Vaccination in childhood

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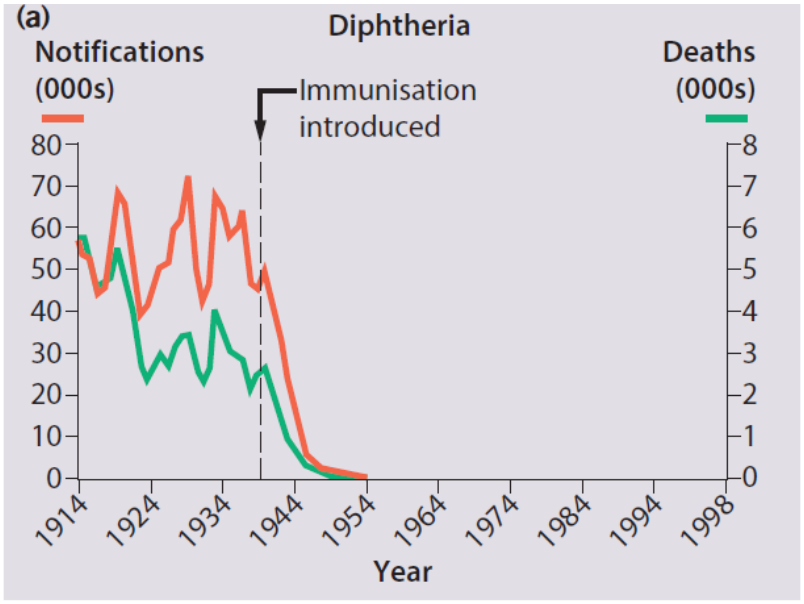
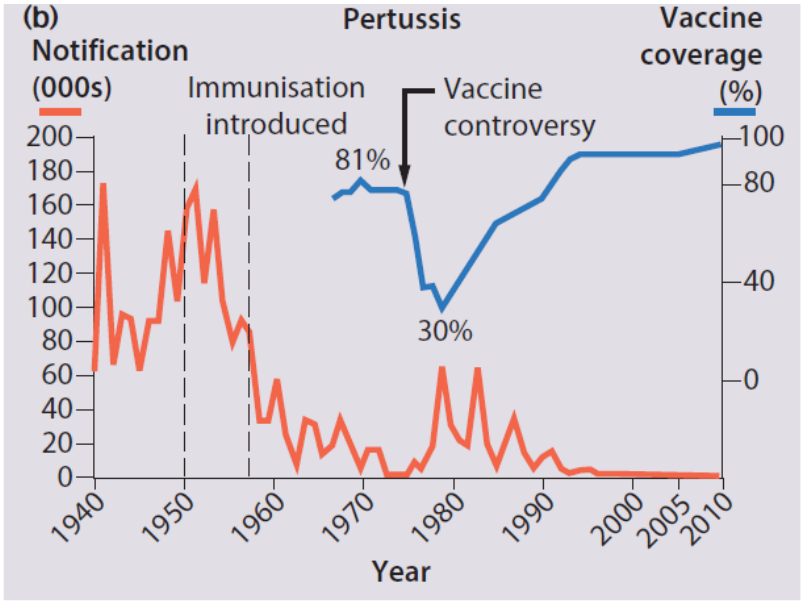
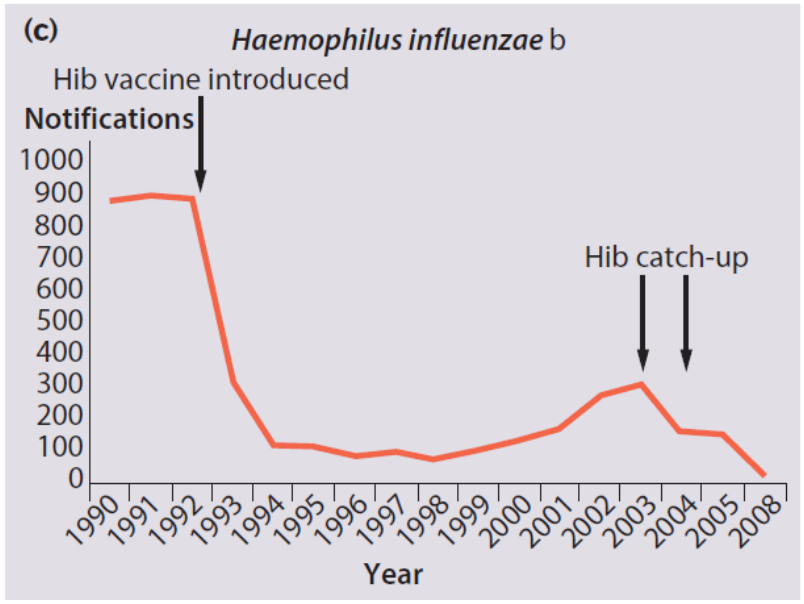
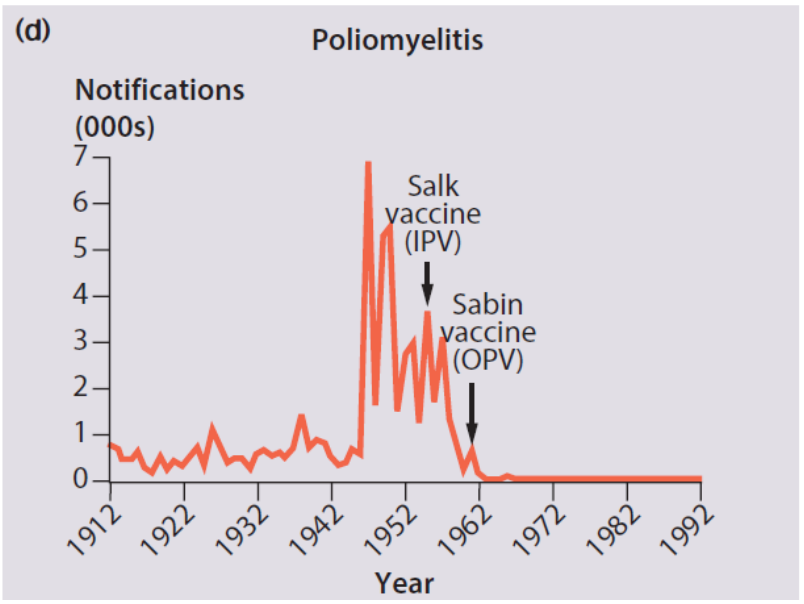
Vaccination

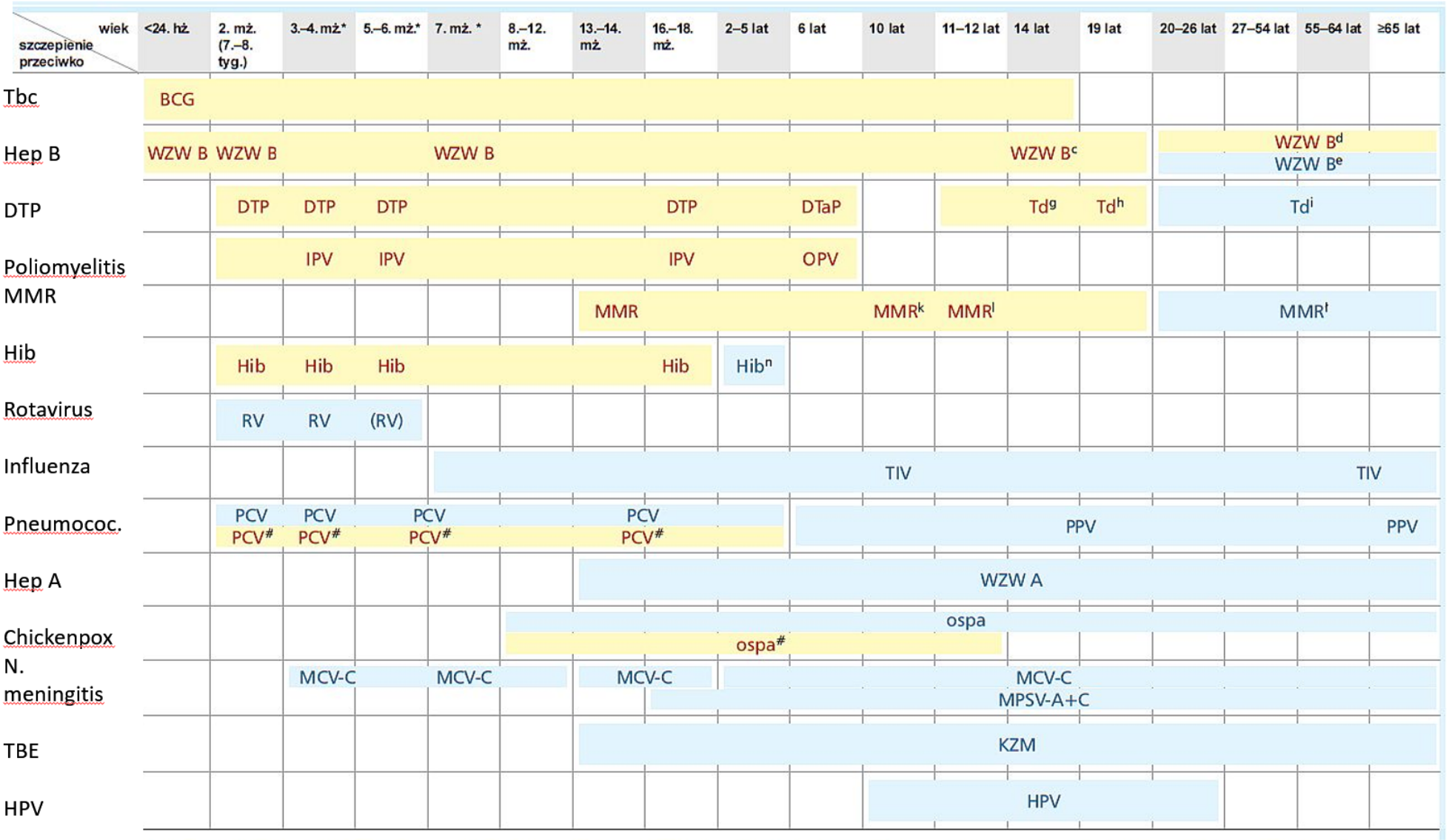
1. Vaccination - active immunization, synthetic, consisting of the insertion into the body biologicals containing antigens of pathogens which stimulate production of specific humoral or cellular immunity
2. Immunisation is one of the most effective and economic public health measures to improve the health of both children and adults.
3. The most notable success has been the worldwide eradication of smallpox achieved in 1979.
4. The prevalence of many other diseases has been dramatically reduced.
5. Differences exist in the composition and scheduling of immunisation programmes in different countries.


(a)
Diphtheria
Notifications (000s)
Deaths (000s)
Immunisation introduced
80
70
60
50
40
30
20
10
0
8
7
6
5
4
3
2
1
0
1914
1924
1934
1944
1954
1964
1974
1984
1994
1998
Year


(b)
Pertussis
Notification (000s)
Immunisation introduced
Vaccine controversy
Vaccine coverage (%)
81%
30%
200
180
160
140
120
100
80
60
40
20
0
100
80
40
0
1940
1950
1960
1970
1980
1990
2000
2005
2010
Year


(c)
Haemophilus influenzae b
Hib vaccine introduced
Notifications
Hib catch-up
1000
900
800
700
600
500
400
300
200
100
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2008
Year


(d)
Poliomyelitis
Notifications (000s)
Salk vaccine (IPV)
Sabin vaccine (OPV)
7
6
5
4
3
2
1
0
1912
1922
1932
1942
1952
1962
1972
1982
1992
Year


wiek
szczepienie przeciwko
<24. hż.
2. mż. (7.–8. tyg.)
3.–4. mż.*
5.–6. mż.*
7. mż. *
8.–12. mż.
13.–14. mż.
16.–18. mż.
2–5 lat
6 lat
10 lat
11–12 lat
14 lat
19 lat
20–26 lat
27–54 lat
55–64 lat
≥65 lat
Tbc
BCG
Hep B
WZW B
WZW B
WZW B
WZW B[c]
WZW B[d]
WZW B[e]
DTP
DTP
DTP
DTP
DTaP
Td[g]
Td[h]
Td[i]
Poliomyelitis
IPV
IPV
IPV
OPV
MMR
MMR
MMR[k]
MMR[l]
MMR[l]
Hib
Hib
Hib
Hib
Hib[n]
Rotavirus
RV
RV
(RV)
Influenza
TIV
TIV
Pneumococ.
PCV
PCV
PCV
PCV
PCV[#]
PCV[#]
PCV[#]
PCV[#]
PPV
PPV
Hep A
WZW A
Chickenpox
ospa
ospa[#]
N. meningitis
MCV-C
MCV-C
MCV-C
MCV-C
MPSV-A+C
TBE
KZM
HPV
HPV

Types of vaccines

Inactivated – include whole inactivated microorganisms of fragments or their metabolites-toxoids, which are significantly cleaned. In order to strengthen response immune often added aluminum hydroxide.

- Vaccine against hepatitis B
- Influenza vaccine
- DTP vaccine
- Vaccine against polio - IPV

Types of vaccines

Live, attenuated - including capable to reproduction microorganisms with reduced virulence or avirulent. They mimic natural infection and therefore they lead to longer lasting immunization.

- BCG

- Vaccine against measles , mumps, rubella

- Vaccine against smallpox

- Vaccine against rotavirus

- Vaccine against polio- OPV

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

Types of vaccined

- Viral
- Bacterial

- Obligatory
- Recommended
- Risk groups

Types of vaccines

Monovalent - contain antigens one type of micro-organism , immunize against a disease

Polivalent - contain several antigens / types or strains of a single species, immunize against a disease

Combined - contain antigens of combined microorganisms of different species immunize against several diseases

Contraindications

* A history of adverse reactions

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

* Primary and secondary immunological deficiency

* Acute infections with fever > 38 degrees Celsius

* steroids

It is not a contraindication

* Mild respiratory tract infection
* antibiotics
* Fever
* Local reactions to vaccination
* Non-progressive disease of CNS
* Cancer in remission, HIV

Side effects of vaccination

- Swelling and discomfort at the injection site
- Mild fever and malaise
- Measles and rubella vaccination- may be followed by a mild form of the disease 7–10 days later
- Anaphylaxis- may occur but are very rare
- Vaccination should be postponed if the child has an acute illness; however, a minor infection without fever or systemic upset is not a contraindication.
- Live vaccines should not be given to children with impaired immune responsiveness (except in children with HIV infection in whom MMR vaccine can be given)

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

General recommendations

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

Vaccination schedule- part 1

Age	Vaccination obligatory	Vaccination recommended
1 st 24 h	Hep B, BCG	
> 6 weeks - 2 mo	Hep B, DTP (DTPwc)/ DTPa, Hib	Pneumococcus, Rotavirus, Men C, Men B
3 / 4 mo	DTP/ DTPa, Hib, Polio- IPV	Pneumococcus, Rotavirus, Men C, Men B
5 / 6 mo	DTP/ DTPa, Hib, Polio- IPV	Pneumococcus, Men C, Men B
7 mo	Hep B	> 6 mo Influenza
13-14 mo	MMR	> 9 mo Varicella, > 12 mo Mec A, C, Y, W -135, Pneum., Men C, Men B
16- 18 mo	DTP/ DTPa, Hib, Polio- IPV	

Vaccination schedule – part 2

Age	Vaccination obligatory	Vaccination recommended
6 yr	DTPa, OPV-> IPV (from 01.04.16)	IPV, TBE
10 yr	MMR	HPV
14 yr	dTpa	
19 yr	dT	

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

- The recovery from naturally acquired diphtheria usually result in immunity to diphtheria

DTP (diphtheria , tetanus , pertussis)

T- tetanus - Inactivated toxin C. tetani with preserved antigenicity (toxoid)

- Adsorbed toxoid of Clostridium tetani

Post-exposure prophylaxis

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

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

Vaccination status	Clean, minor wounds	All other wounds
Unknown or less than 3 doses of tetanus toxoid containing vaccine	Tdap and recommend catch-up vaccination	Tdap and recommend catch-up vaccination Tetanus immunoglobulin
3 or more doses of tetanus toxoid containing vaccine AND less than 5 years since last dose	No indication	No indication
3 or more doses of tetanus toxoid containing vaccine AND 5–10 years since last dose	No indication	Tdap preferred (if not yet received) or Td
3 or more doses of tetanus toxoid containing vaccine AND more than 10 years since last dose	Tdap preferred (if not yet received) or Td	Tdap preferred (if not yet received) or Td

DTP (diphtheria , tetanus , pertussis)

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

- Contraindications: metabolic or inflammatory CNS disease - progressive

- It is not contraindication: epilepsy , seizures

Poliomyelitis

Acute anterior poliomyelitis vertebra

Contains live or killed virus types 3 : 1 , 2, 3

OPV (P.O .) - "Live " vaccine

IPV (s.c.). - " Killed " vaccine

Resistance after vaccination- about 10 years

After oral vaccination for 4-6 weeks - in feces live viruses are excreted

Haemophilus influenzae t. B vaccine

- Type of capsular bacteria
- Vaccine contains a polysaccharide capsule
- Very important vaccination for children up to 5 yr !!!

Rotavirus vaccine

- Rotarix is a monovalent, human, live attenuated rotavirus vaccine containing one rotavirus strain of G1P specificity.
- 2-dose series in infants and children till 24 week od age

Flu vaccination

Flu - an inactivated vaccine

containing 2 subtypes A and B virus

Include: whole virus- so-called split virus, or viral subunits- hemaglutynin and neuraminidase

Indication- clinical and epidemiological

Hepatitis B

- Vaccine contains surface antigens virus (HBsAg)
- 0, 1, 6 month

Hepatitis A

- An inactivated vaccine, immunogenic , well tolerated
- Two doses protect - for about 10 years

Vaccination against S.pneumoniae

Prevenar

- 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.

Pneumo 23

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

Vaccine against N. 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) and B- Bexsero

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

- Vaccine against chickenpox (Varilrix)

> 9 months of age

2 doses

TBE – Tick –bone encehalitis

- From 2 years of age

- 3 doses (0 , 1-3, 9-12) - Scheme shortened (0, 14 days 12m)

- Booster after 3-5 years

- Does not protect against Lyme disease !!!

HPV vaccination

In Poland there are two different vaccine against human papilloma viruses:

Cervarix against 2 types of HPV, cancer-causing viruses : HPV16 and HPV18

Silgard against 4 types of HPV , cancer-causing viruses HPV16 and HPV18 and HPV6 and HPV11 responsible for genital warts (warts).

Both vaccines require a 3 doses

Refferences and literature

Nelson textbook of Pediatrics, 19th Edition, Kliegman, Behrman, Schor, Stanton, St. Geme

Pediatria, Kawalec, Grenda, PZWL, Warszawa 2013

Illutrated textbook of Pediatrics, 4th Edition

http://www.szczepienia.czd.pl/zasady%20wykonywania%20szczepien.odstepy.php?submenu=6

http://www.vaccines.gov/more_info/types/

http://gis.gov.pl/images/ep/akt-1pso2016.pdf

Google.com

Slideshare.net