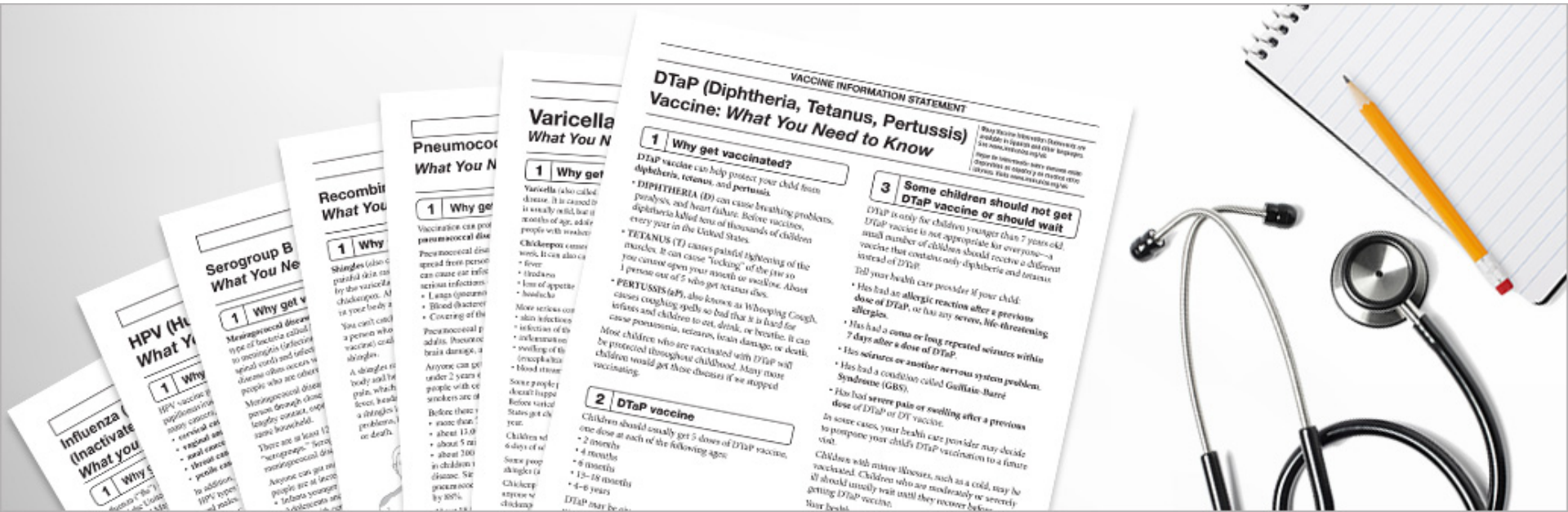
# Vaccination in childhood

Agnieszka Oknińska



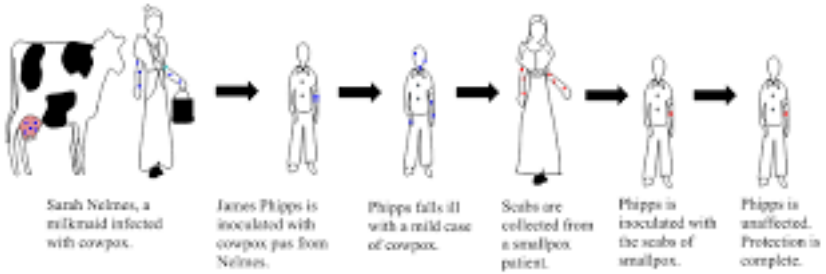
# The history of vaccination

**1798 Edward Jenner**

„Inquiry into the Cause and Effects of the Variolae Vaccinae, a Disease Known by the Name of Cow Pox”

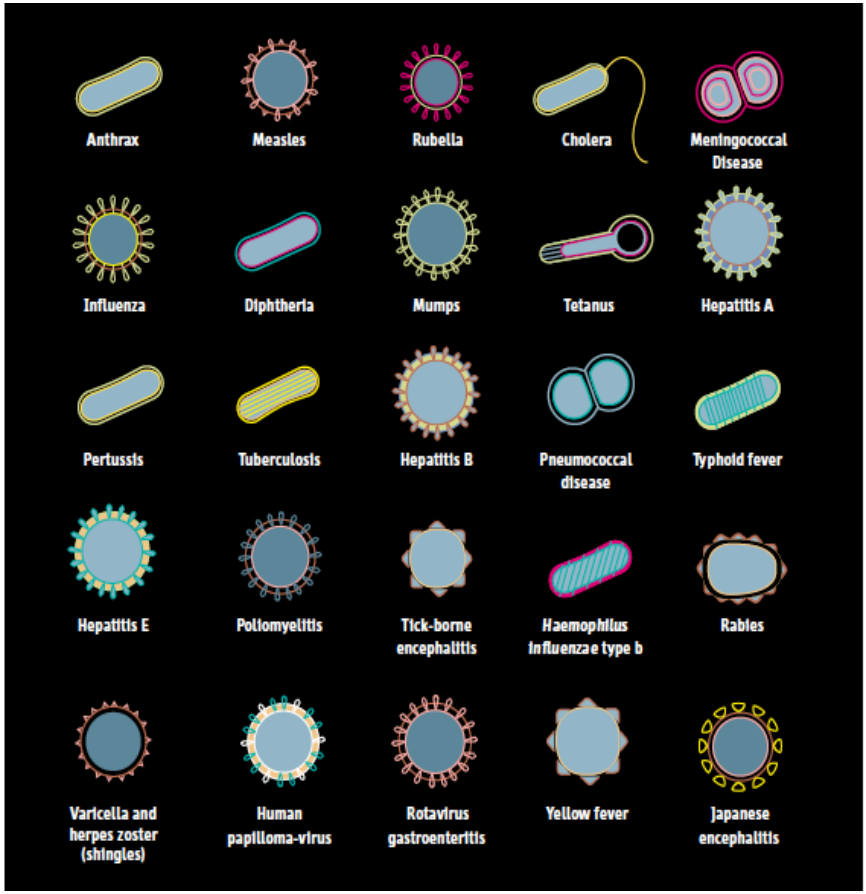
**1885 Louis Pasteur – rabies vaccine**

Introduced the term *vaccination*
from the Latin *vacca* – cow
in honor of Jenner



# What is a vaccine?

- Today the term ‘vaccine’ applies to all biological preparations, produced from living organisms, that enhance immunity against disease and either prevent (prophylactic vaccines) or treat disease (therapeutic vaccines).
- Vaccines are administered in liquid form, either by injection, by oral, or by intranasal routes.



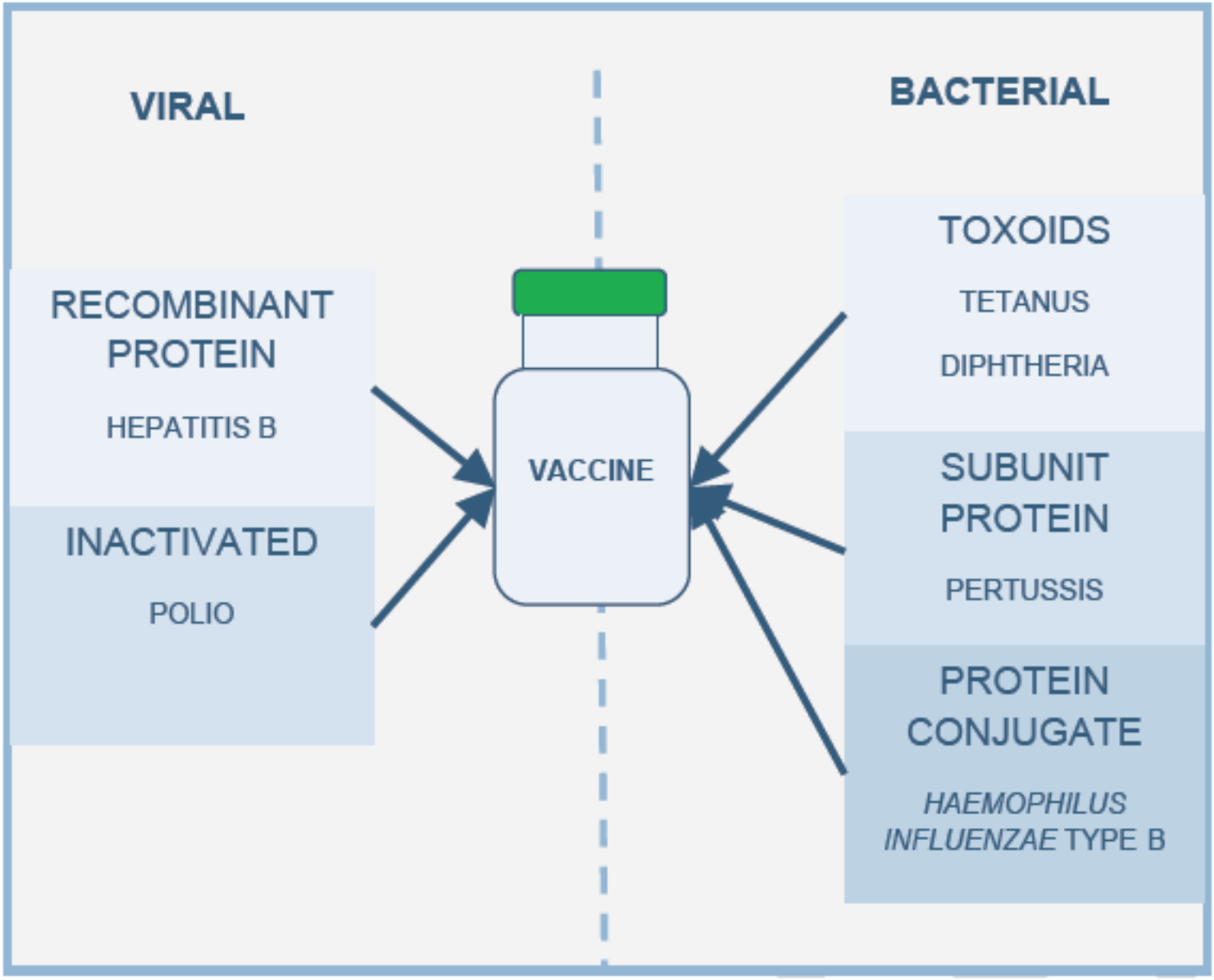
# Vaccines can be *active* or *passive*

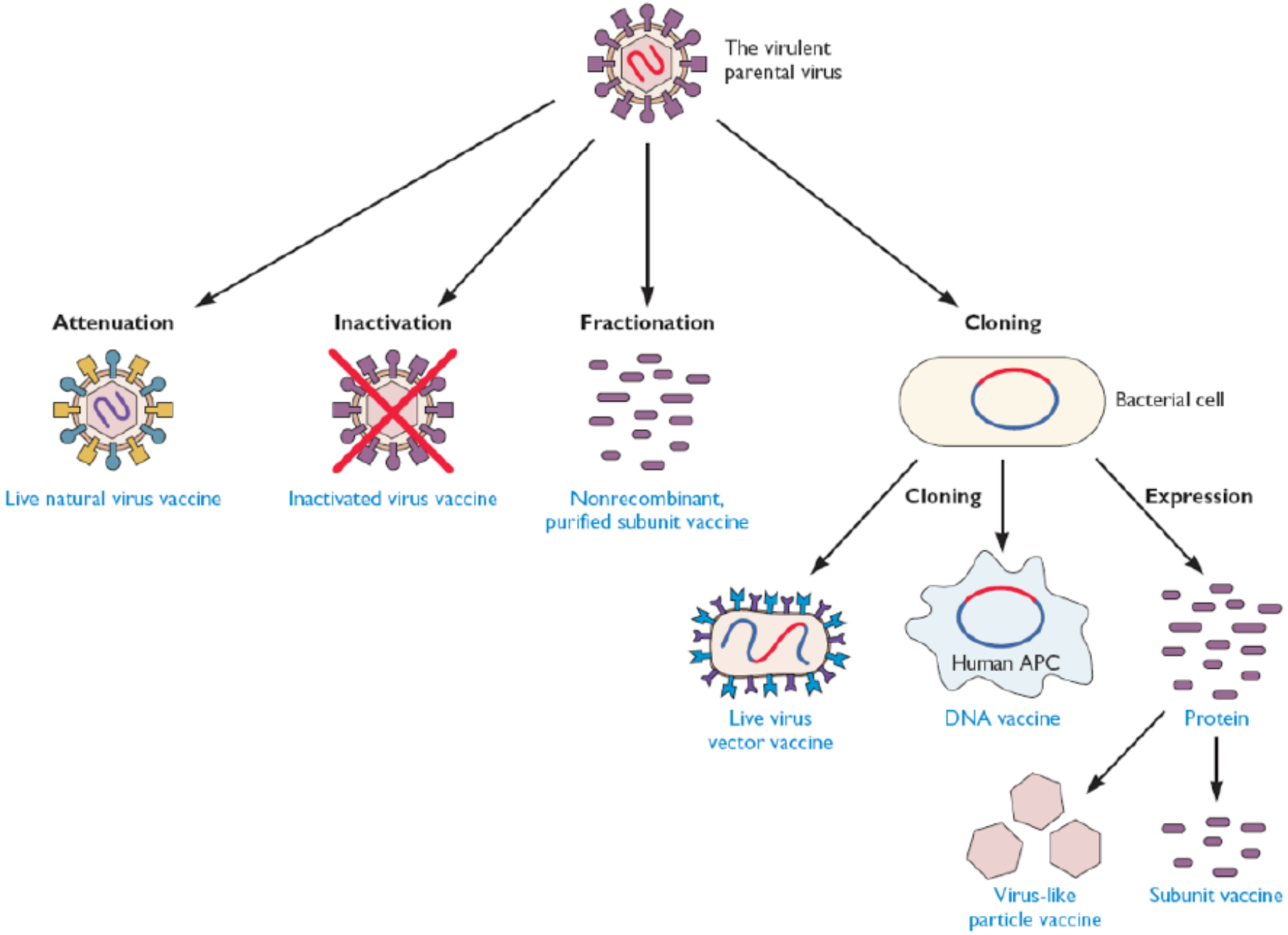
- Active - instilling into the recipient a modified form of the pathogen or material derived from it that induces immunity to disease
  - *Generally useful for long term protection*
- Passive - instilling the products of the immune response (antibodies or immune cells) into the recipient
  - *Only useful for short term protection*
  - *Rabies immune globulin (RIG)*

# Examples of Vaccines by type

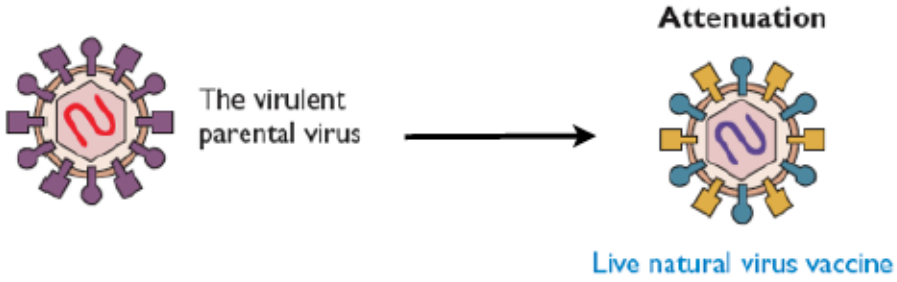
Vaccines are composed of either the entire disease-causing microorganism
or
some of its components

| Type of vaccine | Examples |
|---|---|
| Live-attenuated | Measles, Mumps, Rubella, Varicella zoster |
| Inactivated | Hepatitis A, Influenza, Pneumococcal polysaccharide |
| Recombinant sub-unit | Hepatitis B |
| Toxoid | Tetanus, Diphtheria |
| Conjugate polysaccharide-protein | Pneumococcal, meningococcal, *Haemophlius influenzea* type b (Hib) |


VIRAL
BACTERIAL
RECOMBINANT PROTEIN
HEPATITIS B
INACTIVATED
POLIO
VACCINE
TOXOIDS
TETANUS
DIPHTHERIA
SUBUNIT PROTEIN
PERTUSSIS
PROTEIN CONJUGATE
*HAEMOPHILUS INFLUENZAE* TYPE B

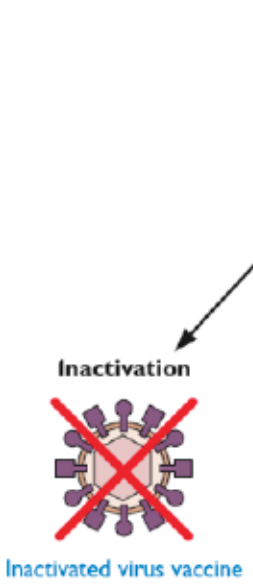

The virulent parental virus
Attenuation
Inactivation
Fractionation
Cloning
Live natural virus vaccine
Inactivated virus vaccine
Nonrecombinant, purified subunit vaccine
Bacterial cell
Cloning
Expression
Human APC
Live virus vector vaccine
DNA vaccine
Protein
Virus-like particle vaccine
Subunit vaccine

# ‘Live’, attenuated vaccines



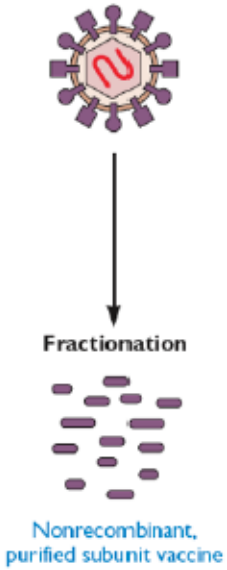

- Viral replication occurs and stimulates an immune response
- Progeny virions may be contained to the site of replication
- Infection induces mild or inapparent disease

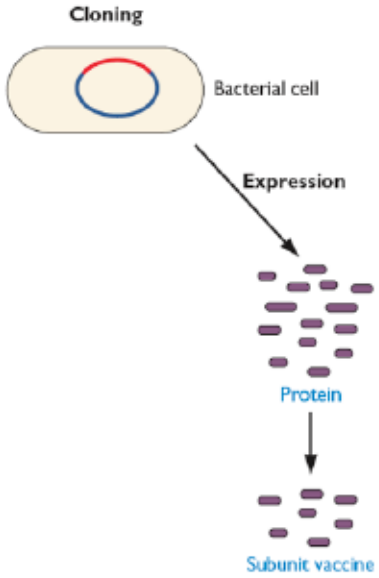
# Inactivated vaccines




- Virions inactivated by chemical procedures (e.g. formalin, β-propriolactone, nonionic detergents)
- Infectivity is eliminated but antigenicity is not compromised

# Subunit vaccines



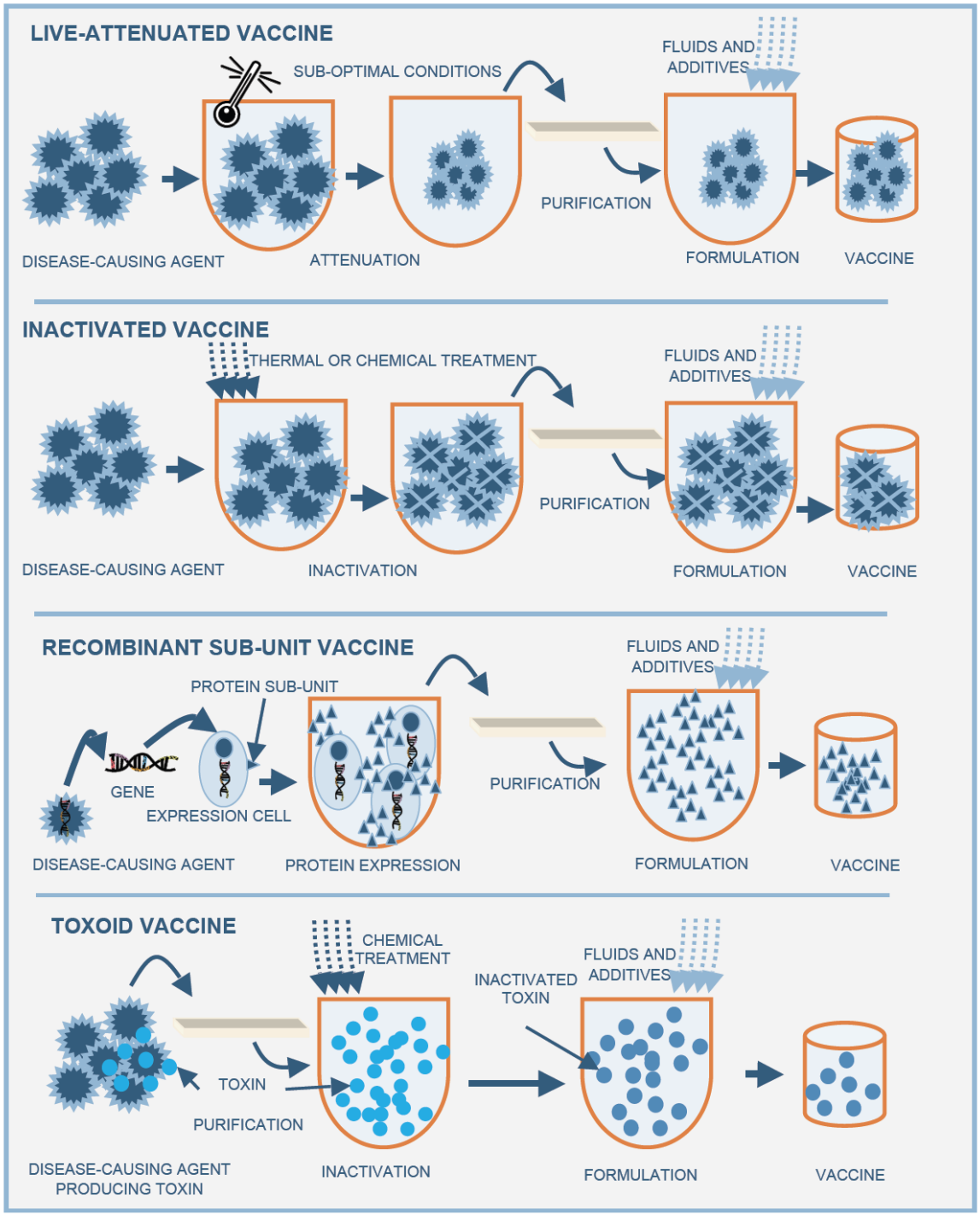

- Break virus into components, immunize with purified components
- Clone appropriate viral gene, express in bacteria, yeast, insect cells, cell culture, purify protein
- Antigen usually a capsid or membrane protein

# Subunit vaccine

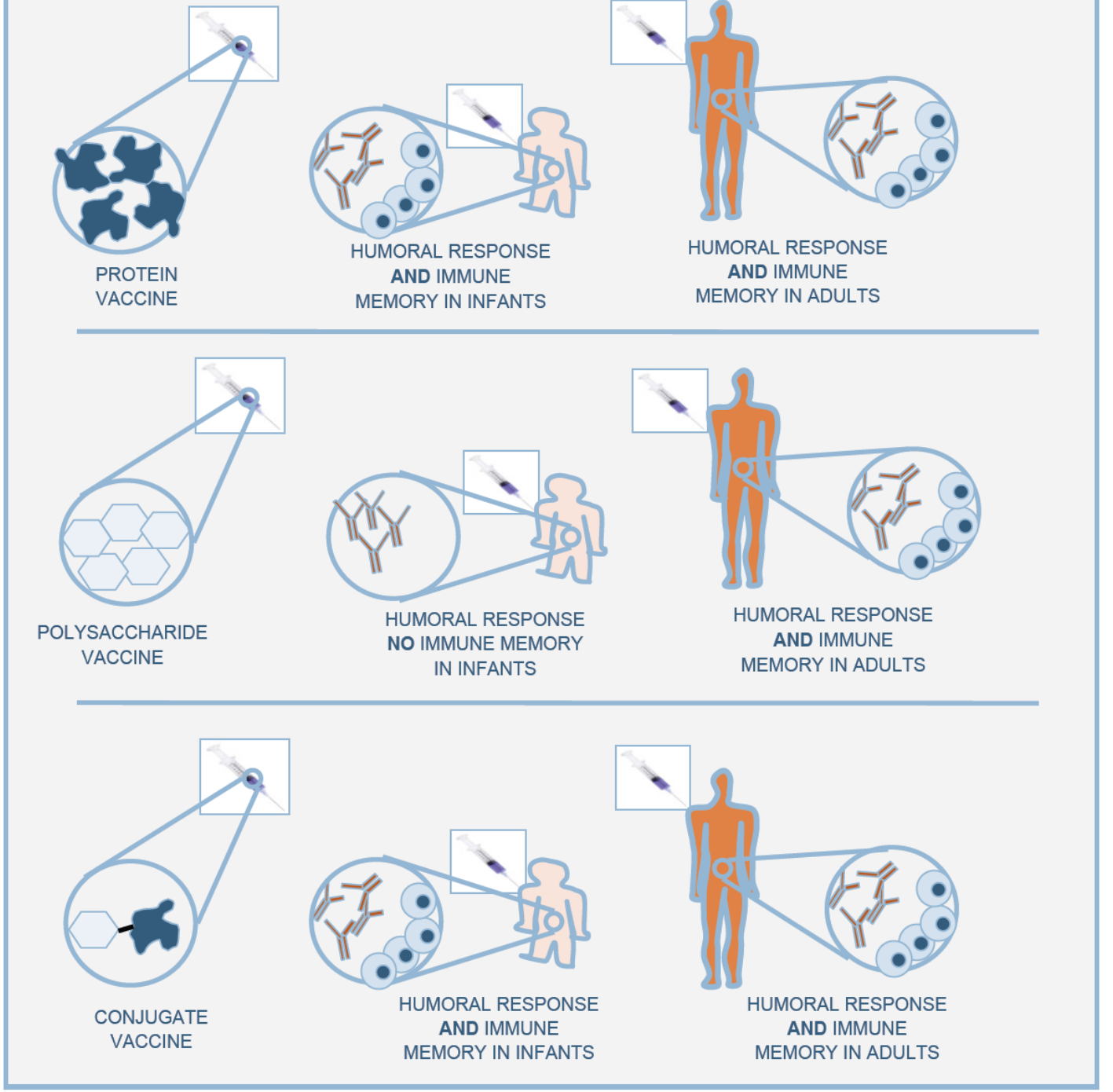
- Advantages of a modern subunit vaccine
  - *Proteins produced by recombinant DNA technology*
  - *Contain no viral genomes that can replicate or escape*
  - *No contamination with infectious virus or foreign proteins*
- Disadvantages
  - *Expensive*
  - *Poor antigenicity (low level, short duration response)*
  - *Usually stimulate production of antibody, not cytotoxic T cells*
  - *Lack of good delivery system (injections are best, not well liked)*

# Inactivated and subunit vaccines have a common problem

- Viral proteins don't replicate or infect
- Don't send out 'danger signal' to the immune response
- Example: failed respiratory syncytial virus
- Pure proteins often require *adjuvant* to mimic inflammatory effects of infection




VACCINE FACT BOOK 2012


PROTEIN VACCINE
HUMORAL RESPONSE AND IMMUNE MEMORY IN INFANTS
HUMORAL RESPONSE AND IMMUNE MEMORY IN ADULTS
POLYSACCHARIDE VACCINE
HUMORAL RESPONSE NO IMMUNE MEMORY IN INFANTS
HUMORAL RESPONSE AND IMMUNE MEMORY IN ADULTS
CONJUGATE VACCINE
HUMORAL RESPONSE AND IMMUNE MEMORY IN INFANTS
HUMORAL RESPONSE AND IMMUNE MEMORY IN ADULTS

# What does a vaccine contain?

- Bulk antigen
- Water/saline
- Additives
- Preservatives

(phenol,

2-phenoxyethanol, thimerosal)

and sometimes

- Adjuvants (aluminum salt)

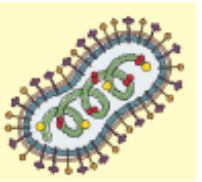
# Adjuvants

- Substances that stimulate early processes in immune recognition, particularly elements of the inflammatory response
- Help produce a more robust acquired immune response with less antigen
- Work in at least three ways
  - *Surface effects: through presentation of antigen as particles*
  - *Depot effects: localization of antigen to the site of inoculation*
  - *Inflammation effects: direct stimulation of the immune response*
- In US vaccines
  - *Aluminum salts in HBV vaccine; AS04 in Cervarix (aluminum hydroxide, monophosphoryl lipid A)*

# How do you make a vaccine?

- Successful vaccination depends upon the induction of an *appropriate immune response*
  - *Remember the Th1 and Th2 response?*
- Gold standard: A vaccinated individual must be *protected against disease* caused by a virulent form of the specific pathogen
  - *Just getting 'a response' is not enough (e.g. producing antibodies)*

# Active vaccines stimulate immune memory

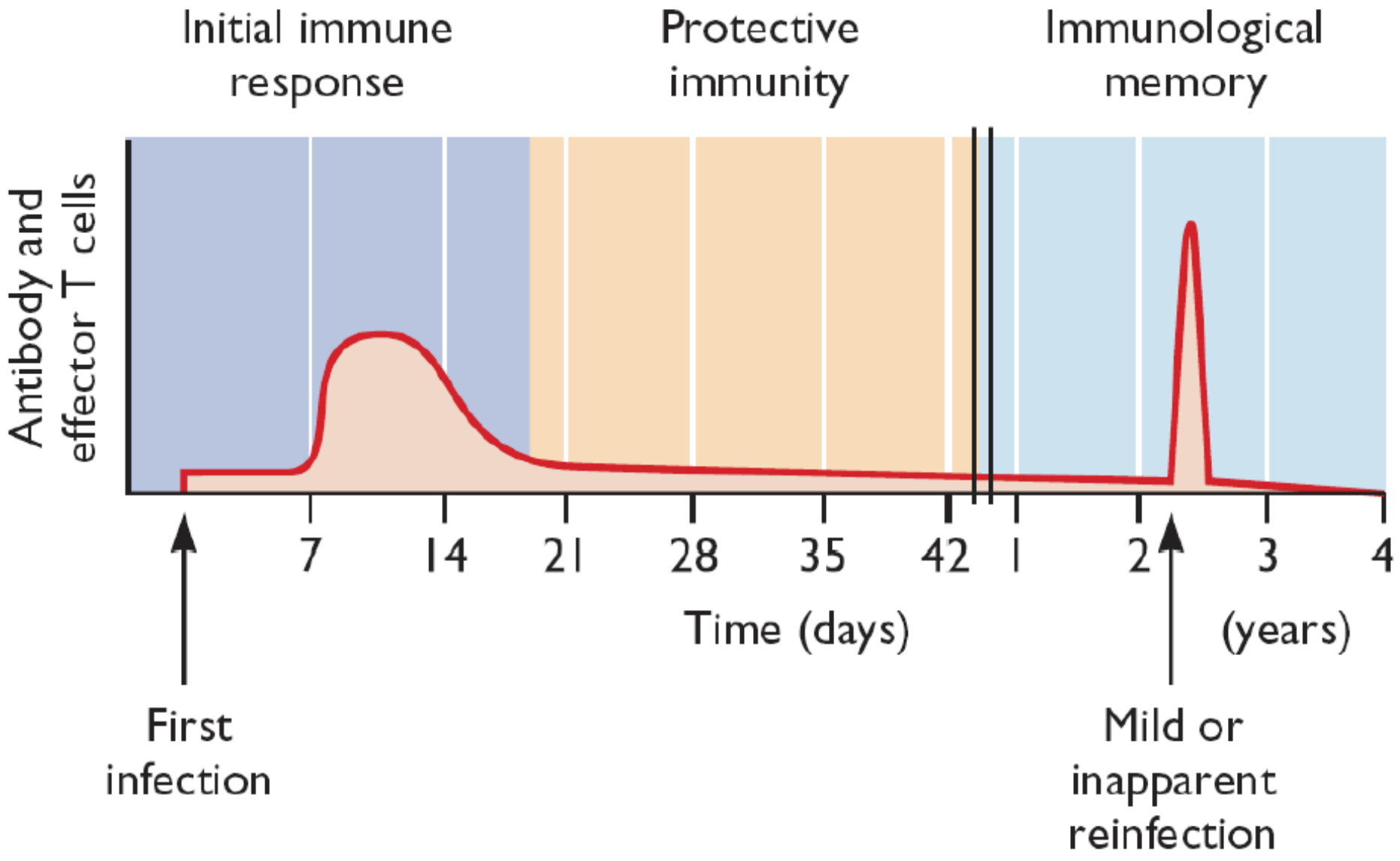
- 1781: outbreak of measles on Faroe Islands
- Next 65 years, islands free of measles
- 1846: another outbreak of measles; none of those who survived the 1781 epidemic were infected
- A 'natural experiment' demonstrating immune memory
- Immune memory lasts a long time, and is maintained without re-exposure to virus

# Immune memory

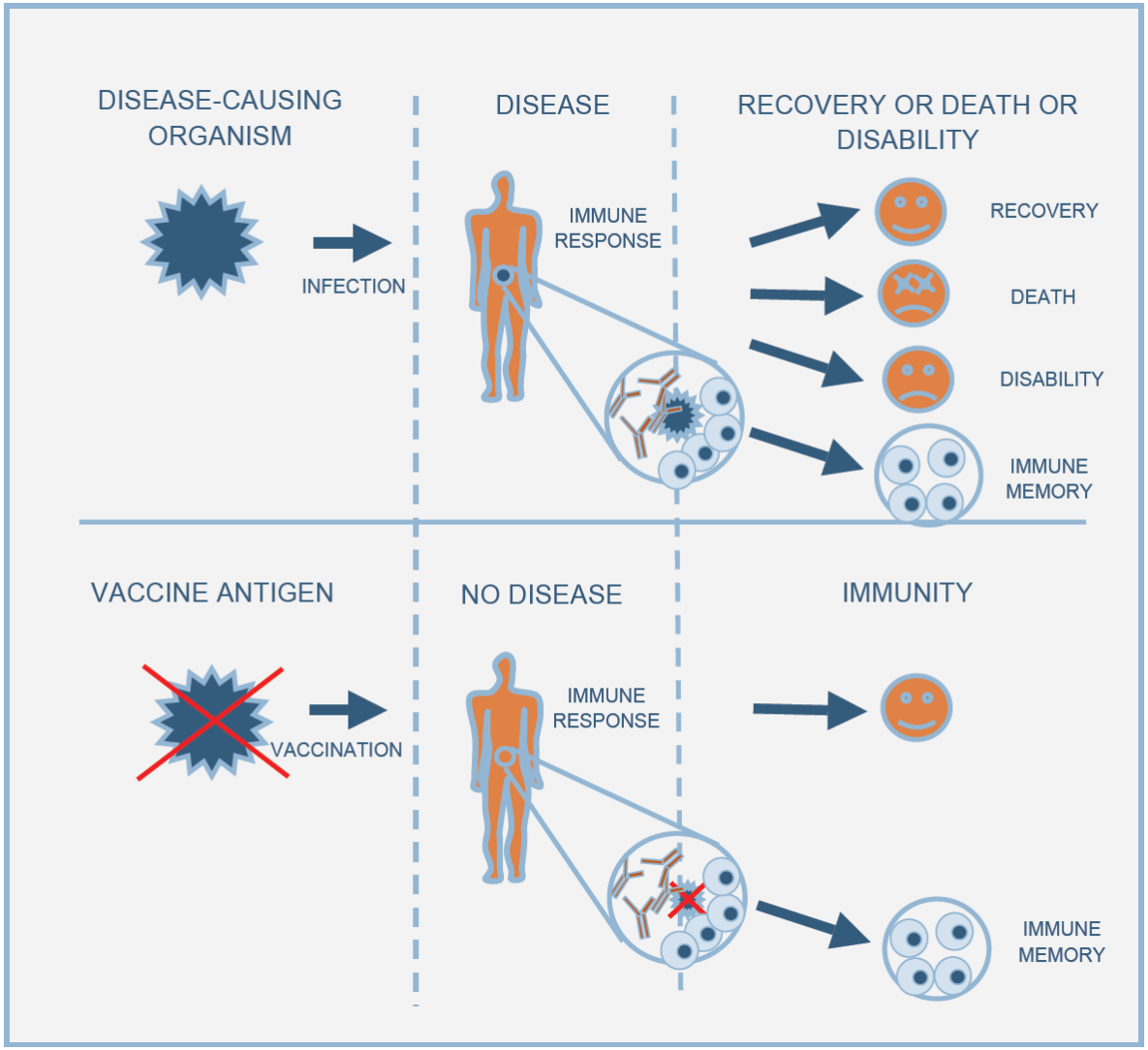
- T and B lymphocytes that remain after infection has waned
- Maintain heightened ability to proliferate after infection
- Vaccines establish immune memory without pathogenic events typical of first encounter with virulent virus

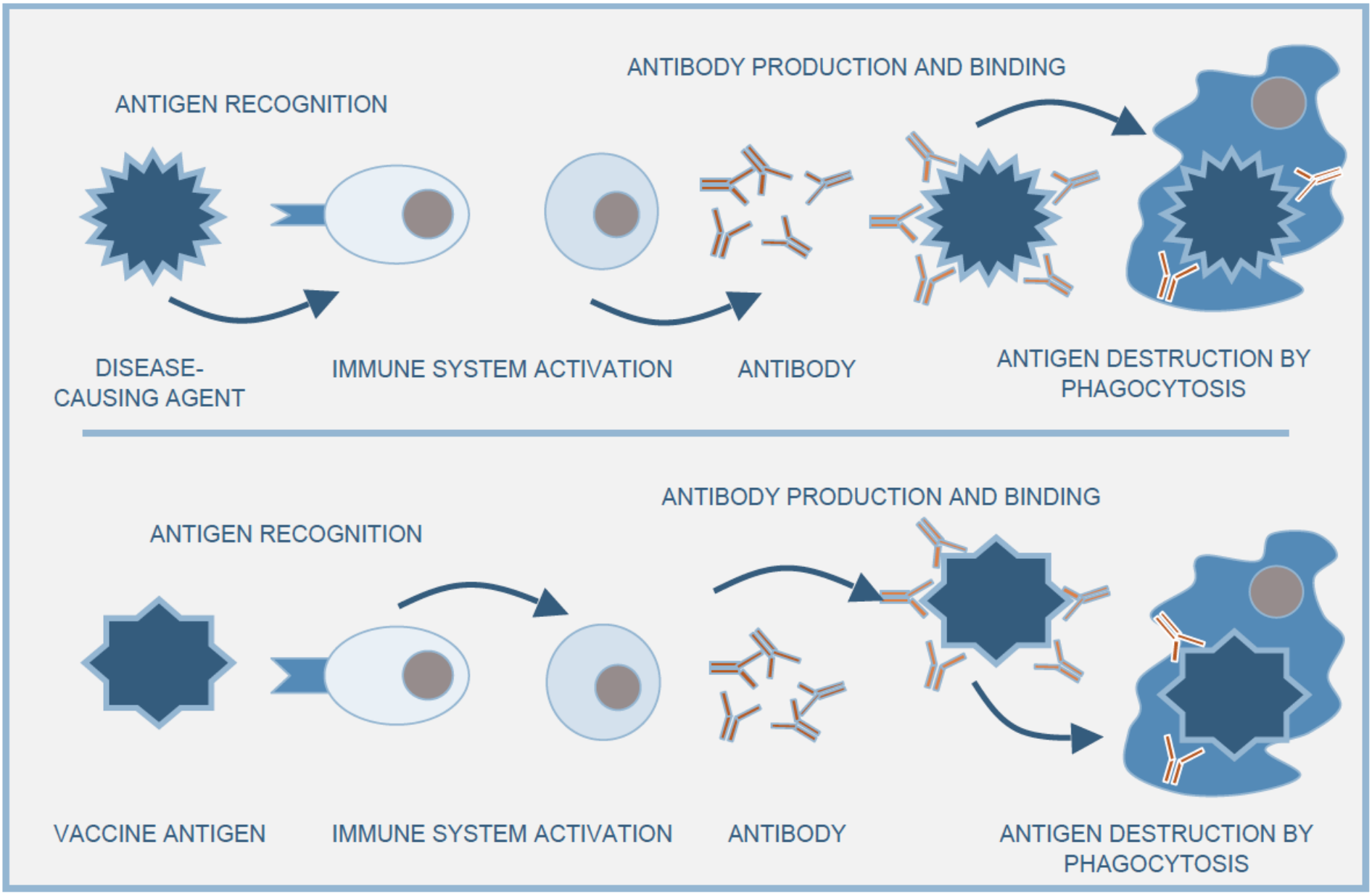
# Vaccines stimulate a protective immune response

**They mimic an infection and provide memory**



# How do vaccines work?




ANTIGEN RECOGNITION
ANTIBODY PRODUCTION AND BINDING
DISEASE-CAUSING AGENT
IMMUNE SYSTEM ACTIVATION
ANTIBODY
ANTIGEN DESTRUCTION BY PHAGOCYTOSIS
ANTIGEN RECOGNITION
ANTIBODY PRODUCTION AND BINDING
VACCINE ANTIGEN
IMMUNE SYSTEM ACTIVATION
ANTIBODY
ANTIGEN DESTRUCTION BY PHAGOCYTOSIS

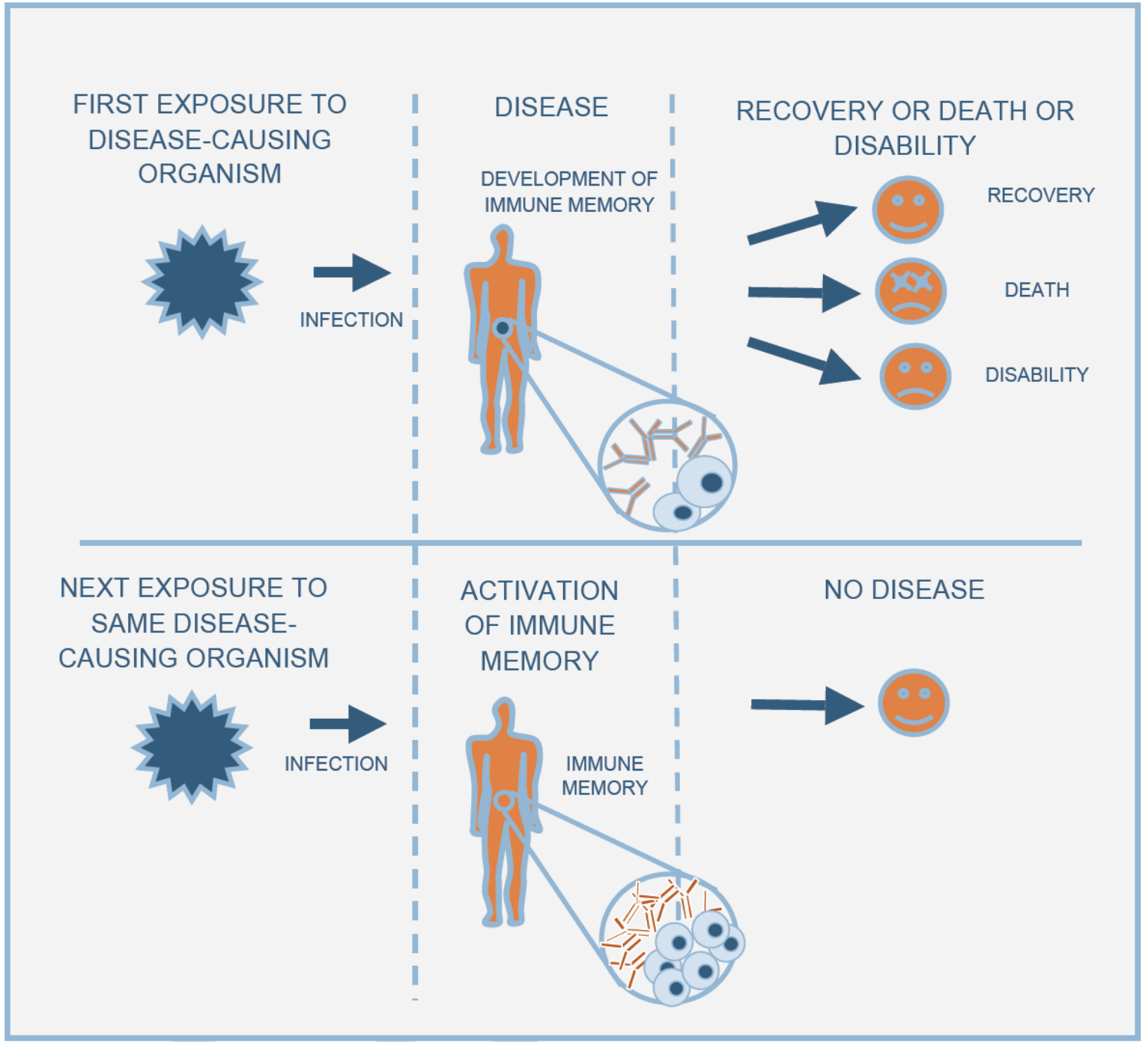
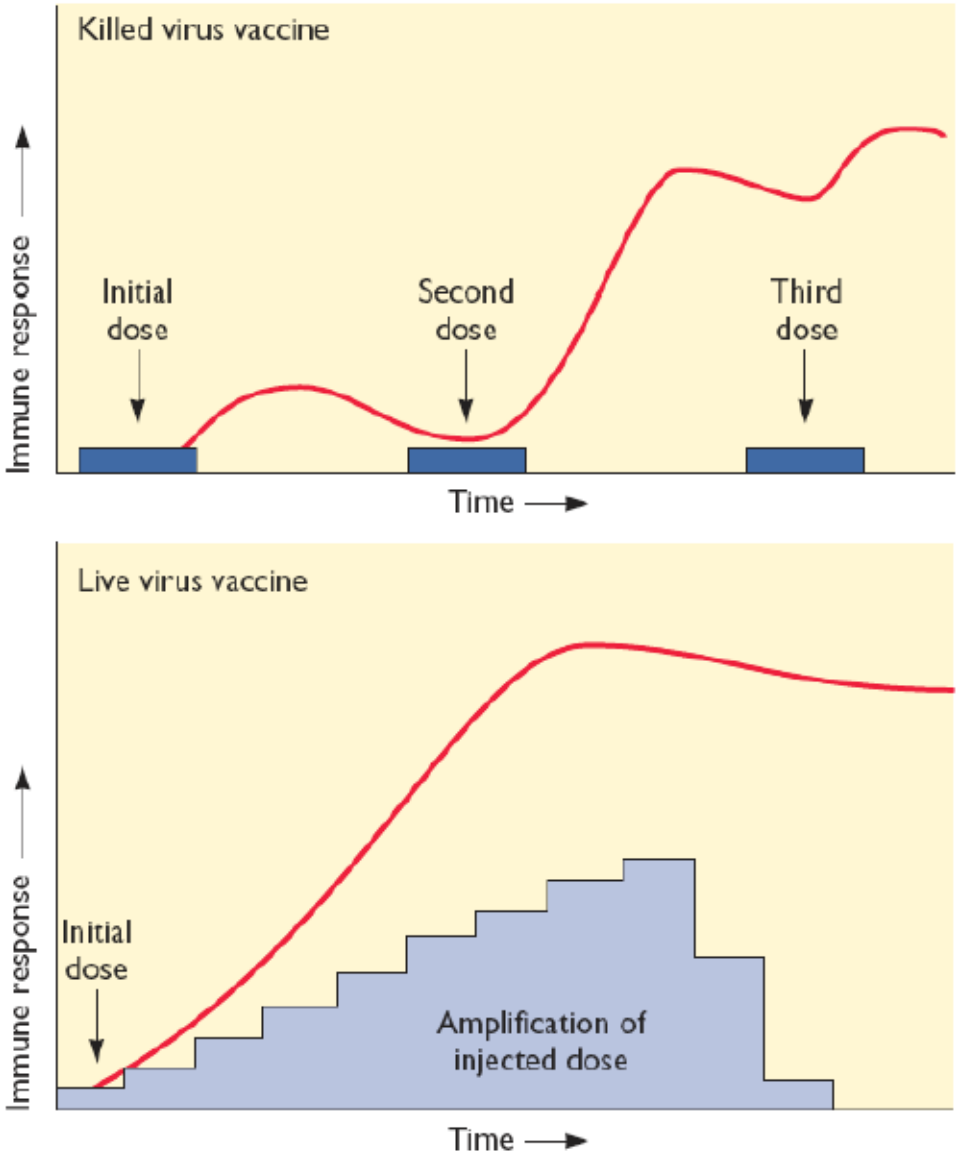



**FIGURE 4.** COMPARISON OF THE IMMUNE RESPONSE TO A DISEASES-CAUSING ORGANISM AND TO A VACCINE

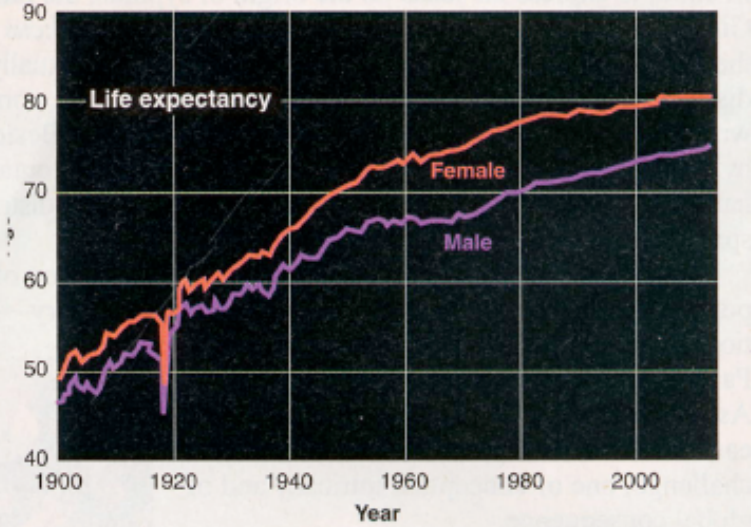

Killed virus vaccine
Immune response
Initial dose
Second dose
Third dose
Time
Live virus vaccine
Immune response
Initial dose
Amplification of injected dose
Time

# Two common threads connect the world of vaccines and antiviral drugs

1. Any agent or method that blocks virus replication or reduces viral pathogenesis *imposes selections for virus mutants* capable of bypassing the agent
   - *Resistant mutants*
   - *Vaccine escape mutants*
   - *Selection for increased virulence*
2. Viruses are obligate intracellular parasites; any intervention in the host-virus relationship carries *inherent risks* for the host
   - Those risks are the well-known *side effects* of therapy

# Vaccines are our proven best defense against viruses

- Vaccination mobilizes the host immune system to prevent virus infections
  - *Takes advantage of the memory system in the adaptive immune response*



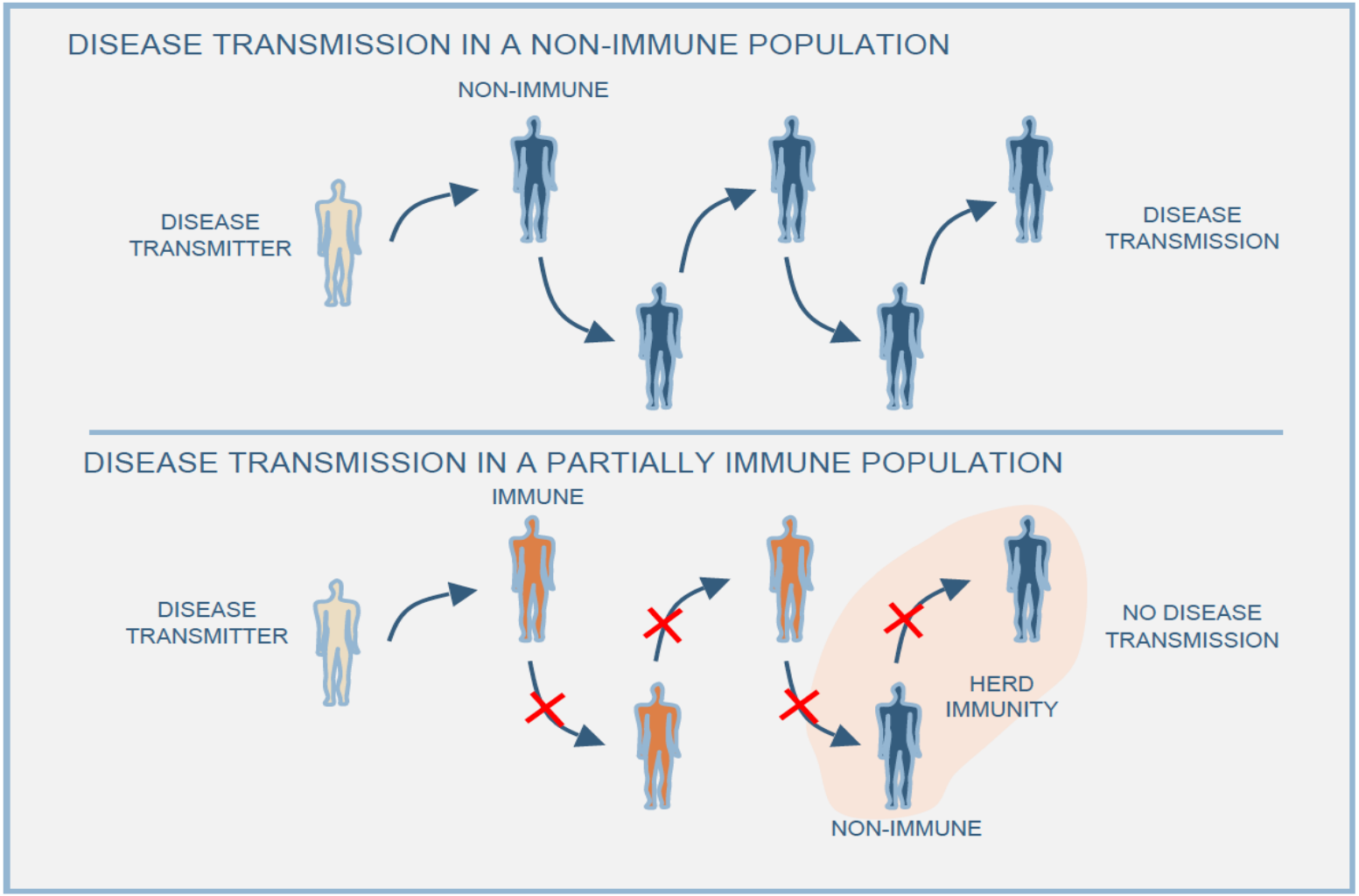

**Longer life.** Anti-infection medicine and other factors have helped dramatically lengthen the average life expectancy in the U.S.

- **Key concept:** Vaccination breaks the transmission cycle of host-host spread in a population

# Two simple, but fundamental ideas about how vaccines work and do not work in the real world

1. Herd immunity
   - *Immunize 'enough people' to block virus spread*
   - *Not everyone has to be immune to protect the population*
2. Maintenance of a critical level of immunity
   - *If immunity of a population falls below a critical level, epidemics can easily occur even with an effective vaccine*
   - *Enough people have to be immune to block transmission in a population*
   - *Varies for virus and population*

# Herd immunity



# Herd immunity threshold for some diseases

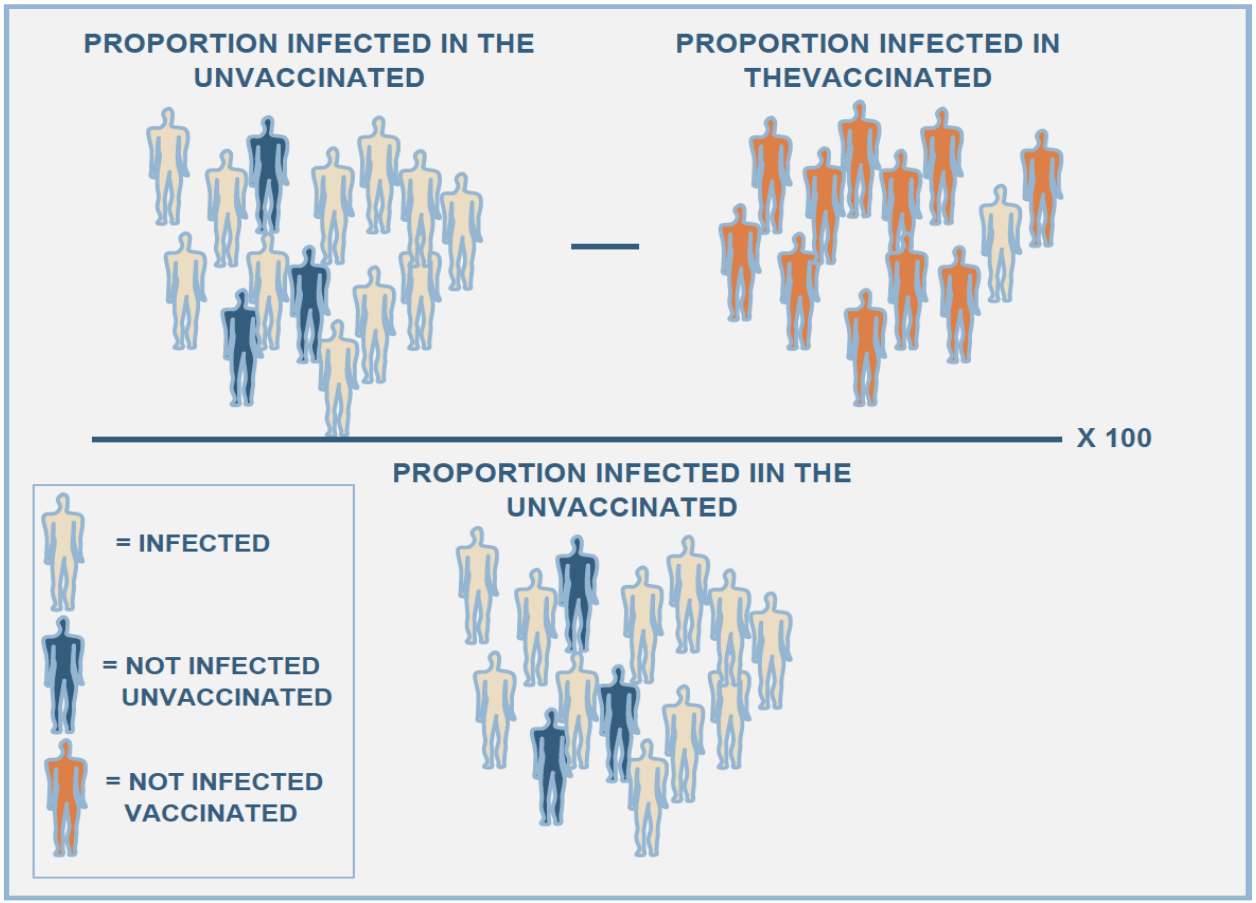
The herd immunity threshold – the proportion of immune individuals in a population that will prevent disease from spreading.

Each disease has its own herd immunity threshold.

| Disease | Herd immunity threshold |
|---|---|
| Diphtheria | 85% |
| Measles | 83-94% |
| Mumps | 75-86% |
| Pertussis | 92-94% |
| Polio | 80-86% |
| Rubella | 80-85% |
| Smallpox | 83-85% |

# Vaccine efficiency - definition

The decrease in incidence of a disease in the vaccinated population compared to the incidence of the disease in the unvaccinated population



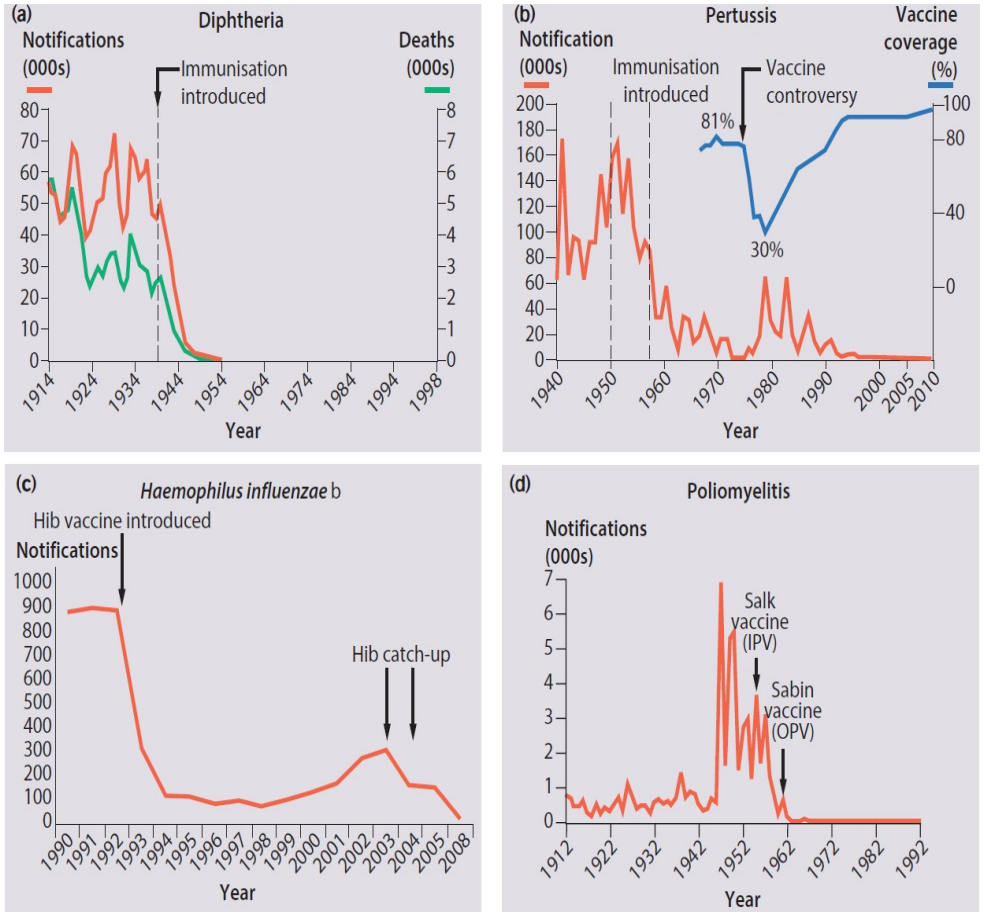
# Vaccine effectiveness

Vaccine effectiveness is often distinguished from vaccine efficacy. Vaccine effectiveness measures the performance of a vaccine under field conditions (usually retrospectively), whereas vaccine efficacy measures the performance of a vaccine under study conditions (usually prospectively). Therefore, vaccine effectiveness will depend not only on the performance of the vaccine, but also on the performance of the vaccine delivery program. Furthermore, whereas vaccine efficacy typically measures the prevention of a disease, vaccine effectiveness can assess the ability of a vaccine to prevent a specific outcome – for example: hospitalization or death from a specific disease.

# Requirements of an effective vaccine

- Safety: must not cause disease, minimal side effects
- Must induce protective immunity in the population
  - Not every individual need be immunized to stop viral spread
  - 80-95% immunity usually stops virus spread - **herd immunity**
- Protection must be long-lasting
- Low cost (<$1, WHO); genetic stability; storage considerations; delivery (oral vs. needle)

# Large-scale vaccination campaigns can be successful



# How safe are vaccines?

# Vaccine-Preventable Diseases and the Vaccines that Prevent Them

| Disease | Vaccine | Disease spread by | Disease symptoms | Disease complications |
|---|---|---|---|---|
| **Chickenpox** | Varicella vaccine protects against chickenpox. | Air, direct contact | Rash, tiredness, headache, fever | Infected blisters, bleeding disorders, encephalitis (brain swelling), pneumonia (infection in the lungs) |
| **Diphtheria** | DTaP* vaccine protects against diphtheria. | Air, direct contact | Sore throat, mild fever, weakness, swollen glands in neck | Swelling of the heart muscle, heart failure, coma, paralysis, death |
| **Hib** | Hib vaccine protects against *Haemophilus influenzae* type b. | Air, direct contact | May be no symptoms unless bacteria enter the blood | Meningitis (infection of the covering around the brain and spinal cord), intellectual disability, epiglottitis (life-threatening infection that can block the windpipe and lead to serious breathing problems), pneumonia (infection in the lungs), death |
| **Hepatitis A** | HepA vaccine protects against hepatitis A. | Direct contact, contaminated food or water | May be no symptoms, fever, stomach pain, loss of appetite, fatigue, vomiting, jaundice (yellowing of skin and eyes), dark urine | Liver failure, arthralgia (joint pain), kidney, pancreatic and blood disorders |
| **Hepatitis B** | HepB vaccine protects against hepatitis B. | Contact with blood or body fluids | May be no symptoms, fever, headache, weakness, vomiting, jaundice (yellowing of skin and eyes), joint pain | Chronic liver infection, liver failure, liver cancer |
| **Influenza (Flu)** | Flu vaccine protects against influenza. | Air, direct contact | Fever, muscle pain, sore throat, cough, extreme fatigue | Pneumonia (infection in the lungs) |
| **Measles** | MMR** vaccine protects against measles. | Air, direct contact | Rash, fever, cough, runny nose, pink eye | Encephalitis (brain swelling), pneumonia (infection in the lungs), death |
| **Mumps** | MMR**vaccine protects against mumps. | Air, direct contact | Swollen salivary glands (under the jaw), fever, headache, tiredness, muscle pain | Meningitis (infection of the covering around the brain and spinal cord) , encephalitis (brain swelling), inflammation of testicles or ovaries, deafness |
| **Pertussis** | DTaP* vaccine protects against pertussis (whooping cough). | Air, direct contact | Severe cough, runny nose, apnea (a pause in breathing in infants) | Pneumonia (infection in the lungs), death |
| **Polio** | IPV vaccine protects against polio. | Air, direct contact, through the mouth | May be no symptoms, sore throat, fever, nausea, headache | Paralysis, death |
| **Pneumococcal** | PCV13 vaccine protects against pneumococcus. | Air, direct contact | May be no symptoms, pneumonia (infection in the lungs) | Bacteremia (blood infection), meningitis (infection of the covering around the brain and spinal cord), death |
| **Rotavirus** | RV vaccine protects against rotavirus. | Through the mouth | Diarrhea, fever, vomiting | Severe diarrhea, dehydration |
| **Rubella** | MMR** vaccine protects against rubella. | Air, direct contact | Sometimes rash, fever, swollen lymph nodes | Very serious in pregnant women—can lead to miscarriage, stillbirth, premature delivery, birth defects |
| **Tetanus** | DTaP* vaccine protects against tetanus. | Exposure through cuts in skin | Stiffness in neck and abdominal muscles, difficulty swallowing, muscle spasms, fever | Broken bones, breathing difficulty, death |

* DTaP combines protection against diphtheria, tetanus, and pertussis.
** MMR combines protection against measles, mumps, and rubella.

Last updated January 2020 - CS314226-B

# Classification of adverse events following immunization (AEFI)

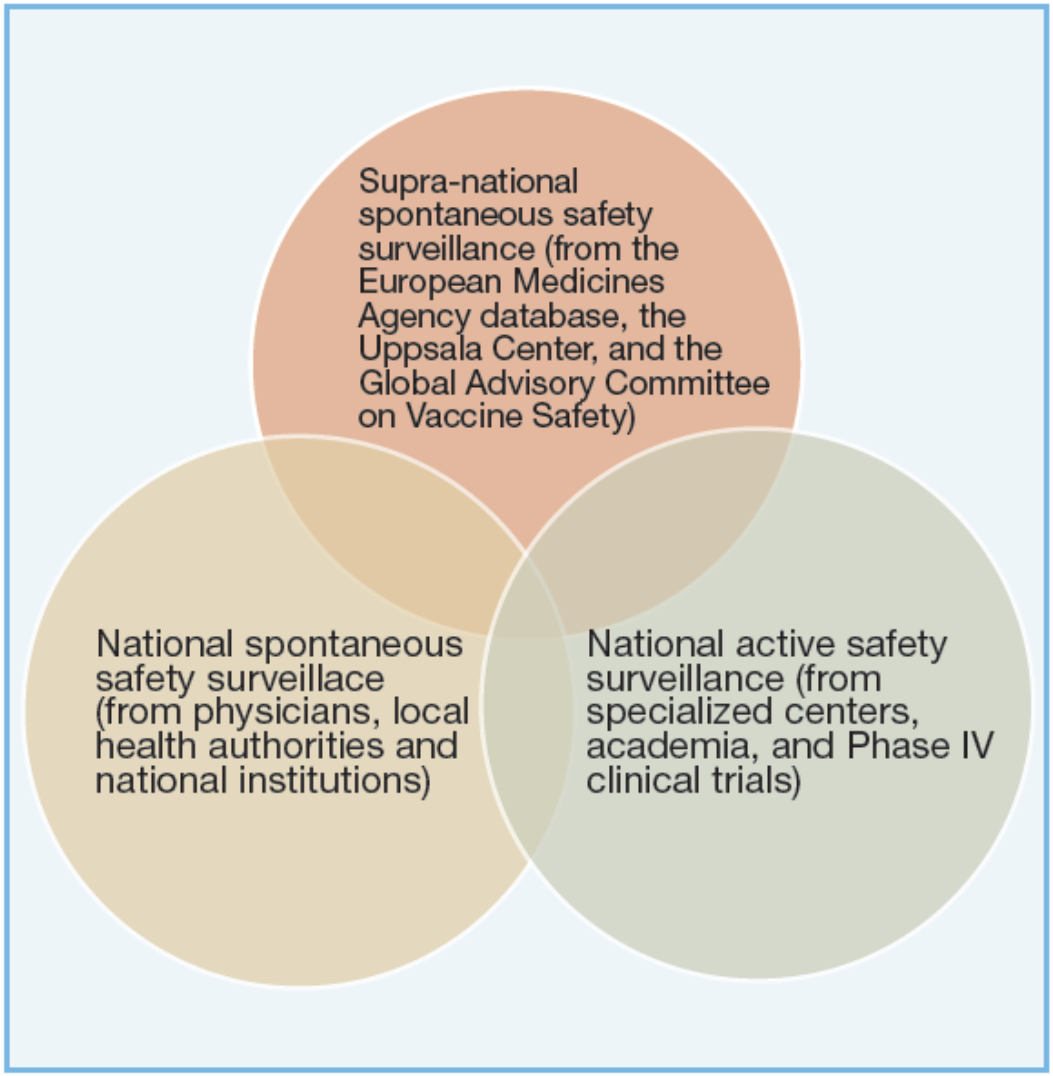
| Classification | Frequency |
|---|---|
| very common | > 1 / 10 |
| common | > 1 / 100 and < 1 / 10 |
| uncommon | > 1 / 1 000 and < 1 / 100 |
| rare | > 1 / 10 000 and < 1 / 1 000 |
| very rare | < 1 / 10 000 |

| Vaccine | Pain, swelling, redness | Fever > 38°C | Systemic symptoms |
|---|---|---|---|
| BCG (against tuberculosis) | 90-95% | | |
| Haemophilus influenzae type b | 5-15% | 2-10% | |
| Hepatitis B | adults 15%<br>children 5% | 1-6% | |
| Measles / Measles, Mumps, Rubella / Measles, Rubella | ~10% | 5-15% | 5% rash |
| Oral polio | very rare | < 1% | <1% diarrhea, headache, muscle pains |
| Tetanus / Tetanus, diphtheria | ~10%<br>50-85% booster doses | ~10% | ~25% irritability and malaise |
| Pertussis (whole cell) | up to 50% | up to 50% | up to 55% irritability and malaise |

**TABLE 8.** COMMON REACTIONS TO VACCINES ROUTINELY USED IN SEVERAL INDUSTRIALIZED COUNTRIES[17]

The vast majority of adverse events associated with vaccines are minor and transient. These are typically pain at the injection site, or mild fever (See **Table 8**). More serious adverse events occur rarely. Some serious adverse events may be so rare that they occur only once in millions of vaccine doses delivered[15], and some serious adverse events may occur so rarely that their risk cannot be accurately assessed[16]. Some individuals may be sensitive to some components or trace elements in some vaccines, such as eggs, antibiotics, or gelatin. Otherwise, the cause of rare or very rare adverse events is usually unknown. It is believed that rare and very rare adverse events are associated with individual differences in immune responses.

# National and supra-national vaccine safety surveillance in Europe



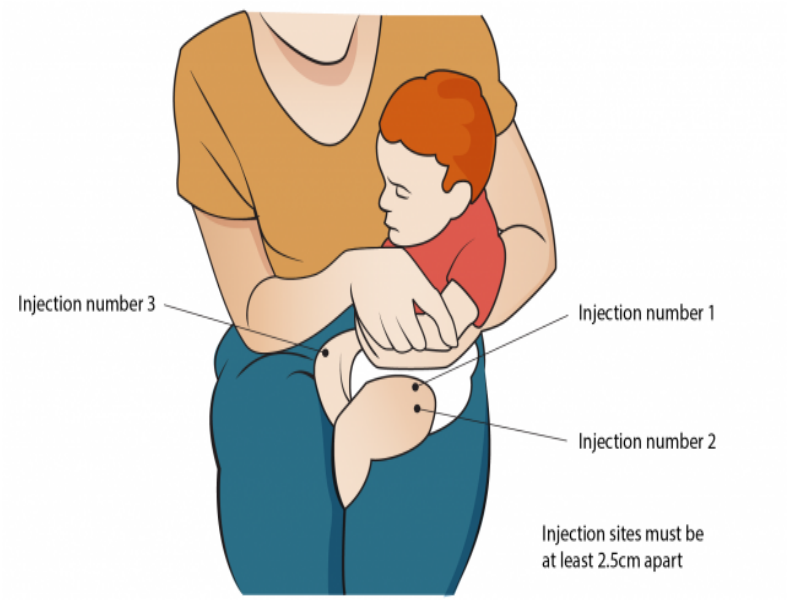
# General recommendations

1. Every healthy child should be carried out in accordance with vaccination schedule
2. Before each vaccination doctor is obliged to provide patient information relating to:
   - benefits resulting from the protective vaccination
   - type vaccines
   - the duration of immunity to vaccination
   - the necessity to provide doses
   - reminding the possible side effects
3. Every child before vaccination must be carefully examined
4. If possible, use a combined vaccine
5. In any case, check the expiration date on the packaging of the vaccine and method of storage
6. Carried out vaccination should be documented saving series numbers
7. You should instruct parents carefully to observe vaccinated child for 3 consecutive days

8.When side effects appear the doctor should immediately notify Department of Health, Pharmaceutical Committees and / or competent authorities.

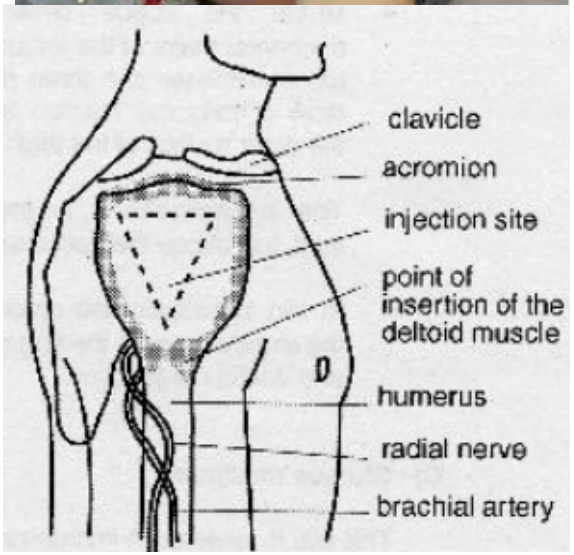
# Injection sites

<1 year




Exception – BCG vaccine

>1 year



# General contraindications to immunization

* A history of adverse reactions

*Allergies immediate (Type I) components of vaccines against ( eg. chicken egg protein - flu,  neomycin - measles )

* Acute infections with fever > 38 degrees Celsius

* Primary and secondary immunological deficiency

* A history  of encephalopathy unattributed to another identifiable cause within 7 days after a previous vaccine administration

* Progressive or uncontrolled CNS disease

* Specific situations with cellular pertusis or live vaccine.

| Type of vaccine | Recommended shortest interval between doses different vaccines |
|---|---|
| Two or more inactivated | Administered at the same time or any time interval |
| Inactivated and living | Administered at the same time or any time interval |
| Two or more living | Administered at the same time or 4 weeks apart if they weren't given at the same time |

The time interval between two doses of the same vaccination min. 4 weeks, optimal 6- 8 weeks

# 2020 Recommended Immunizations for Children from Birth Through 6 Years Old

| Birth | 1 month | 2 months | 4 months | 6 months | 12 months | 15 months | 18 months | 19–23 months | 2–3 years | 4–6 years |
|---|---|---|---|---|---|---|---|---|---|---|
| HepB | HepB | | | HepB | | | | | | |
| | | RV | RV | RV | | | | | | |
| | | DTaP | DTaP | DTaP | | DTaP | | | | DTaP |
| | | Hib | Hib | Hib | Hib | | | | | |
| | | PCV13 | PCV13 | PCV13 | PCV13 | | | | | |
| | | IPV | IPV | IPV | | | | | | IPV |
| | | | | Influenza (Yearly)* | | | | | | |
| | | | | | MMR | | | | | MMR |
| | | | | | Varicella | | | | | Varicella |
| | | | | | HepA§ | | | | | |

**Is your family growing?** To protect your new baby against whooping cough, get a Tdap vaccine. The recommended time is the 27th through 36th week of pregnancy. Talk to your doctor for more details.

Shaded boxes indicate the vaccine can be given during shown age range.

**NOTE:**
If your child misses a shot, you don't need to start over. Just go back to your child's doctor for the next shot. Talk with your child's doctor if you have questions about vaccines.

**FOOTNOTES:**

* Two doses given at least four weeks apart are recommended for children age 6 months through 8 years of age who are getting an influenza (flu) vaccine for the first time and for some other children in this age group.

§ Two doses of HepA vaccine are needed for lasting protection. The first dose of HepA vaccine should be given between 12 months and 23 months of age. The second dose should be given 6 months after the first dose. All children and adolescents over 24 months of age who have not been vaccinated should also receive 2 doses of HepA vaccine.

*If your child has any medical conditions that put him at risk for infection or is traveling outside the United States, talk to your child's doctor about additional vaccines that he or she may need.*

See back page for more information on vaccine-preventable diseases and the vaccines that prevent them.

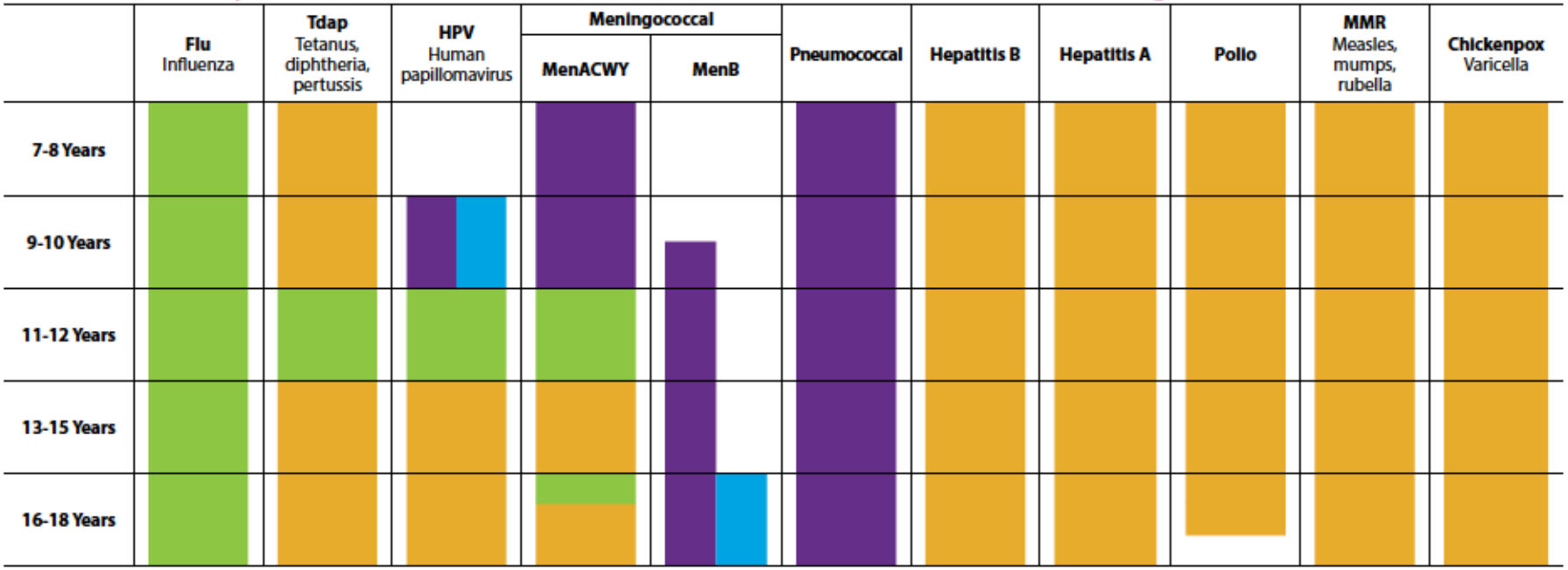
For more information, call toll-free
**1-800-CDC-INFO** (1-800-232-4636)
or visit
**www.cdc.gov/vaccines/parents**

**U.S. Department of Health and Human Services**
Centers for Disease Control and Prevention

INFORMATION FOR PARENTS

# 2020 Recommended Immunizations for Children 7–18 Years Old

## Talk to your child's doctor or nurse about the vaccines recommended for their age.




| More Information: | Everyone 6 months and older should get a flu vaccine every year. | All 11- through 12-year olds should get one shot of Tdap. | All 11- through 12-year olds should get a 2-shot series of HPV vaccine. A 3-shot series is needed for those with weakened immune systems and those who start the series at 15 years or older. | All 11- through 12-year olds should get one shot of meningococcal conjugate (MenACWY). A booster shot is recommended at age 16. | Teens 16–18 years old **may** be vaccinated with a serogroup B meningococcal (MenB) vaccine. |
|---|---|---|---|---|---|

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.

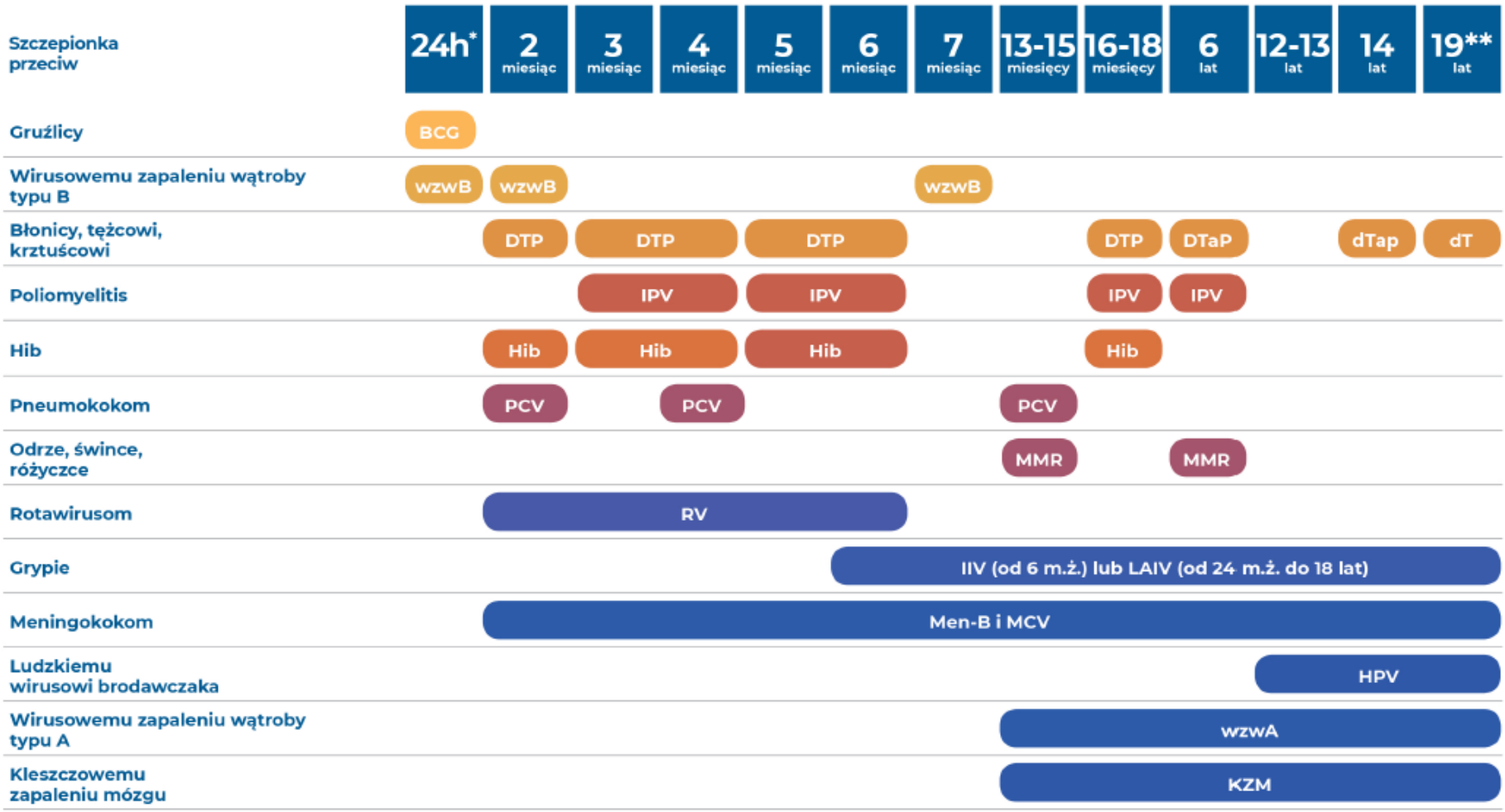
These shaded boxes indicate the vaccine is recommended for children with certain health or lifestyle conditions that put them at an increased risk for serious diseases. See vaccine-specific recommendations at www.cdc.gov/vaccines/hcp/acip-recs/.

This shaded box indicates children not at increased risk may get the vaccine if they wish after speaking to a provider.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

# KALENDARZ SZCZEPIEŃ NA 2020 ROK

szczepienia info




* szczepienie powinno być przeprowadzone przed wypisaniem dziecka z oddziału noworodkowego, ** dT obowiązkowe lub dTap zalecane,

**BCG**-szczepionka przeciw gruźlicy, **wzwB**- szczepionka przeciw wirusowemu zapaleniu wątroby typu B, **DTP**- szczepionka przeciw błonicy, tężcowi i krztuścowi, całokomórkowa, **DTaP**- szczepionka przeciw błonicy, tężcowi i krztuścowi, bezkomórkowa, **dTap**- szczepionka przeciw błonicy, tężcowi i krztuścowi bezkomórkowa z obniżoną zawartością antygenów błonicy i krztuśca, **IPV**- szczepionka przeciw poliomyelitis, zabita, **Hib**- szczepionka przeciw Haemophilus influenzae typu b, **MMR**- szczepionka przeciw odrze, śwince i różyczce, **PCV**- skoniugowana szczepionka przeciw pneumokokom, **RV**- szczepionka przeciw rotawirusom, **IIV**- szczepionka przeciw grypie (inaktywowana), **LAIV**- szczepionka przeciw grypie (żywa, donosowa), **MenB**- szczepionka przeciw meningokokom grupy B, **MCV**- szczepionka przeciw meningokokom grupy C, lub A, C, W, Y, **HPV**- szczepionka przeciw ludzkiemu wirusowi brodawczaka, **KZM**- szczepionka przeciw kleszczowemu zapaleniu mózgu.

Vaccine 36 (2018) 4979–4992

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Review

# A report on the status of vaccination in Europe

Shazia Sheikh [a,*], Eliana Biundo [b], Soizic Courcier [a], Oliver Damm [c], Odile Launay [d], Edith Maes [b], Camelia Marcos [a], Sam Matthews [e], Catherina Meijer [b], Andrea Poscia [f], Maarten Postma [g,h,i], Omer Saka [b], Thomas Szucs [j], Norman Begg [a]

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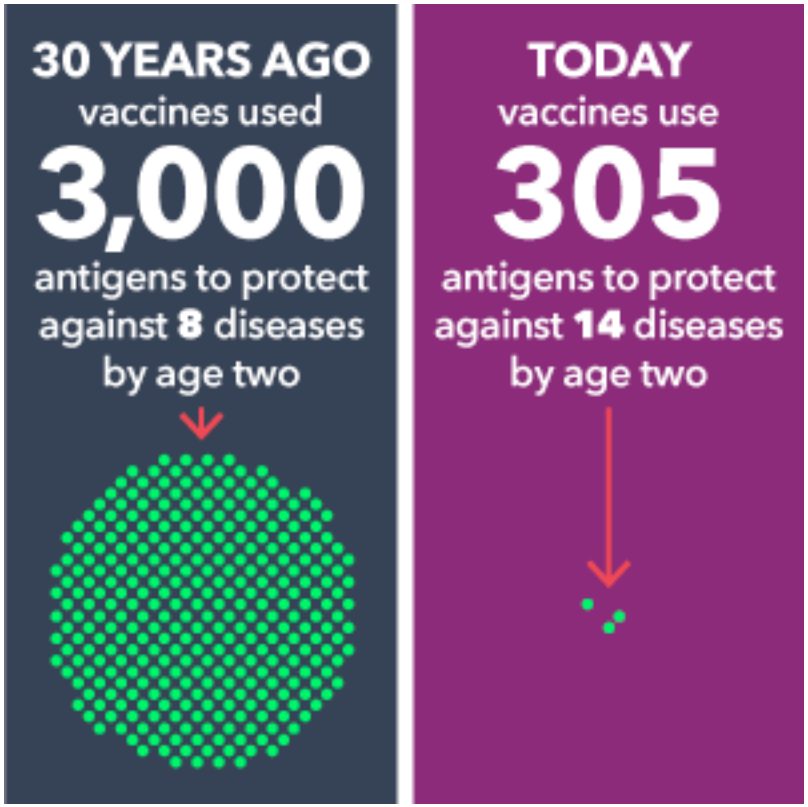
| UMV[28] | AT | BE | BG | HR | FI | FR | DE | GR | IT | NL | PL | RO | SP | SE | CH | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BCG | ✖ | ✖ | ✓ | ✓ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✓ | ✓ | ✖ | ✖ | ✖ | ✖ |
| Hepatitis B | ✓ | ✓ | ✓ | ✓ | ✖ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✓ | ✓ |
| Polio | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Diphtheria | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Tetanus | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Pertussis | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Hib | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Pneumococcal | ✓ | ✓ | ✓ | ✖ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Rotavirus | ✓ | ✓ | ✓ | ✖ | ✓ | ✖ | ✓ | ✓ | ✓ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖ | ✓ |
| Measles | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mumps | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Rubella | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Hepatitis A | ✖ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖ | ✓ | ✖ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Varicella | ✓ | ✖ | ✖ | ✖ | ✓ | ✖ | ✓ | ✓ | ✓ | ✖ | ✖ | ✖ | ✓ | ✖ | ✓ | ✖ |
| HPV | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✓ | ✓ | ✓ | ✓ |
| MenC | ✓ | ✓ | ✓ | ✖ | ✖ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✖ | ✓ | ✖ | ✓ | ✓ |
| MenACWY | ✓ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖ | ✓ | ✓ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖ | ✓ |
| MenB | ✓ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✓ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖§ | ✓ |
| Influenza | ✓ | ✖ | ✖ | ✖ | ✓ | ✓ | ✖ | ✖ | ✖ | ✖ | ✓ | ✖ | ✖ | ✖ | ✖ | ✓ |
| ***Legend*** | ✓ Recommended for UMV | | | | | | | | ✖ Not recommended for UMV | | | | | | | |
| | | | Funded/reimbursed | | | | | | Out-of-pocket (OOP) | | | | | Co-payment | | |
| ***Abbreviations*** | AT: Austria, BE: Belgium, BG: Bulgaria, HR: Croatia, FI: Finland, FR: France, DE: Germany, GR: Greece, IT: Italy, NL: Netherlands, PL: Poland, RO: Romania; SP: Spain, SE: Sweden, CH: Switzerland**§ (not licensed)**, UK: United Kingdom; BCG: Bacillus Calmette–Guérin; Hib: Haemophilus influenzae B; HPV: human papillomavirus; Men: meningitis; UMV: universal mass vaccination. | | | | | | | | | | | | | | | |

**Fig. 2.** Recommended childhood and adolescent UMV vaccines by country and funding level (2017).

| | AT | BE | BG | HR | FI | FR | DE | GR | IT | NL | PL | RO | SP | SE | CH | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **UMV for Pregnant Women[28]** | | | | | | | | | | | | | | | | |
| Diphtheria | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ |
| Tetanus | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ |
| Pertussis | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ |
| Influenza | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **UMV for Adults[28]** | | | | | | | | | | | | | | | | |
| Diphtheria | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ |
| Tetanus | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ |
| Pertussis | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ |
| Hepatitis B | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ |
| **UMV for Older adults (≥60 or 65 years of age)[28]** | | | | | | | | | | | | | | | | |
| Zoster | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ | ✗ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ |
| Pneumococcal | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ | ✗ | ✓ |
| Diphtheria | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ |
| Tetanus | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ |
| Pertussis | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✗ |
| Influenza | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| ***Legend*** | ✓ Recommended for UMV | | | | | ✗ Not recommended for UMV | | | | | | | | | | |
| | Funded/reimbursed | | | | | Out-of-pocket (OOP) | | | | | | Co-payment | | | | |
| ***Abbreviations*** | AT: Austria, BE: Belgium, BG: Bulgaria, HR: Croatia, FI: Finland, FR: France, DE: Germany, GR: Greece, IT: Italy, NL: Netherlands, PL: Poland, RO: Romania, SP: Spain, SE: Sweden, CH: Switzerland, UK: United Kingdom; UMV: universal mass vaccination. | | | | | | | | | | | | | | | |

**Fig. 3.** Recommended vaccines by country and funding level for pregnant women, adults and older adults (2017).


30 YEARS AGO
vaccines used
3,000
antigens to protect against 8 diseases by age two
TODAY
vaccines use
305
antigens to protect against 14 diseases by age two

# Polish Immunisation Programme

Polish Immunisation Programme includes:

1. Mandatory Immunisation Programme,
2. Mandatory Immunisation Programme for Risk Groups,
3. Recommended Immunisation Programme.

Immunisation Programme is established as national policy by the Ministry of Health and General Sanitary Inspectorate with cooperation of an - Sanitary-Epidemiology Board (*Rada Sanitarno-Eppidemilogiczna*). The Board is an advisory group and consists of: epidemiologists, paediatricians, infectious disease physicians, microbiologists and sanitary inspection members. The Programme is published at the beginning of the year as a directive Ministry of Health approved by the General Sanitary Inspectorate. Vaccines listed as mandatory are paid by the Ministry of Health, and the costs of the immunizations are paid by the National Health Fund (payer of health services in Poland). Mandatory vaccines are given in practices/hospitals/clinics contracted with the National Health Fund (patients don't need to pay for it). However recommended vaccines and immunizations need to be paid by patients individually, by employers or from individual insurance funds.

Vaccines are also available on the private market (then costs fully covered by patients).

# Mandatory vaccines in Poland

# Poland among last countries in Europe still recommending universal BCG vaccination

BCG vaccination:

- is given to newborns within 24h after birth or later, before discharge from the hospital.

The vaccine should be injected intradermally into the outer 1/3 upper part of the left arm.

- catch-up (supplementary) vaccinations in subjects unvaccinated after birth

should be performed as early as possible, no later than at 15 years of age.

- in case of BCG immunisation booster vaccine doses are not recommended.

- is mandatory to all children residing in Poland longer than 3 months.

# BCG vaccine contraindications

- persons with known hypersensitivity to any component of the vaccine;
- neonates of body weight below 2000 g;

Prematurity as such does not constitute a contraindication to vaccination, vaccination is recommended to be performed in this group of patients after weight gain up to 2000 g.

- neonates born to HIV-positive mothers until HIV infection in child can be excluded;
- neonates with suspected innate immunodeficiency disorders;
- neonates born to mothers treated in the third trimester of pregnancy with such drugs as monoclonal antibodies against TNF-alpha.

# BEWARE OF KILLER VIRUS
# HEPATITIS B

# YOU ONLY HAVE × ONE LIVER

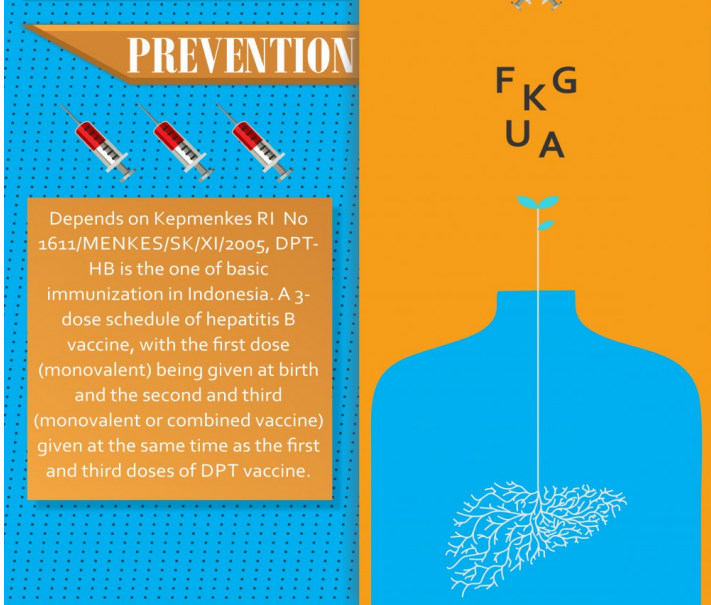
to live your wonderful life

PLEASE MAKE SURE

( THAT YOURS ALREADY )

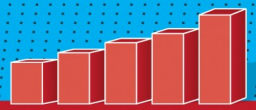
# VACCINATED

F K G
U A



## FACTS

1 of 10 Indonesian have been infected



Riskesdas 2013: prevalence of hepatitis B is double than in 2007

300 million of 400 million people who infected hepatitis B live in Asia

## TRANSMISSION

Infected mothers to their babies at birth. This is the most prevalent transmission. Sexual contact is the most common means of transmission, followed by using contaminated needles for injecting illicit drugs, tattooing, body piercing, or acupuncture. Additionally, hepatitis B can be transmitted through sharing toothbrushes and razors contaminated with infected fluids or blood. Health care provider who do not care about sterile services also at risk.

medicinenet.com

## PREVENTION



Depends on Kepmenkes RI No 1611/MENKES/SK/XI/2005, DPT-HB is the one of basic immunization in Indonesia. A 3-dose schedule of hepatitis B vaccine, with the first dose (monovalent) being given at birth and the second and third (monovalent or combined vaccine) given at the same time as the first and third doses of DPT vaccine.

## SYMPTOPMS


*May be asymptomatic

1928 stovit

85 tahun PERHIMPUNAN DOKTER GIGI INDONESIA

R S G
M P

MIRZA 23.FEB.14

# Hepatitis B vaccine

## Vaccine contains surface antigens virus (HBsAg)

Hepatitis B vaccine may be given as a stand-alone vaccine, or as part of a combination vaccine

Vaccine is given im (anterolateral thigh or deltoid)

- The first dose is generally administered at birth.
- The next dose at 1 month and the third at 6 months of age.


**Vaccination of Preterm Infants (birth weight<2000g)**

Vaccine is given at 0,1,2,12 months of age

**Hepatitis B Immune Globulin (HBIG):**

Infants born to HBsAG – positive mothers: Hepatitis B vaccine+HBIG within 12 hours after birth

# Preoperative HBV vaccination policy in Poland

Ganczak et al. BMC Infectious Diseases (2017) 17:515
DOI 10.1186/s12879-017-2607-2

BMC Infectious Diseases

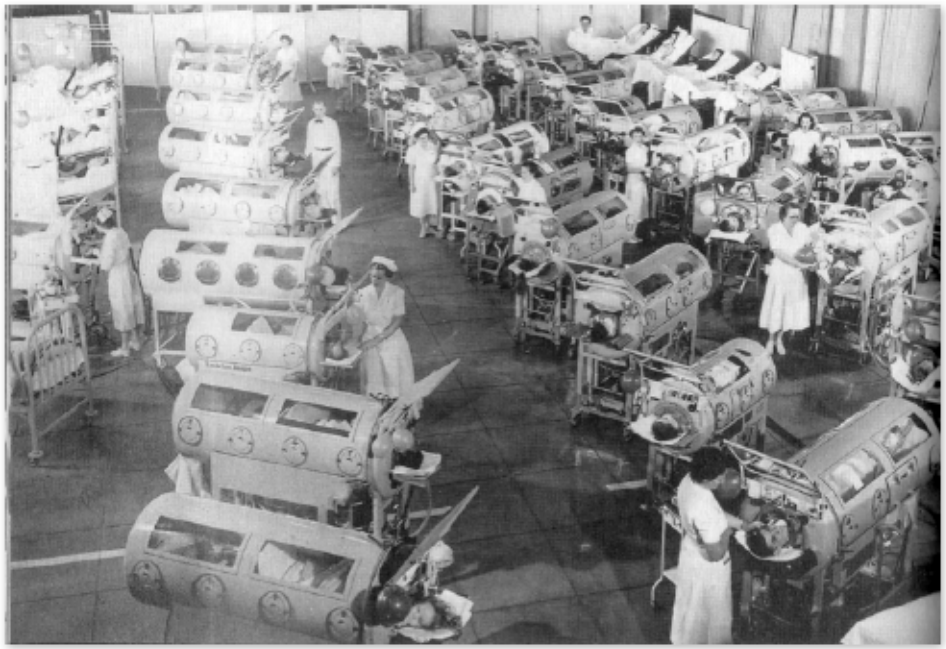
RESEARCH ARTICLE Open Access

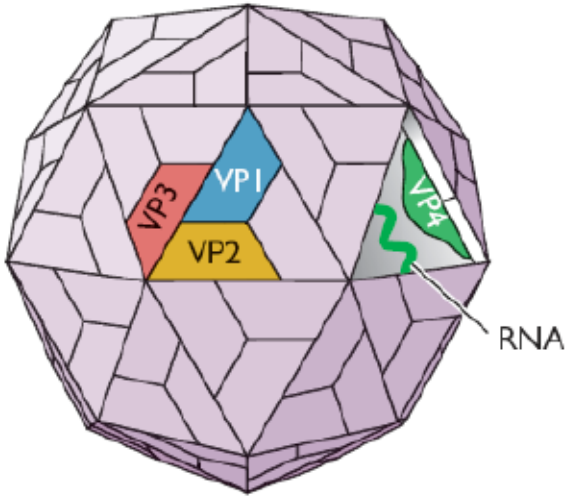
## A cross-sectional sero-survey on preoperative HBV vaccination policy in Poland

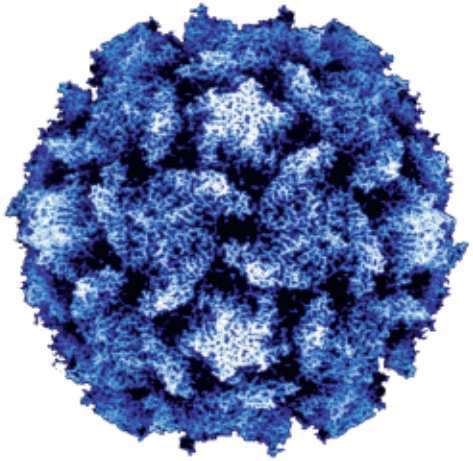
Maria Ganczak[1*], Marcin Korzeń[2], Alina Jurewicz[3] and Zbigniew Szych[4]

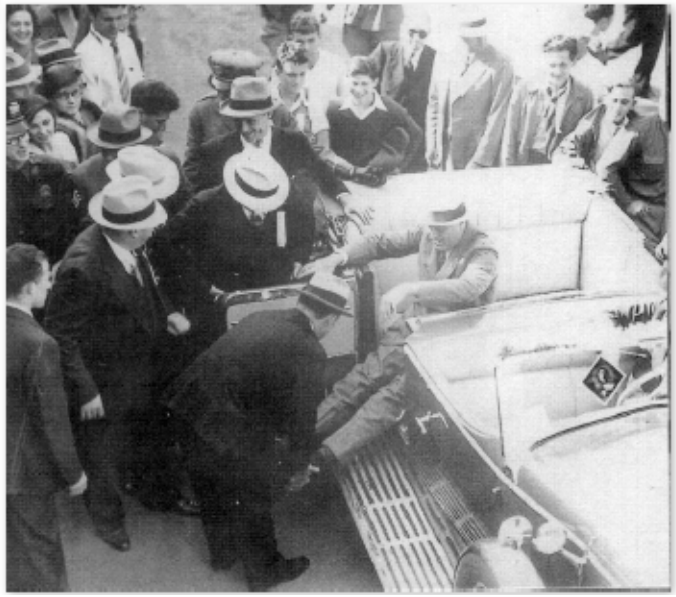
**Conclusions:** The success rate in achieving adequate immune protection with two dose HBV vaccination schedule in preoperatively vaccinated patients is relatively low, especially among those vaccinated less than five weeks prior to surgery. In more than a third of cases the standard three-dose regimen could have been implemented, as participants had time to complete a third dose. Current recommendations regarding a preoperative policy with a 2-dose vaccination schedule in Poland should be revised; the best time to perform surgery after the implementation of the second dose of vaccine in the context of patient protection against HBV infection would be between 38 and 60 days.

# Poliomyelitis







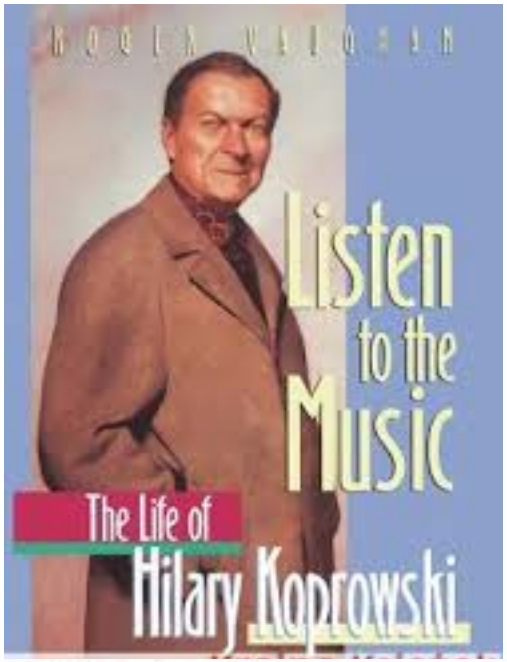
# Poliomyelitis

Polio (grey), myelon (marrow) = Greek

itis (inflammation of) = Latin

"A common, acute viral disease characterized clinically by a brief febrile illness with sore throat, headache and vomiting, and often with stiffness of the neck and back. In many cases a lower neuron paralysis develops in the early days of illness"

—J.R. Paul, "Poliomyelitis (Infantile Paralysis)", in *A Textbook of Medicine*, 1959.




POLIO Vaccine – Who was the first?


All Local Teams Are Rained Out
Journal American
SALK'S VACCINE WORKS!
Official Count
All Local Teams Are Rained Out
Herald Tribune
Salk Report Shows;


New York Times.
SALK POLIO VACCINE PROVES
MILLIONS WILL BE IMMUNIZ
CITY SCHOOLS BEGIN SHOT
New York World-Telegram
Dr. Francis' Official Report:
POLIO VACCINE IS 'SAFE, EFFECTIVE AND POTENT'
Rain Washes Out Three Local Clubs
Only 2 Shots Needed Now, Salk Reveals
Major Success Against Killing Paralytic Type
Mirror
They Vanished!
CCINE WILL
N BETTER
00% Effectiveness

# Poliovirus vaccine (IPV)

Oral poliovirus vaccine (OPV) is no longer recommended in Poland.

Two doses are administered sc at least 4 weeks apart, but preferably 8 weeks apart starting at 2 months of age.

A third dose is administered at 6 to 18 months of age and a fourth dose sholud be given at 6 years of age.

Polio vaccine may be given as a stand-alone vaccine, or as part of a combination vaccine.

# Haemophilus influenza Type b Conjugate Vaccine (Hib)

*Haemophilus influenzae type b* can cause many different kinds of infections.

Hib bacteria can cause mild illness, such as ear infections or bronchitis, or they can cause severe illness, such as infections of the bloodstream. Before Hib vaccine, Hib disease was the leading cause of bacterial meningitis among children under 5 years old.

Hib infection can also cause:

- pneumonia,
- severe swelling in the throat, making it hard to breathe,
- infections of the blood, joints, bones, and covering of the heart,
- death.

Four doses are administered *im.* at 2, 3-4,5-6, and 16-18 months of age.

Hib vaccine may be given as a stand-alone vaccine, or as part of a combination vaccine.

Hib vaccine is not required after 60 months of age.

# Vaccination against Streptococcus pneumoniae

Pneumo 23

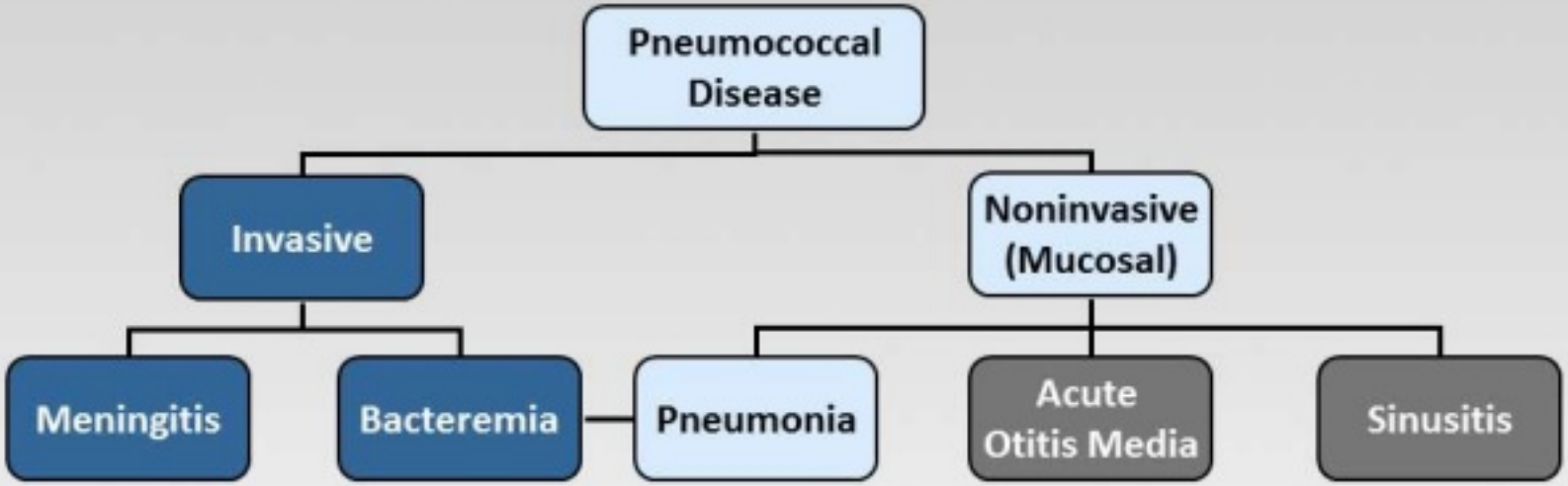
- Contains the capsular polysaccharides.
- protects against 23 strains of pneumococcal bacteria.
- They are not effective in children under 2 years of age


- Prevenar/Synflorix
  - conjugate vaccine
  - The sugar molecules from the outside of the bacteria have been attached to a special protein to make them better at stimulating the immune system.
  - Young infants respond well to this type of vaccine.
  - Prevenar 13 is against 13 types of pneumococcal bacteria.
  - Synflorix is against 10 types of pneumococcal bacteria


# PCV10 and PCV13
# Summary of product characteristics

| Vaccine | PCV10 Synflorix - Two dose | PCV13 Prevenar - Single dose |
|---|---|---|
| Serotypes | 1, 4, 5, 6B, 7F, 9V, 14, 18CV, 19F, 23F | 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 23F |
| Number of doses | 3 doses | |
| Target Age Group | Infants (under 12 months of age) | |
| EPI Schedule | 3 doses, with DTP | |
| Min interval between doses | 4 weeks | |
| Shelf Life | 36 months at 2 - 8 degrees celcius | 24 months at 2 - 8 degrees celcius |
| Interchangeability | No data - WHO recommends completing a course with the product started. If product unavailable, alternative product may be used to conclude the course. | |
| Method administration | Intramuscular | |
| Presentation | Liquid - Two dose vial - preservative free | Liquid - Single dose vial |
| Per dose cold chain requirement | 4.8 cm3 | 12 cm3 |
| Price (through AMC) | $3.50 per dose | |
| VVM type | VVM7 | VVM30 |
| Wastage rate | 10% | 5% |
| Special Precautions | Two dose preservative free presentation: All opened vials must be discarded 6 hours from first opening or at the end of each session, whichever comes first. | N/A |

# Major Clinical Forms of Pneumococcal Disease




- **Pneumococcal disease can be broadly grouped into categories of invasive disease and noninvasive (also termed *mucosal*) disease.[a]**
- **Noninvasive forms of disease may become invasive (eg, pneumonia when accompanied by bacteremia).[b]**

a. WHO. Acute Respiratory Infections (Update September 2009). www.who.int/vaccine_research/diseases/ari/en/print.html
b. Atkinson W, et al. Centers for Disease Control. *Epidemiology and Prevention of Vaccine-Preventable Diseases.* 11th ed. 2009;217-230.

# Invasive Pneumococcal Disease (IPD)

Burden of Pneumococcal Disease in Children*

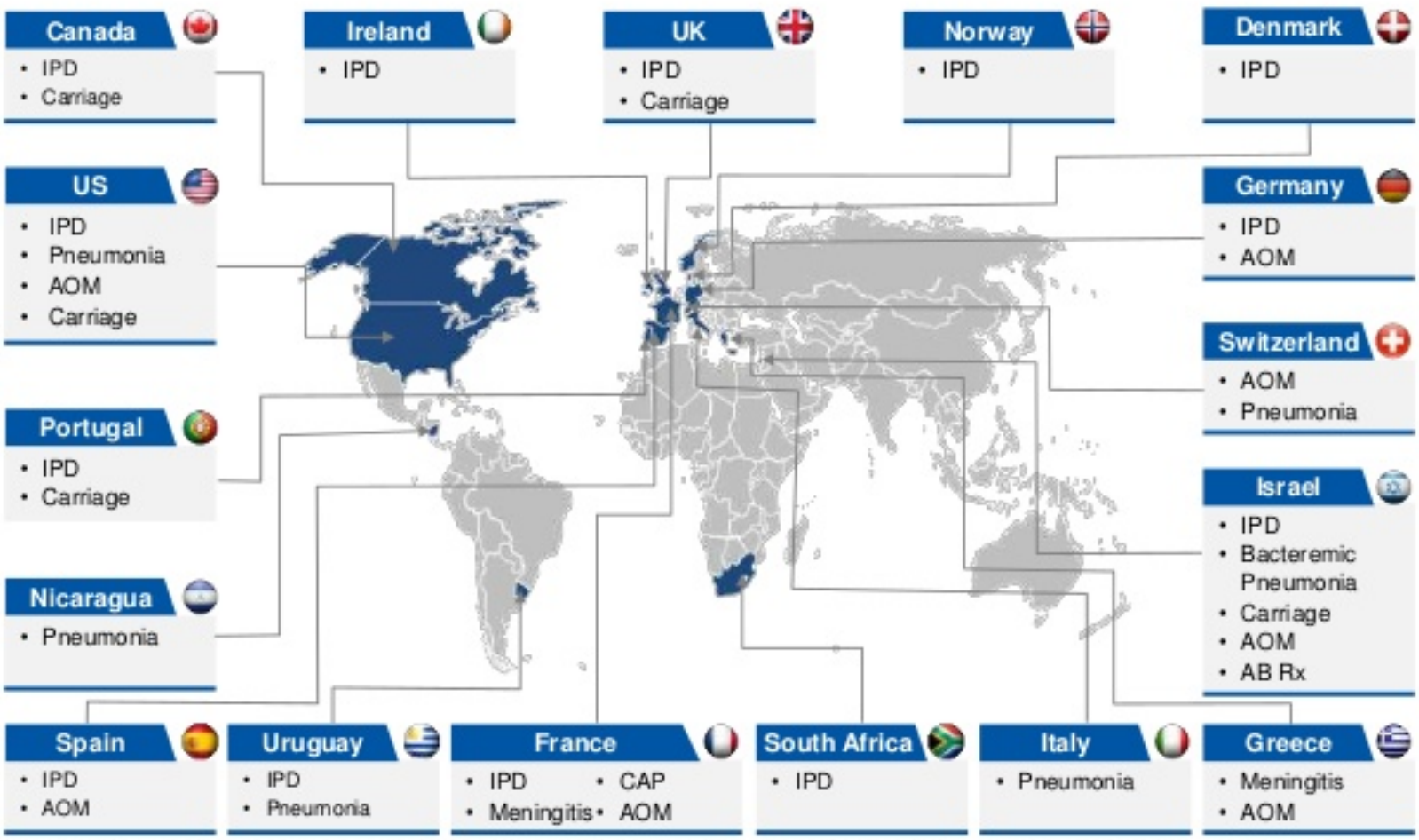
| Syndrome | Cases |
|---|---|
| Bacteremia | 13,000 |
| Meningitis | 700 |
| Death | 200 cases |
| Otitis media | 5,000,000 cases |

*Prior to routine use of pneumococcal conjugate vaccine

## Children at Increased Risk of Invasive Pneumococcal Disease

- Functional or anatomic asplenia, particularly sickle cell disease
- Immune compromise, including HIV infection
- Alaska Native, African American, American Indian (Navajo and White Mountain Apache)
- Child care attendance
- Cochlear implant

# PCV13 Has Demonstrated IMPACT across Different Countries in Providing Protection That Extends beyond Pneumococcal Disease




AB Rx = Antibiotic Resistance; AOM = Acute Otitis Media; CAP = Community-acquired Pneumonia; IPD = Invasive Pneumococcal Disease; PCV – Pneumococcal Conjugate Vaccine; References in subsequent slides.

# Vaccination against S.pneumoniae in Poland

PCV10 vaccine (Synflorix) is purchased for mandatory vaccination programme in Poland.

2-dose primary series given 2 months apart and a booster dose at least 6 months after the last primary dose. The first dose may be given as early as 6 weeks of age.

**Preterm infants born after at least 27 weeks of gestational age**:

An immunization series of 4 doses is recommended:

3 primary doses with the first dose usually given at 2 months of age and with an interval of at least 1 month between doses with a booster dose at least 6 months after the last primary dose.

PCV13 vaccine (Prevenar13)

is recommended in preterm newborns born< **27weeks** of gestational age

# National Reference Centre for Bacterial Meningitis, National Medicines Institute, Warsaw, Poland

PCV13 is the only vaccine that demonstrated protection against invasive and non-invasive diseases caused by serotype 19A, which is the most common multi-drug resistant serotype in the population

(approximately 80% of the isolates of 19A are MDR).

Serotype 19A was the third most common serotype after 6B and 14, responsible for invasive pneumococcal disease (IPD) in children up to 2 years of age.

The vaccine PCV10 does not include antigen of serotype 19A.

# Scientific Position of PCV13 Has Been Validated by Vaccine Technical Committees

1

**In 2017, the UK Joint Committee on Vaccination and Immunisation (JCVI) Emphasized the Higher Incidence of Diseases Caused by Serotypes Included in PCV13 That Are Not Covered by PCV10, Especially Serotype 19A**

> “…**A move to PCV10 vaccine [from PCV13] would potentially lead to a rise in disease associated with serotypes 19A and 3**, as disease associated with these serotypes was still being seen in unvaccinated groups and in other countries. It was also noted that the serotypes covered by PCV13 which were not covered by PCV10, typically had a higher case fatality rate than those included only in PCV10.”

Joint Committee on Vaccination and Immunisation. Meeting minutes. February 1, 2017. Available on https://app.box.com/s/lddfb4ppwkmtjusir2to/file/229171795849. Accessed March 08, 2018.

PCV – Pneumococcal Conjugate Vaccine.

# WHO SAGE Recommendation[1,2]

| | Recommendations | Analysis |
|---|---|---|
| 1 | No evidence of different net impact on overall disease burden between the 2 products | • In countries where PCV10 is used it has resulted in bringing down the disease burden caused by the serotypes in the vaccine<br>• Similar is the case with PCV13<br>• Does not convey that PCV10 is equal to PCV13 or better |
| 2 | PCV13 may have additional benefit in settings where disease attributable to serotype 19A (ST19A) or serotype 6C (ST6C) is significant | • WHO SAGE does not believe in the cross protection theory and attributes serotype 19A to be an important cause of pneumococcal disease<br>• PCV13 has serotype 19A in addition to serotypes 3 and 6A for direct protection<br>• Serotype 19A is a problem in India and various studies done (PNEUMONET, PIDOPS, ASIP, WHO) have shown its prevalence[4]<br>• Serotype 6A that cross protects 6C and hence WHO SAGE has accepted this fact[5] |

1. Meeting of the Strategic Advisory Group of Experts on immunization, October 2017 – conclusions and Recommendations Weekly epidemiological record 2017; 48: 729–748
2. http://www.who.int/immunization/sage/meetings/2017/october/1_Hosangadi_PCV_Executive Summary_SAGE_PCV_WG_Oct2017.pdfu last accessed February 13, 2018.
*3. Synflorix Prescribing Information Version SYN/PI/IN/2014/04 dated 4th September 2014. 4. Singh J, Sundaresan S, Manoharan A, Shet A. Serotype distribution and antimicrobial susceptibility pattern in childrens 5 years with invasive pneumococcal disease in India–A systematic review. Vaccine. 2017 Aug 16;35(35):4501-9. 5. Cooper D et al. The 13-valent pneumococcal conjugate vaccine (PCV13) elicits cross-functional opsonophagocytic killing responses in humans to Streptococcus pneumoniae serotypes 6C and 7A. Vaccine 2011; 29(41): 7207-7211;* WHO = World Health Organization; SAGE (Strategic Advisory Group of Experts); PCV – Pneumococcal Conjugate Vaccine.

# DTP (diphtheria, tetanus, pertussis)

**D - diphtheria**: - Inactivated toxin C.diphteriae with preserved antigenicity (toxoid)

- DTP ( diphtheria toxoid 30 IU )

- d (2 IU )

- Td ( 2 or 5 IU )

- The duration of immunity for about 10 years

**P- pertussis**

-Pwc - the whole pertussis cells

-Pa (acellular pertussis ) - contain components 1-3-5 antigens - the pertussis toxin, hemaglutinin, pertactin and fimbriae antigens

- Resistance – vaccination 3-12 years

**T- tetanus –**

Inactivated toxin C. tetani with preserved antigenicity (toxoid)

Adsorbed toxoid of Clostridium tetani

# Pertussis vaccines

**DTPw** (diphtheria, tetanus, whole-cell pertussis)

- Introduced in 1940s and still used in many countries

**DTPa/DTaP** (diphtheria, tetanus, acellular pertussis) – e.g. *Infanrix-hexa*

- Introduced in 1980s
- Antigenic components of *B. pertussis*
- Reduced reactogenicity [1,2] but some swelling after fourth and fifth doses[3]
- Consistent 85–90% efficacy[2]
- Immunity persists for 5–10 years[2]

**dTpa/dTap** (diphtheria, tetanus, acellular pertussis) – *e.g. Boostrix*

- Introduced 2000
- Reduced antigen formulations
- Immunogenic and well tolerated in adolescents and adults[1]

1 Mattoo S, Cherry D. *Clin Microbiol Rev* 2005;18:326-82. 2 Zhang L et al. *Cochrane Database Syst Rev* 2011;1: CD001478 . 3 Marshall H et al. *Pediatrics* 2006;118:1501-09.

# What does WHO say?

- Protection against severe pertussis in infancy and early childhood can be obtained after a primary series of vaccination with wP or aP vaccine
- The best aP vaccines have shown similar protective efficacy as the best wP vaccines (≥ 85%)
- All licensed vaccines have proved to be highly effective in controlling pertussis in infants and young children

WER 28 January 2010, vol. 85, 40 (pp 385-400), WER 28 January 2005, vol. 80, 4 (pp 31-39)

# Frequency of Side Effects with Pertussis Vaccines

| Event | wP vaccine Average | aP vaccine Average |
|---|---|---|
| **Fever < 38.3°C** | 44.5% | 20.8% |
| **Fever > 38.3°C** | 15.9% | 3.7% |
| **Erythema** | 56.3% | 31.4% |
| **> 2.0 cm** | 16.4% | 3.3% |
| **Swelling** | 38.5% | 20.1% |
| **Drowsiness** | 62.0% | 42.7% |

**Significant reduction in adverse reactions with aP Vaccines**

Acellular Pertussis Vaccines: Pertinent Issues. Ind Pediatr 2008; 45; 727-729

# Serious Reactions: Whole cell vs. Acellular pertussis vaccines

**Decrease in Hospital Admissions for Febrile Seizures and Reports of Hypotonic-Hyporesponsive Episodes Presenting to Hospital Emergency Departments Since Switching to Acellular Pertussis Vaccine in Canada: A Report From IMPACT**

*Nicole Le Saux, MD*, Nicholas J. Barrowman, PhD, Dorothy L. Moore, Sharon Whiting, David Scheifele, and Scott Halperin*

*PEDIATRICS Vol. 112 No. 5 November 2003, pp. e348-e348*

# Report from IMPACT

- In 1997–1998, Canada adopted 1 combination acellular pertussis vaccine, having previously used 1 particular combination whole-cell pertussis vaccine.
- Active surveillance was performed between 1995 and 2001 by the Immunization Monitoring Program–Active monitors at 12 hospitals using standard case definitions.
- The study documented a ***79% decrease in febrile seizures*** associated with receipt of pertussis vaccine.
- There was a ***60% to 67% reduction in HHEs*** associated with pertussis-containing vaccines between the same time periods, depending on case definition.
- ***Conclusions***. The risks of febrile seizures and HHEs after pertussis-containing vaccine declined significantly with the introduction of acellular pertussis vaccine in Canada. Active surveillance systems are important for detecting trends in uncommon adverse events after routine immunizations.

*Nicole LS et al. Pediatrics* 2003;112;e348

# Funded DTaP Vaccines in Poland
# SPECIAL GROUPS

Preterm newborns (born <37 weeks of gestational age)

Or

Newborns with birth weight <2500g

Or

Neurological indications – a medical certificate should be issued

# Acellular Pertussis Vaccines available in Poland

| Brand | Components | Components of Pertussis |
|---|---|---|
| Hexacima | DTaP-IPV-Hib-hep B | PT, FHA |
| Infanrix Hexa | DTaP-IPV-Hib-hep B | PT, FHA, PRN |
| Pentaxim | DTaP-IPV-Hib | PT, FHA |
| Infanrix-IPV+Hib | DTaP-IPV-Hib | PT, FHA, PRN |
| Tetraxim | DTaP-IPV | PT, FHA |
| Infanrix DTPa | DTaP | PT, FHA, PRN |
| Tripacel | DTaP | PT, FHA, PRN<br>FIM2, FIM3 |

**CLINICAL TRIAL ARTICLE**

Front. Immunol., 24 January 2018 | https://doi.org/10.3389/fimmu.2018.00051 (https://doi.org/10.3389/fimmu.2018.00051)

# Whole-Cell or Acellular Pertussis Primary Immunizations in Infancy Determines Adolescent Cellular Immune Profiles

 Saskia van der Lee (http://www.frontiersin.org/people/u/492554)[1,2]*, Lotte H. Hendrikx[1,3†], Elisabeth A. M. Sanders[1,2], Guy A. M. Berbers[1] and  Anne-Marie Buisman (http://www.frontiersin.org/people/u/446939)[1]

[1]Centre for Infectious Disease Control, National Institute for Public Health and the Environment (RIVM), Bilthoven, Netherlands

[2]Department of Paediatric Immunology and Infectious Diseases, Wilhelmina Children's Hospital, University Medical Centre, Utrecht, Netherlands

[3]Research Centre Linnaeus Institute, Spaarne Hospital, Hoofddorp, Netherlands

**Conclusion:** The memory immune profiles at preadolescent age to all DTaP vaccine antigens are already determined by the wP or aP combination vaccines given in infancy, showing a beneficial Th1-dominated response after wP-priming. These immunological data corroborate epidemiological data showing that DTaP-primed adolescents are less protected against clinical pertussis than DTwP-primed children.

# What about combination vaccines?

- they can reduce the total number of injections greatly.
- they help infants to alleviate with discomfort and pain related,

so the parents can be of less worry.

These vaccines adopt non-cellular formula of pertussis.
These vaccines are not funded in Poland for general population.

| | 4 in 1 vaccine | 5 in 1 vaccine | 6 in 1 vaccine |
|---|---|---|---|
| Prevention of Diseases | Diphtheria | Diphtheria | Diphtheria |
| | Tetanus | Tetanus | Tetanus |
| | Whooping Cough | Whooping Cough | Whooping Cough |
| | Poliomyelitis | Poliomyelitis | Poliomyelitis |
| | | HIB | HIB |
| | | | Hepatitis B |

# Post-exposure prophylaxis

Tetanus toxoid can be given in case of a suspected exposure to tetanus.

The need for prophylaxis depends on wound cleanliness and severity, as well as prior tetanus toxoid vaccination history.

In such cases, it can be given with or without tetanus immunoglobulin (also called tetanus antibodies or tetanus antitoxin).

# Measles-Mumps-Rubella vaccine (MMR)

- Live attenuated virus vaccine.

- S.C.: at age 12 to 15 months.
- A booster dose is now recommended at 6 years of age.



Measles cases by first subnational level, 2016


Source: Measles and rubella elimination Annual Status Update report, 2016

# What about the studies that suggested a link between MMR and IBD /autism?

Medical and scientific experts who have reviewed the few studies where the authors claim a relationship between measles or MMR vaccine and autism/IBD have found them to have many significant weaknesses.

Additionally, they are not the types of studies that can possibly determine such a link. In 1993 Dr Wakefield suggested an association between both the natural and vaccine types of measles virus and IBD based on a study of bowel specimens from children with IBD. However, other groups of researchers using sensitive laboratory methods have shown that there is no evidence of measles virus in the blood or bowel of children with IBD. In 1998 Dr Wakefield and others reported 12 children with an apparently new syndrome of IBD in association with developmental disorders like autism. However, this study was conducted on highly selected patients, and no control patients. This significantly limits the credibility of the study findings. In 2002 Uhlmann, Wakefield and others published a study showing a higher rate of measles virus in the bowel of autistic children with bowel symptoms, compared to a group of children without autism. However, key information on the characteristics and the method of selection of the cases and control patients, on vaccination status, and on laboratory methods were not given, and the control subjects were not matched for gender or age.

In 2004, 10 of the original 13 authors of Dr Wakefield's 1998 study published a statement retracting the paper's interpretation, stating that the data were insufficient to establish a causal link between MMR vaccine and autism.

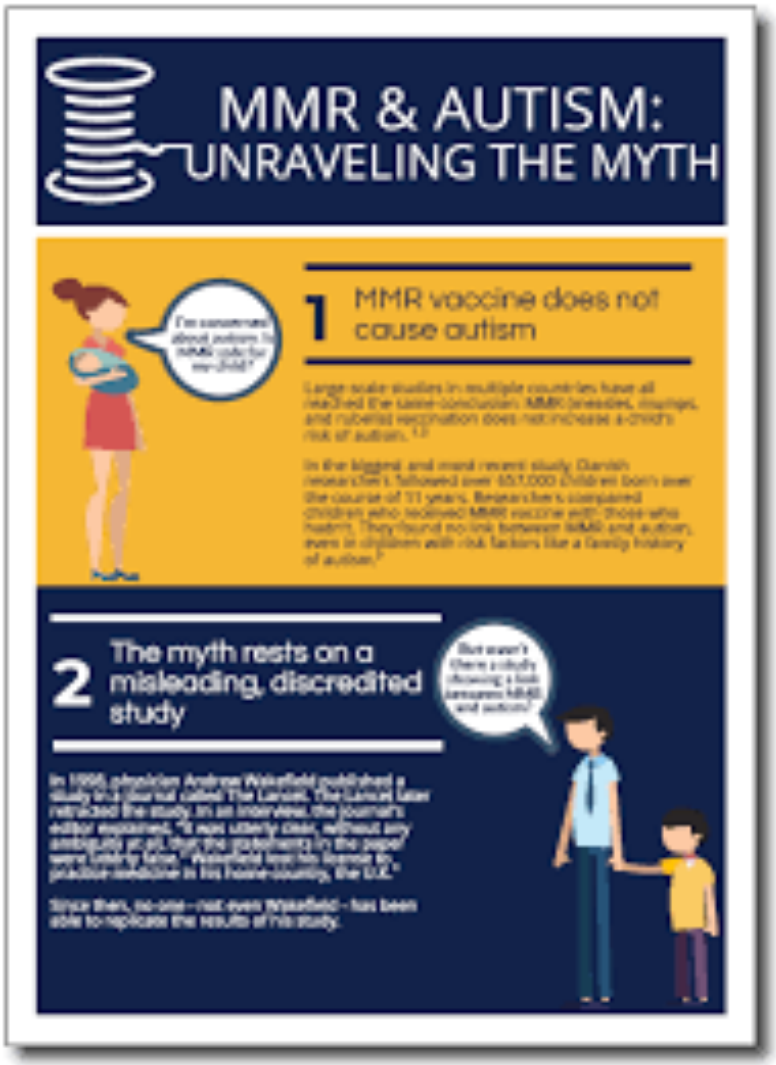
# What studies show that autism and IBD are not related to the MMR vaccine?

A large number of independent researchers from around the world, using many different techniques ranging from molecular biology studies to population based epidemiology, have now shown that there is no evidence of a link between MMR vaccine and autism or IBD. Many of these studies compare the rates of autism and IBS in large groups of vaccinated and unvaccinated children. The following are summaries of some of the studies performed.

- In 1999, a large population-based study in England looked at the vaccination status of 498 children with autism and control subjects without autism and found no link between the timing of vaccination with MMR and the o
- In 2004 another English study looke 5,500 children who attended GPs a MMR, and found no evidence to su vaccine and autism.

- A study of more than 440,000 Danish children vaccinated in the 1990's compared with 96,000 unvaccinated children provided strong evidence against the hypothesis that MMR causes autism or autistic spectrum disorder.
- A large study in Finland followed almost 600,000 children for 20 years after MMR vaccination and found no evidence for MMR vaccine-associated autism or other neurological disorders.
- A study of the rates of IBD and autism among 6100 French school- aged children found no association between MMR and these diseases.
- A study in Sweden in 1998 looking at the prevalence of autism over 10 years found no change after the introduction of MMR vaccine.
- Two independent groups of researchers in the UK performed epidemiologic studies to determine if there was an association between bowel symptoms, autism and MMR. Both studies found no evidence for gastrointestinal problems being linked to developmental regression or to MMR vaccination.
- Additional studies in the US and UK found no correlation between trends in early childhood MMR immunisation rates and trends in autism diagnosis. For example, a study done in California, showed that although rates of autism have gone up by 373% over 15 years, the increase in the number of children immunised with MMR has only increased by 14% in that time.
- A study in the United States looked at patients with IBD born over a 32 year period, found that vaccination with MMR or other measles-containing vaccines, or the timing of vaccination early in life, did not increase the risk for IBD.
- At least 3 laboratory-based studies by different research groups using technical methods similar to those in the Uhlmann study, found no evidence of measles virus in the bowel specimens of patients with IBD.

# What have expert reviews concluded?




There is no link
between
autism or IBD
and
the measles vaccine

# Recommended vaccines in Poland

# Rotavirus vaccine (Rota)

## Oral live attenuated vaccine

- RotaTeq® (RV5) is given in three doses

at 2 months, 4 months, and 6 months of age.

The third dose should not be given after 32 weeks of age.

- Rotarix® (RV1) is given in two doses:

First - at 6 weeks of age

Second after an interval of at least 4 weeks and up to 24 weeks of age.

There are no restrictions on the infant's liquid consumption, including breast milk, either before or after vaccination

# Currently available rotavirus vaccines

| | Rotarix® (GSK Bio) | RotaTeq® (Merck) |
|---|---|---|
| **Origin** | Human monovalent | Bovine pentavalent |
| **Strain** | G1, P[8] | G1, G2, G3, G4, P[8] & G6P[7] |
| **Vaccine course** | 2 doses - oral | 3 doses - oral |
| **Pivotal Phase III trial** | n=63,225 (20,169 for efficacy) Latin America and Finland | n=70,301 (5,673 for efficacy) Latin America, US and Finland |
| **Efficacy vs rotavirus GE** | 85% - 100% vs severe rota GE | 98% vs severe rota GE |
| **Efficacy vs all-cause severe GE** | 42% hospitalization for severe GE of any cause | 59% hospitalization for diarrhea of any cause |
| **Intussusception risk** | No association observed | No association observed |

# Vaccine against Neisseria meningitidis

Meningococcal group A , B, C , Y, W 135

- Poland dominated the group B and C

-The current polysaccharide vaccine against Meningococcal group C ( NeisVac - C )

-B - Bexsero

- Nimenirix- Meningococcal group A , C , Y, W 135



# Adolescents and young adults are carriers of meningococcal disease


Source: Vetter V, Baxter R, Denizer G et al. Routinely vaccinating adolescents against meningococcus: targeting transmission and disease. Expert review of vaccines. 2016; 15 (5): 641-58.

# Meningococcal vaccines

## Recombinant B

- Bexsero (with prophylactic paracetamol in <2 years olds)

## Conjugate Quadrivalent (A.C.W.Y)

- Menactra (MCV4-D)
- Nimenrix (MCV4-T)

## Conjugate C

- NeisVac-C (MenCCV)


## 3. Nimenrix® – MCV4-T

- Quadrivalent meningococcal conjugate vaccine
  - Types A,C,W,Y – from polysaccharide capsules
  - Tetanus toxoid carrier protein
- Licensed from 6 weeks of age
  - 2 dose schedule for < 12 months
  - Single dose all others
  - Booster dose after 5 years if at increased risk

## NeisVac-C® – MCVC-D

Monovalent meningococcal conjugate vaccine

Diphtheria toxoid carrier protein

Licensed from 8 weeks of age – use in infants too young for Menactra

# Bexsero: recombinant vaccine against meningococcal B

- Targets proteins (unlike polysaccharide capsule)
- Reverse vaccinology

  whole genome sequencing of the MenB to identify surface antigens
- 4 components: including OMV from MeNZB
- Licensed from 8 weeks,
  - 2-3 doses for < 1 year + booster in second year
  - 2 doses for all > 1 year of age

**Prophylactic paracetamol with every dose of Bexsero**

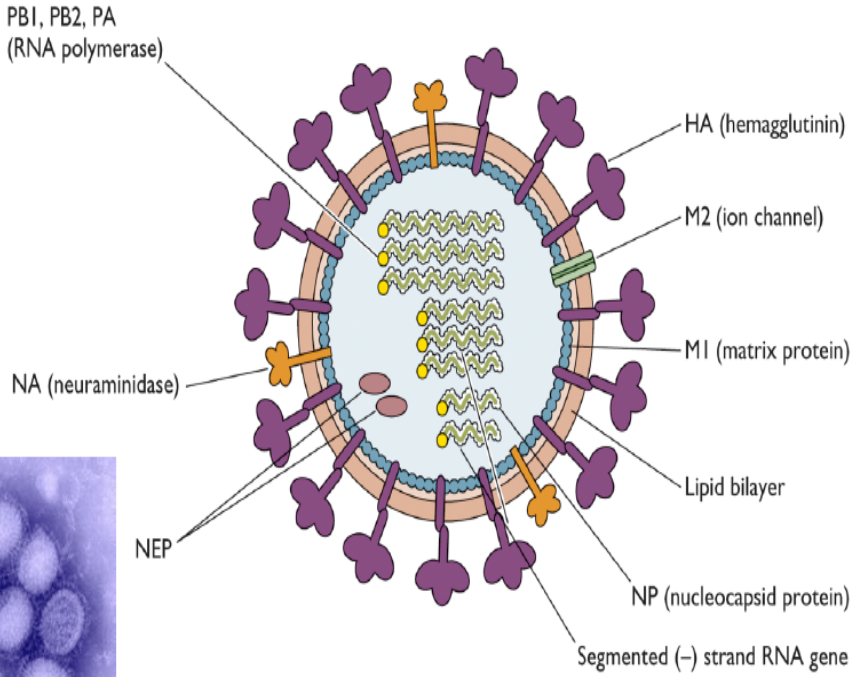
- Children under 2 years
- Three doses (15mg/kg) every 6 hours whether child has a fever or not
- First dose half an hour before vaccination

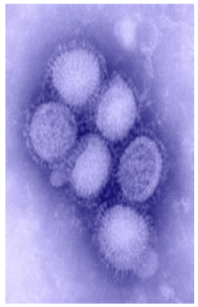
# GET A FLU VACCINE NOW.

#FIGHT FLU

CDC

## Influenza



Three types: A, B, C

# Types of Vaccines Available for Children 6 months-17 years

For the 2019-2020 flu season, providers may choose to administer any licensed, age appropriate flu vaccine – inactivated influenza vaccine (IIV4) or live attenuated influenza vaccine (LAIV4):

| Vaccine type | Vaccine description | Recommended for* |
|---|---|---|
| Quadrivalent (4-component) Inactivated Influenza Vaccine (IIV4) | Injectable inactivated vaccine containing the influenza A(H1N1), (H3N2) and two influenza B lineage viruses predicted to be most common | People 6 months and older |
| Live Attenuated Influenza Vaccine (LAIV4) | Intranasal live attenuated vaccine containing the influenza A(H1N1), (H3N2) and two influenza B lineage viruses predicted to be most common | Healthy non-pregnant people 2 through 49 years of age |
| Quadrivalent Cell Culture-Based Inactivated Influenza Vaccine (ccIIV4) | Injectable influenza vaccine produced without the use of influenza viruses or eggs; containing the influenza A(H1N1), (H3N2) and two influenza B lineage viruses predicted to be most common | People 4 years and older |

Public Health England

NHS

# Flu vaccines 2019/20 season

| 6 months to under 2 years | 2 to 10 years | 2 to 17 years | 11 to 17 years | 18 to 64 years | 65 years and over[ii] | Resources |
|---|---|---|---|---|---|---|
| **in a clinical risk group**<br><br>**QIVe** (Quadrivalent influenza vaccine, egg based) [i]<br><br>1 | **all children with no contraindications to LAIV**<br><br>**Quadrivalent LAIV** (Live attenuated influenza vaccine, nasal spray suspension)<br><br>2 | **in a clinical risk group and LAIV medically contraindicated**<br><br>**QIVe** (Quadrivalent influenza vaccine, egg based)<br><br>1[i] 3 4 5 | **in a clinical risk group (no contraindications to LAIV)**<br><br>**Quadrivalent LAIV** (Live attenuated influenza vaccine, nasal spray suspension)<br><br>2 | • **in a clinical risk group**<br>• **pregnant women**<br>• **frontline health and social care workers**<br><br>**QIVe** (Quadrivalent influenza vaccine, egg based) **or QIVc** (Quadrivalent influenza vaccine, cell based)<br><br>1 3 4 5 6 | **all 65 years and over** (and those who will turn 65 years before 31/03/20) [ii]<br><br>**aTIV** (Adjuvanted trivalent influenza vaccine) [ii] **or QIVc** (Quadrivalent influenza vaccine, cell based) **or TIV-HD** (High dose trivalent influenza vaccine) [ii] [iii]<br><br>6 7 8 | **Letter detailing 2019/20 flu programme:**<br>www.gov.uk/government/publications/national-flu-immunisation-programme-plan<br><br>**Green Book Influenza chapter 19:**<br>www.gov.uk/government/collections/immunisation-against-infectious-disease-the-green-book<br><br>**Leaflets, posters, information materials:**<br>www.gov.uk/government/collections/annual-flu-programme |



**Quadrivalent Influenza Vaccine** Sanofi Pasteur

[i] QIVe (available to order from ImmForm for children 6m to 2y, and children 2y to 17y for whom LAIV is contraindicated)


licensed from 6 months of age

**Fluenz Tetra** AstraZeneca

LAIV


licensed from 2 years to less than 18 years of age

**Fluarix Tetra** GSK

QIVe


licensed from 6 months of age

**Quadrivalent Influenza Vaccine Tetra MYL** Mylan

QIVe


licensed from 3 years of age

**Quadrivalent Influvac sub-unit** Mylan

QIVe


licensed from 3 years of age

**Flucelvax Tetra** Seqirus

QIVc


licensed from 9 years of age

**Fluad** Seqirus

aTIV


licensed from 65 years of age

**Trivalent Influenza Vacci High Dose** Sanofi Pasteur

[iii] TIV-HD (suitable but not eligible f reimbursement under NH flu vaccine programme)


licensed from 65 years of ag

[ii] Although aTIV and TIV-HD are not licensed for those less than 65 years of age it is recommended that those who will become 65 before 31 March 2020 can be offered these vaccines 'off label'.

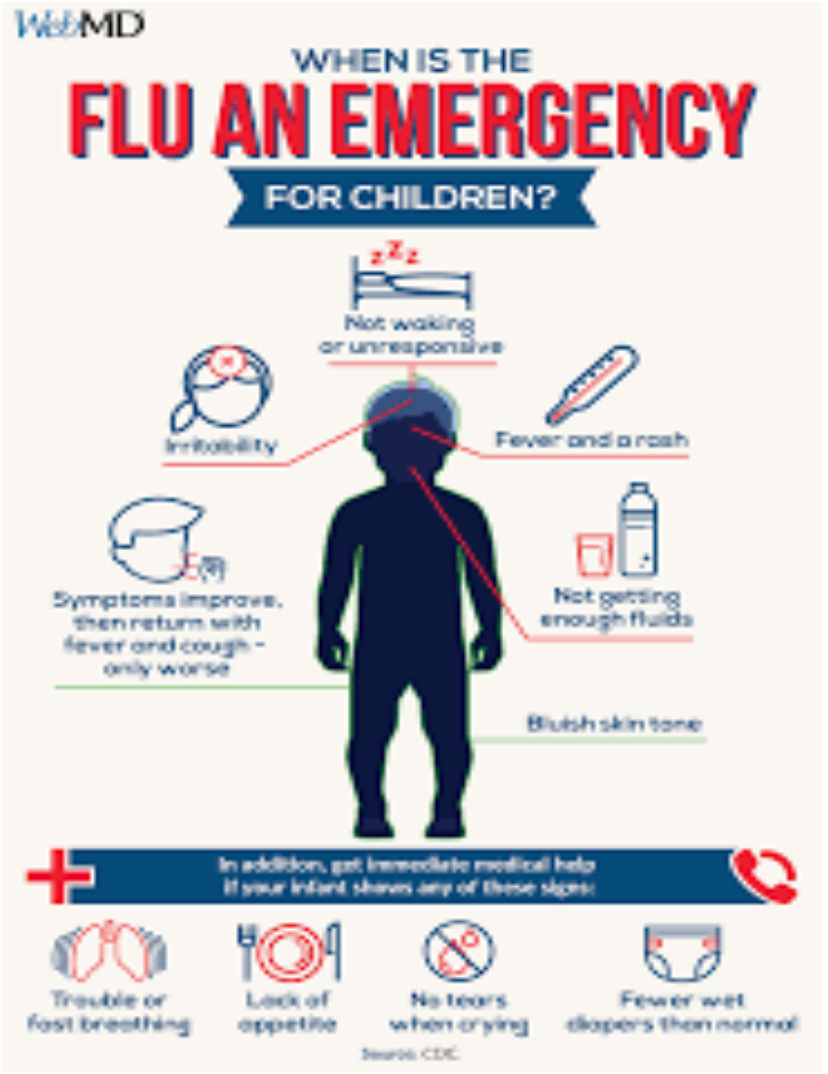
Flu immunisation
Helping to protect people, every winter

**Table 11.1** Dose of influenza vaccine

| Age group | Dose |
|---|---|
| Children aged 6 months* to <9 years | Two doses, 4 weeks apart, if receiving influenza vaccine for the first time |
| Those aged 9 and older<br>• post haematopoeitic stem cell transplant<br>• post solid organ transplant | Two doses, 4 weeks apart, if receiving influenza vaccine for the first time post transplant |
| Cancer patients who receive the vaccine while on chemotherapy and who complete their treatment in the same season** | Two doses<br>2nd dose on completion of treatment at least 4 weeks after 1st dose (regardless of influenza vaccination in previous seasons) |
| All others | One dose |

*LAIV from 24 months to <18 years.

** if the lymphocyte count is ≥1.0 x$10^9$/L



# Chickenpox Vaccination in Poland

- Live attenuated vaccine
- 2 doses - the first at 12 months – the second at least 4 weeks apart

Varicella vaccine is mandatory and reimbursed:

- for children up to 12 years of age who meet specific conditions, i.e. if they are immunocompromised, in remission of acute lymphoblastic leukemia, or human immunodeficiency virus (HIV) infected, and the vaccine must be administered prior to immunosuppressive therapy or chemotherapy.
- It is also reimbursed for children (≤12 years) who are living in close quarters to the previously mentioned immunocompromised individuals and for children (≤12 years) who are at risk due to densely populated living conditions such as long-term care, nurseries, and orphanages. Varicella is, nonetheless, one of the recommended vaccines in the national schedule, with specific recommendations for those who have not yet had chickenpox or have not yet been vaccinated, in addition to women trying to conceive; however, it is not reimbursed as part of the country's national immunization programme.

# Hepatitis A vaccine

Hepatitis A vaccines contain hepatitis A virus inactivated with formaldehyde and adsorbed to aluminum hydroxide as adjuvant.

The vaccine should be administered im. in the deltoid muscle.

A single dose prevents hepatitis A for a year.

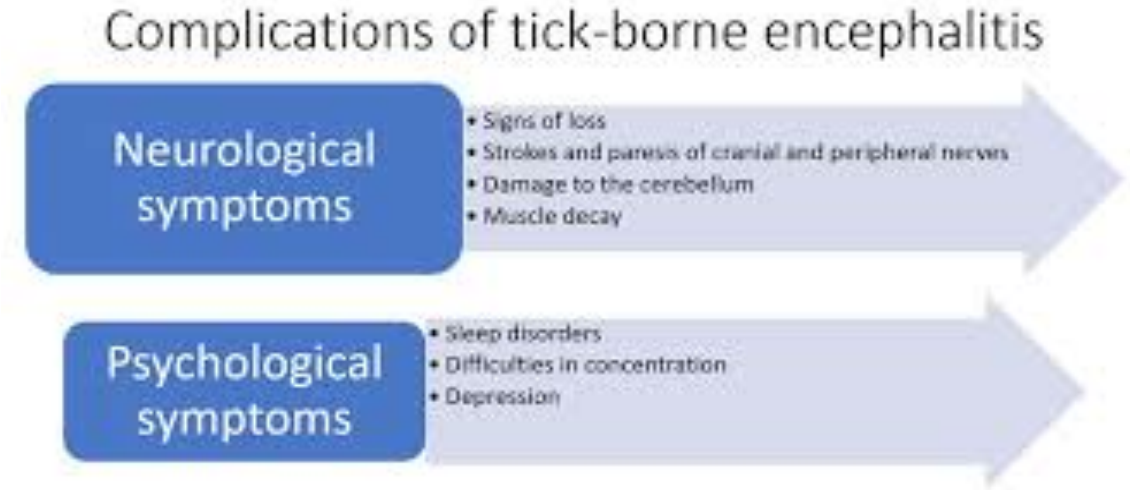
For a long-term protection a second dose should be given 6-12 months after the first one.

No boosters are recommended.

Vaccines can be used in children older than 12 months.

They can be administered separately or with other vaccines during the same visit (in separate syringes and distant sites).

# Tick borne encephalitis (TBE) vaccine



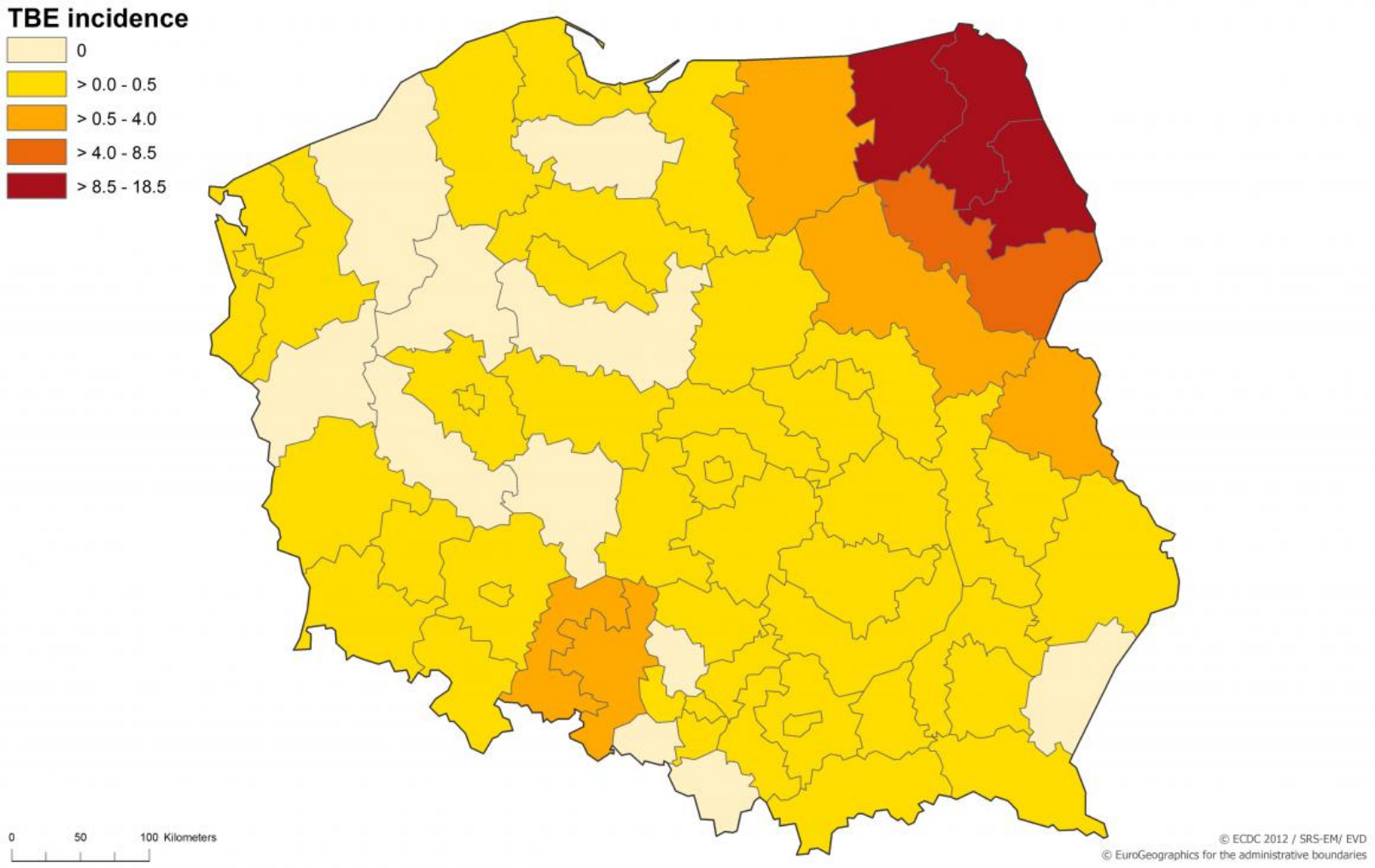


Vaccination from 2 years of age

- 3 doses ( 0 , 1-3, 9-12) - Scheme shortened ( 0, 14 days 12m )
- Booster aRer 3-5 years

TBE Vaccine does not protect against Lyme disease !!!

**In Poland,**
**TBE is endemic and 200–300 cases are reported annually,**
**90% from two provinces neighbouring the Baltic States**



# HPV vaccination

| | **Bivalent 2vHPV** (Cervarix) | **Quadrivalent 4vHPV** (Gardasil) | **9-Valent 9vHPV** (Gardasil 9) |
|---|---|---|---|
| Manufacturer | GlaxoSmithKline | Merck | Merck |
| Year licensed and for whom | October 2009, females | June 2006, females; October 2009, males | December 2014, females and males |
| HPV types included | 16, 18 | 6, 11, 16, 18 | 6, 11, 16, 18, 31, 33, 45, 52, 58 |
| Contraindications | Hypersensitivity to latex* | Hypersensitivity to yeast | Hypersensitivity to yeast |
| Dosing schedule | 3-dose series: 0, 1, 6 months | 3-dose series: 0, 2, 6 months | 3-dose series: 0, 2, 6 months |

*Only contained in pre-filled syringes, not single-dose vials.

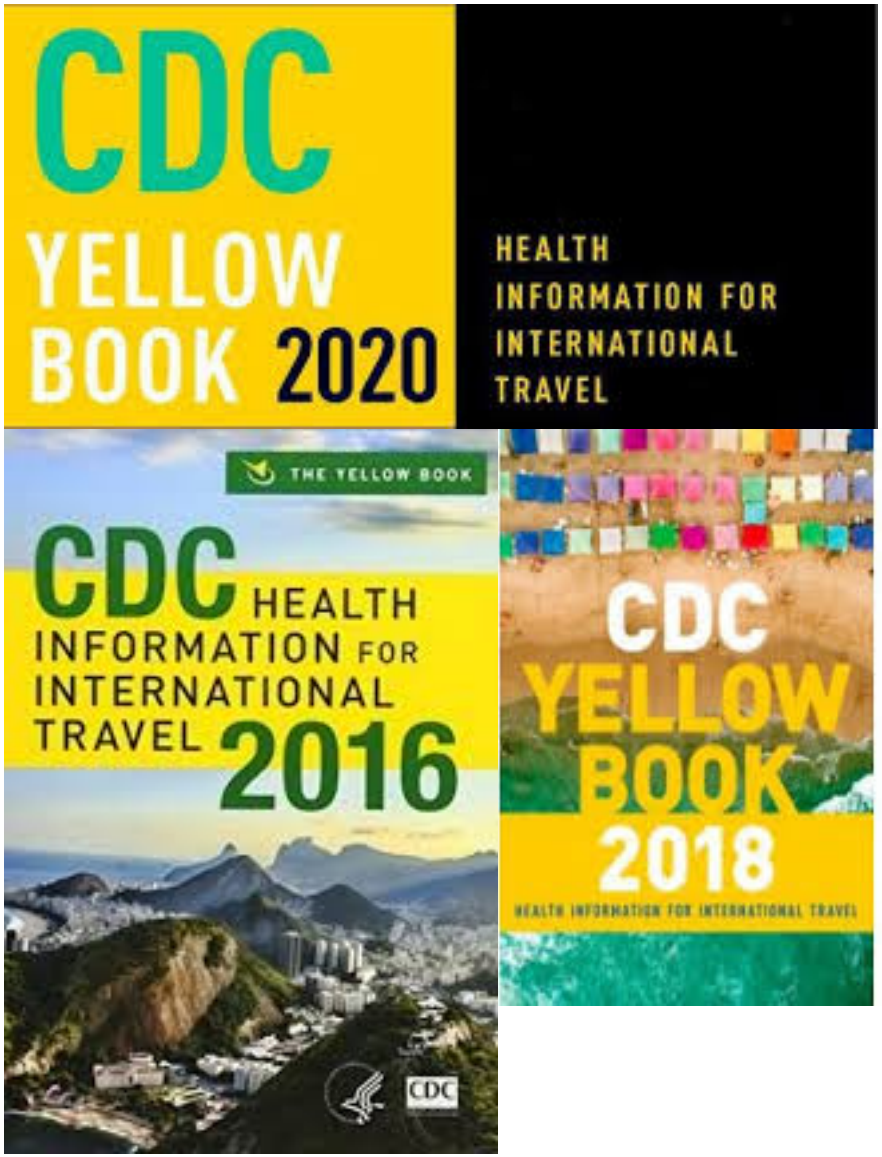
# BEZPŁATNE SZCZEPIENIA PRZECIWKO HPV

DLA 12-LATEK I 12-LATKÓW W WARSZAWIE

19115

MIASTO STOŁECZNE WARSZAWA

zaszczep się w Warszawie




CDC's Yellow Book
(Health Information for International Travel)

- published every two years as a resource for health professionals providing care to international travelers.

The fully revised and updated CDC Yellow Book 2020 compiles the US government's most current travel health guidelines, including pretravel vaccine recommendations, destination-specific health advice, and easy-to-reference maps, tables, and charts.

# References and literature:


- VACCINE FACT BOOK 2012
- Vaccines, Lecture 20 Virology W3310/4310 Spring2012
- Slideshare.net
- www.szczepienia.pzh@gov.pl
- Schwartz's Clinical Handbook of Pediatrics
- www.cdc.gov
- www.who.int