can't get the vaccines
 - Protects those in whom immunity has waned
- Herd immunity is imperfect
 - Requires disease-specific vaccine uptake rates of herd immunity
 - Doesn't exist for tetanus or shingles
- Vaccine-preventable disease just a plane ride away
- We still should vaccinate even when the disease is not around



Vaccines and not Hygiene Wiped Out Vaccine-Preventable Diseases

- Vaccines have greatly reduced vaccine-preventable diseases
- A myth has emerged that hygiene and sanitation did this
- But the different diseases shrank at very different times
- And those different times related to the vaccines for those diseases
- Vaccines and not hygiene wiped out those diseases



Measles in the USA

- Pre 1963
 - 4,000,000 infections a year
 - 48,000 children hospitalized a year
 - 500 deaths a year
- 1963
 - First measles vaccine introduced
- 1970
 - 25,000 cases a year



Annual Disease Rates in US in Relation to the Vaccine Introduction

Disease	Pre-Vaccine		Vaccine Era	
Smallpox	1921	102,791	2009	0
Diphtheria	1921	206,000	2009	0
Pertussis	1943	175,000	2009	16,858
Tetanus	1948	600	2009	18
Polio	1952	29,000	2009	0
Measles	1962	503,000	2009	71
Mumps	1964	212,000	2009	1,991
Rubella	1969	57,686	2009	3
Congenital Rubella	1970	70	2009	2
Hib	1980	20,000	2009	38

Immunity from Vaccines is Better than from the Diseases Themselves

- Immunity from vaccines is better than from the disease themselves
- A myth has emerged that **natural** immunity is better
- It's not; it is never as safe; it would never meet FDA standards
- It's not even necessarily stronger
- Vaccines provide safer, effective immunity than disease



The Reality with Natural Disease

- Stronger immunity than the vaccine
 - Can be the case (measles, mumps, rubella)
 - Not the case with HPV, Hib, influenza, COVID, pneumo, tetanus
- With all diseases
 - Risk of complications is always much, much higher
 - Occurrence is unpredictable
 - Consider chickenpox and the lifelong risk of shingles that results
- With most diseases
 - Contagion to others unlike vaccines
 - Risk for others who may suffer more than you

MMR and Thrombocytopenia

- MMR does increase the risk of thrombocytopenia
 - Drop in platelets
 - Usually self-limited and not life-threatening
 - Rarely serious bleeding, requiring transfusions
 - 1/40,000
- Rubella as a viral illness in children and adults
 - Risk of thrombocytopenia
 - 1/3,000
 - Not to mention the risk to fetuses of non-immune pregnant individuals



Vaccines Are Very Safe

- Vaccines are safer than any other health treatment we have
- A myth has emerged that vaccines are often **harmful**
- Overwhelming reactions to vaccines are mild, transient
- Vaccines are required to be very safe given their role and use
 - FDA requires massive randomized controlled trials against controls
 - The standards prelicensure and post-licensure exceed all other drugs
- Vaccines have an incredible record of safety



Vaccines Are Safer Than any Other Health Treatment We Have

- Pre-licensure studies with vaccine
 - Conducted at age of indication
 - Conducted with other vaccines recommended
 - Conducted in very large numbers as RCTs
- FDA Licensure
 - Insures validity, reliability, and generalizability
 - Insures safe and uniform manufacture
- Advisory Committee on Immunization Practices
 - Assures balance of benefit, cost, and risk

Vaccines Are Safer Than any Other Health Treatment We Have

- Post-licensure studies mandated by FDA, CDC
 - Vaccine Adverse Events Reporting System
 - Vaccine Safety Link Program
 - Mandated Phase IV studies
- No other drug or biologic gets such scrutiny



Vaccines Do Not Cause the Diseases That They Are to Prevent

- The vaccines we use do not cause the disease they target
- A myth has emerged that vaccines do **cause** those diseases
- They cannot; they do not contain the germs that infect to do that
- They often only contain pieces of the germs that drive immunity
- The vaccines cannot cause the disease it is designed to prevent



The Vaccines We Use Do Not Cause the Disease

- Vaccines do cause some symptoms
 - Cause mild symptoms
 - Foreign body reaction locally and systemically
 - Sometimes resemble disease
 - Some live viral vaccines can cause transient rash, fever
 - Measles-mumps-rubella
 - Varicella
- The oral poliovirus vaccine did rarely revert
 - 1/4,000,000
 - No longer used in U.S.; replaced with the inactivated poliovirus vaccine

The Flu Vaccine Does Not Cause the Flu

- Inactivated influenza vaccine
 - Inactivated
 - Study among those 65 years and older in the Minneapolis VA
 - Randomized to saline versus vaccination
 - No increase in non-local-reaction adverse events
 - Claims of having the “flu” as a result equal in both groups
- Live attenuated influenza vaccine
 - Attenuated, cold-adapted, cannot live at body temperature
 - Never shown to cause disseminated disease
 - Even in immunocompromised

New Vaccines Are Just as Safe as Old Vaccines

- New vaccines are just as safe as the old vaccines
- A myth has arisen that the **newer** ones are unsafe
- All are required prelicensure testing
 - Preclinical studies at the bench and in animals
 - Demonstration of lot-to-lot consistency in manufacture
 - Phase 1 human studies to determine dose-limiting toxicity
 - Phase 2 human studies to determine utility and safety
 - Phase 3 human studies to prove efficacy and safety compared to controls
- These requirements remain the same, even w/COVID vaccines

New Vaccines Are Tested Just as Rigorously

- Randomized Controlled Trials
 - Thousands of participants
 - All at the age when the vaccine is to be given
 - All receiving the other vaccines due at that age
 - Randomized to either get the vaccine or a control
 - Control agent either saline or the vaccine vehicle minus the vaccine
 - Blinding to reduce biases in interpretation
 - Registration of the protocol a priori to avoid reporting bias
 - Proof of disease prevention and not just immunity



HPV Vaccine Is the Poster Child of a “New” Vaccine

- Parents often give this as a reason for their hesitancy
- The vaccine first came out only a year after Tdap and MenACWY
- HPV vaccines have been licensed since 2006 in the U.S.
- Used across the world
- And post-licensure studies confirm all that pre-licensure work
 - Truly effective
 - Truly safe



Vaccines Contain Only Safe Levels of Chemicals

- Vaccines contain only safe levels of chemicals
- But a myth has emerged that they often are **dangerous**
- Keep in mind large amounts of any substance can be harmful
- Licensure requires strict manufacture
 - FDA requires no changes in manufacturing process with relicensure
 - FDA requires lot-to-lot consistency between batches
 - The chemicals used and contained do not fluctuate
- Vaccines contain only safe levels of chemicals



Formaldehyde

- Use includes
 - Inactivation of viruses (polio)
 - Detoxification of bacterial toxins (diphtheria)
- Diluted in manufacturing process
- Vaccines may contain trace amounts
- Our own bodies have higher concentrations
- Body processes formaldehyde readily

Aluminum

- Aluminum boosts immune response
- Examples include DTaP, PCV, and HepB
- Used in vaccines now for over 60 years
- Only uncommonly associated with severe reactions
 - Subcutaneous nodules from shallow “IM” shots
- Greatest human exposures in food and water

Mercury

- Appeared in vaccines in **thimerosal**
- Worked as preservative
- No longer used in infant vaccines (since 2001)
- Was never shown to be harmful
 - Ethyl not methyl mercury
 - Does not accumulate
 - Easily clears body
 - No association with asthma

A Very Different Situation for Vitamins, Minerals and Supplements

- No prelicensure testing for safety
- No ongoing FDA monitoring of manufacture
- 70% lack any quality control
- Poisonings occur frequently
- 20% of serious liver disease in 2013
- No federal watchdog for dosing, sanitation
- A leading children's hospital even **removed** these from formulary



The Problem with Vaccine Myths

- Vaccine myths are **sticky**; they are memorable
- Vaccine myths resonate; they sound **plausible**
- Vaccine myths **recycle, recirculate, and resurrect** on their own
- Vaccine myths **impact** hesitant parents and patients
- Vaccine myths result in **harm**, hospitalization, and death



What **NOT** to Do with Vaccine Myths

- You cannot ignore them; they persist on their own
- You cannot debate them head on; your effort can backfire
- You must avoid a myth-versus-fact approach



What to Do with Vaccine Myths

- Deal with them
- Recognize and call them out for what they are
- But do all of that carefully with what is called a **Truth Sandwich**
 - Lead with the truth
 - Then briefly identify the myth and label it so
 - Explain why it is not true
 - And follow with a restatement of the truth



The Truth

Start with a short and memorable truth as it relates to the myth

The Myth

Then and only then briefly state the myth and label it as a myth

The Explanation

Explain why the myth is a myth and not true

The Truth

Restate the truth and offer further support for the true statement

Resources for Creating Truth Sandwiches

- Here are **five** resources for investigating vaccines myths
 - [Immunize.org](https://immunize.org)
 - [VoicesforVaccines.org](https://voicesforvaccines.org)
 - [CHOP.edu/Vaccine-Education-Center](https://chop.edu/vaccine-education-center)
 - [HistoryofVaccines.org/](https://historyofvaccines.org/)
 - [HealthyChildren.org](https://healthychildren.org)



Caveat with These Resources

- Don't just direct parents or patients to these sites
- Such educational efforts **backfire**
- Use them to organize your truth sandwiches
- Use them to back up your recognition of vaccine myths
- Furthermore, only offer up the truth sandwich after you have
 1. Made a strong recommendation using presumptive language
 2. Learned of the parent's or patient's vaccine hesitancy
 3. Asked what the person's concern was
 4. Heard the person express the vaccine myth



Summary

- Describe some of the most **common** vaccine myths
- Relate **how** one should respond to a vaccine myth
- List a variety of helpful **resources** in responding to vaccine myths

