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,

- number of doses needed for adequate and prolonged protection (basic schema) varies from vaccine to vaccine,
- booster dose - for some vaccines, later in life to maintain protection.

- 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?

OVERVIEW

I. INTRODUCTION TO VACCINOLOGY

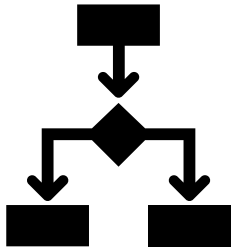
- Importance of vaccination
- Composition of vaccine
- Classification of vaccines
- Immune response to vaccines
- Vaccination contraindications
- Side effects of immunization
- Principles of right vaccination
- Vaccination programs

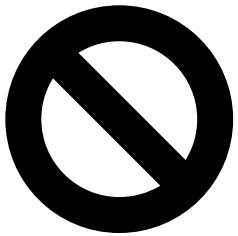
II. SPECIAL VACCINOLOGY

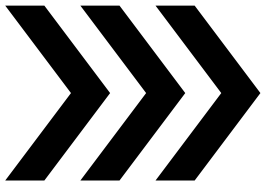
- Vaccinations preventable diseases
- Vaccinations for travellers
- Vaccination for risk patients

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:

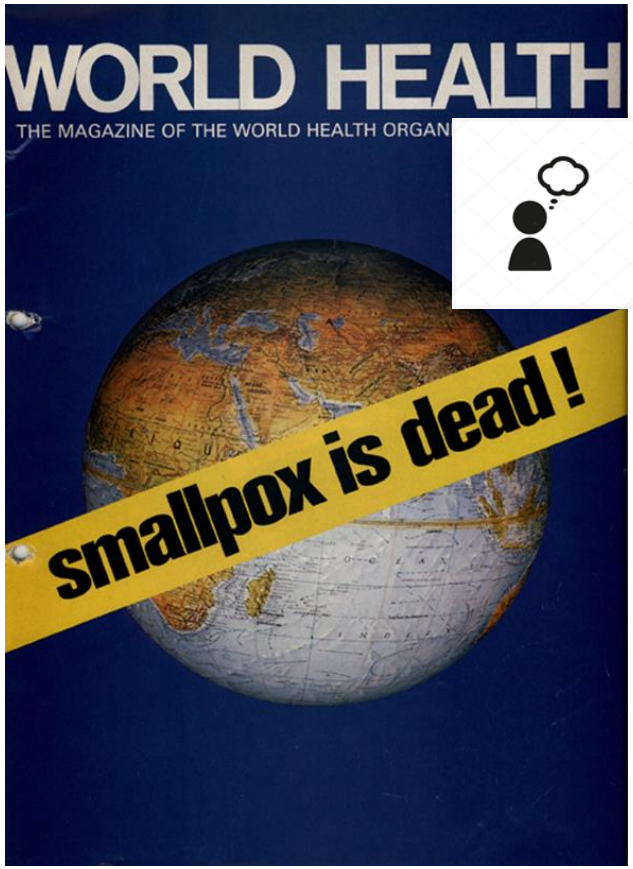
- mass vaccination strategies: mass vaccination of the population with a target of 80% vaccine coverage in each country,

- 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

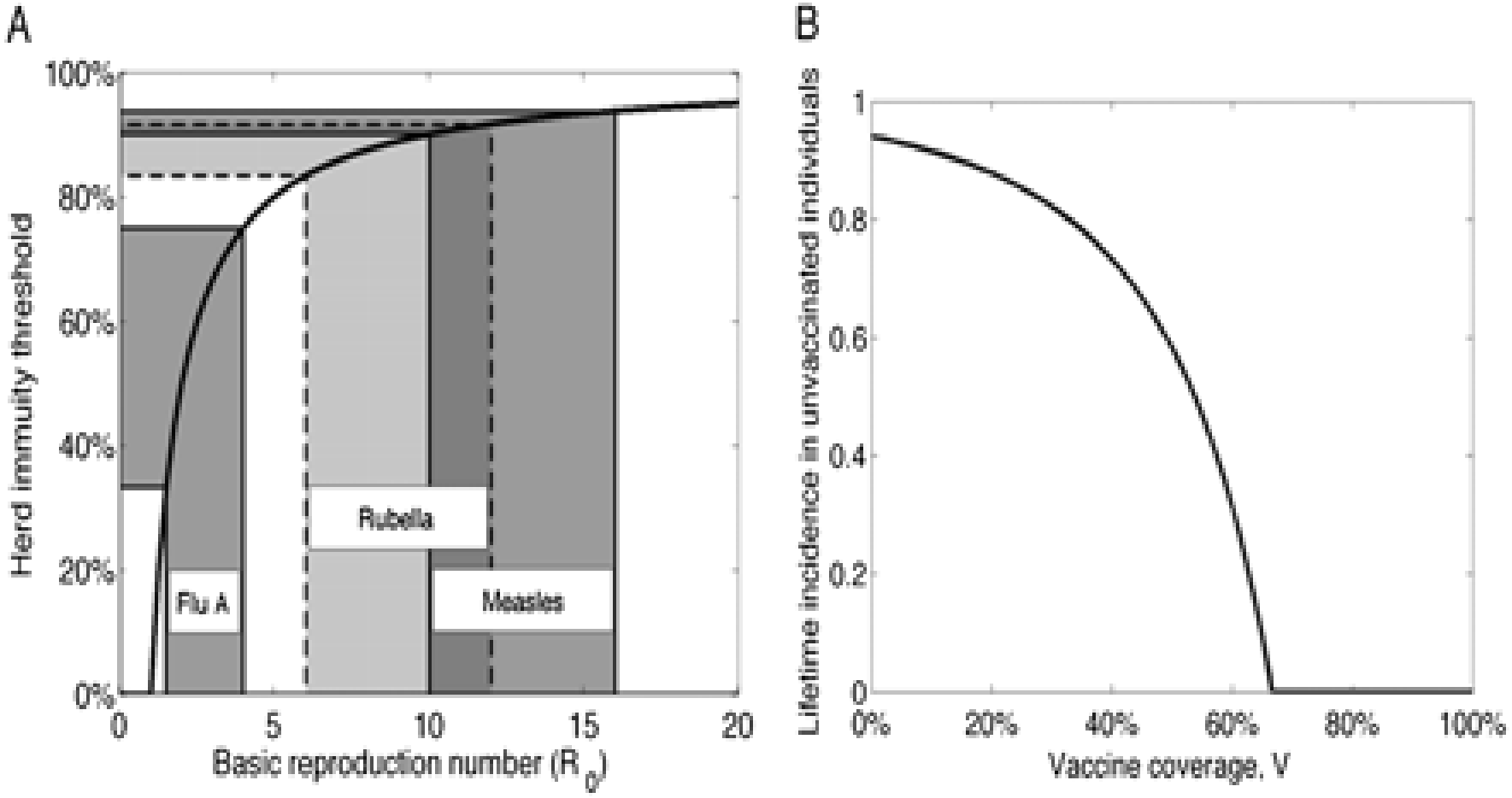
↓

- 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.*

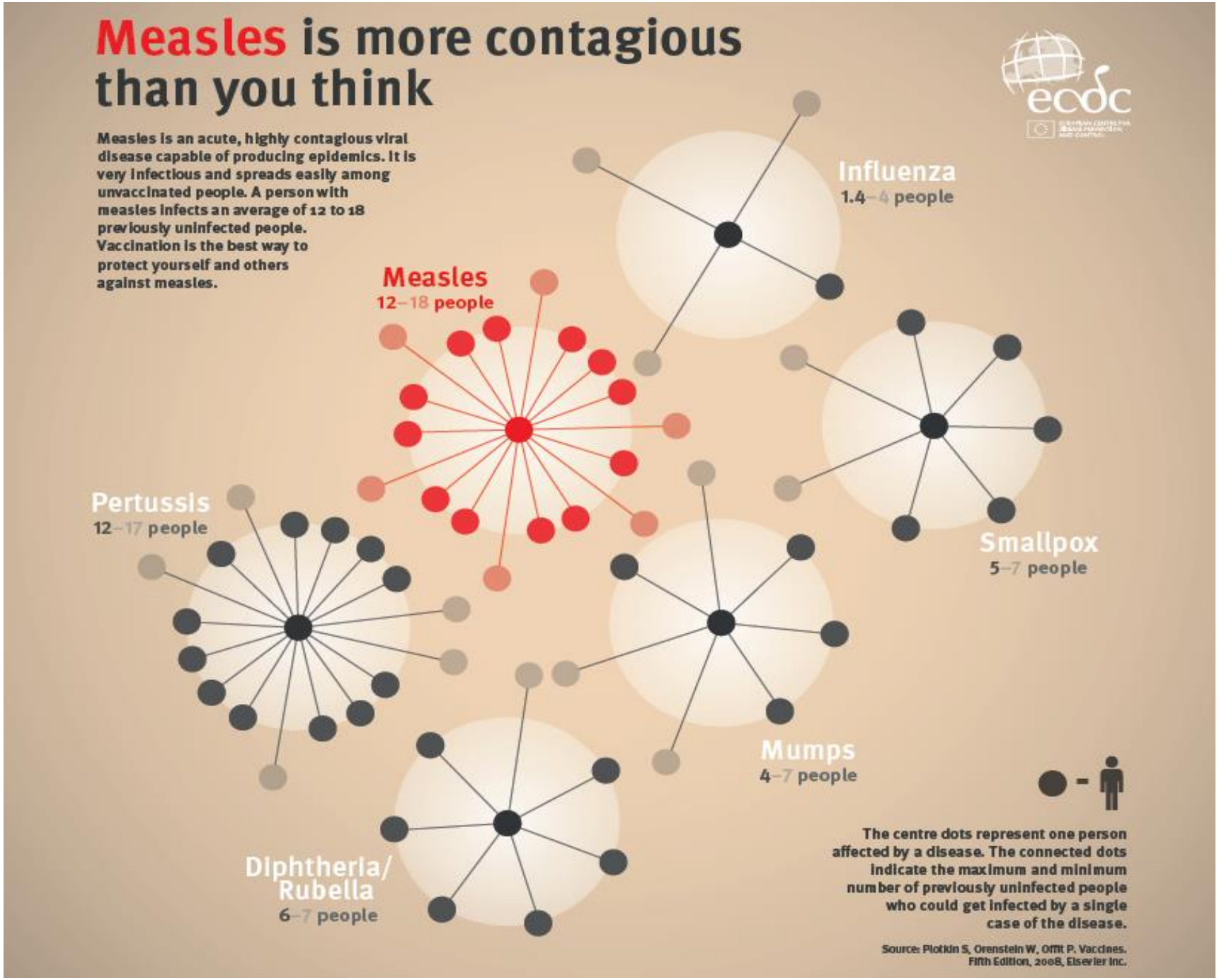
Simple threshold concept of herd immunity



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.



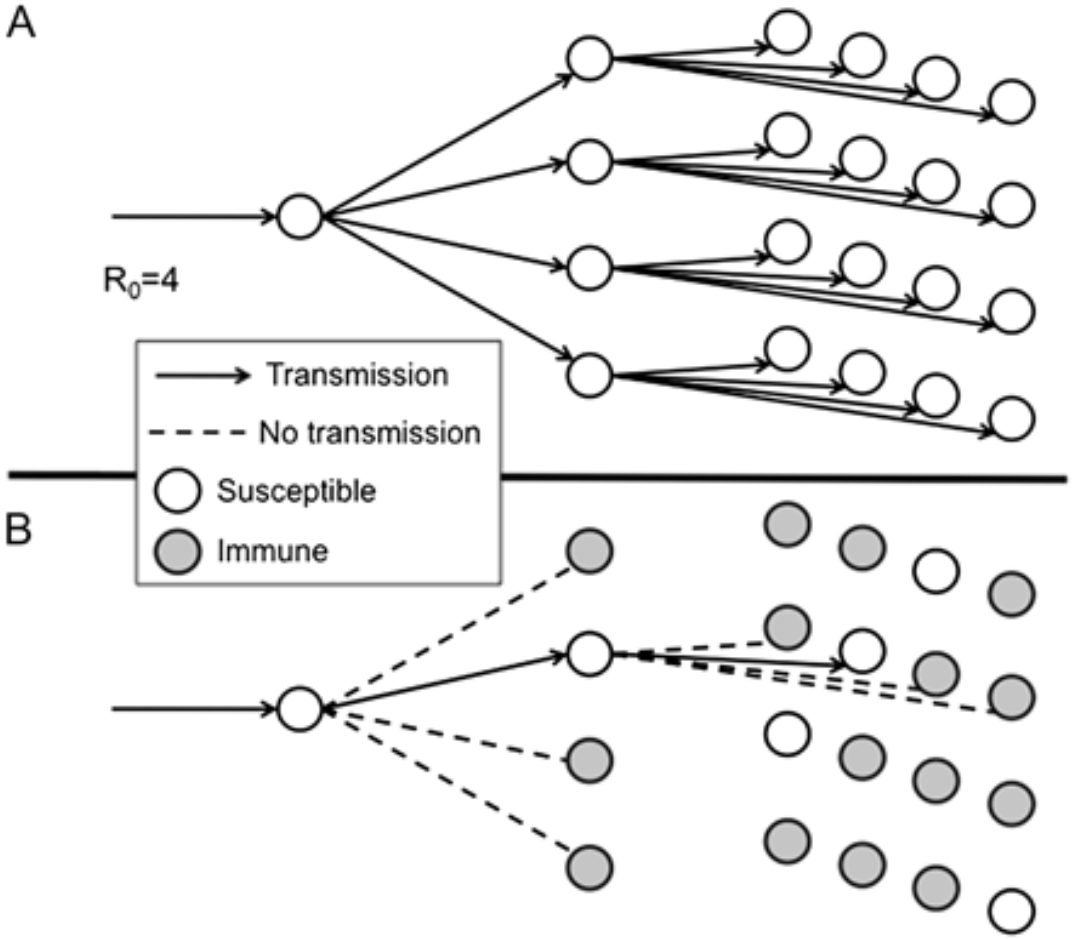
The centre dots represent one person affected by a disease. The connected dots indicate the maximum and minimum number of previously uninfected people who could get infected by a single case of the disease.

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 $R_0 = 4$



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


NOT
VACCINATED
PROTECTED

Other consequences

- If the vaccine only protects against signs of disease and does not affect infectiveness or transmission, no herd immunity is created.
- Selective vaccination of risk groups for transmission may reduce or slow down the spread in the group at risk of severe disease.

  (Influenza vaccination in school children in Japan - Reichert TA, 2001)

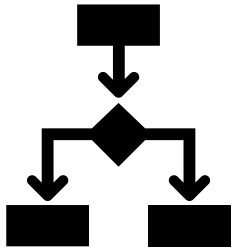
- Models for the use of vaccines with indirect effect only *(*transmission blocking vaccines' - *„TB vaccines“)*

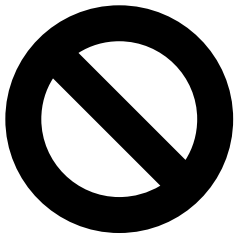
Challenges for public health strategies

- target thresholds for vaccination but use sensible public health practice
- use of mathematical epidemiological models but!...
- appropriate ways of monitoring the coverage (!)
- herd immunity is not biologic (immunologic) immunity!
- ethical and legal consequences
- growth of antivaccine sentiment….  ?

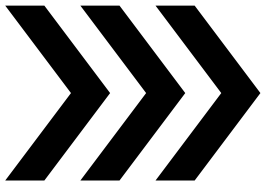
I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION

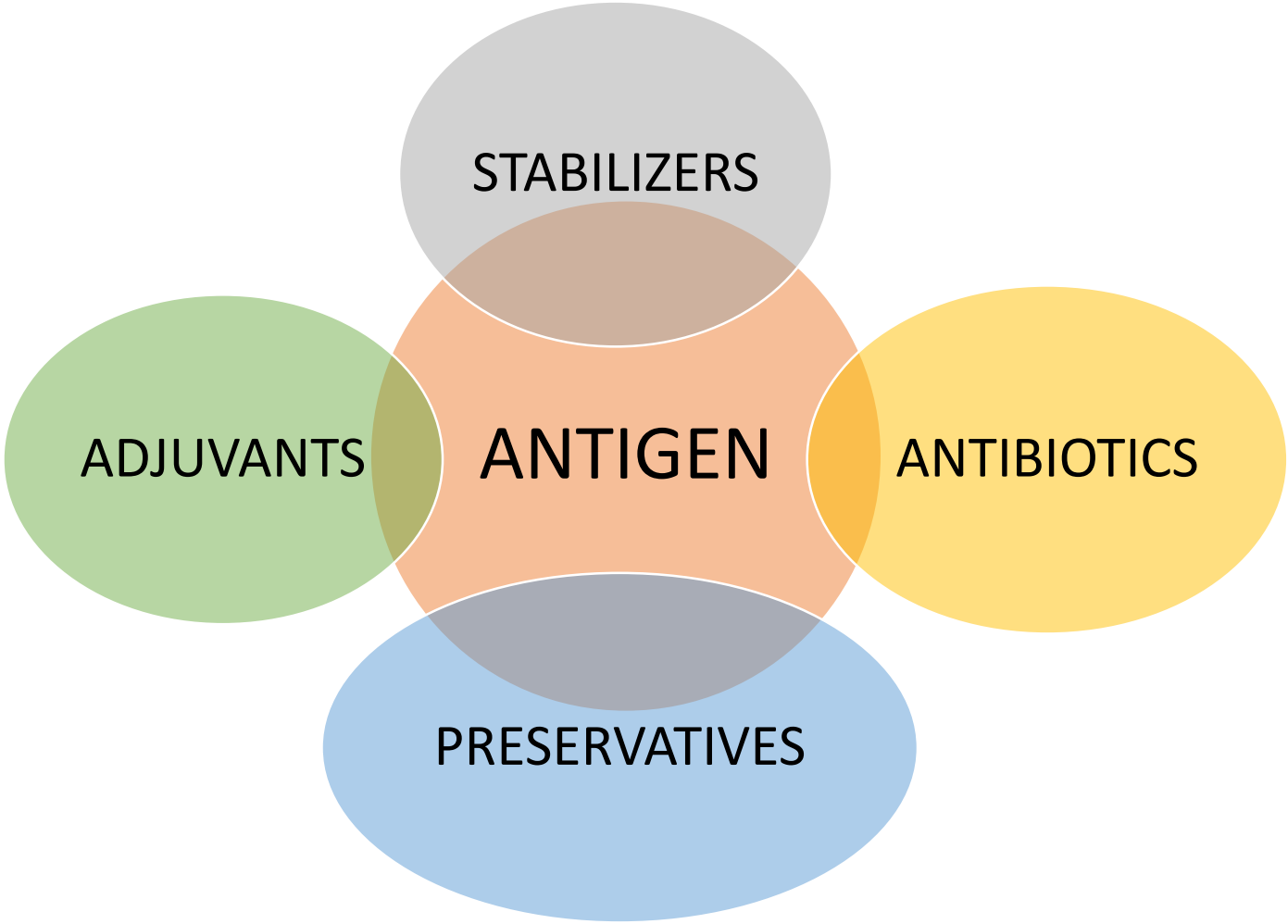




COMPOSITION OF VACCINES



VACCINE INGREDIENTS



ADJUVANTS

- added to some vaccines to enhance the immune response,
- people with compromised immune systems, the elderly, and the very young particularly benefit from vaccines with adjuvants,
- allow to use less antigen which, in some cases, may be in short supply or costly,
- reducing or eliminating the need for booster vaccinations
- ALUMINUM-CONTAINING ADJUVANTS

- others: AS04, MF59, AS01B, …

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 drus) are not used in vaccine production!

STABILIZERS

- help protect the vaccine from adverse conditions (e.g. temperature).
- sugars such as sucrose and lactose, amino acids such as glycine or the monosodium salt of glutamic acid and proteins such as human serum albumin or gelatin.

ANTIGEN

- any substance inducing a desired immune response in a vaccinated person,
- protective immune response is directed against individual epitopes of the antigen,
- complex (live vaccines) or with one (HepB) or more components (acellular pertusis vaccine),
- alone (≥ 5 kdal) or conjugated (e.g. with toxoid)

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

CLASSIFICATION OF VACCINES

TYPES X KINDS

TYPES OF VACCINES

- Live-attenuated vaccines
- Inactivated vaccines
- Subunit, recombinant, polysaccharide, and conjugate vaccines
- 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
- 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 hepatitis A, TBE, polio - Salk, typhoid fever,…
- + chimeric vaccines/chimeric viruses
- 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
- against Hib, pneumococcal and meningococcal infections.

SUBUNIT VACCINES II

TOXOID VACCINES

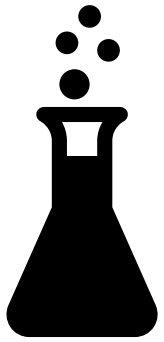
- chemically inactivated toxins (toxoids),
- elicit immune responses against disease-causing proteins, or toxins, secreted by the bacteria,
- against bacterial illnesses, such as diphtheria and tetanus.

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

SUBUNIT VACCINES – NEW CHALLENGES

- nanoparticle-based vaccine (universal flu vaccine in trial)
- developing of vaccines that could offer broad protection against various diseases - vaccine to prevent mosquito-borne diseases – by recombinant proteins from mosquito salivary glands….



NUCLEIC ACID VACCINES

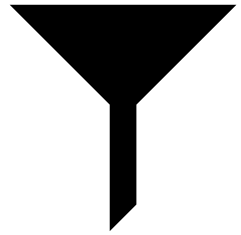
- use introduction of genetic materials encoding one or more antigens of pathogen into the body cells, they then produce the antigen

  → 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 COMBINE – 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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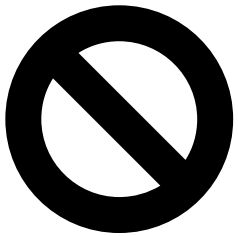
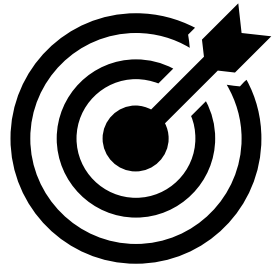
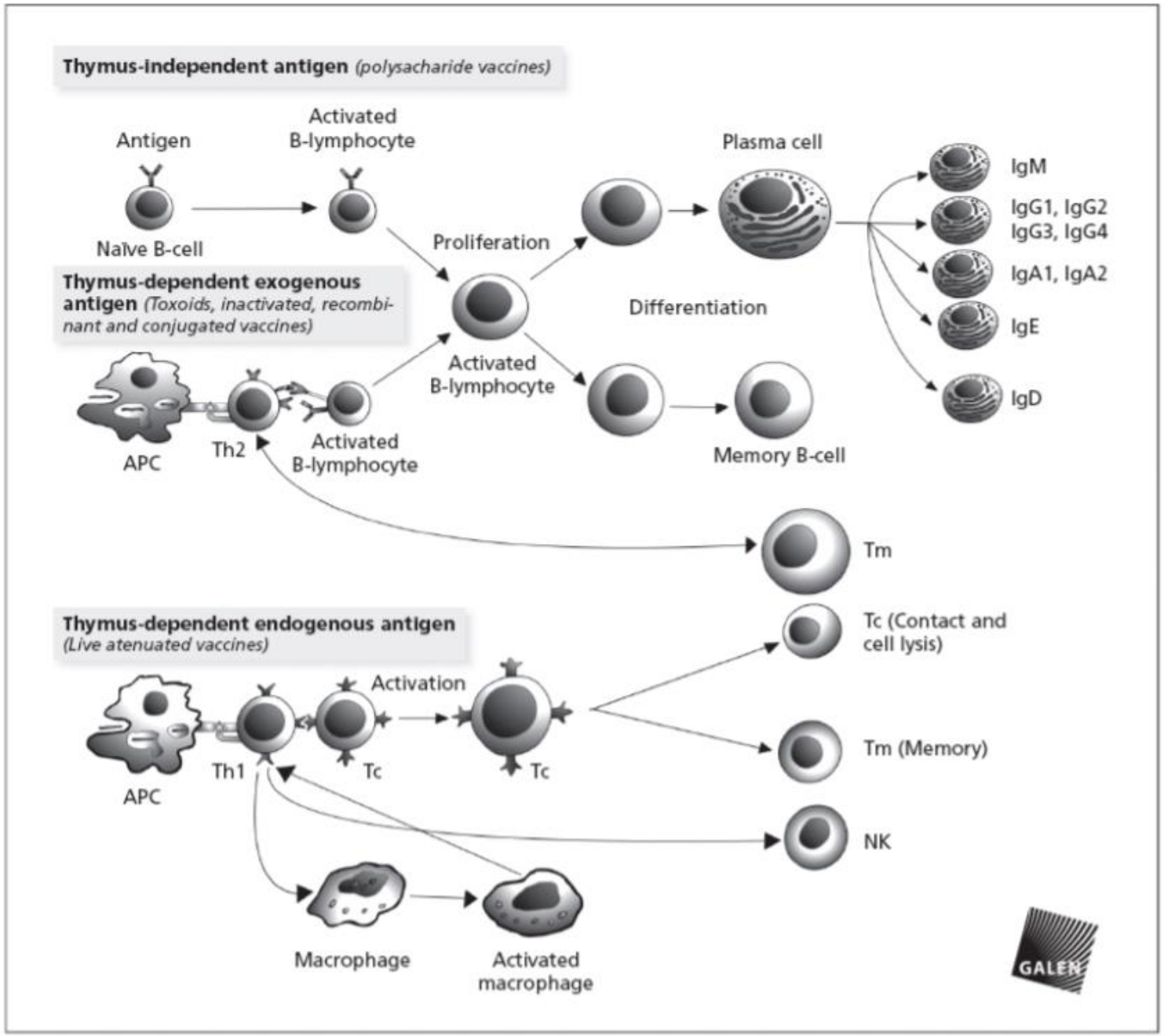




IMMUNE RESPONSE TO VACCINATION

3 ways of interaction between vaccine antigens and immune system

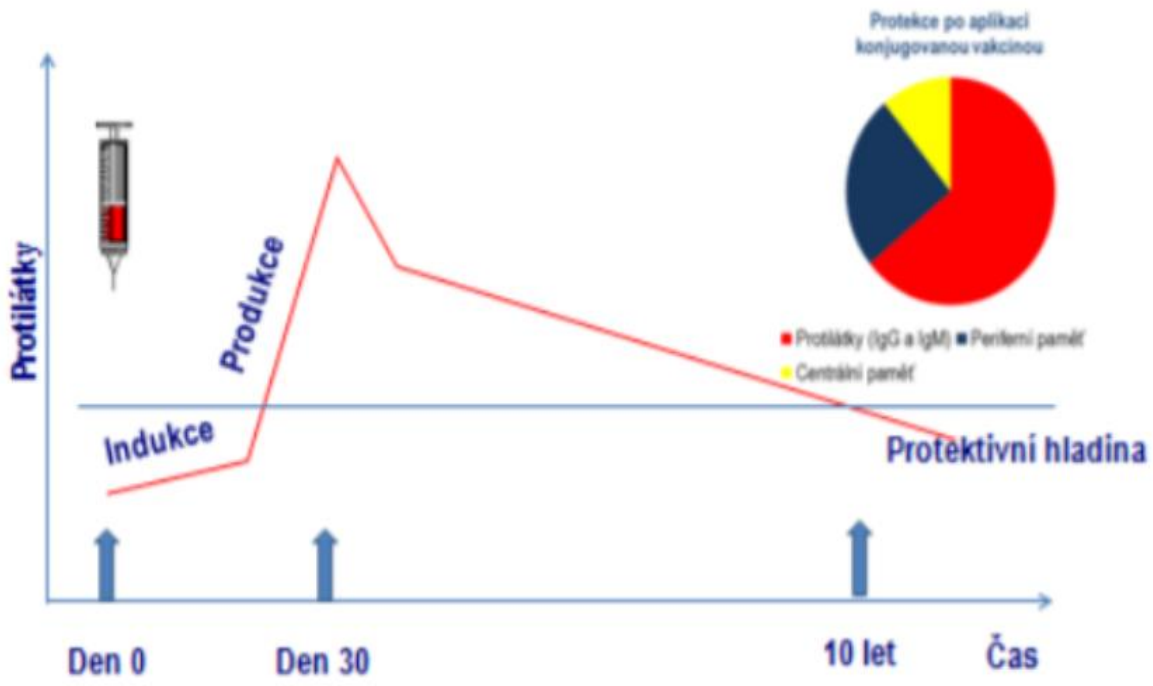


Source: J. Beran :Physiology of immune response to vaccination. Available at: https://www.vakcinace.eu/prednasky-stud .

COMPARISON OF IMMUNE RESPONSE

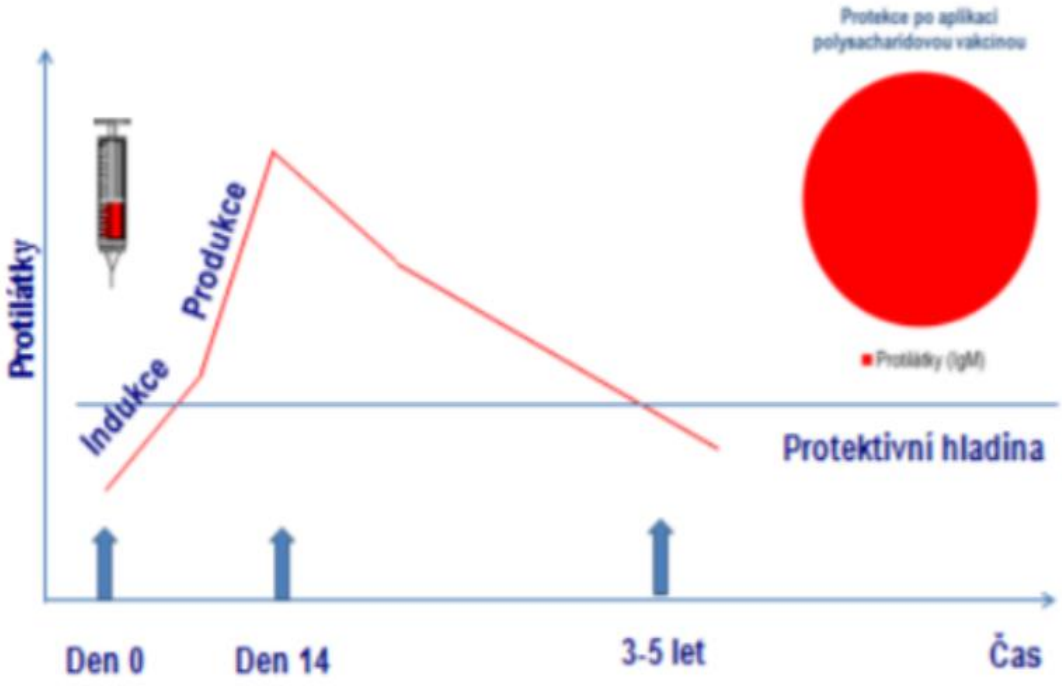
CONJUGATED VACCINES:

Ig G, immunologic memory



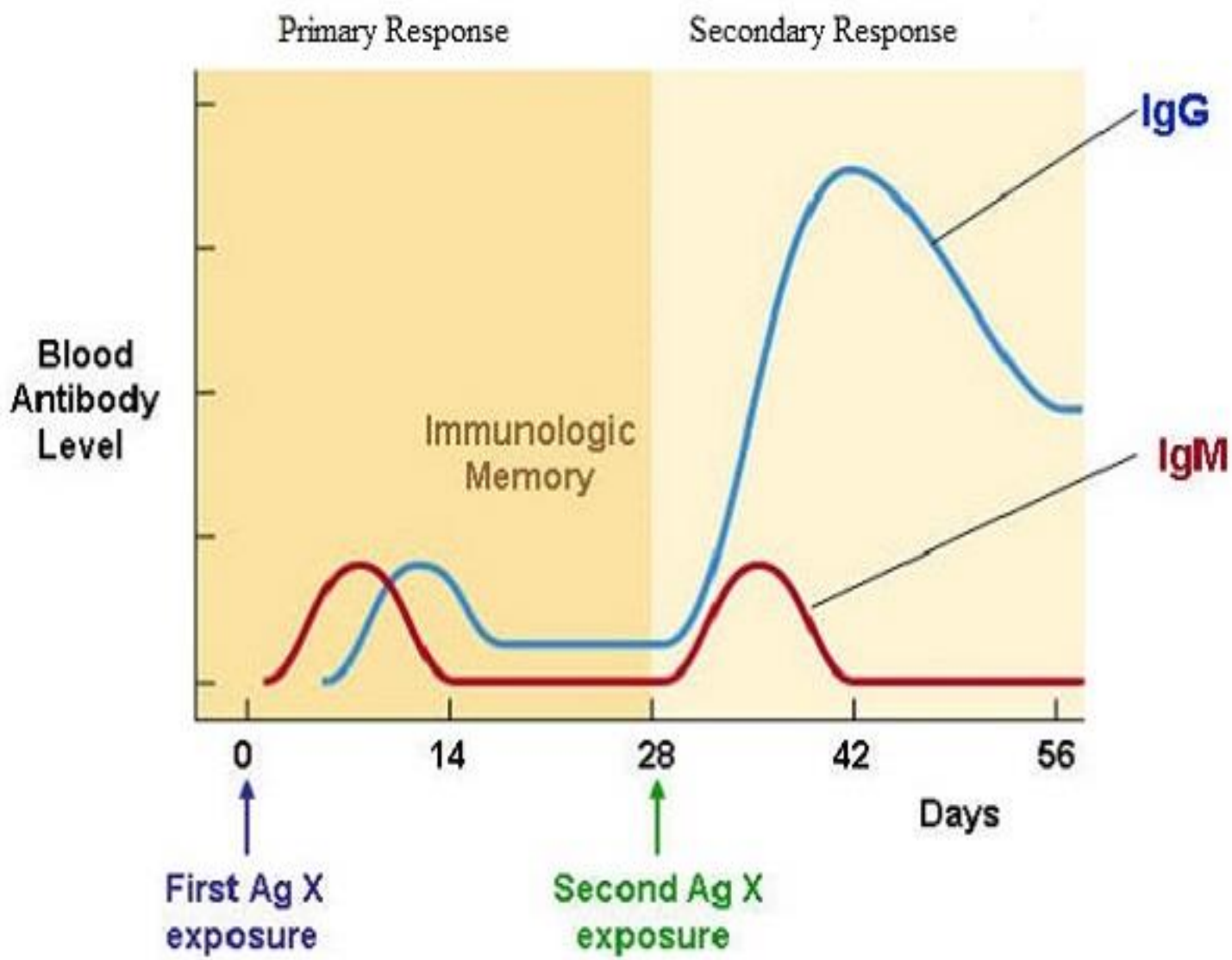
POLYSACCHARID VACCINES

Ig M, no immunologic memory



	Primary immune response	Secondary immune response
1.	This occurs as a result of primary contact with an antigen.	This occurs as a result of second and subsequent exposure of the same antigen
2	Responding cell is naïve B-cell and T-cell.	Responding cell is memory cell.
3	Lag phase is often longer (4-7 days), sometimes as long as weeks or months.	Lag phase is shorter (1-4 days) due to the presence of memory cell.
4	Level of antibody reaches peak in 7 to 10 days.	Level of antibody reaches peak in 3 to 5 days.
5	It takes longer time to establish immunity.	Takes shorter time to establish immunity.
6	First antibody produced is mainly IgM. Although small amount of IgG are also produced.	Mainly IgG antibody is produced. Although sometimes small amount of IgM are produced. Other immunoglobulins such as IgA and in the case of allergy IgE are produced.

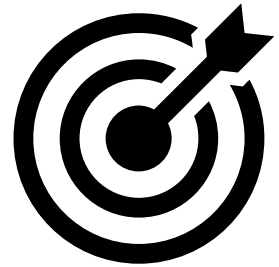
	Primary immune response	Secondary immune response
7	Amount of antibody produced depends on nature of antigen. Usually produced in low amount.	Usually 100-1000 times more antibodies are produced.
8	Antibody level declines rapidly.	Antibody level remain high for longer period.
9.	Affinity of antibody is lower for its antigen.	Antibodies have greater affinity for antigen.
10	Primary response appears mainly in the lymph nodes and spleen.	Secondary response appears mainly in the bone marrow, followed by the spleen and lymph nodes.
11	Both Thymus dependent and Thymus independent antigen gives primary immune response.	Only Thymus-dependent antigen gives secondary immune response.


Primary Response
Secondary Response
IgG
IgM
Blood Antibody Level
Immunologic Memory
0
14
28
42
56
Days
First Ag X exposure
Second Ag X exposure

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:**

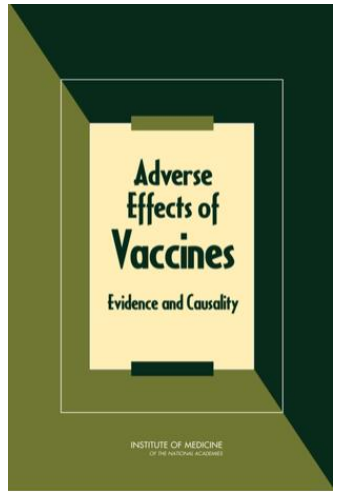
1. Physiological side effects
2. Severe side effects (physiological or neurological)
3. Allergic side effects

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

Assessment - each side effect that causes:

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

NEUROLOGICAL SIDE EFFECTS

- non-stop crying for 3 hours or more
- febrile seizures
- Guillain-Barré Syndrome
- encephalitis
- encephalomyelitis

ANAPHYLACTIC REACTION

- usually occur within minutes of parenteral administration,
- most common signs and symptoms are cutaneous (e.g. sudden onset of generalized 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 in anaphylaxis is epinephrine,
- providers should have a plan in place to contact emergency medical services immediately in the event of a severe acute vaccine reaction.

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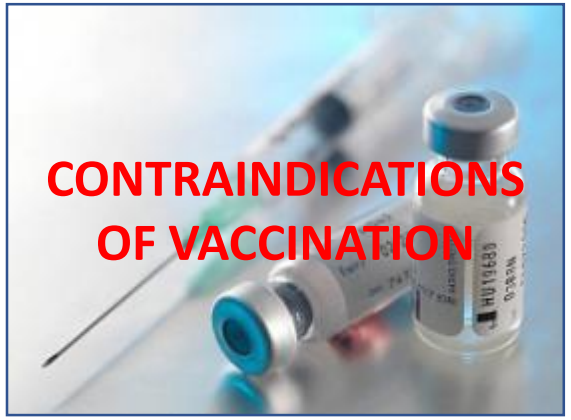
IMPORTANCE OF VACCINATION

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

- 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
- PREGNANT WOMAN

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 precaution at various vaccines.

Conditions that are not contraindications to vaccination with DTaP, DT, Td, and Tdap (CDC)

Vaccine	Conditions commonly misperceived as contraindications (i.e., vaccine may be administered under these conditions)
General for DTaP, DT, Td, Tdap	Mild acute illness with or without fever Mild-to-moderate local reaction (i.e., swelling, redness, soreness); low-grade or moderate fever after previous dose Lack of previous physical examination in well-appearing person Current antimicrobial therapy Convalescent phase of illness Preterm birth Recent exposure to an infectious disease History of penicillin allergy, other nonvaccine allergies, relatives with allergies, or receiving allergen extract immunotherapy
DTaP	Fever of <105°F (<40.5°C), fussiness or mild drowsiness after a previous dose of DTP/DTaP Family history of seizures Family history of sudden infant death syndrome Family history of an adverse event after DTP or DTaP administration Stable neurologic conditions (e.g., cerebral palsy, well-controlled seizures, or developmental delay) History of collapse or shock-like state (i.e., hypotonic hyporesponsive episode) within 48 hours after receiving a previous dose of DTP/DTaP History of seizure with or without fever within 3 days after receiving a previous dose of DTP/DTaP History of persistent, inconsolable crying lasting >3 hours within 48 hours after receiving a previous dose of DTP/DTaP
Tdap	Fever of ≥105°F (≥40.5°C) for <48 hours after vaccination with a previous dose of DTP or DTaP History of collapse or shock-like state (i.e., hypotonic hyporesponsive episode) within 48 hours after receiving a previous dose of DTP/DTaP History of seizure with or without fever within 3 days after receiving a previous dose of DTP/DTaP History of persistent, inconsolable crying lasting >3 hours within 48 hours after receiving a previous dose of DTP/DTaP History of extensive limb swelling after DTP/DTaP/Td that is not an Arthus-type reaction Stable neurologic disorder History of brachial neuritis Breastfeeding Immunosuppression

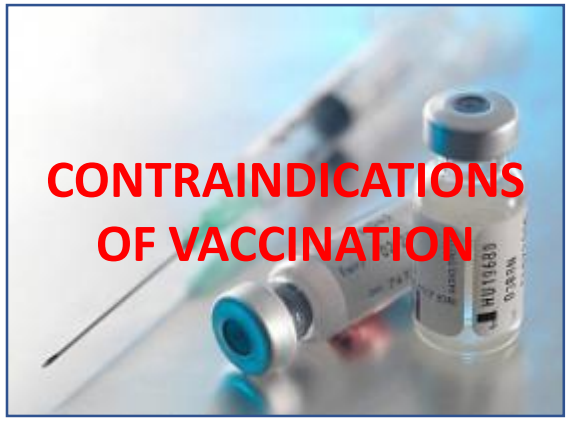
Abbreviations: DT = diphtheria and tetanus toxoids vaccine; DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; DTP = diphtheria toxoid, tetanus toxoid and whole-cell pertussis vaccine; Td = tetanus and diphtheria toxoids vaccine; Tdap = tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine.
Source: Adapted from CDC. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep-2011;60(No. RR-2).

I. INTRODUCTION TO VACCINOLOGY

IMPORTANCE OF VACCINATION

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)s

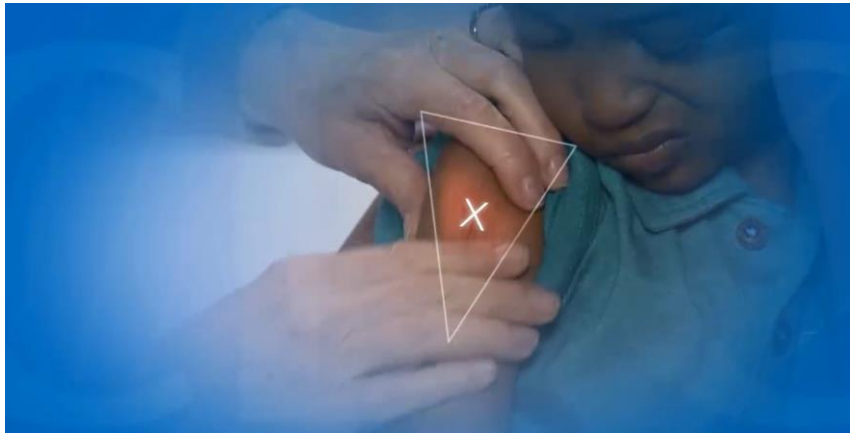
ROUTS OF ADMINISTRATION OF THE VACCINE(S)

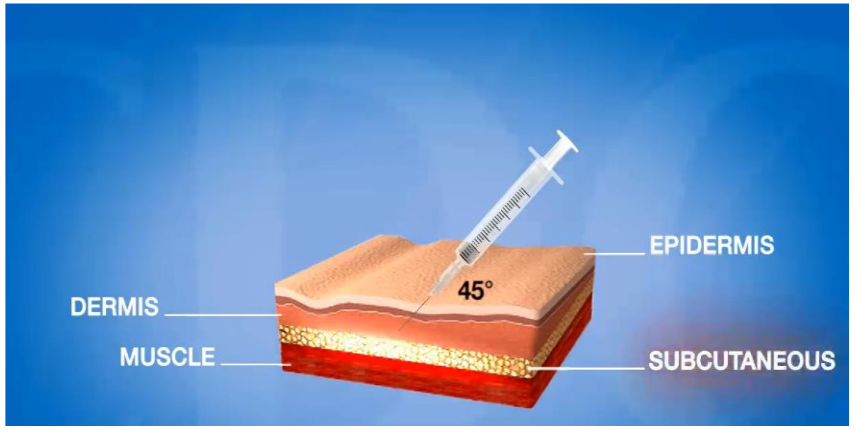
- Each vaccine has a recommended administration route and site.
- Health care personnel should always perform hand hygiene before administering vaccines by any route.

1. Oral route: administered by mouth
2. Subcutaneous route: injected into the area just beneath the skin into the fatty, connective tissue
3. Intramuscular route: injected into muscle tissue
4. Intradermal route: injected into layers of the skin
5. Intranasal route: administered into the nose

https://www.cdc.gov/vaccines/videos/low-res/Intramuscular/SC_Admin_LowRes.mp4

https://www.cdc.gov/vaccines/videos/low-res/Intramuscular/IM_Sites_All_Ages_LowRes.mp4





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

Evidence-based strategies to reduce procedural pain:

- Breastfeeding
- Giving sweet-tasting liquids (orally)
- Injecting vaccines rapidly without aspiration
- Injecting the most painful vaccine last
- Using tactile stimulation (rubbing/stroking near the injection site before and during injection)
- Distracting the patient (done by either the parent or clinician)
- Having the patient seated rather than lying down
- Using topical anesthetics

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

INTERVAL BETWEEN ADMINISTRATIONS OF DIFFERENT TYPES OF VACCINES

(IF NOT ON SAME DAY)

- Two or more injectable or nasally administered live vaccines not administered on the same day should be separated by at least 4 weeks, to minimize the potential risk for interference.
- If 2 such vaccines are separated by <4 weeks, the second vaccine administered should not be counted and the dose should be repeated at least 4 weeks later.
- On the day a live injectable or intranasal vaccine will be administered, providers should ensure that no live injectable or intranasal vaccine was given in the previous 28 days.

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

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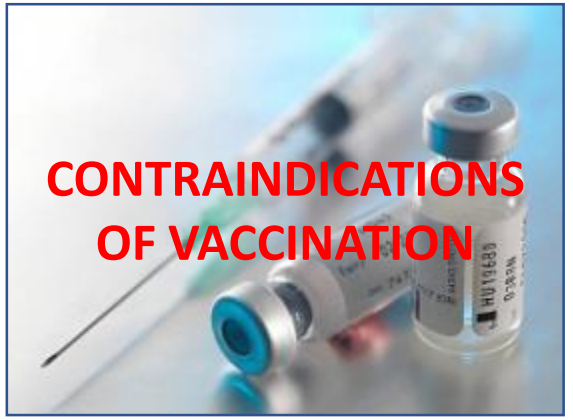


IMMUNIZATION PROGRAMS

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/

- https://ec.europa.eu/health/vaccination/ev_20190912_cs#f
- https://ec.europa.eu/health/sites/health/files/vaccination/videos/ev_20190912_vid03_en.mp4

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

II. SPECIAL VACCINOLOGY

MENINGOCOCCAL, PNEUMOCOCCAL DISEASES

POLIOMYELITIS
ROTAVIROSIS

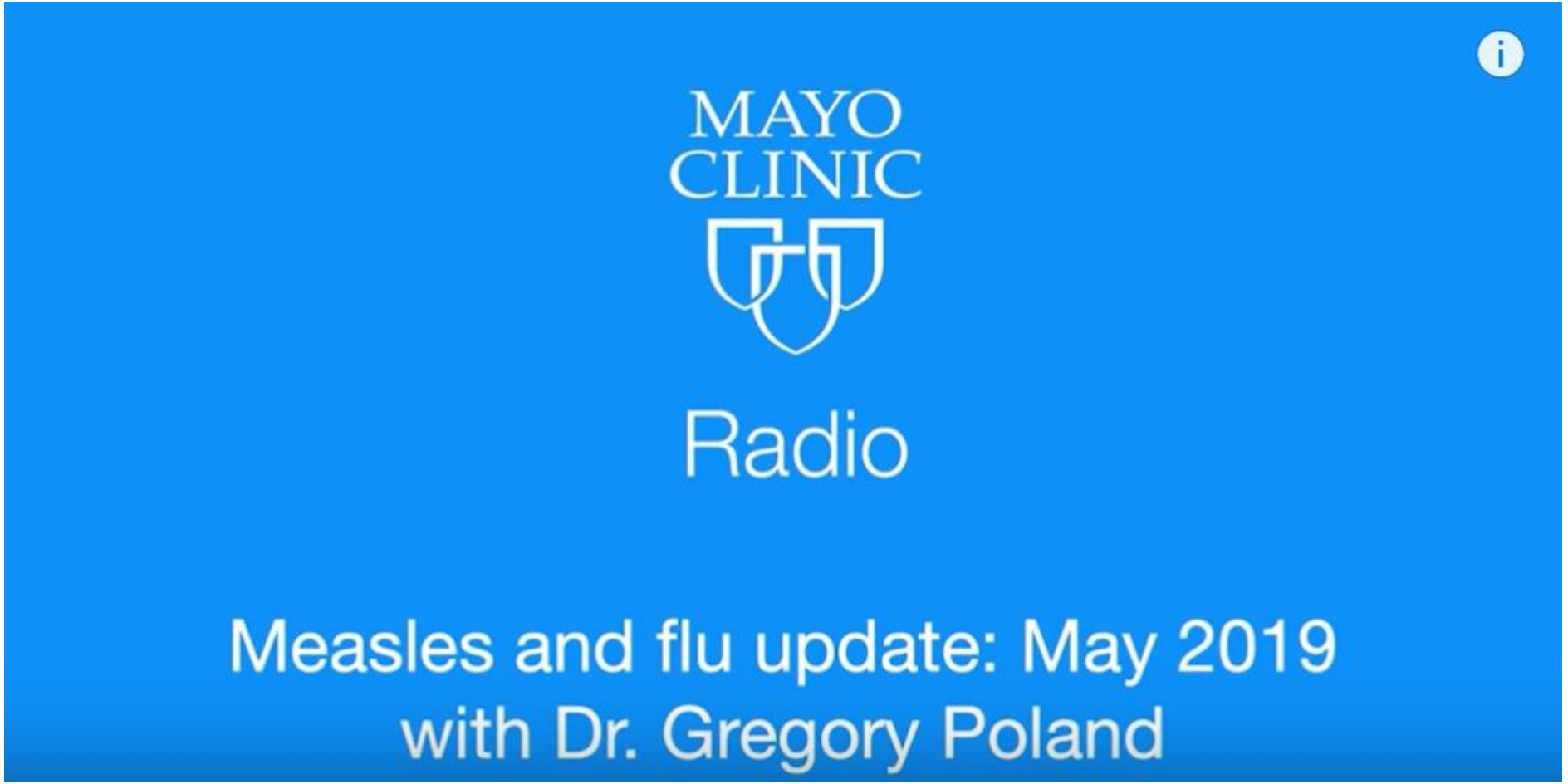
MEASLES
MUMPS
RUBELLA
CHICKEN-POX

TUBERCULOSIS
INFLUENZA

TETANUS
DIPHTERIA
PERTUSSIS

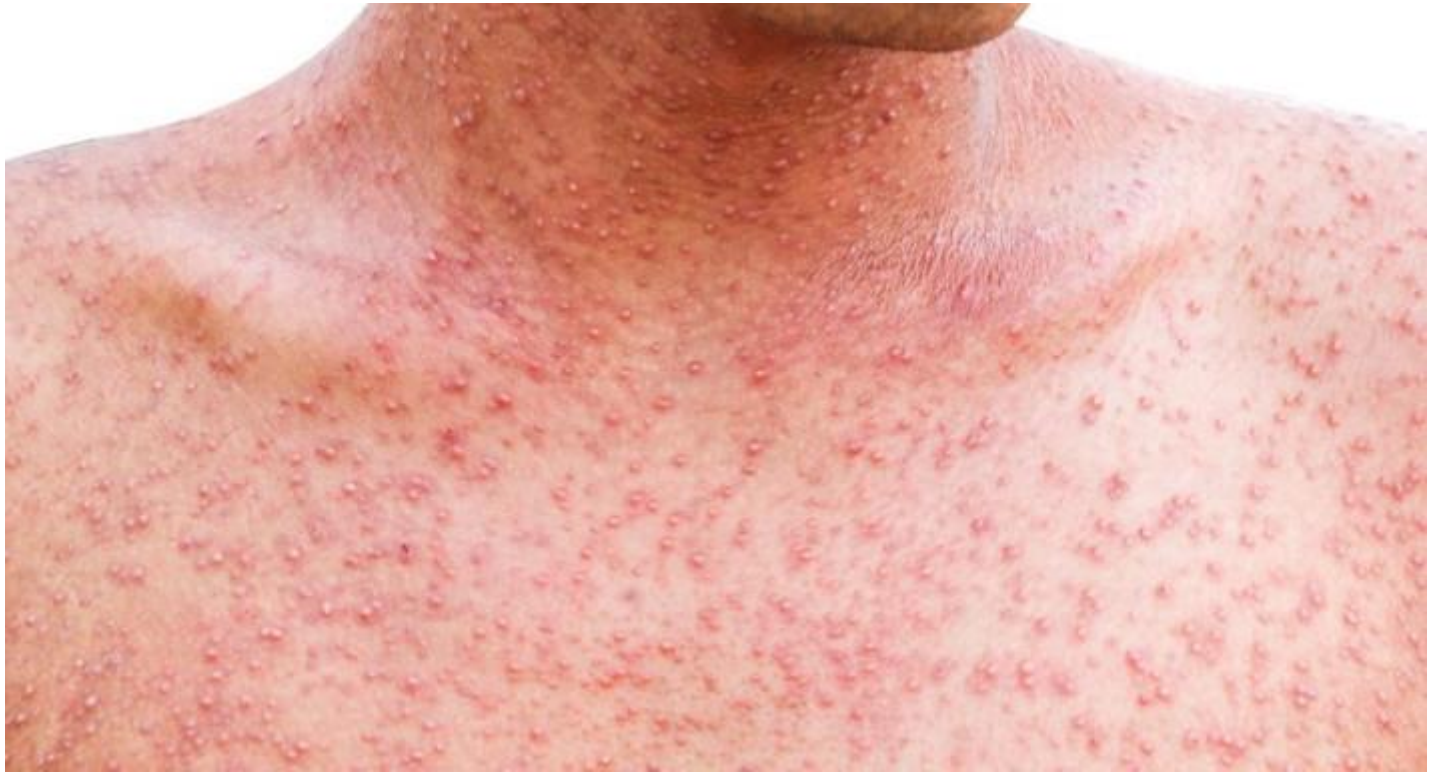
VACCINATION FOR TRAVELLERS

https://youtu.be/V9DinPkjbgo



MEASLES I.

https://www.youtube.com/watch?time_continue=33&v=sGKL4NPzdJY



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.
- The virus is transmitted from person to person via respiratory droplets produced when sick people cough and sneeze. Virus-containing droplets can remain in the air for several hours and the virus remains infectious on contaminated surfaces for up to two hours.
- Infected people are considered contagious from about five days before the onset of rash to four days afterwards. Measles is maximally contagious during the prodromal phase which lasts for 2–4 days and is characterised by intense coughing.

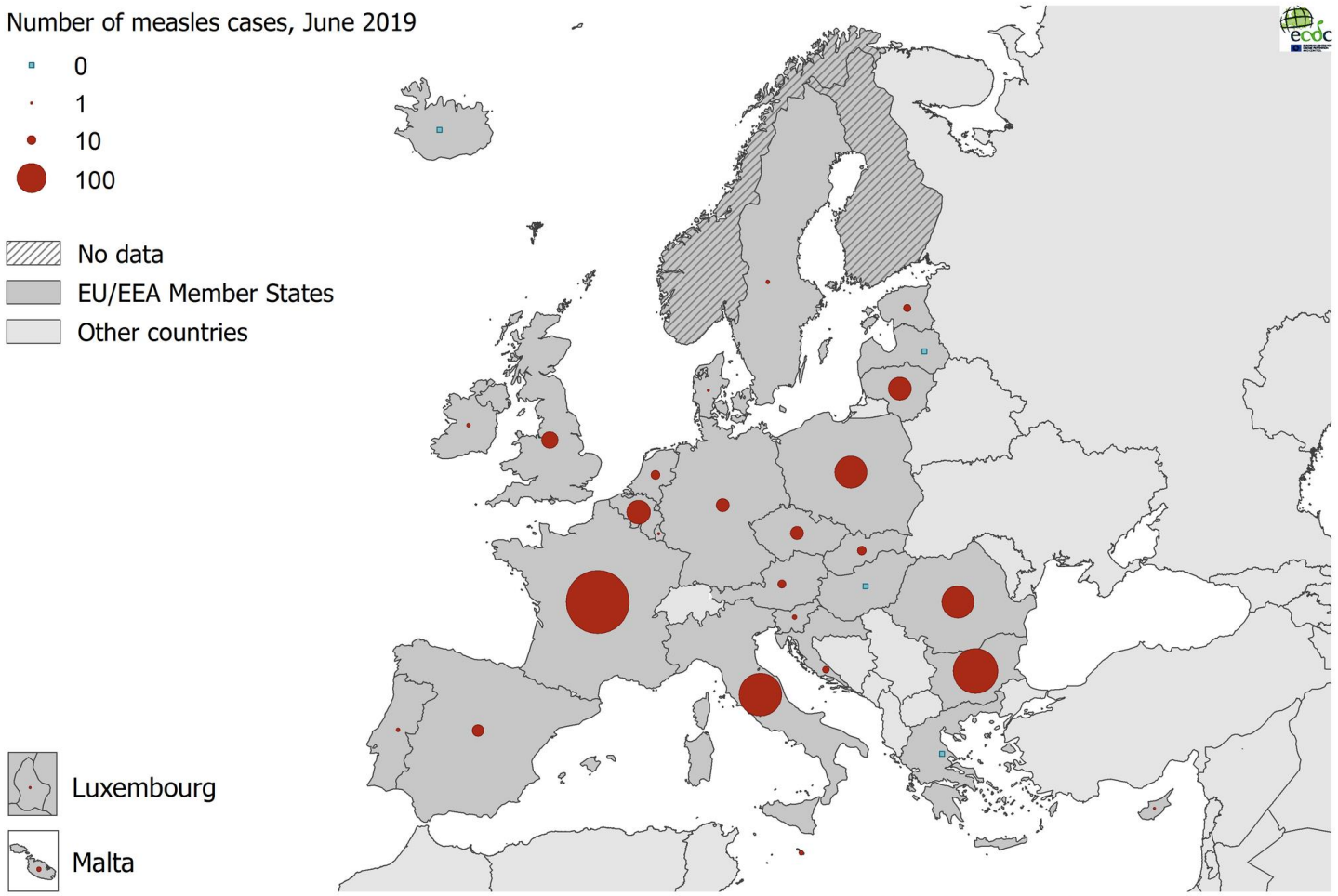
MEASLLES II.

- The prodrome starts after a 10–12-day incubation period and is characterised by fever, conjunctivitis, coryza, cough and bronchiolitis. Nearly all infected susceptible individuals develop clinical disease.
- 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.
- The rash, which blanches on pressure early in the course, fades in the order of appearance during the next 3–4 days and assumes a nonblanching appearance.

MEASLES III.

- Mortality from measles is predominantly caused by complicating bacterial infections.
- Complications are likely to have developed if the fever does not drop within 1 or 2 days after the onset of the rash.
- The most common complications of measles are: otitis media (7–9%), pneumonia (1–6%), diarrhoea (8%), post-infectious encephalitis (1 per 1000 to 2000 cases), and subacute sclerosing panencephalitis (SSPE), which affects 1 per 100 000 cases.
- Case fatality is 1–3 per 1000 cases and highest in those younger than five years of age and among

MEASLES IN EUROPE



MEASLES – EPIDEMIOLOGICAL RISK

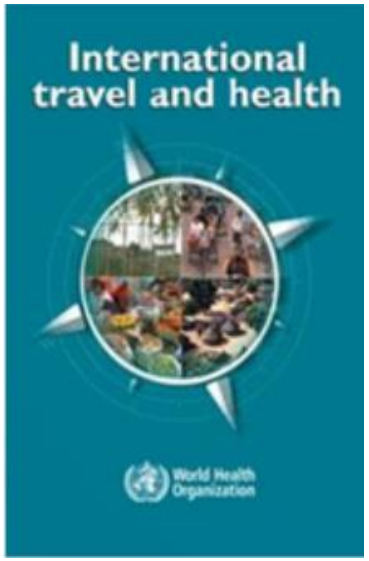
- Vaccination coverage is below 95% in most countries!
- Measles cases in Europe primarily occur in unvaccinated populations in both adults and children.
- Large outbreaks with fatalities are ongoing in countries that had previously eliminated or interrupted endemic transmission!

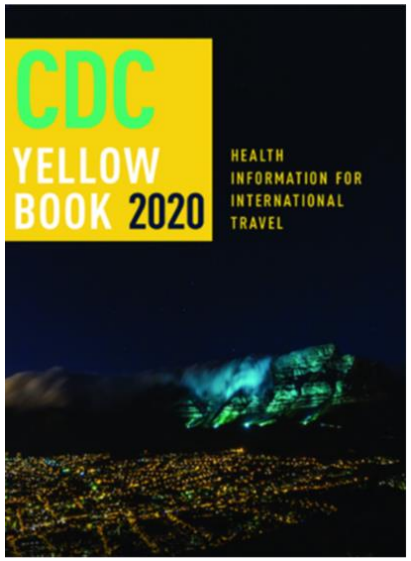
MEASLES – VACCINATION

- MMR is a combination measles, mumps, and rubella vaccine.
- MMRV (ProQuad)is a combination measles, mumps, rubella, and varicella vaccine.
- Both vaccines contain live, attenuated measles, mumps, and rubella virus. MMRV also contains live, attenuated varicella-zoster virus.
- CDC recommends two doses of measles-containing vaccine routinely for children, starting with 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

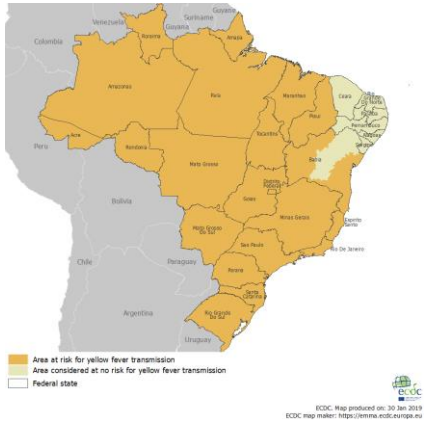
- Cholera
- Hepatitis A
- Hepatitis E
- Japanese encephalitis
- Meningococcal disease
- Rabies
- Tick-borne encephalitis
- Typhoid fever
- Yellow fever

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 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.
Published online 2018 October. doi: [10.2105/AJPH.2018.304567]
PMCID: PMC6137759
PMID: 30138075

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

David A. Broniatowski, PhD,[✉] Amelia M. Jamison, MAA, MPH, SiHua Qi,
Adrian Benton, MS, Sandra C. Quinn, PhD, and Mark Dredze, PhD

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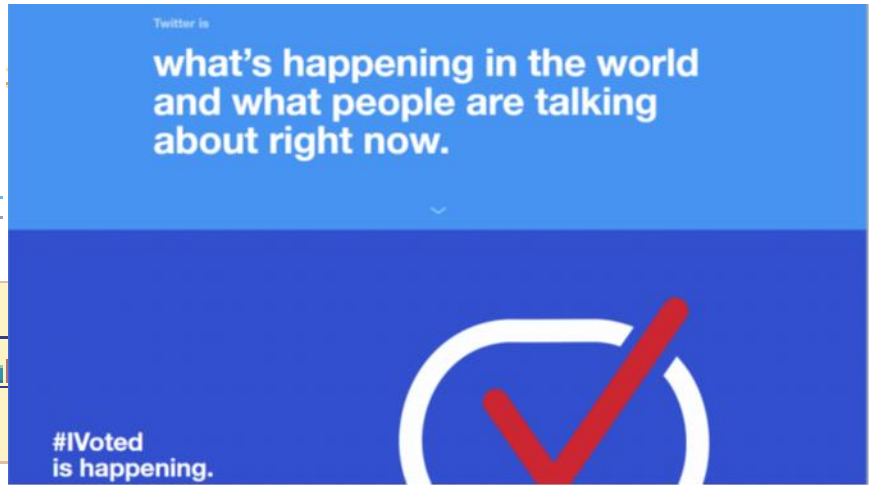


See "Health Communication Trolls and Bots Versus Public Health Agencies' Trusted
See "Population Health Science as the Basic Science of Public Health: A Public Heal
on page 1288.

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.

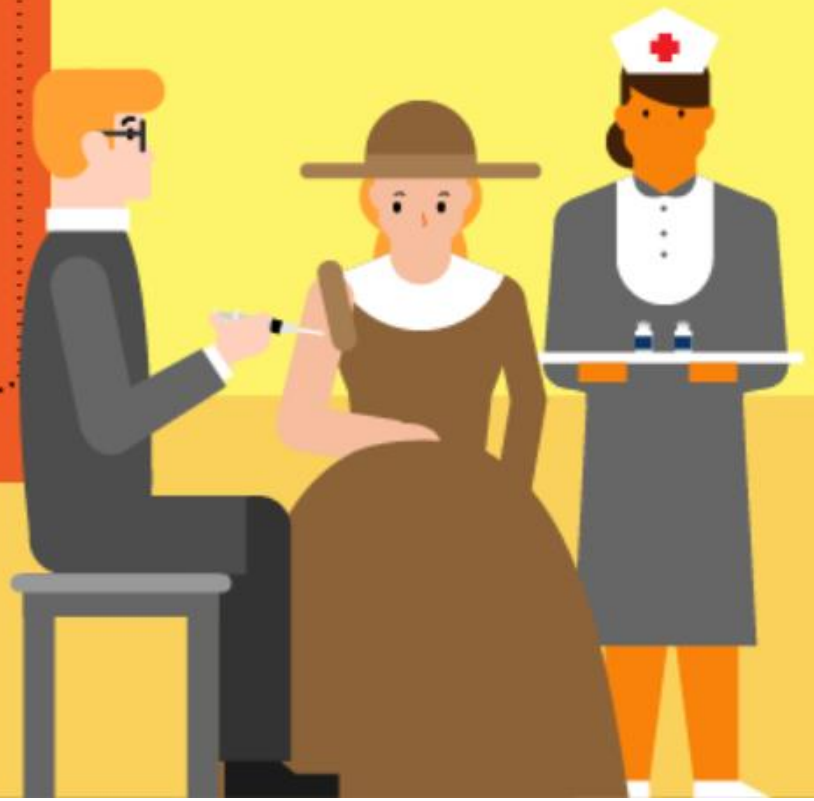
DTP VACCINE CONTROVERSY

1974

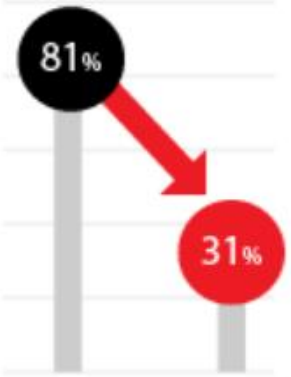
ENGLAND

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...

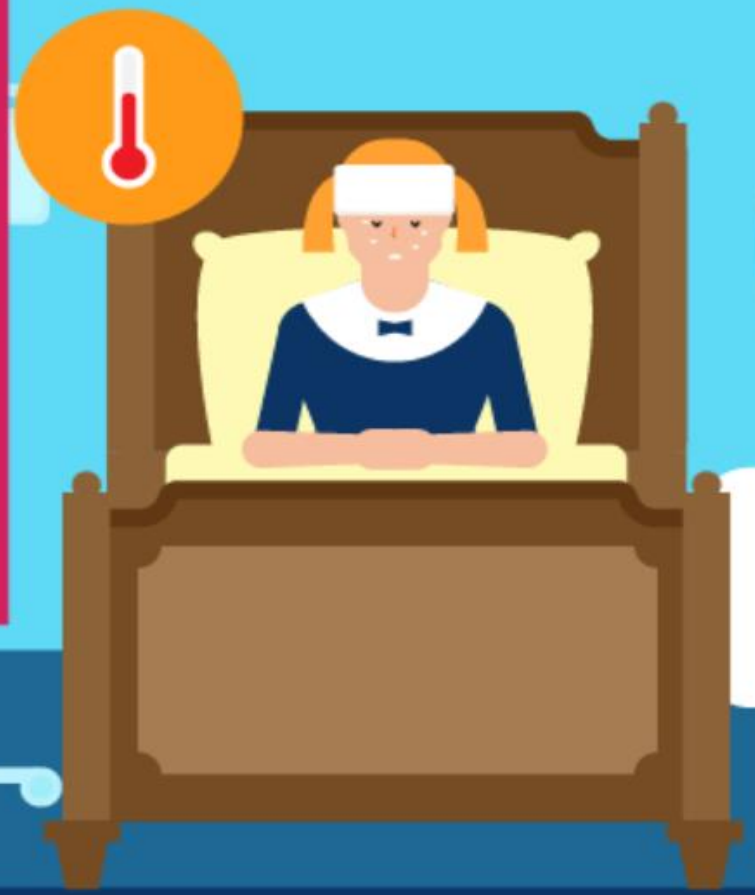


3 MAJOR PERTUSSIS EPIDEMICS

SWEDEN'S VACCINATION MORATORIUM

1979 to 1996

SWEDEN



Sweden suspended vaccination against whooping cough from 1979 to 1996.

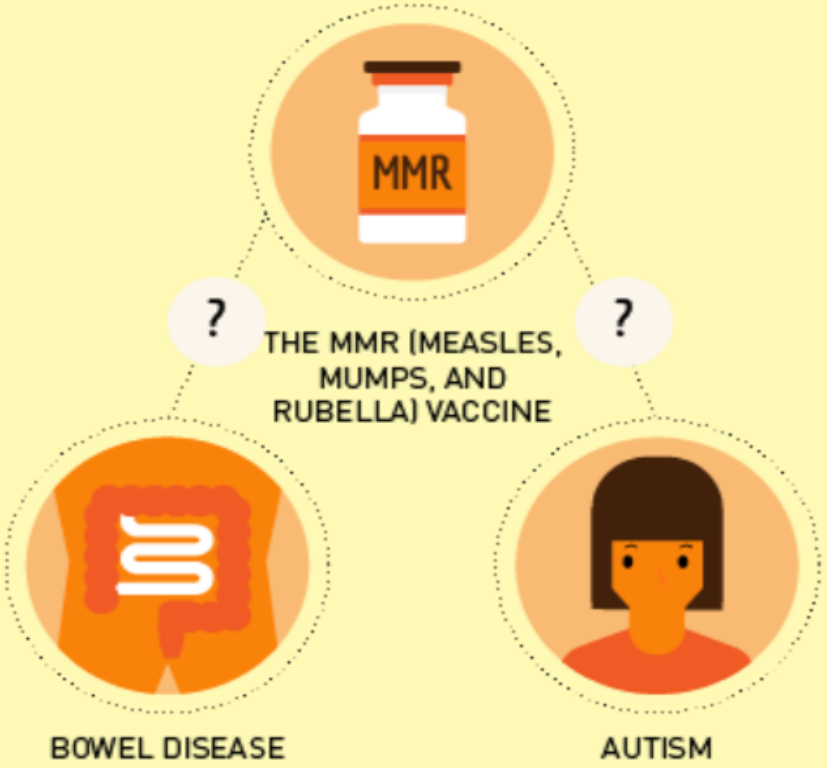
During that time, **60%** of all children in Sweden contracted the disease before the age of 10.

VACCINATION-AUTISM CONTROVERSY

1998

ENGLAND

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

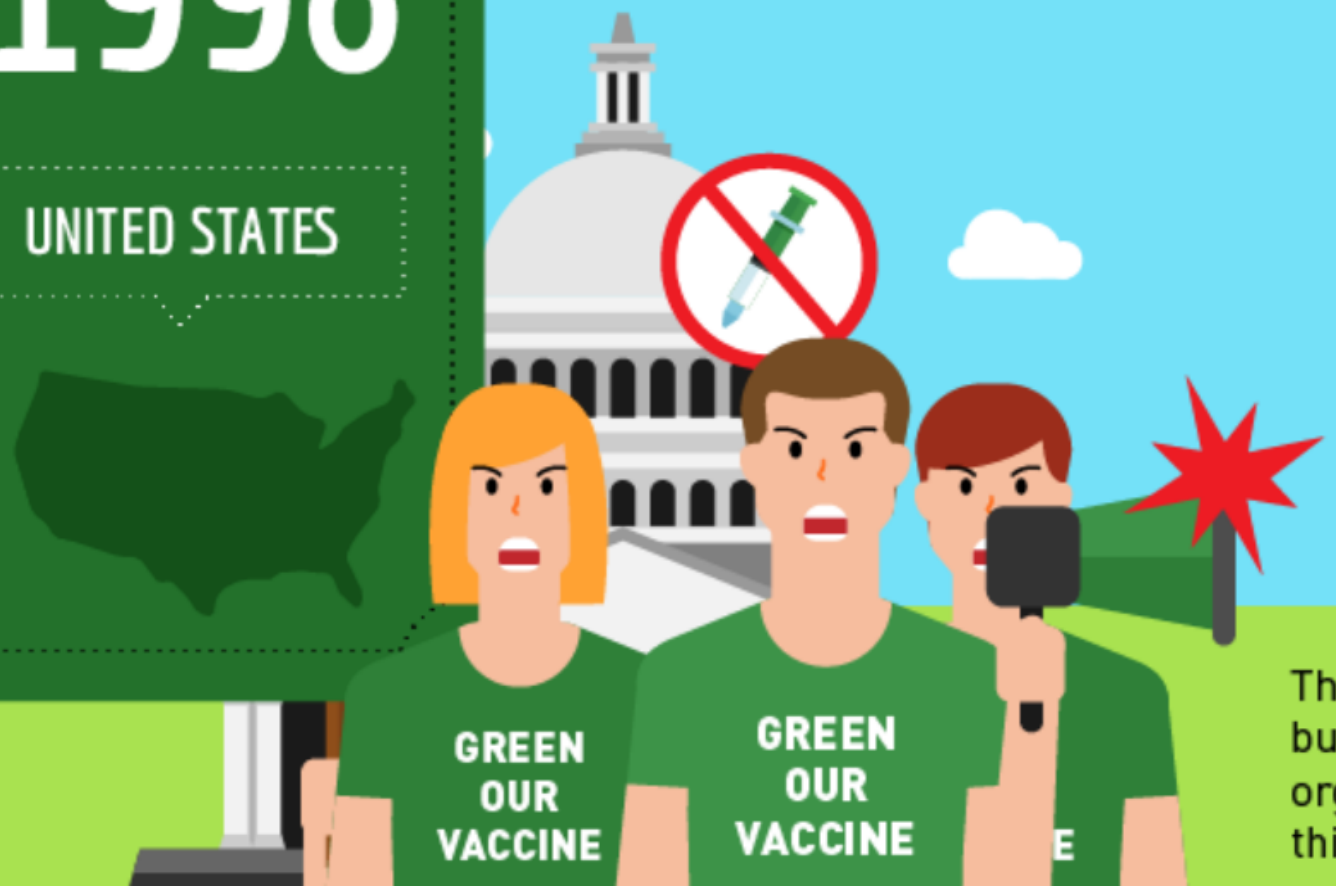


In 2011 the paper was found to be fraudulent, but it damaged the public's opinion of the MMR vaccine.

"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/