Vaccines and Vasculitis

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Why does immunization work?

- Starts with Infection with a bacteria or virus, or an artificial trigger (vaccine).
- Either event stimulates the production of T and B cells, the key cells of the active immune system.
- As a result we produce both effector cells, to fight off the infection, and memory cells, which retain the ability to recognize a recurrent infection.
- These memory cells are the basis for the relatively permanent effects of vaccination.
Effectiveness of Vaccinations

• Because of the memory cells, protection is long-lasting. When it does wane (vaccine specific), boosters can be used.

• Boosters used with some vaccines to maximize initial response.

• A small percentage of those vaccinated will respond poorly.
  – May be driven by genetic factors

• **Herd Immunity**
  – The majority of population is immune, so the chance of coming in contact with someone infected is low
  – Smallpox, measles
Herd Immunity

• Factors affecting herd immunity
  – Environmental Factors: crowded conditions, seasonal variations
  – Strength of Individual’s Immune System
  – Infectiousness of Disease: greater the risk of infection, the higher percentage of people need vaccines to attain herd immunity

• When enough people are vaccinated, chance of germ infecting the non-immunized population is small

• Can lead to disappearance of diseases (smallpox)
  – Vaccination no longer necessary
"But if everybody else gets a flu shot, I won't need one, 'cause there won't be anybody to catch it from."
What’s in a vaccine?

• **Bacterial cells (inactivated or live attenuated)**
  – Whooping cough, typhoid

• **Viral particles (inactivated or live attenuated)**
  – Flu, measles, mumps, hepatitis A, chicken pox/zoster

• **Purified viral or bacterial particles**
  – Tetanus, pneumonia, meningitis, hepatitis B
Types of Vaccines

- **Live virus**: contain weakened (attenuated) form of the virus e.g. measles, mumps, and rubella (MMR) vaccine; varicella (chickenpox) vaccine

- **Killed (inactivated)**: contain protein(s) or other small pieces taken from a virus or bacteria. e.g. inactivated polio vaccine

- **Toxoid**: contain toxin or chemical made by the bacteria or virus. e.g. diphtheria; tetanus vaccines.

- **Conjugate**: link viral/bacterial antigen with a carrier protein to enhance immune response. e.g. Hib (Haemophilus influenzae type B)
The Good and the Bad

• Modern vaccines are safe and effective
• However, they are neither perfectly safe nor perfectly effective

• Some people who receive vaccine will have adverse event
• Some people who receive vaccine will not be protected

• The decision to vaccinate depends on a balance of benefits and risks
  — Both individual and society
What is the most common vaccine-preventable disease?
# Influenza. “Just the flu”

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Under 5 Years</th>
<th>5-17 Years</th>
<th>Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Just sick”</td>
<td>2,030,000</td>
<td>3,296,000</td>
<td>12,414,000</td>
</tr>
<tr>
<td>Outpatient visit</td>
<td>1,741,000</td>
<td>1,535,000</td>
<td>7,282,000</td>
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<tr>
<td>Hospitalized</td>
<td>54,343</td>
<td>2,805</td>
<td>195,776</td>
</tr>
<tr>
<td>Deaths</td>
<td>142</td>
<td>43</td>
<td>21,282</td>
</tr>
</tbody>
</table>

“Hi! I’m the Flu! Do you have a couple of weeks free?”
This is why we vaccinate...

<table>
<thead>
<tr>
<th>Disease</th>
<th>Annual Cases – Pre-Vaccine Era</th>
<th>Annual Cases Since Vaccine</th>
<th>Percent Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>175,885</td>
<td>0</td>
<td>100%</td>
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<tr>
<td>Tetanus</td>
<td>1314</td>
<td>28</td>
<td>98%</td>
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<tr>
<td>Measles</td>
<td>503,282</td>
<td>43</td>
<td>99.9%</td>
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<tr>
<td>Mumps</td>
<td>152,209</td>
<td>800</td>
<td>99.5%</td>
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<tr>
<td>Rubella</td>
<td>47,745</td>
<td>12</td>
<td>99.9%</td>
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<tr>
<td>Congenital Rubella Syndrome</td>
<td>823</td>
<td>0</td>
<td>100%</td>
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<tr>
<td>Polio</td>
<td>16,316</td>
<td>0</td>
<td>100%</td>
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<tr>
<td>Haemophilus influenzae b</td>
<td>20,000</td>
<td>54</td>
<td>99.7%</td>
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</tbody>
</table>
Why don’t people get vaccinated?

• 2002 study of 22 anti-vaccination websites
  – 100% - vaccines cause illness (autism)
  – 95% - vaccines erode immunity
  – 95% - adverse reactions are underreported
  – 91% - vaccine policy is motivated by profit
  – 81% - vaccines produce only temporary immunity
  – 77% - mandatory caccines violate civil liberties
  – 73% - diseases have declined w/o vaccines
  – 50% - multiple vaccinations increase risk

• 0% - Science
“The committee concludes that the body of epidemiological evidence favors rejection of a causal relationship between the MMR vaccine and autism...[and] between thimerosal-containing vaccines and autism...potential biological mechanisms for vaccine-induced autism...are theoretical only.

“...available funding for autism research [should] be channeled to the most promising areas.”
• 79% of pediatricians have had at least 1 instance of parents refusing to allow child to be vaccinated
• ~10% of pediatricians report more than 10% of parents avoiding vaccines because of safety concerns
You represent a parent's right to choose, resist government mandates and live free!

How does that make you feel, son?

SICK.

Mike Keefe, Columbus, Ohio 2.4.15
## 2015 Recommended Immunizations for Children from Birth Through 6 Years Old

<table>
<thead>
<tr>
<th>Age</th>
<th>HepB</th>
<th>RV</th>
<th>DTaP</th>
<th>Hib</th>
<th>PCV</th>
<th>IPV</th>
<th>IPV</th>
<th>DTaP</th>
<th>Hib</th>
<th>PCV</th>
<th>IPV</th>
<th>Influenza (Yearly)*</th>
<th>MMR</th>
<th>Varicella</th>
<th>HepA$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>HepB</td>
<td>RV</td>
<td>DTaP</td>
<td>Hib</td>
<td>PCV</td>
<td>IPV</td>
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*Shaded boxes indicate the vaccine can be given during shown age range.

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Is your family growing? To protect your new baby and yourself against whooping cough, get a Tdap vaccine in the third trimester of each pregnancy. Talk to your doctor for more details.
### 2015 Recommended Immunizations for Children from 7 Through 18 Years Old

#### 7–10 Years
- **Tdap**
- **MCV4**

#### 11–12 Years
- **Tetanus, Diphtheria, Pertussis (Tdap) Vaccine**
- **Human Papillomavirus (HPV) Vaccine** (3 Doses)
- **Meningococcal Conjugate Vaccine (MCV4) Dose**

#### 13–18 Years
- **Tdap**
- **HPV**
- **MCV4 Dose**
- **Booster at age 16 years**
- **Influenza (Yearly)**
- **Pneumococcal Vaccine**
- **Hepatitis A (HepA) Vaccine Series**
- **Hepatitis B (HepB) Vaccine Series**
- **Inactivated Polio Vaccine (IPV) Series**
- **Measles, Mumps, Rubella (MMR) Vaccine Series**
- **Varicella Vaccine Series**

*These shaded boxes indicate when the vaccine is recommended for all children unless your doctor tells you that your child cannot safely receive the vaccine. These shaded boxes indicate the vaccine should be given if a child is catching-up on missed vaccines. These shaded boxes indicate the vaccine is recommended for children with certain health conditions that put them at high risk for serious diseases. Note that healthy children can get the HepA series. See vaccine-specific recommendations at [www.cdc.gov/vaccines/pubs/ACIP-list.htm](http://www.cdc.gov/vaccines/pubs/ACIP-list.htm).*
Rationale for this schedule

• Provide immunity early in life, before exposure
• Protect against diseases that are threats
• Vaccines tested for safety and effectiveness
• Do not overload the immune system
• No known benefits of delayed schedules
• Reviewed annually by CDC/ACIP
Healthy adults often unaware they need be vaccinated

- Think vaccines are for kids, old people, or those with poor health
- Haven’t heard about vaccine-preventable diseases (whooping cough, shingles, HPV, etc.) that affect adults
- Not getting recommendations for vaccination from their healthcare professionals
- Adult vaccination services beyond influenza/pneumococcal may not be offered by all healthcare providers
  - The role of pharmacies in adult vaccination expanding (beyond flu)
  - Vaccinations are increasingly offered at work sites and for travel abroad
Vaccinating adults

• All adults need:
  – Influenza (flu) vaccine every year
  – Td or Tdap vaccine: Every adult should get the Tdap vaccine once, a Td (tetanus, diphtheria) booster shot every 10 years, and women should get the Tdap vaccine each time they are pregnant
  – Zoster vaccine at age 60
  – One or two pneumococcal vaccines at age 65

• Other vaccines adults may need as an adult are determined by
  – Health conditions
  – Job (healthcare workers)
  – International travel
  – Vaccines you have received or maybe did not get as a child
A Few Pearls

• Influenza vaccine is annual
  • Never too early in the season
• There are 2 types of pneumonia vaccine
  • Doctors can work out which to give
• No limit to the number of vaccines you can have at once
• No harm from getting a booster too early
• There is a *theoretical* risk with live virus vaccines in people who are immunocompromised (disease or meds)
• *No* risk to immunocompromised contacts of people getting live vaccines
Keep Calm AND Get Vaccinated
Questions?