VACCINATION AND IMMUNIZATION

Public Health III

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IMMUNIZATION

POSSIBILITIES OF IMMUNIZATION		
IMMUNIZATION	**NATURALLY ACQUIRED**	**ARTIFICIALLY ACQUIRED**
ACTIVE	**AFTER INFECTION**	**AFTER VACCINATION**
PASSIVE	**TRANSPLACENTAL TRANSFER OF IG**	**IG PREPARATIONS TRANSFER**

PASSIVE IMMUNIZATION I.

- reception of pre-formed specific antibodies from an exogenous source - homologous (human) x heterologous (animal) antibodies, monoclonal antibodies produced by biotechnology
- polyclonal Ig, hyper Ig, antitoxins
- temporary protection: 4 - 6 weeks
- risk of strong side effects at heterologous Ig (allergy, anaphylaxis, serum sickness):
  - ⇒ fractionated administration
  - ⇒ during hospitalization with continual observation
  - ⇒ only at very dangerous and necessary cases
- can inactivate live attenuated viral vaccines like varicella, measles, OPV, and rotavirus vaccines.

PASSIVE IMMUNIZATION II.
Indications and preparations

1. Prophylaxis of dangerous infections or in individuals at risk
2. Therapy of severe acute infections and intoxications (tetanus, diphteria,…)
3. Protection for individuals who cannot be vaccinated because they are immunodeficient or immunocompromised (intraveneous polyclonal Ig - IVIG).

Tetanus immunisation and prophylaxis following injuries

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/820628/Tetanus_information_for_health_professionals_2019.pdf

Immunisation Status	Immediate treatment			Later treatment
	Clean wound[1]	Tetanus prone	High risk tetanus prone	
Those aged 11 years and over, who have received an adequate priming course of tetanus vaccine[2] with the last dose within 10 years Children aged 5-10 years who have received priming course and pre-school booster Children under 5 years who have received an adequate priming course	None required	None required	None required	Further doses as required to complete the recommended schedule (to ensure future immunity)
Received adequate priming course of tetanus vaccine[2] but last dose more than 10 years ago Children aged 5-10 years who have received an adequate priming course but no preschool booster *Includes UK born after 1961 with history of accepting vaccinations*	None required	Immediate reinforcing dose of vaccine	Immediate reinforcing dose of vaccine One dose of human tetanus immunoglobulin[3] in a different site	Further doses as required to complete the recommended schedule (to ensure future immunity)
Not received adequate priming course of tetanus vaccine[2] *Includes uncertain immunisation status and/or born before 1961*	Immediate reinforcing dose of vaccine	Immediate reinforcing dose of vaccine One dose of human tetanus immunoglobulin[3] in a different site	Immediate reinforcing dose of vaccine One dose of human tetanus immunoglobulin[3] in a different site	

DISEASE	NAME OF MATERIAL	COMMENTS AND USE
Tetanus	Tetanus immune globulin, human	Management of tetanus-prone wounds in persons without adequate prior active immunization and treatment of tetanus
Cytomegalovirus	Cytomegalovirus immune globulin, intravenous	Prophylaxis for bone marrow and kidney transplant recipients
Diphtheria	Diphtheria antitoxin, equine	Treatment of established disease, high frequency of reactions to serum of nonhuman origin; in the United States,
Rabies	Rabies immune globulin, human	Postexposure prophylaxis of animal bites
Measles	Immune globulin, human	Prevention or modification of disease in contacts of cases, not for control of outbreaks

DISEASE	NAME OF MATERIAL	COMMENTS AND USE
Hepatitis A	Immune globulin, human	Pre-exposure and postexposure prophylaxis for travelers and others who need protection before immunity can be achieved with hepatitis A vaccine
Hepatitis B	Hepatitis B immune globulin, human	Prophylaxis for needlestick or mucous membrane contact with HBsAg-positive persons, for sexual partners with acute hepatitis B or hepatitis B carriers, for infants born to mothers who are carriers of HBsAg, for infants whose mother or primary caregiver has acute hepatitis B
Varicella	Varicella-zoster immune globulin (VariZIG)	Persons with underlying disease and at risk for complications from chickenpox who have not had varicella or varicella vaccine and who are exposed to varicella; may be given after exposure to known susceptible adults, particularly if antibody negative. VariZIG is available under IND.

DISEASE	NAME OF MATERIAL	COMMENTS AND USE
Botulism	Bivalent A and B antitoxin, equine	Treatment of botulism;
Snakebite	Antivenin, equine (North American coral snake antivenin)	Specific for North American coral snake, *Micrurus fulvius*
	Crotalidae, polyvalent	Effective for viper and pit viper bites, including rattlesnakes, copperheads, moccasins
Spider bite	Antivenin, equine	Specific for black widow spider, *Latrodectus mactans*, and other members of the genus

ACTIVE IMMUNIZATION

- one of the most beneficial and cost-effective disease prevention measures
- one of the most important inventions in medicine,
- method that used natural ways of bodies protection,
- key process – arising of immunological memory

faster and more powerful immunity response,

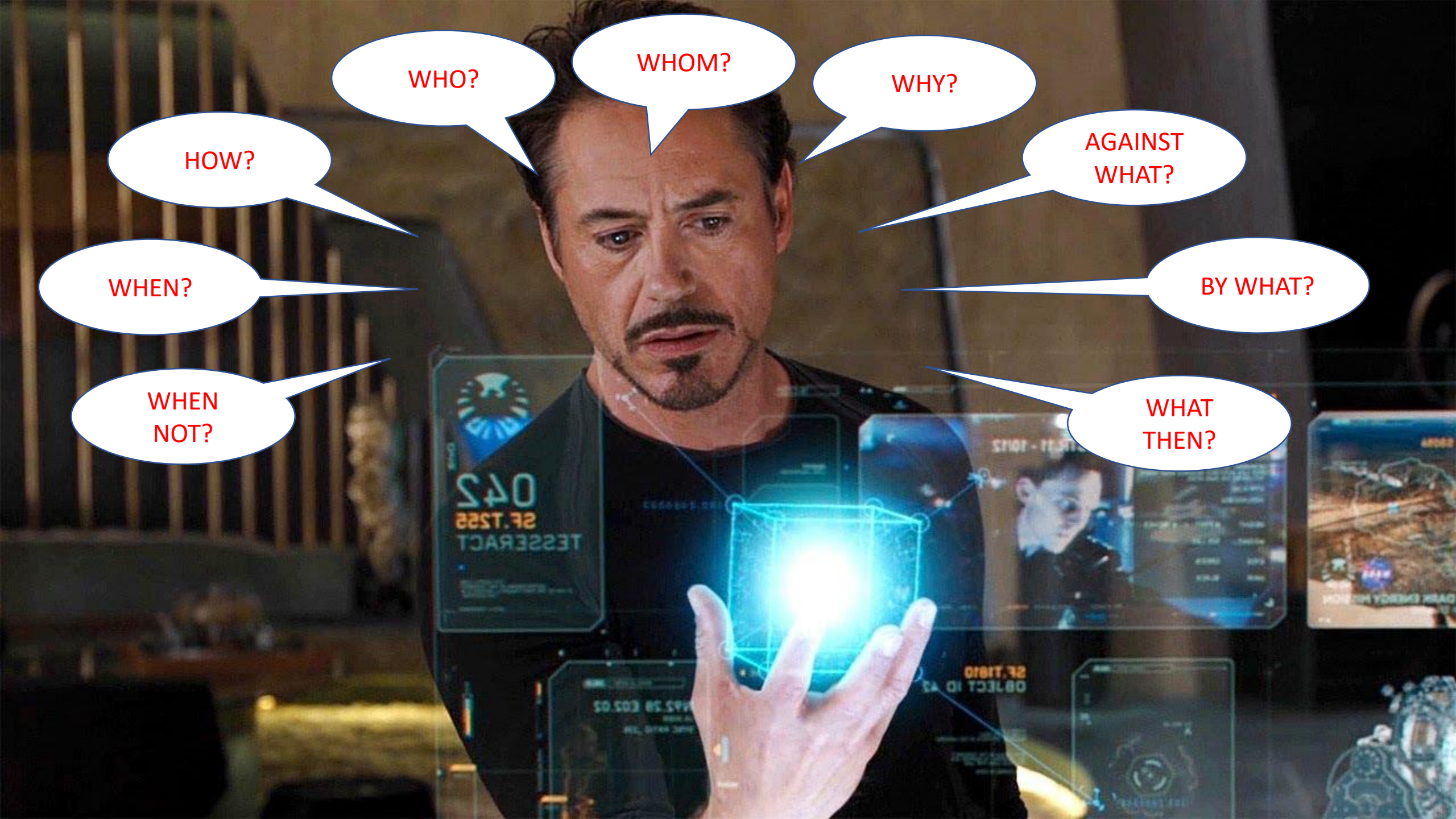
Finally Jane found a real expert….

„Vaccination - the pros and cons“ (vitalia.cz):

- **Question:** Do you think it is normal to give a small child a vaccine in which there are seven diseases at once? Even with poisonous additives!
- **Answer:** It's not normal. It's a crime against humanity!

MUDr. Ludmila Elekova

- Is it possible for a vaccinated child to get the disease against which it is vaccinated?
- Is it true that vaccination reduces immunity to other diseases?
- Can vaccines cause autism?
- Wouldn't it be better to postpone some vaccinations until later? Little child can hardly catch jaundice B….
- Isn't it dangerous to vaccinate so many infections at once?
- Why is aluminum used in vaccines? Isn't it dangerous for the baby?


WHO?
WHOM?
WHY?
HOW?
AGAINST WHAT?
WHEN?
BY WHAT?
WHEN NOT?
WHAT THEN?

OVERVIEW

I. INTRODUCTION TO VACCINOLOGY

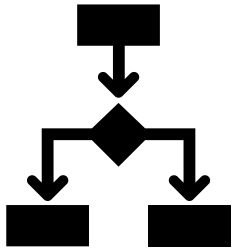
- Importance of vaccination
- Composition of vaccine
- Classification of vaccines
- Immune response to vaccines
- Vaccination contraindications
- Side effects of immunization
- Principles of right vaccination
- Vaccination programs

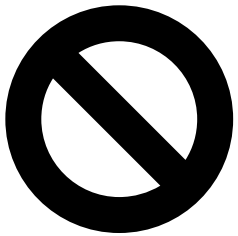
II. SPECIAL VACCINOLOGY

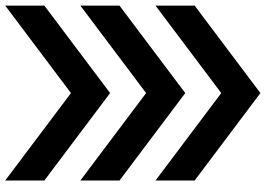
- Vaccinations preventable diseases
- Vaccinations for travellers

I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION







1796 - Edward Jenner showed efficacy of smallpox vaccine

1801 – vaccination commenced in the UK

1802 - vaccination started in the Czech lands

1959 – WHO accepted plan for eradication

MAIN STRATEGY:

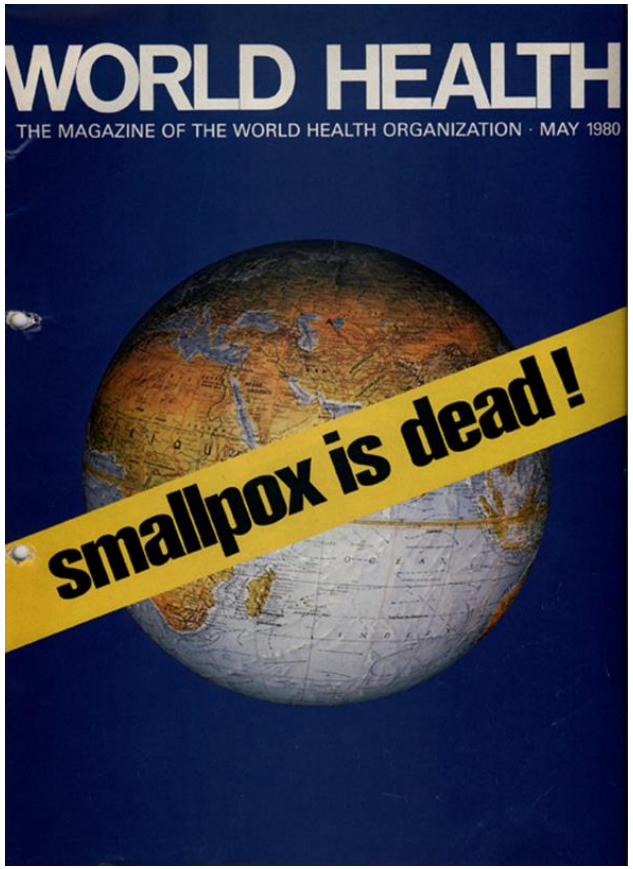
- mass vaccination strategies: mass vaccination of the population with a target of 80% vaccine coverage in each country,

- surveillance and anti-epidemic strategies: reporting of variegated disease, regular screening actions, strict isolation of patients, rapid vaccination of all persons in contact with the sick person

  ⇒ to interrupt the spread of the disease where vaccination is low.

Mass campaign and vaccination

Declaration of eradication




ONLY ONE
NOT
VACCINATED

IMPACTS OF VACCINATION

DIRECT EFFECT

- resulted from immune response of organisms to vaccine

→ creation of individual immunity

↓

- prevents the disease or its severe course

INDIRECT EFFECT

- impact on disease transmission in the population

→ creation of herd immunity

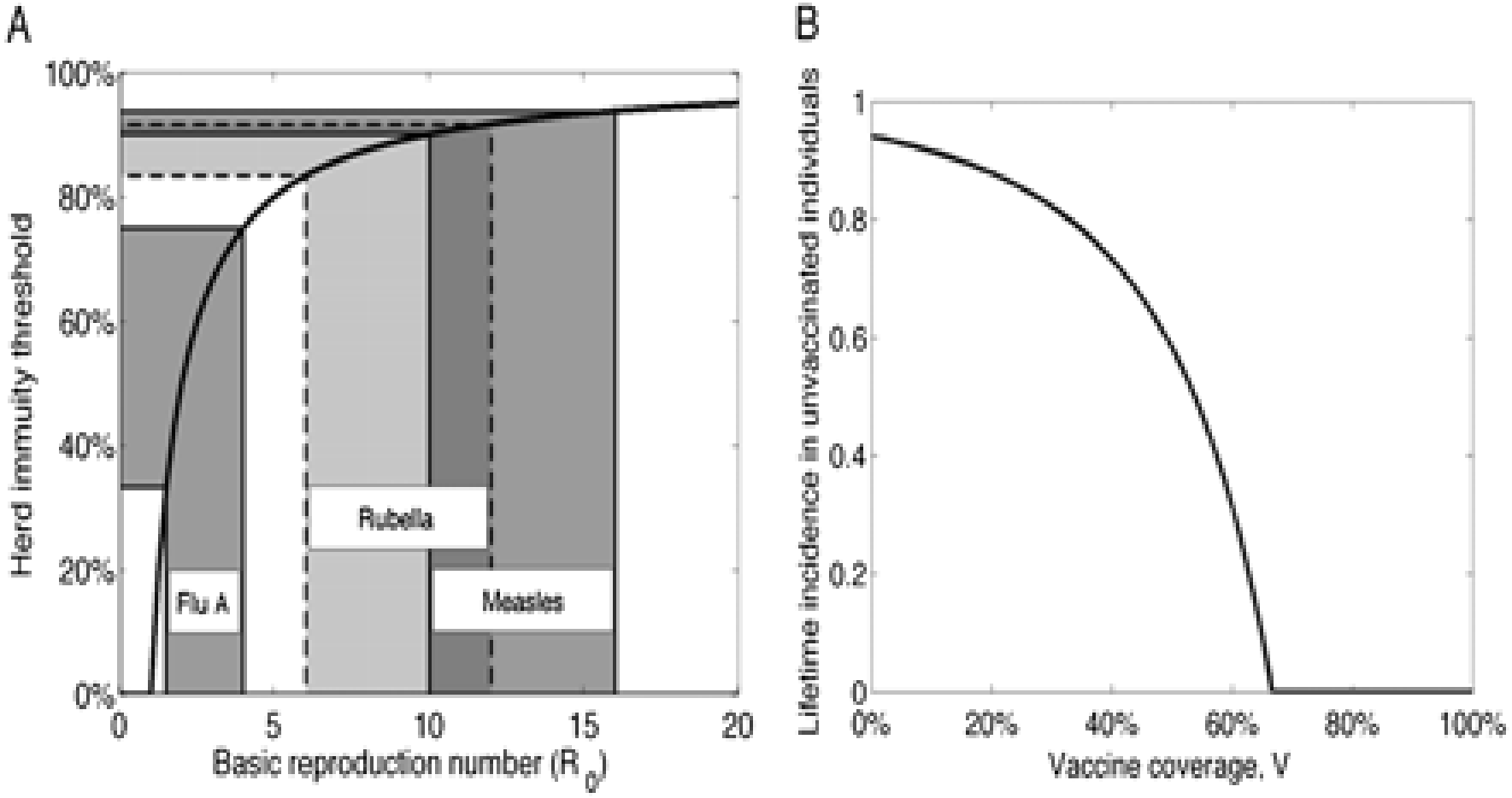
↓

- stops the spread of infections in the population
- helps protect unvaccinated persons

HERD IMMUNITY

- *percentage of immune people in the population needed to prevent the spread of the agent.*

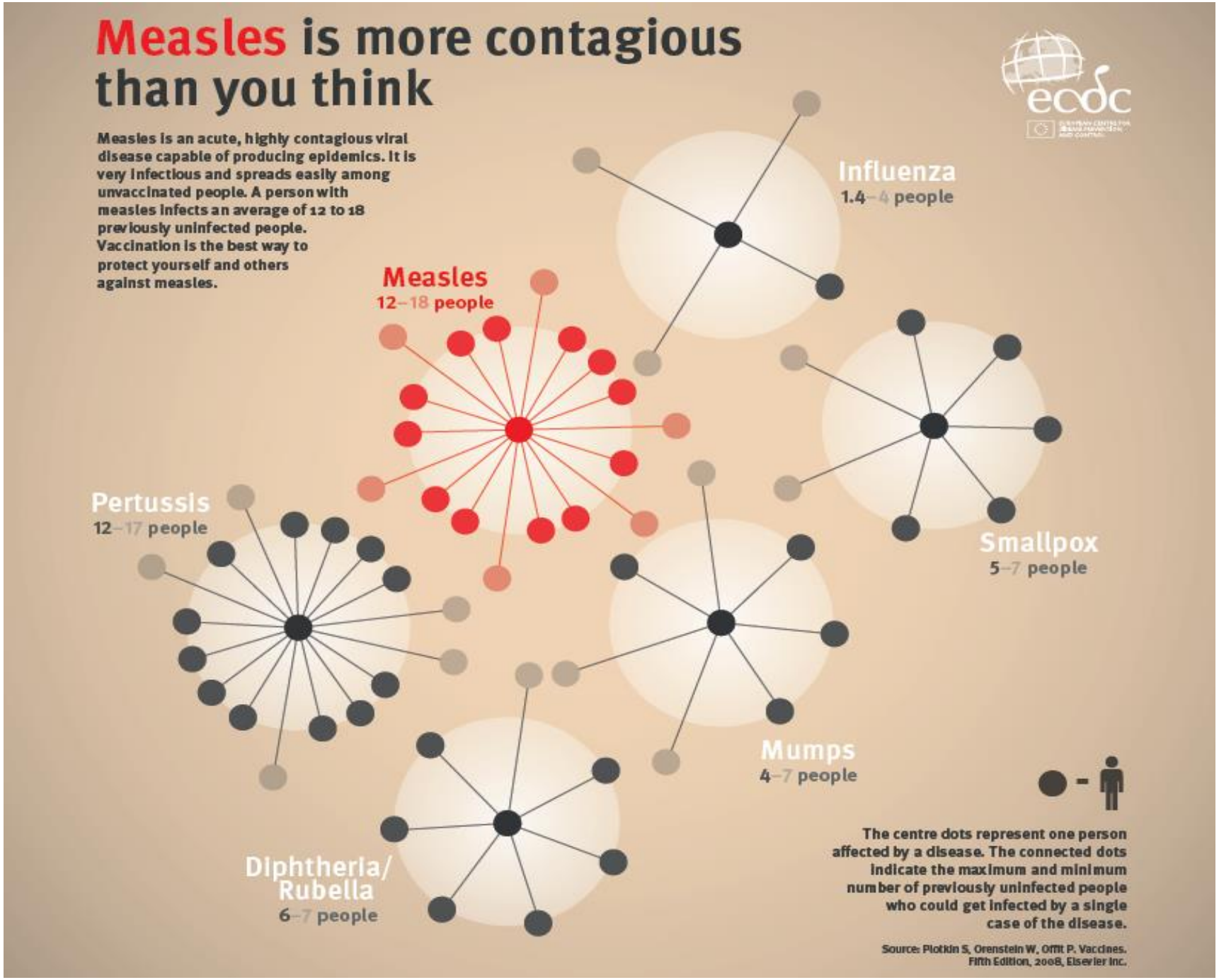
Simple threshold concept of herd immunity



Clinical Infectious Diseases, Volume 52, Issue 7, 1 April 2011, Pages 911–916, https://doi.org/10.1093/cid/cir007

Measles is more contagious than you think

Measles is an acute, highly contagious viral disease capable of producing epidemics. It is very infectious and spreads easily among unvaccinated people. A person with measles infects an average of 12 to 18 previously uninfected people. Vaccination is the best way to protect yourself and others against measles.



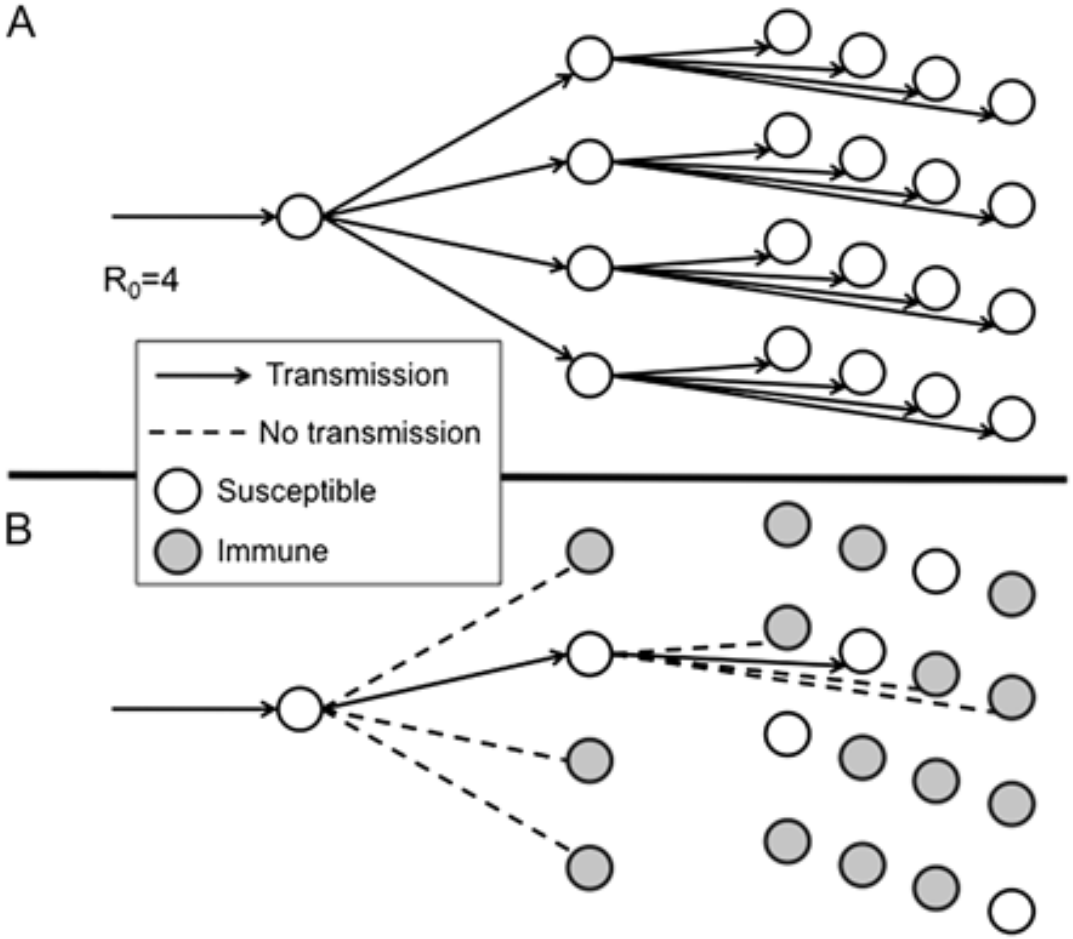
The centre dots represent one person affected by a disease. The connected dots indicate the maximum and minimum number of previously uninfected people who could get infected by a single case of the disease.

Source: Plotkin S, Orenstein W, Offit P. Vaccines. Fifth Edition, 2008, Elsevier Inc.

What defines the protective thresholds of herd immunity and public health strategies?

- infectivity of the agent
- immunogenicity of the vaccine and type of immune response
- duration of infectiousness in the infected persons
- duration of vaccination induced immunity
- homogeneity of population (interaction between age group,…)

Diagram illustrating transmission of an infection with a basic reproduction number $R_0 = 4$



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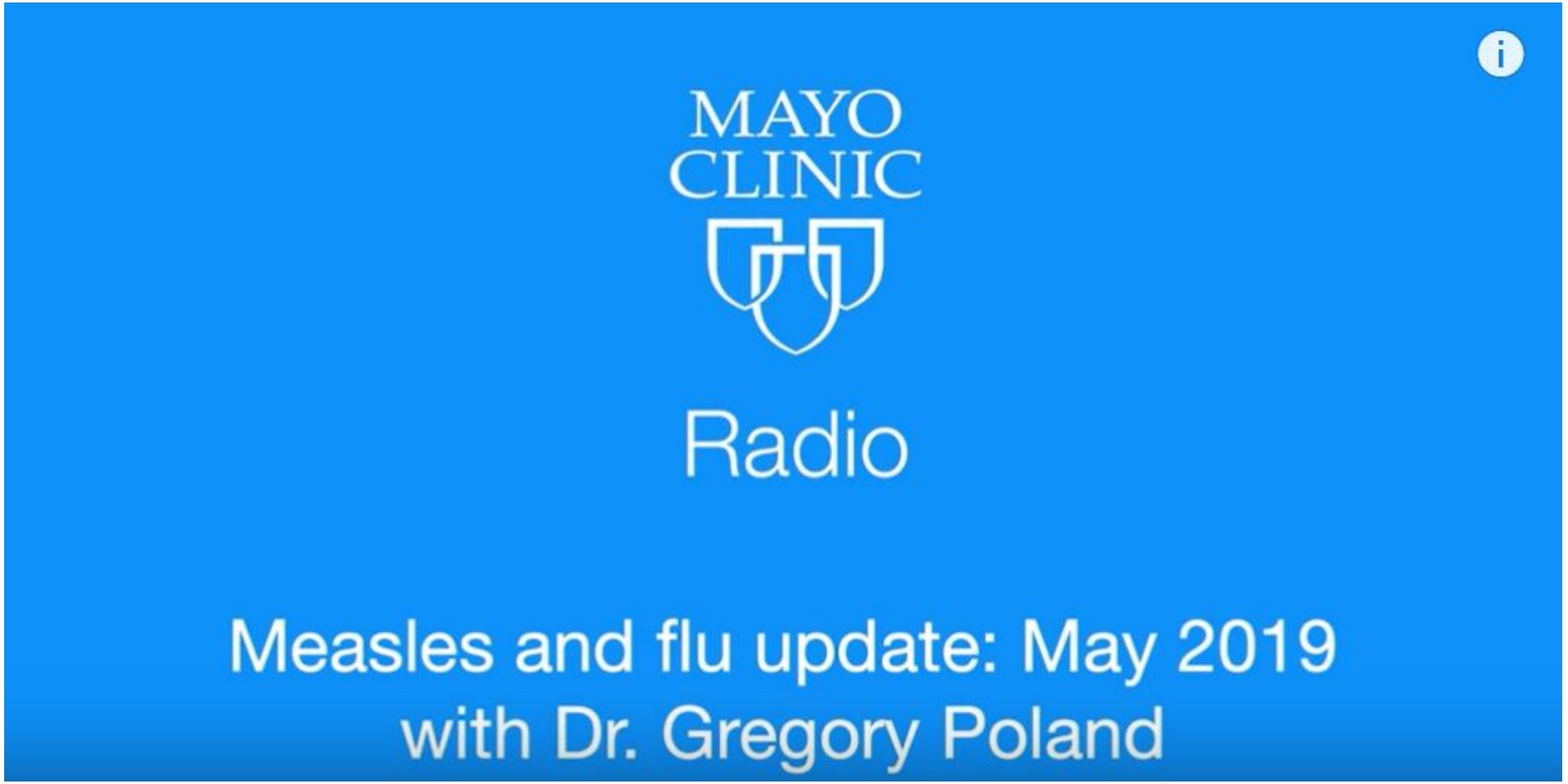
NOT
VACCINATED
PROTECTED

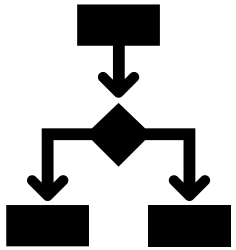
https://youtu.be/V9DinPkjbgo

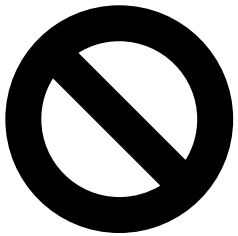


THE RISK DOCTORS DON'T TALK ABOUT

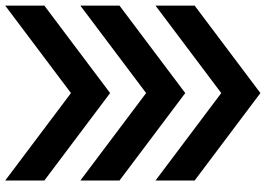
I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION

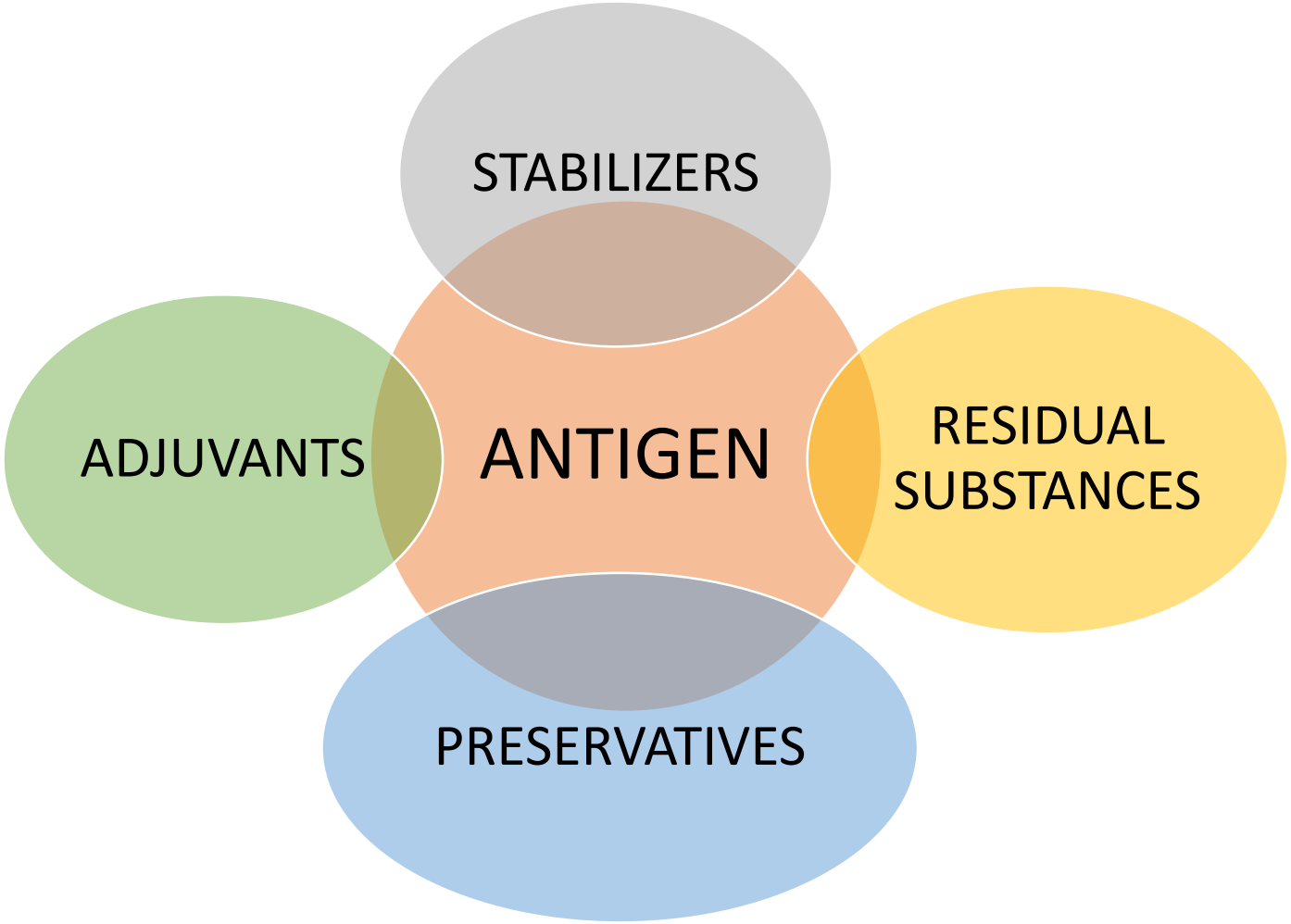




COMPOSITION OF VACCINES



VACCINE INGREDIENTS



ADJUVANTS

- added to some vaccines to enhance the immune response,
- benefit for people with compromised immune systems, the elderly, and the very young,

  ➡ use of less antigen (in short supply or costly),

  reducing or eliminating the need for booster vaccinations

- Aluminum-containing adjuvants
- others: AS04, MF59, AS01B, …

RESIDUAL SUBSTANCES - ANTIBIOTICS

- in some vaccines,
- used to help prevent bacterial contamination during manufacturing

  ➡ small amounts of antibiotics may be present in some vaccines,
- e.g. neomycin, polymyxin B, streptomycin, gentamicin,
- antibiotics most likely to cause severe allergic reactions (e.g., penicillins, cephalosporins and sulfa drugs) are not used in vaccine production!

STABILIZERS

- help protect the vaccine from adverse conditions (e.g. temperature).
- various substances - e.g.:

➢sugars such as sucrose and lactose,

➢amino acids such as glycine or the monosodium salt of glutamic acid

➢proteins such as human serum albumin or gelatin.

ANTIGEN

- any substance inducing a desired immune response in a vaccinated person,
- complex (live vaccines) or with one (HepB) or more components (acellular pertussis vaccine),
- alone (≥ 5 kdal) or conjugated with some proteins (e.g. with a toxoid)

→ CONJUGATED VACCINES

PRESERVATIVES

- to prevent the growth of bacteria or fungi that may be introduced into the vaccine during its use (e.g. repeated puncture of a multi-dose vaccine vial with a needle).
- THIMEROSAL

I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION

TYPES OF VACCINES

1. Live-attenuated vaccines
2. Inactivated vaccines
3. Subunit, recombinant, polysaccharide, and conjugated vaccines
4. Toxoid vaccines

- Whole-Pathogen Vaccines
- Subunit Vaccines
- Nucleic Acid Vaccines

WHOLE – PATHOGEN VACCINES

LIVE-ATTENUATED VACCINES

- contain a version of the living microbe that has been weakened in the laboratory
- vaccine against measles, mumps and rubella (MMR), varicella, TB, oral polio, …
- elicit strong immune responses
- life-long immunity after only one or two doses
- stronger and more frequent side effects

INACTIVATED VACCINES

- produced by killing the pathogen with chemicals, heat or radiation
- vaccine against rabies, hepatitis A, TBE, polio - Salk, typhoid fever,…
- side effects are weaker
- immune response is not so strong (need of 3 doses)

SUBUNIT VACCINES I

- include only the components, or antigens, that best stimulate the immune system,
- antigens alone are not sufficient to induce adequate long-term immunity
  → + adjuvants,
- are safer and easier to produce.

POLYSACCHARID VACCINES

- based on the polysaccharides, or sugars, that form the outer coating of bacteria
- activate only T – indep. immunity

↓

- short – term immunity
- age limited indications

• CONJUGATED VACCINES

- polysaccharide is conjugated to a protein antigen to offer improved protection (e.g. toxoid)

↓

- change immune response – useful for young children and elderly people
- against Hib, pneumococcal and meningococcal infections.

SUBUNIT VACCINES II

TOXOID VACCINES

- chemically inactivated toxins (toxoids),
- elicit immune responses against disease-causing proteins, or toxins, secreted by the bacteria,
- against bacterial illnesses, such as diphtheria and tetanus.

RECOMBINANT VACCINES

- recombinant DNA technology,
- genetic code for the viral protein has been inserted into other cells which then produce it,
- against hepatitis B, Men B, HPV

NUCLEIC ACID VACCINES

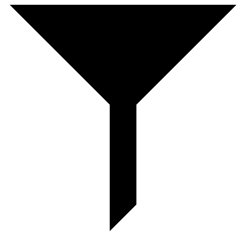
- use introduction of genetic materials encoding one or more antigens of pathogen into the body cells, they then produce the antigen

  → stimulation of broad long-term immune responses,

- relative ease of large-scale vaccine manufacture,
- excellent vaccine stability,
- in the research pipeline, not currently licensed for human use,
- e.g. DNA plasmid vaccines

KINDS OF VACCINES

1. SIMPLE X COMBINED – against one or more infections (e.g. MMR, hexavaccine,…)
2. MONOVALENT X POLY (…) VALENT – against one or more serotypes of one pathogen (e.g. tetravalent vaccine against meningococcus A,C,W,Y)



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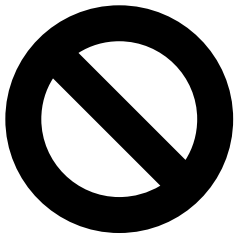
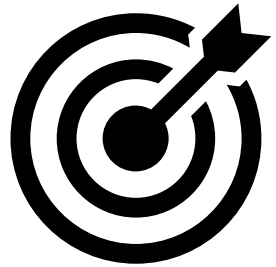
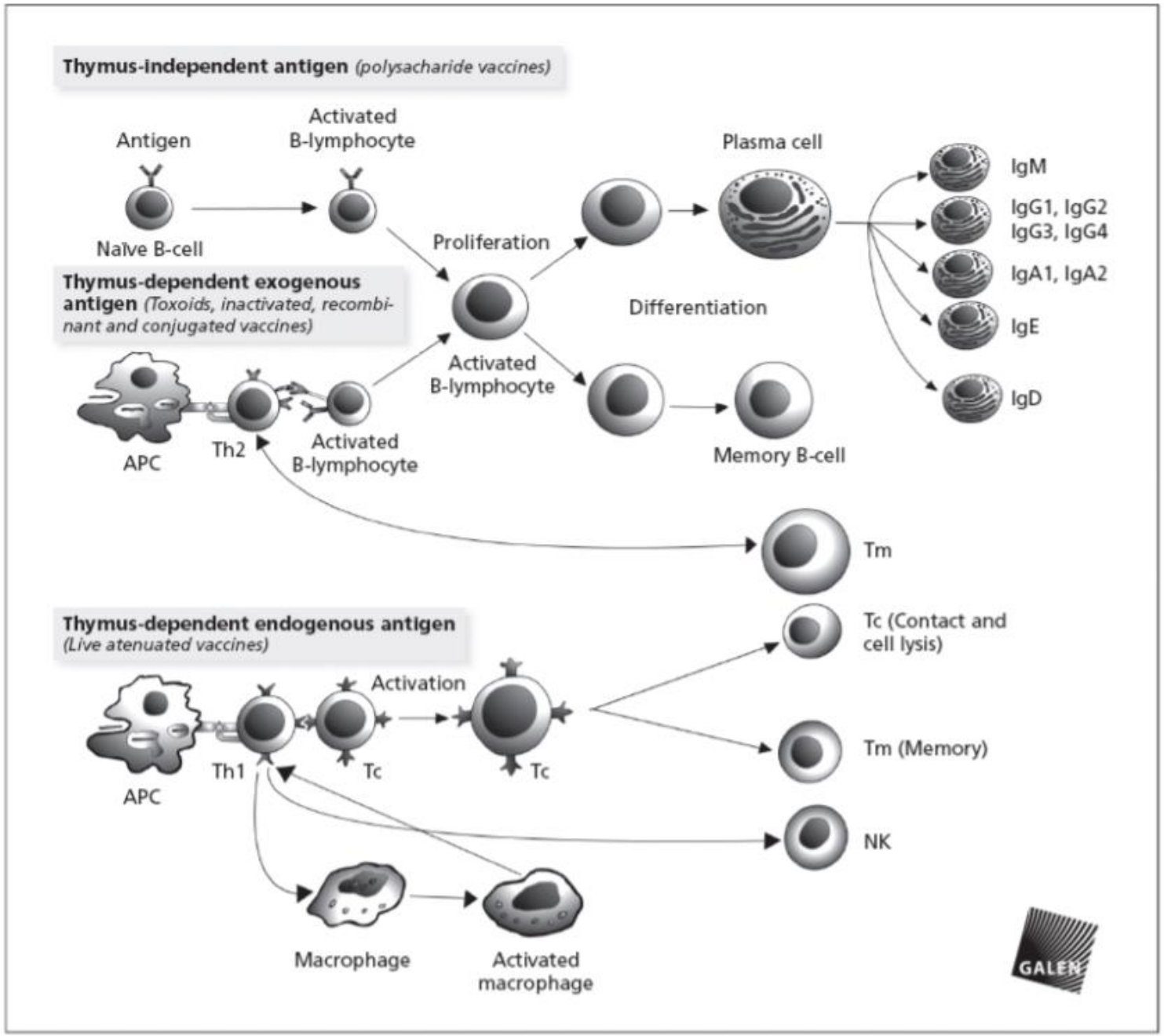




IMMUNE RESPONSE TO VACCINATION

3 ways of interaction between vaccine antigens and immune system

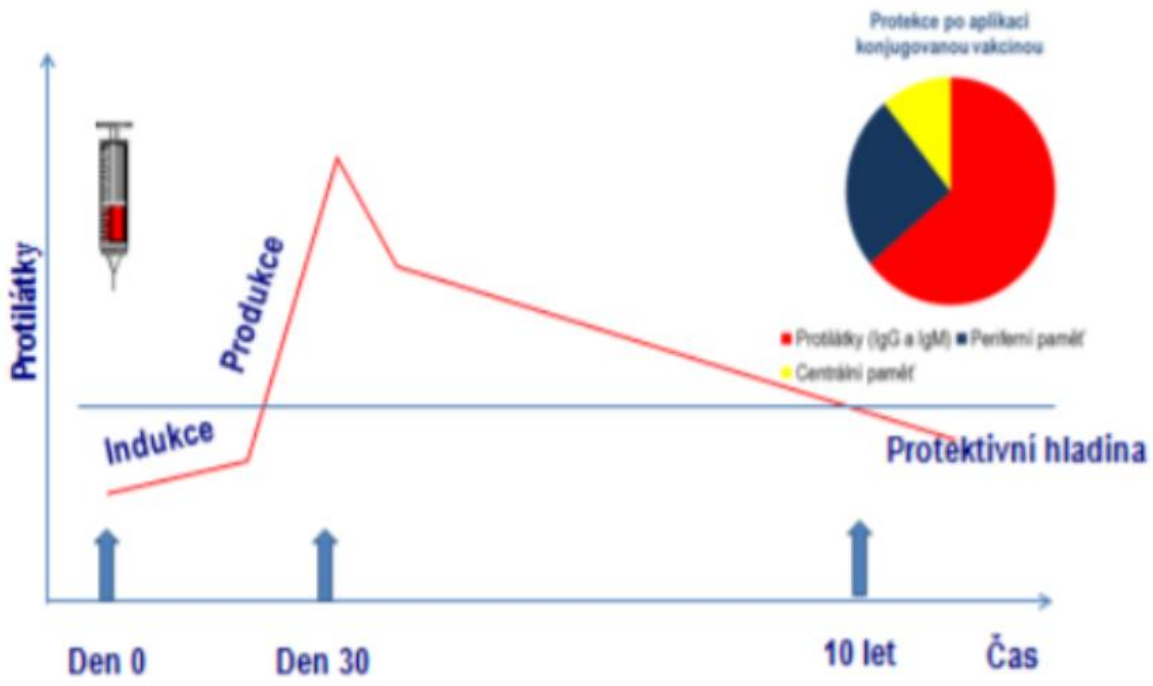


Source: J. Beran :Physiology of immune response to vaccination. Available at: https://www.vakcinace.eu/prednasky-stud .

COMPARISON OF IMMUNE RESPONSE

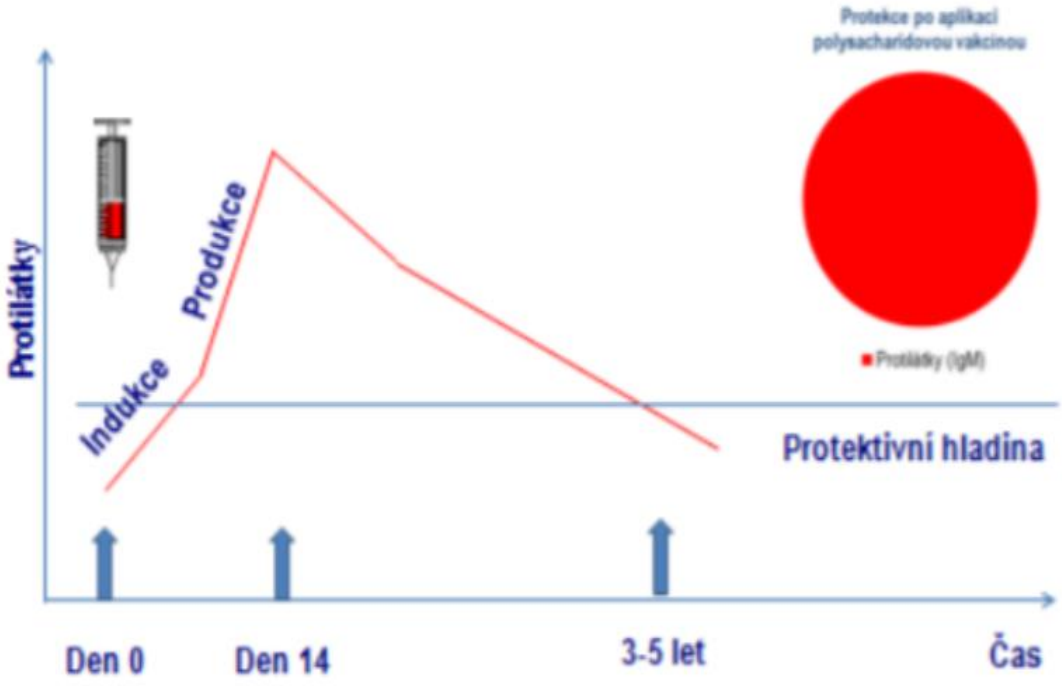
CONJUGATED VACCINES:

Ig G, immunologic memory



POLYSACCHARID VACCINES

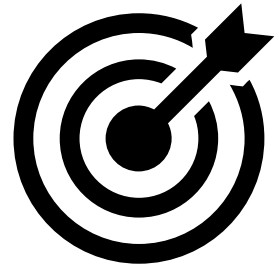
Ig M, no immunologic memory



I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION

SIDE EFFECTS OF VACCINATION



IMMUNE RESPONSE TO VACCINATION

SIDE EFFECTS OF VACCINES

- Any vaccine can cause side effects.
- All side effects are monitored by national institution systems.
- **Expected x unexpected**
- **Local x general**
- **From the view of severity:**

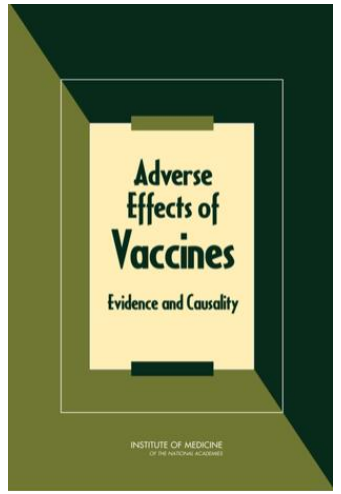
1. Physiological side effects
2. Severe side effects (physiological or neurological)
3. Allergic side effects

CAUSALITY ASSESSMENT FOR POTENTIAL ADVERSE EVENTS

1. *Evidence convincingly supports a causal relationship*

   (e.g. the oral polio vaccine and vaccine-associated paralytic polio)
2. *Evidence favors acceptance of a causal relationship*
3. *Evidence is inadequate to accept or reject a causal relationship*
4. *Evidence favors rejection of a causal relationship*

https://www.nap.edu/catalog/13164/adverse-effects-of-vaccines-evidence-and-causality



COMMON PHYSIOLOCIGAL SIDE EFFECTS

- Local reaction (redness and/or swelling around injection site)
- Mild temperature or fever
- Irritability, decreased appetite, sleepiness
- Vomiting and diarrhoea
- Fainting (uncommon; however, this may sometimes occur)

sometimes happen 1 to 3 days after the vaccination

SEVERE SIDE EFFECTS

Each side effect that causes:

- Death
- Life threat
- Severe alteration of organisms
- Long term damage
- Hospitalisation
- Congenital anomaly in descendants

NEUROLOGICAL SIDE EFFECTS

- febrile seizures
- Guillain-Barré Syndrome
- encephalitis
- encephalomyelitis

- non-stop crying for 3 hours or more

ANAPHYLACTIC REACTION

- usually occur within minutes of parenteral administration,
- most common signs and symptoms are cutaneous (e.g. urticaria, angioedema, flushing, pruritus). However, 10 to 20% of patients have no skin findings.
- ➡ rapid progression of symptoms, evidence of respiratory distress (e.g., stridor, wheezing, dyspnoea, increased work of breathing, retractions, persistent cough, cyanosis), signs of poor perfusion, abdominal pain, vomiting, dysrhythmia, hypotension, collapse,
- first and most important therapy - epinephrine,
- providers should have a plan in place to contact emergency medical services.

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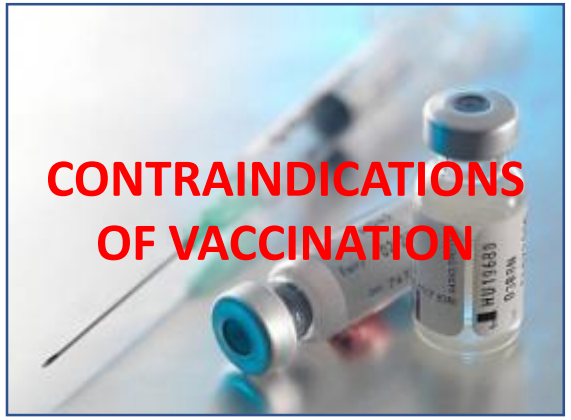
SIDE EFFECTS OF VACCINATION

IMMUNE RESPONSE TO VACCINATION



GENERAL CONTRAINDICATIONS

- Conditions in a recipient that increases the risk for a serious adverse reaction.
- Persons who administer vaccines should screen patients for contraindications!

1. **Severe allergic reaction (e.g. anaphylaxis) after a previous dose or to a vaccine component.**
2. **Severe reaction after previous dose with alteration of general condition.**

CONRAINDICATIONS FOR LIVE VACCINES

- Pregnant women
- General contraindications
- Diagnosed immunodeficiency
- Treatment by Corticosteroids (0,5 mg/kg/2 weeks)
- Specific biological treatment
- Selected haemato-oncological or haematological diagnosis
- 3 months after transfusion or passive immunization

PRECAUTIONS

- Condition in a recipient that might increase the risk of a serious adverse reaction.
- In general, vaccinations should be deferred when a precaution is present.
- Vaccination might be indicated in the presence of a precaution if the benefit of protection from the vaccine outweighs the risk for an adverse reaction.

1. **Moderate or severe acute illness with or without fever.**
2. **Other specific precautions at various vaccines.**

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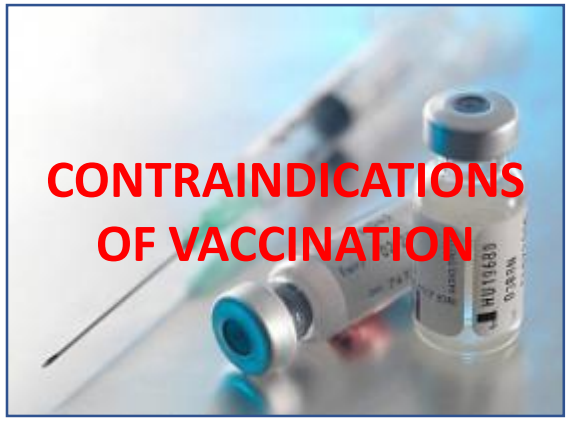
SIDE EFFECTS OF VACCINATION

IMMUNE RESPONSE TO VACCINATION



PROPER VACCINE ADMINISTRATION

- critical to ensure that vaccination is safe and effective.
- Vaccine administration protocol (CDC):

1. Review vaccination history
2. Assess for Needed Immunizations
3. Screen for Contraindications and Precautions
4. Educate the Parent or Patient
5. Prepare the Vaccine(s)
6. Administer the Vaccine (use conventional or abbreviated scheme)
7. Document the Vaccination(s)

VACCINATION SCHEME

- basic (conventional) scheme) - number of doses needed for adequate and prolonged protection, varies from vaccine to vaccine,

  x abbreviated scheme
- booster dose - for some vaccines, later in life to maintain protection.

BEST PRACTICES FOR MULTIPLE INJECTIONS

- Label each syringe to identify the vaccine it contains.
- Separate injection sites by 1 inch or more, if possible.
- Administer vaccines that may be more likely to cause a local reaction (e.g., tetanus-toxoid-containing and PCV13) in different limbs, if possible.
- Use combination vaccines (e.g., DTaP-IPV-HepB or DTaP-IPV/Hib), if appropriate, to decrease the number of injections.

https://www.cdc.gov/vaccines/hcp/admin/administer-vaccines.html

CDC RECOMMENDED INTERVALS BETWEEN ADMINISTRATIONS OF DIFFERENT TYPES OF VACCINES

(IF NOT ON SAME DAY)

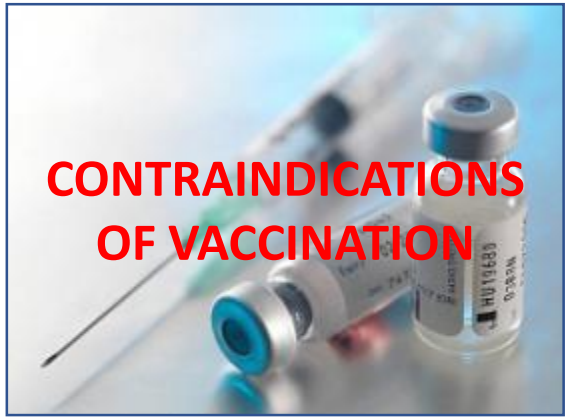
COMBINATIONS OF ANTIGENS	RECOMMENDED MINIMUM INTERVAL
≥ 2 INACTIVATED	NO INTERVAL, COULD BE AMINISTERED ANYTIME
INACTIVATED AND LIVE	NO INTERVAL, COULD BE ADMINISTERED ANYTIME
≥ 2 LIVE - ADMINISTRED PARENTERALLY	4 WEEKS, IF NOT ADMINISTERED ON SAME DAY
AFTER BCG PRIMOVACCINATION	8 WEEKS OR AFTER THE LESION HEALED

I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION

SIDE EFFECTS OF VACCINATION

IMMUNE RESPONSE TO VACCINATION



IMMUNIZATION PROGRAMS

IMMUNIZATION PROGRAMS

- All countries have a national immunization programme to protect the population against vaccine-preventable diseases.
- WHO: the Expanded Programme on Immunization (EPI)

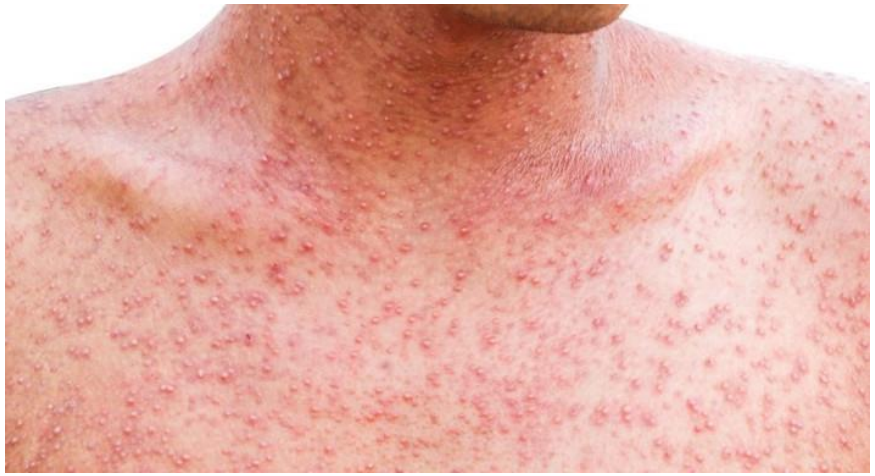
https://vaccine-schedule.ecdc.europa.eu/

VACCINATION PREVETABLE DISEASES
RUTINE VACCINATION

- BCG
- Measles
- Rubella
- Mumps
- Pertusiss
- Tetanus
- Diphteria
- Influenza
- TBE
- Meningococcal diseases
- Pneumococcal diseases
- Rotavirus
- Poliomyelitis
- Hepatitis A
- Hepatitis B
- HiB
- Varicella – Zoster
- HPV

MEASLES

https://www.youtube.com/watch?v=zBkVCpbNnkU



MEASLES I.

- Acute, highly contagious viral disease (infectivity is close to 100% in susceptible individuals).
- CA: RNA virus of the genus Morbillivirus and the family Paramyxoviridae.
- Transmitted mainly directly via respiratory droplets but also by air as indirect way of transmission (several hours later).
- Infectiousness - from about five days before the onset of rash to four days afterwards.
- Maximally contagious during the prodromal phase - lasts for 2–4 days (intense coughing!).

MEASLLES II.

- Incubation period - 10–12-day.
- Prodromal phase - fever, conjunctivitis, coryza, cough and bronchiolitis.
- Koplik’s spots, the enanthema believed to be pathognomic for measles, appear on the buccal mucosa 1–2 days before the onset of rash.
- The measles rash, an erythematous maculopapular exanthema, develops 2–4 days after the onset of fever and spreads from the head to the body over the next 3–4 days.

MEASLES III.

- The most common complications:

➢otitis media (7–9%),

➢pneumonia (1–6%),

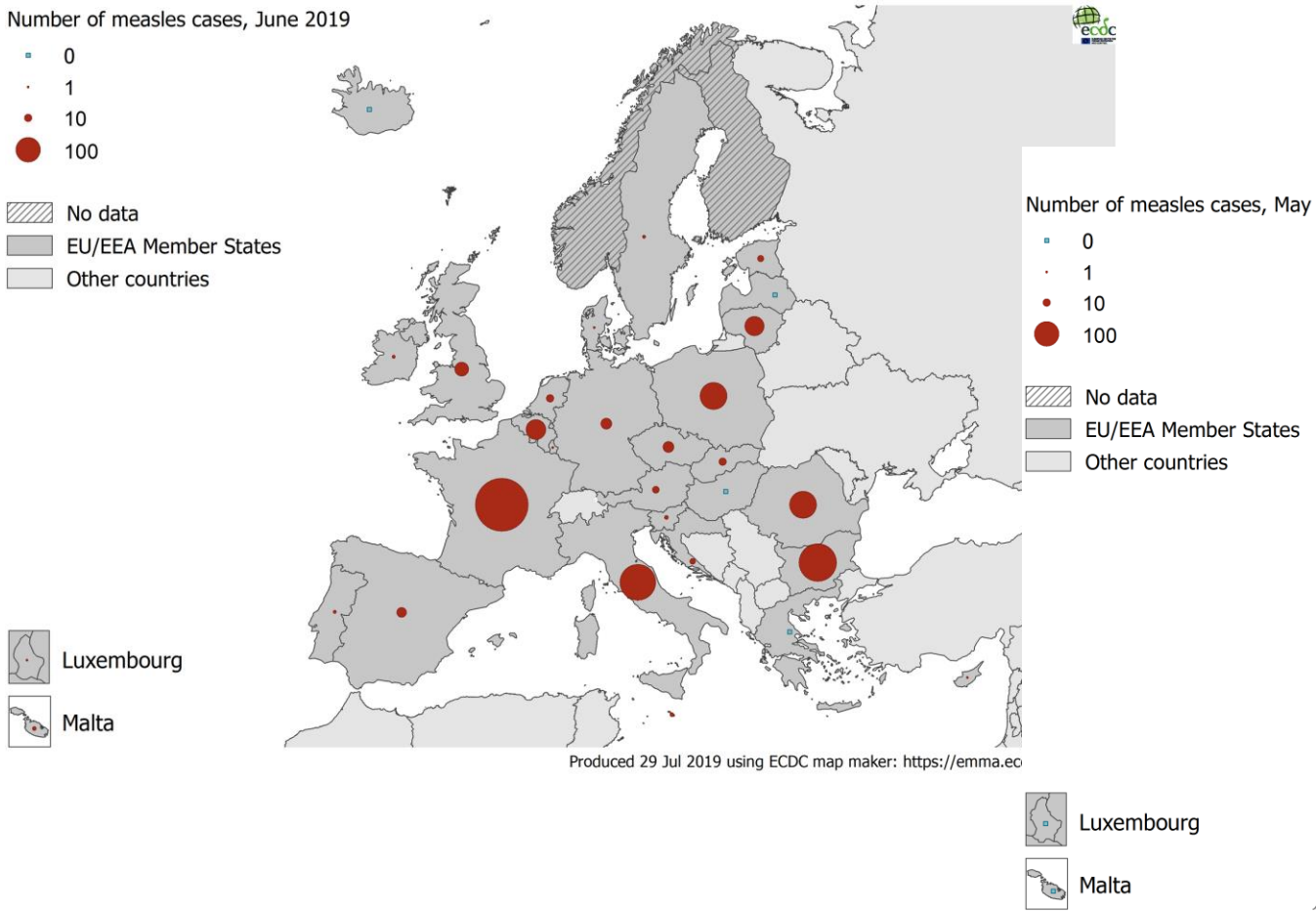
➢diarrhoea (8%),

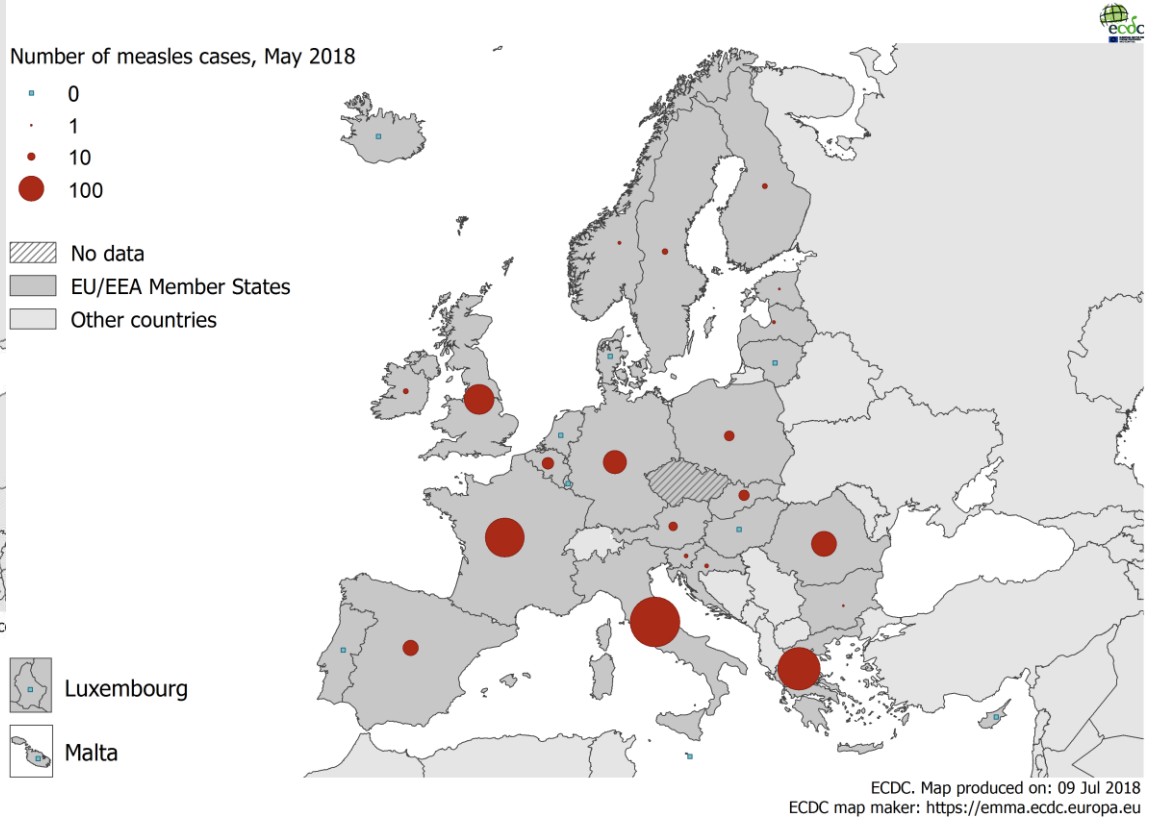
➢post-infectious encephalitis (1 per 1000 to 2000 cases),

➢subacute sclerosing panencephalitis (SSPE), which affects 1 per 100 000 cases.

- Case fatality is 1–3 per 1000 cases (predominantly caused by complicating bacterial infections).

MEASLES IN EUROPE





MEASLES – EPIDEMIOLOGICAL RISK

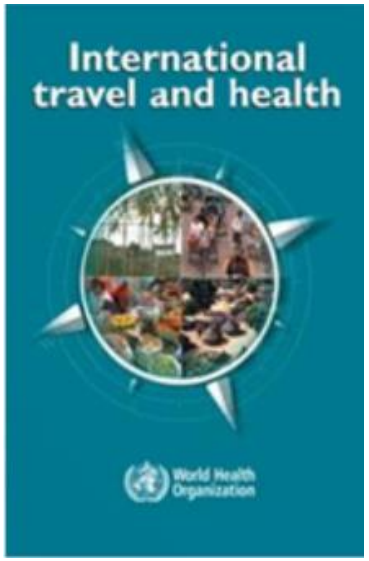
- Vaccination coverage is below 95% in most countries!
- Measles cases in Europe primarily occur in unvaccinated populations in both adults and children.
- Large outbreaks with fatalities are ongoing in countries that had previously eliminated or interrupted endemic transmission!

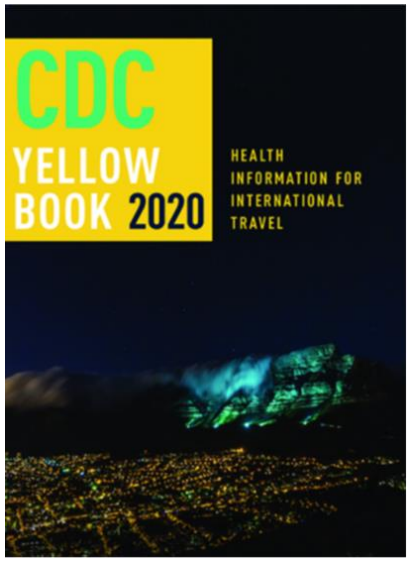
MEASLES – VACCINATION

- MMR - a combination measles, mumps, and rubella vaccine.
- MMRV (ProQuad) - a combination measles, mumps, rubella, and varicella vaccine.
- Both vaccines contain live, attenuated viruses.
- CDC recommends two doses of measles-containing vaccine routinely for children.
- The first dose at age 12 through 15 months and the second dose at age 4 through 6 years before school entry.

VACCINATION FOR TRAVELLERS

- international travel can pose various risks to health,
- consultation - at least 4–8 weeks before the journey – at the travel medicine clinic or medical practitioner.





VACCINES FOR TRAVELLERS (WHO)

SELECTIVE USE FOR TRAVELLERS

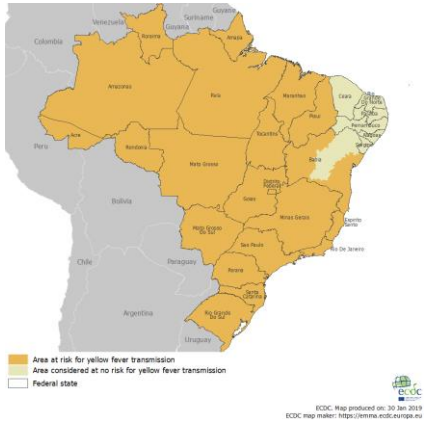
- Cholera
- Hepatitis A
- Hepatitis E
- Japanese encephalitis
- Meningococcal disease
- Rabies
- Tick-borne encephalitis
- Typhoid fever
- Yellow fever

REQUIRED VACCINATION

- Yellow fever (Country list)

- Meningococcal disease and polio (required by Saudi Arabia for pilgrims, updates are available on www.who.int/wer)

YELLOW FEVER



- mosquito-borne infection of primates,
- caused by a virus of the Flavivirus genus,
- transmitted between monkeys by forest-dwelling primatophilic Aedes mosquitoes → Sylvatic infection of humans (hunt, gather food) + Aedes aegypti in towns and villages → human to human transmission).
- in west, central and east Africa and in South America, from Panama to the northern part of Argentina, never in Asia, once endemic in Europe.
- a wide spectrum of symptoms, from mild to fatal.
- live attenuated vaccine, known as YF 17D – effective and safe.

CHOLERA

- acute diarrhoeal infection,
- caused by the bacterium Vibrio cholera of serogroups O1 or O139.
- humans are the only relevant reservoir, even though Vibrios can survive for a long time in coastal waters contaminated by human excreta,
- several countries in Africa, Asia and the Americas are reporting cholera outbreaks,
- major outbreaks: Yemen, Nigeria, the DRC, Haiti,
- oral inactivated vaccine.

TYPHOID

- are systemic disease,
- caused by the bacteria Salmonella typhi,
- humans are the only reservoir,
- humans can carry the bacteria in the gut for very long times (chronic carriers), and transmit the bacteria to other persons (either directly or via food or water contamination),
- incubation period: 1-2 weeks,
- high fever, malaise, cough, rash and enlarged spleen develops (intestinal perforation and haemorrhage may occur),
- untreated (x ATB) has a 10% death rate.
- vaccines : 1. inactivated (polysaccharid) vaccine (inj.),
  2. live, attenuated (weakened) vaccine which is taken orally,
  3. combined typhoid/hepatitis A vaccine.

HEPATITIS A

- caused by the hepatitis A virus (HAV).,
- usually transmitted through the fecal-oral route or by contaminated food or water,
- most adults - symptoms, including fatigue, low appetite, stomach pain, nausea, and jaundice, that usually resolve within 2 months of infection,
- most children less than 6 years of age do not have symptoms or have an unrecognized infection,
- Ig produced in response to hepatitis A infection last for life and protect against reinfection,
- inactivated single-antigen hepatitis A vaccines (HAVRIX), live vaccine and combination vaccine A + B (TWINRIX).

Vaccines in research pipelines

Vaccines Against Viral Diseases

- Dengue Fever Prevention
- Ebola Vaccines
- Hepatitis Disease-Specific Research
- HIV Vaccine Development
- Influenza Vaccines
- MERS and SARS Therapeutics and Vaccines
- Respiratory Syncytial Virus (RSV) Prevention
- Smallpox Vaccine Supply and Strength
- West Nile Virus Vaccines
- Zika Virus Vaccines

Vaccines Against Bacterial and Parasitic Diseases

- Cholera Treatment and Prevention
- Group A Streptococcus Vaccine Research
- Lyme Disease Vaccines
- Pertussis Vaccines
- Tuberculosis Vaccine Development
- Leishmaniasis Vaccines
- Malaria Prevention, Treatment, and Control Strategies

FOR X AGAINST?

TAKE AWAY MESSAGE…

- **Vaccines are safe and effective.**
- **Any vaccine can cause side effects.**
- **Serious side effects from vaccines are extremely rare.**
- **Getting vaccinated is much safer than getting the diseases vaccines prevent.**

Am J Public Health. 2018 October; 108(10): 1378–1384.
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PMCID: PMC6137759
PMID: 30138075

Weaponized Health Communication: Twitter Bots and Russian Trolls Amplify the Vaccine Debate

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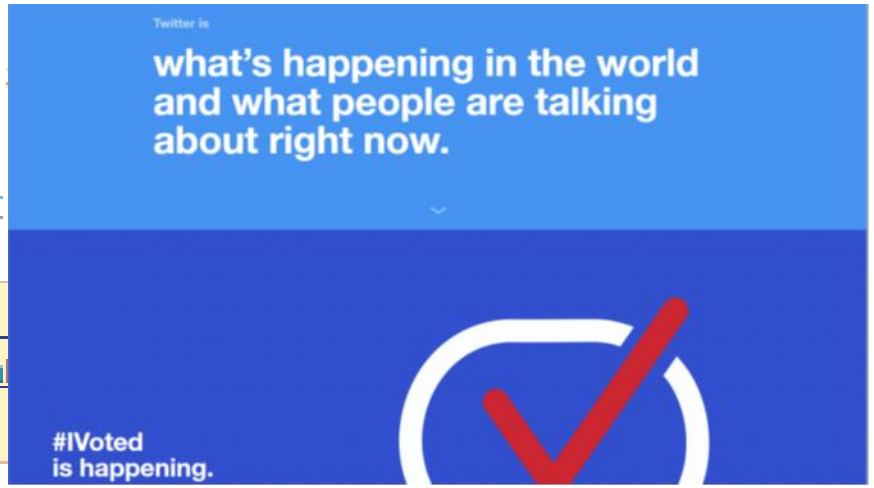
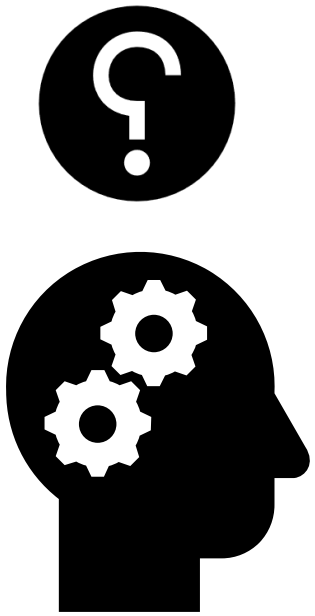


See "Health Communication Trolls and Bots Versus Public Health Agencies' Trusted
See "Population Health Science as the Basic Science of Public Health: A Public Heal
on page 1288.

ANTIVACCINATION MOVEMENT – WHY?



AntiVaxxer 

- A person who thinks they know more about medicine and public health than the overwhelming majority of doctors, scientists, immunologists, and every major health organization across the whole entire planet.
- Pfffft, I don't need to believe in "evidence based medicine" & fancy "science" made up by sheeple and shills! I'm an arrogant anti-vaxxer!

(https://www.urbandictionary.com)

INVENTION OF THE SMALLPOX VACCINE

1796 to 1798

ENGLAND

Edward Jenner engineered the smallpox vaccine, which inoculated people with cowpox, instead of smallpox.

CONTROVERSY SURROUNDED THE VACCINE, INCLUDING...

General distrust in medicine and doctors.

Concerns about the safety and sanitation of early methods of vaccination.

Clergypeople claiming smallpox was God's punishment, and shouldn't be treated.

THE LEICESTER DEMONSTRATION MARCH OF 1885

1885

LEICESTER, ENGLAND

Leicester was a popular location for Anti-Vaccination Leagues to meet.

IN 1885, BETWEEN 80,000 -100,000 DEMONSTRATORS LED AN ELABORATE MARCH THAT INCLUDED...

- Anti-vaccination banners
- Children's coffins
- A burning effigy of Edward Jenner

Due to such demonstrations, a new Vaccination Act in 1898 removed the penalty for vaccine refusal.

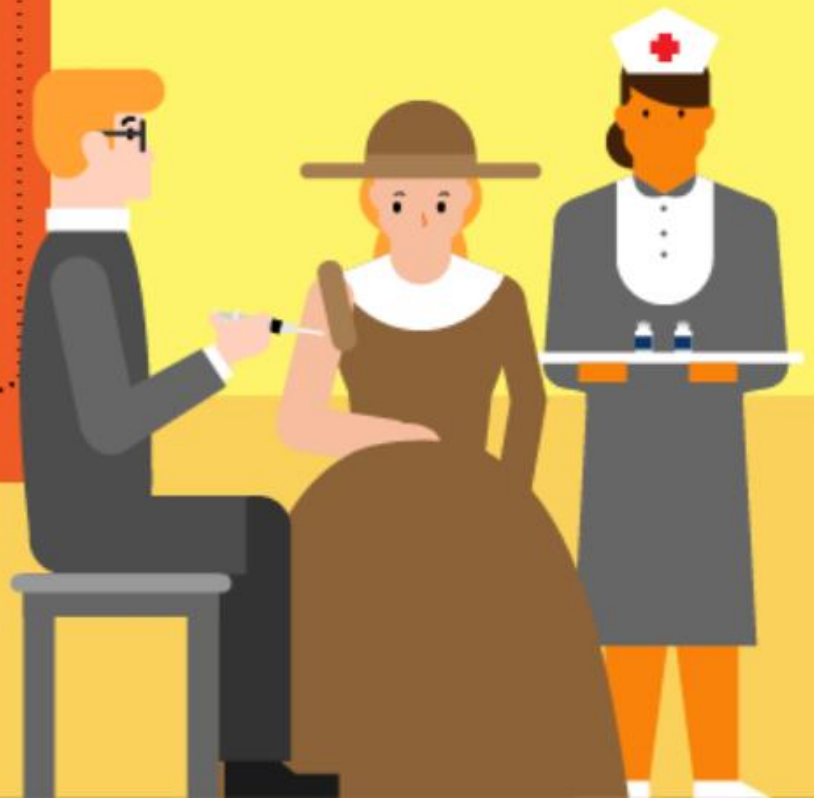
DTP VACCINE CONTROVERSY

1974

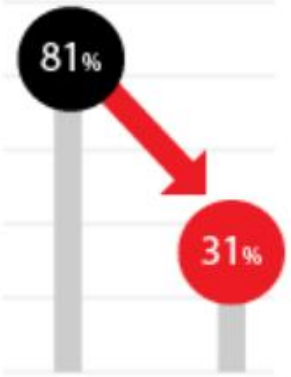
ENGLAND

A report from the Great Ormond Street Hospital in London alleged 36 children suffered neurological conditions following immunization for Diphtheria, Tetanus, and Pertussis (Whooping Cough).

The safety of the DTP vaccine was question across Europe, Asia, and North America.



VACCINATION RATES IN THE UK DECREASED FROM 81% TO 31% , WHICH LED TO...

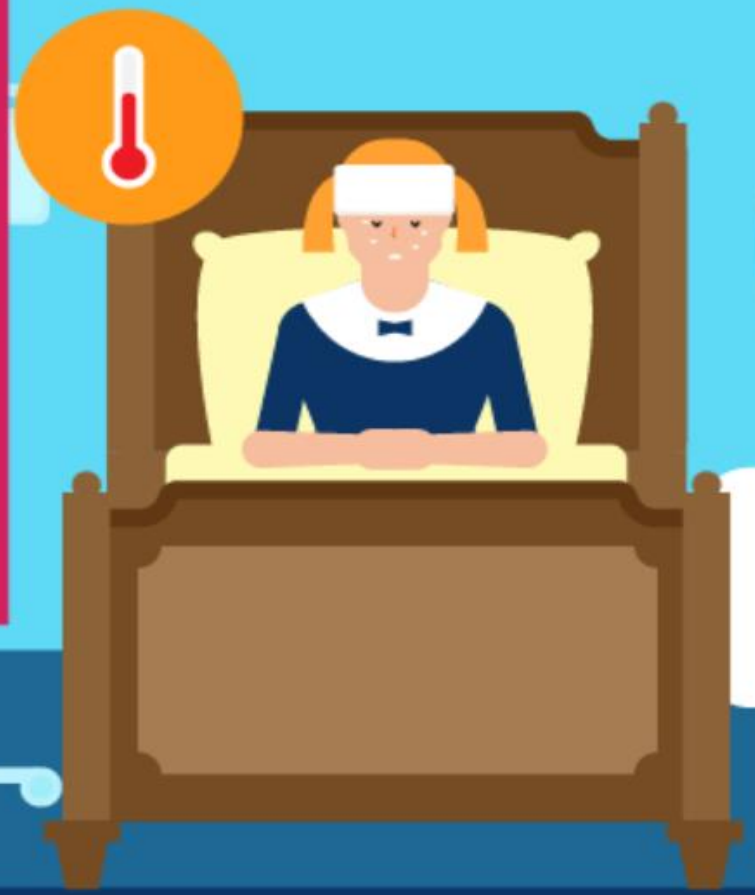


3 MAJOR PERTUSSIS EPIDEMICS

SWEDEN'S VACCINATION MORATORIUM

1979 to 1996

SWEDEN



Sweden suspended vaccination against whooping cough from 1979 to 1996.

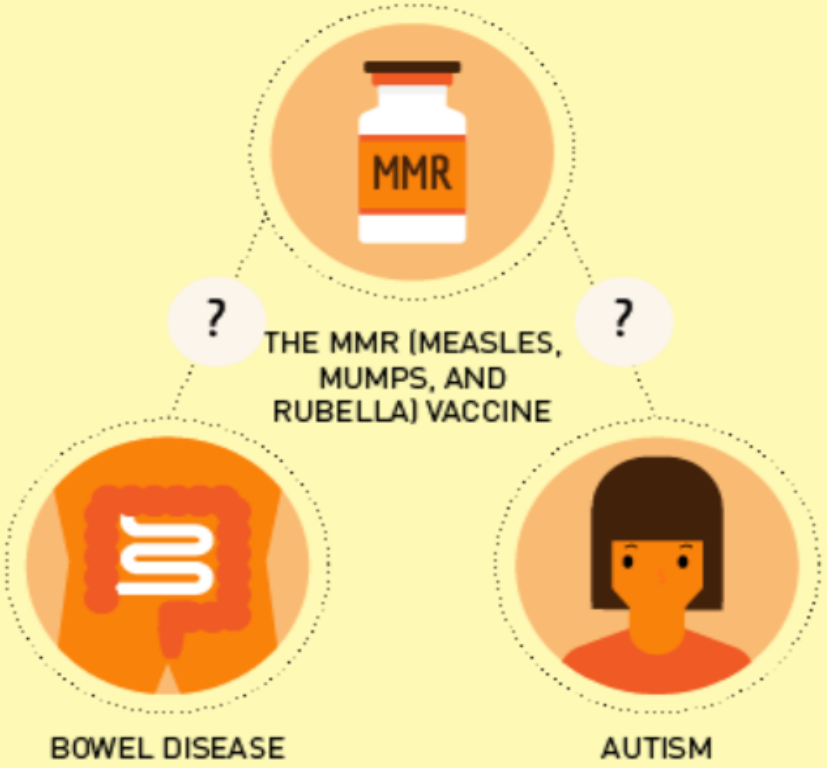
During that time, **60%** of all children in Sweden contracted the disease before the age of 10.

VACCINATION-AUTISM CONTROVERSY

1998

ENGLAND

A British doctor released a research paper investigating the relationship between...

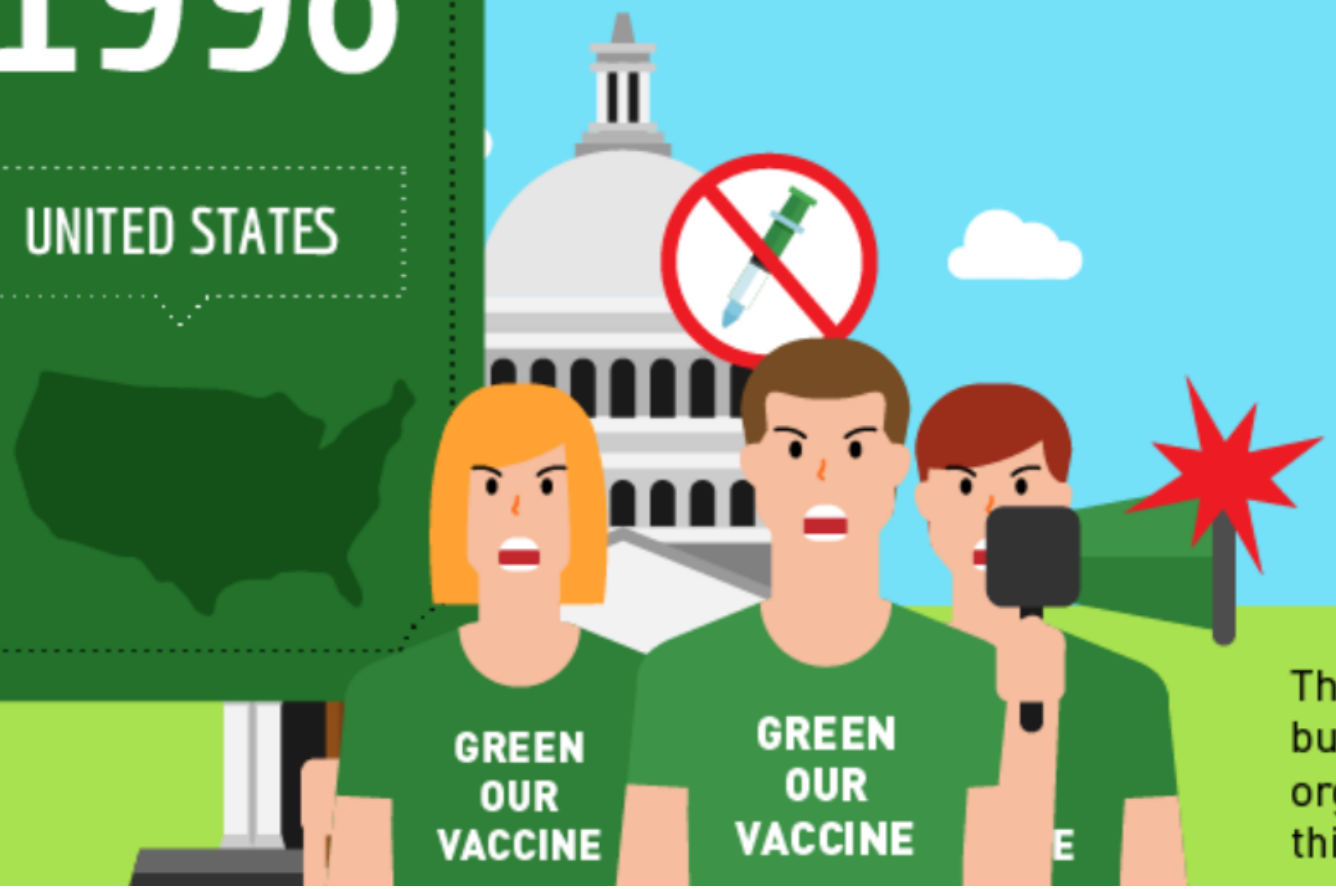


In 2011 the paper was found to be fraudulent, but it damaged the public's opinion of the MMR vaccine.

"GREEN OUR VACCINES" MOVEMENT

1998

UNITED STATES



Thimerosal is a compound used as a preservative in vaccines. It contains mercury.

"Green Our Vaccines" was a public campaign to remove thimerosal and other "toxins" from vaccines.

There is no evidence of harmful side effects, but in 1999 U.S. public health and medical organizations agreed to reduce or eliminate thimerosal in vaccines.

https://measlesrubellainitiative.org/anti-vaccination-movement/