Principles of Vaccination

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The word “vaccine” comes from the Latin word *vaccinus*, which means “pertaining to cows.” What do cows have to do with vaccines? The first vaccine was based on the relatively mild cowpox virus, which infected cows as well as people. This vaccine protected people against the related, but much more dangerous, smallpox virus.

More than 200 years ago (in 1789), Edward Jenner, a country physician practicing in England, noticed that milkmaids rarely suffered from smallpox.

The milkmaids often did get cowpox, a related but far less serious disease, and those who did never became ill with smallpox.

In an experiment that laid the foundation for modern vaccines, Jenner took a few drops of fluid from a skin sore of a woman who had cowpox and injected the fluid into the arm of a healthy young boy who had never had cowpox or smallpox.

Six weeks later, Jenner injected the boy with fluid from a smallpox sore, but the boy remained free of smallpox.

Dr. Edward Jenner

Dr. Jenner had discovered one of the fundamental principles of immunization.

He had used a relatively harmless foreign substance to evoke an immune response that protected someone from an infectious disease.

His discovery would ease the suffering of people around the world and eventually lead to the elimination of smallpox, a disease that killed a million people, mostly children, each year in Europe.

By the beginning of the 20th century, vaccines were in use for diseases that had nothing to do with cows—rabies, diphtheria, typhoid fever, and plague—but the name stuck.

Remembering an Old Disease

Smallpox

Face lesions on boy with smallpox.

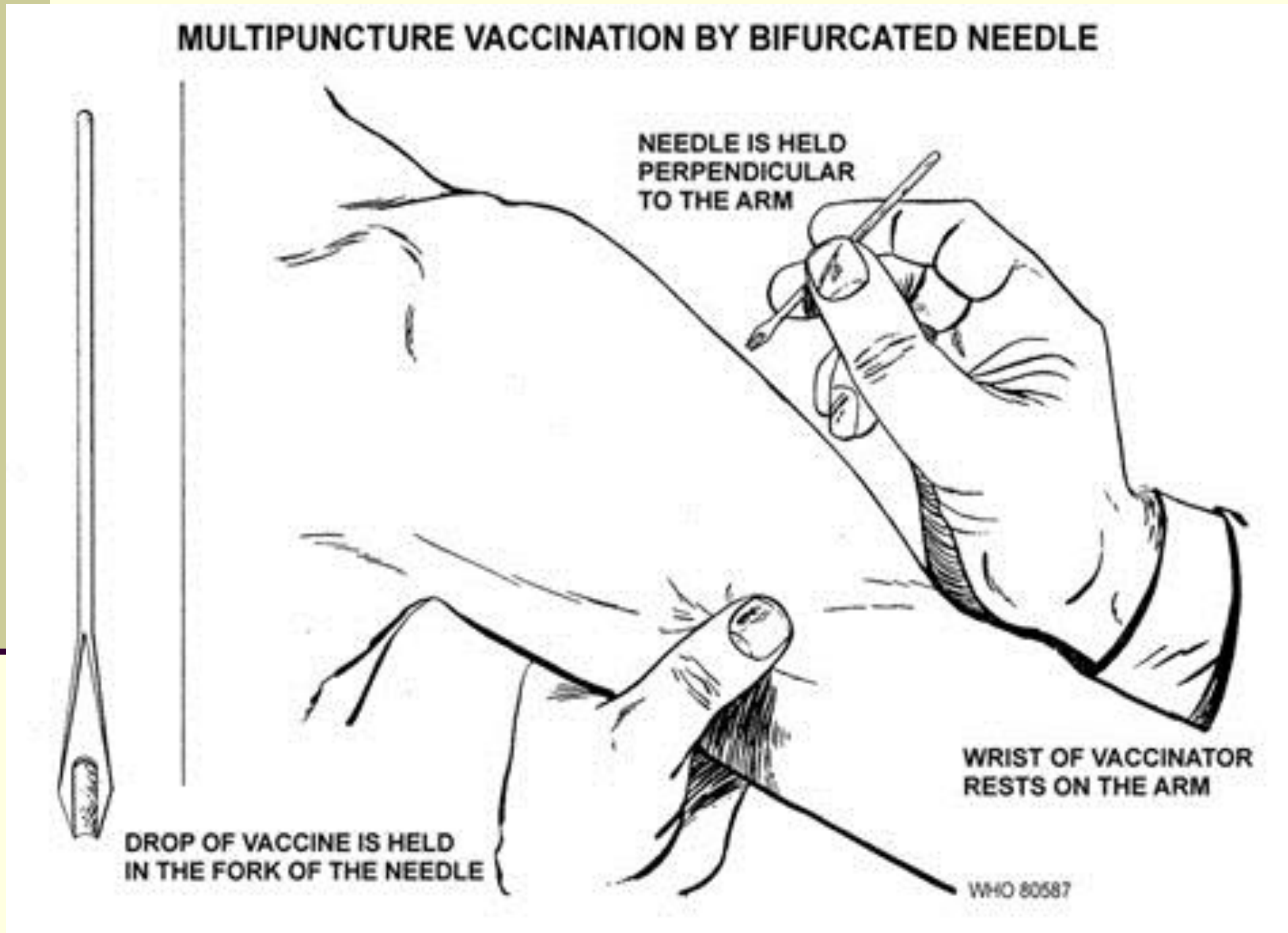
Public Health Images Library (PHIL) ID # 3.
Source: CDC/Cheryl Tyron

Smallpox recognition card, c.1973, courtesy Dr. Damodar Bhonsule, Panjim, Goa, India.

Smallpox lesions on skin of trunk.
Picture taken in Bangladesh, 1973.

Public Health Images Library (PHIL) ID # 284. Source: CDC/James Hicks

Rural vaccinator in United Provinces, British India, c.1930, private collection of Dr. Sanjoy Bhattacharya


MULTIPUNCTURE VACCINATION BY BIFURCATED NEEDLE
NEEDLE IS HELD PERPENDICULAR TO THE ARM
WRIST OF VACCINATOR RESTS ON THE ARM
DROP OF VACCINE IS HELD IN THE FORK OF THE NEEDLE
WHO 80587

Variola virus, which causes smallpox, was once the scourge of the world.

This virus passes from person to person through the air.

A smallpox infection results in fever, severe aches and pains, scarring sores that cover the body, blindness in many cases, and, often, death. There is no effective treatment.

Although vaccination and outbreak control eliminated smallpox in the United States by 1949, the disease still struck an estimated 50 million people worldwide each year during the 1950s.

In 1967, the World Health Organization (WHO) launched a massive vaccination campaign to rid the world of smallpox —and succeeded.

The last natural case of smallpox occurred in Somalia in 1977.

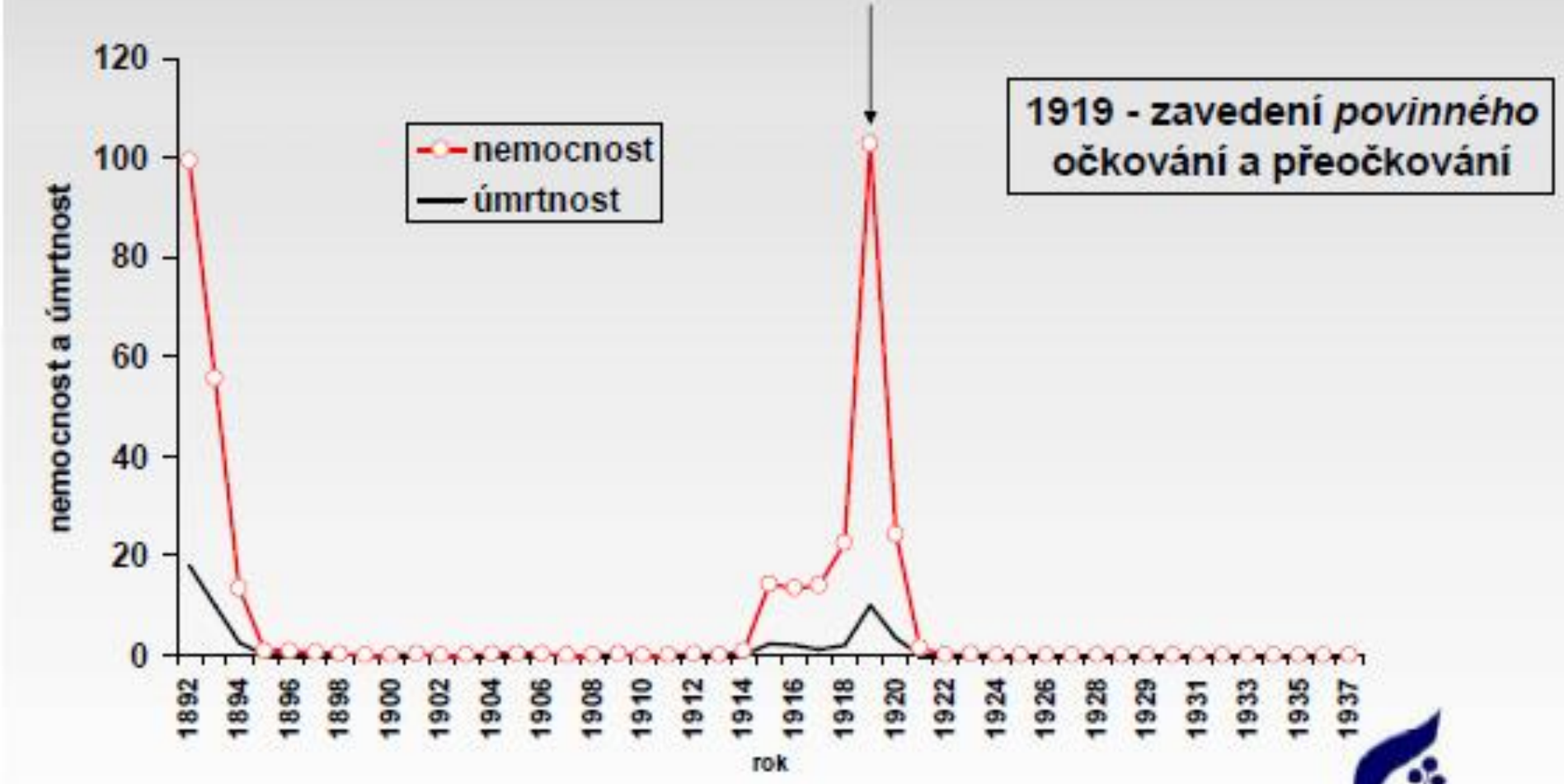
Ali Maow Maalin, cook twenty-three of the hospitals in the Somali Merce. He contracted when he showed the path of the ambulance chauffeur who drove two sick children to camp insulation.

In 1978 was ill photographer Medical School in Birmingham, England. She was killed by a virus that escaped from a neighboring lab.

Mr. John Wickett, of the World Health Organization, with **the last person** to have contracted – **and survived** – naturally occurring smallpox in Somalia.

(1977), courtesy Mr. John Wickett.

Variola, České země, 1892-1937, nemocnost a úmrtnost na 100 000 obyvatel



Státní zdravotní ústav

SZÚ

Eradication of smallpox
Czech experts

A key figure in the global eradication program smallpox was prof. MUDr. Karel Raska, MD., who drove in the sixties division

Communicative Diseases of the WHO

Secretariat in Geneva.

He promoted the establishment of a new, independent units "Eradication of smallpox"and ensure its initial financial and material support, not only in Geneva,
but also in regional offices of WHO.

With its support of the program also attended the 20 Czechoslovak health professionals (14 Czechs and Slovaks 6), mainly epidemiologists.

They participated in both the preparation methodology and procedures, thus working directly in infested areas.

Smallpox eradication was
officially announced
at the 33rd General Assembly WHO

8. May 1980.

Tuesday, March 8, 2011; 9:41 AM

Milestones in the eradication of smallpox

1789 Edward Jenner invents a smallpox vaccine.

1966 The World Health Organization (WHO) launches a massive global campaign to eradicate smallpox.

1972 Smallpox vaccinations are discontinued in the United States.

1975 and 1977 The last cases of the two known variants of smallpox occur in the world, in Bangladesh and Somalia.

1978 Two people are sickened in a lab accident in England; one dies.

1980 The WHO declares smallpox eradicated.

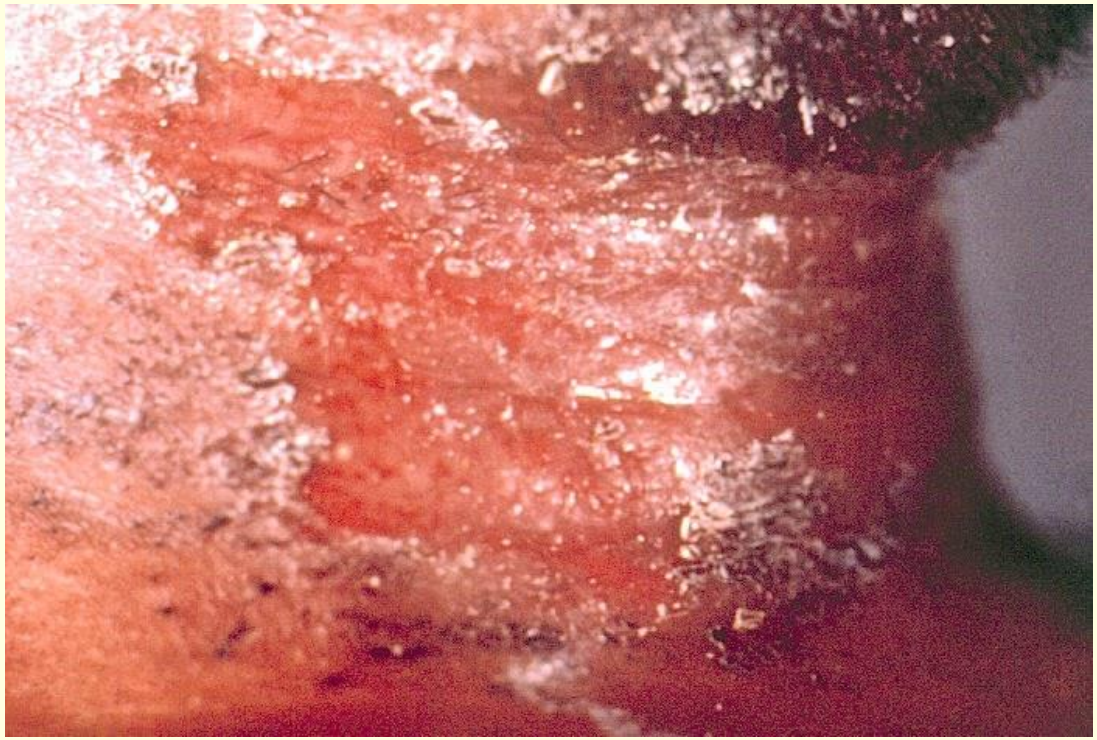
1991 Smallpox virus DNA is mapped.

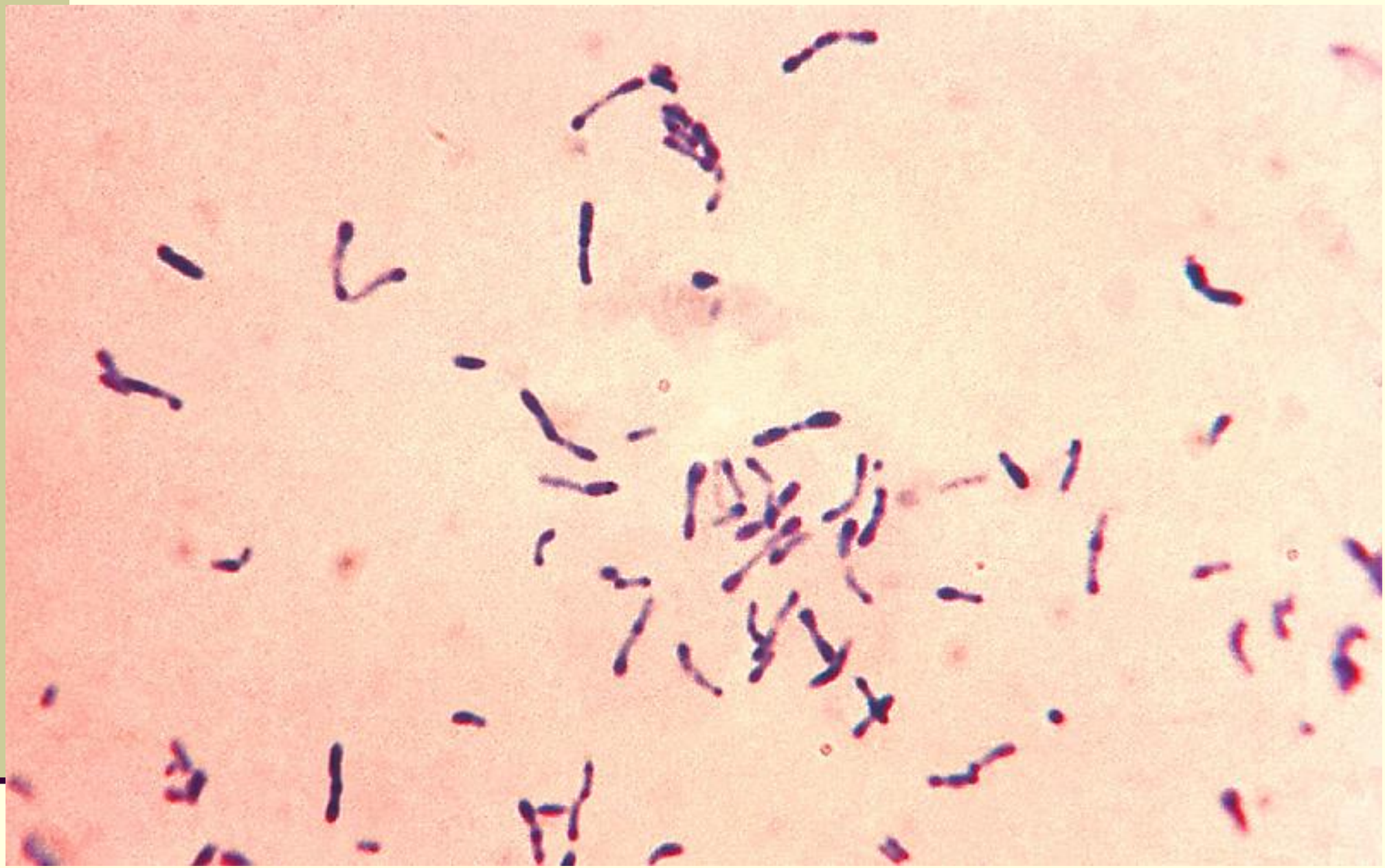
1999 The WHO sets this deadline, by which remaining lab stocks of the virus are to be destroyed. The deadline will be postponed again and again.

2003 Millions of doses of vaccine are produced to hedge against a biological attack.

2011 WHO's decision-making body will meet in May to again vote on whether to kill the remaining live viruses.

Remembering an Old Disease Diphtheria:





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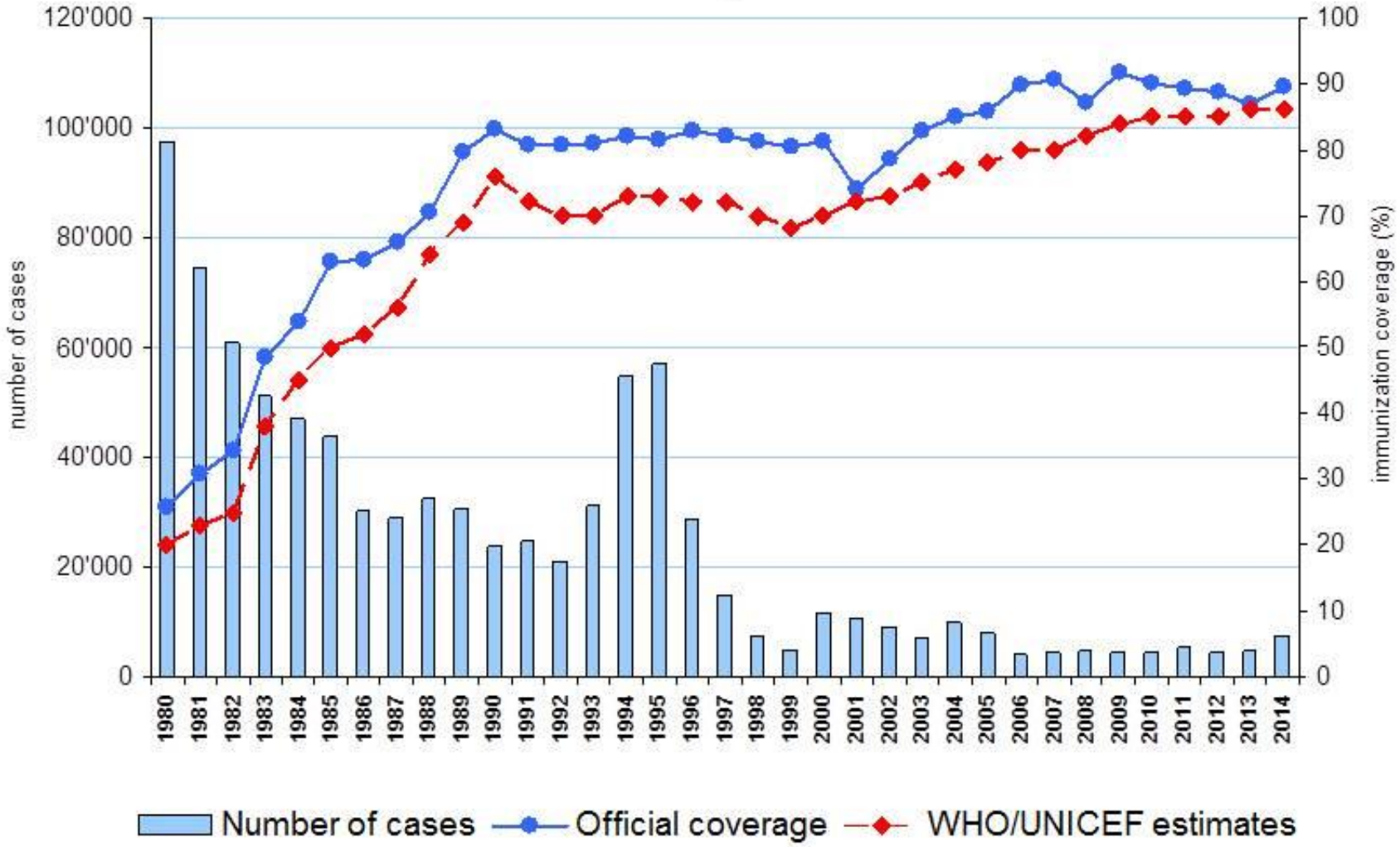
Diphtheria global annual reported cases and DTP3 coverage, 1980-2014



Source: WHO/IVB database, 2015
194 WHO Member States.
Data as of July 2015

Date of slide: 14 July 2015

WHO

Causes and Transmission

Diphtheria is an infection caused by the toxic *Corynebacterium diphtheriae* bacterium.

Diphtheria is spread (transmitted)

from person to person,

usually through respiratory droplets, like from coughing or sneezing.

Rarely, people can get sick from touching open sores (skin lesions) or clothes that touched open sores of someone sick with diphtheria.

A person also can get diphtheria by coming in contact with an object, like a toy, that has the bacteria that cause diphtheria on it.

Symptoms

When the bacteria get into and attach to the lining of the respiratory system, they produce a poison (toxin) that can cause:

- Weakness
- Sore throat
- Fever
- Swollen glands in the neck (sometimes referred to as „bull neck“)

PHIL Photo ID#5325

The poison destroys healthy tissues in the respiratory system.

Within two to three days, the dead tissue forms a thick, gray coating that can build up in the throat or nose. This thick gray coating is called a "**pseudomembrane**."

It can cover tissues in the nose, tonsils, voice box, and throat, making it very hard to breathe and swallow.

The poison may also get into the blood stream and cause damage to the heart, kidneys, and nerves.

Complications

Complications from diphtheria may include:

- Blocking of the airway
- Damage to the heart muscle (myocarditis)
- Nerve damage (polyneuropathy)
- Loss of the ability to move (paralysis)
- Lung infection (respiratory failure or pneumonia)

For some people, diphtheria can lead to death. Even with treatment, about 1 out of 10 diphtheria patients die.

Without treatment, as many as 1 out of 2 patients can die from the disease

Diagnosis and Treatment

- A swab from the back of the throat (also take a sample from a skin lesion and test it for the bacteria that cause diphtheria.

- **It is important to start treatment right away if a doctor suspects diphtheria and not to wait for laboratory confirmation**.

Diphtheria treatment today involves:

- Using **diphtheria antitoxin** (DAT) to stop the poison (toxin) produced by the bacteria from damaging the body
- Using **antibiotics**

Even with treatment, about 1 out of 10 people who gets diphtheria will die.

Diphtheria patients are usually **kept in isolation**, until they are no longer contagious — this usually takes about 48 hours after starting antibiotics.

After the patient finishes taking the antibiotic, the doctor will run tests to make sure the bacteria are not in the patient's body anymore.

Diphtheria once was a major cause of illness and death among children.

This upper airway infection often results in a grayish, thick membrane that grows in the throat and obstructs breathing. Other symptoms include fever, hoarseness, and coughing.

Most diphtheria deaths resulted not from blocked airways but from the paralyzing **toxin** the bacterium secretes, which can cause the heart or other organs to fail.

For clinical purposes, it is convenient to classify diphtheria into a number of manifestations, depending on the site of disease:

- Respiratory diphtheria
  - Nasal diphtheria
  - Pharyngeal and tonsillar diphtheria
  - Laryngeal diphtheria
- Cutaneous diphtheria

The incubation period of diphtheria is 2–5 days (range: 1–10 days).

After:

- ✓ the provisional clinical diagnosis is made
- ✓ and appropriate cultures are obtained,

persons with suspected diphtheria should be given:

1. - antitoxin and
2. - antibiotics in adequate dosage and
3. - placed in isolation.

Respiratory support and airway maintenance should also be administered as needed.

Preventive Measures

The best way to prevent diphtheria is to get vaccinated.

For close contacts, especially household contacts,

- a diphtheria toxoid booster, appropriate for age, should be given.
- Contacts should also receive antibiotics:

  a 7- to 10-day course of oral erythromycin

Identified carriers in the community should also receive antibiotics. Contacts should be closely monitored and antitoxin given at the first sign(s) of illness.

Contacts of cutaneous diphtheria should be treated as described above; however, if the strain is shown to be nontoxigenic, investigation of contacts can be discontinued.

Challenges

- Circulation of the bacteria appears to continue in some settings, even in populations with more than 80% childhood immunization rates.
- An asymptomatic carrier state can exist even among immune individuals.
- Immunity wanes over time and a booster dose of vaccine should be administered every 10 years to maintain protective antibody levels.
- Large populations of older adults may be susceptible to diphtheria, in both developed as well as in developing countries.

The United States recorded

- 206,000 cases of diphtheria in 1921,
- resulting in 15,520 deaths.

Starting in the 1920s, diphtheria rates dropped quickly due to the widespread use of vaccines.

Between 2004 and 2015, 2 cases of diphtheria were recorded.

However, the disease continues to cause illness globally.

In 2014, 7,321 cases of diphtheria were reported worldwide to the World Health Organization, but many more cases likely go unreported.

- The case-fatality rate for diphtheria has changed very little during the last 50 years. The overall case-fatality rate for diphtheria is 5%–10%, with higher death rates (up to 20%) among persons younger than 5 and older than 40 years of age. Before there was treatment for diphtheria, the disease was fatal in up to half of cases.

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Diphtheria once was a major cause of illness and death among children.

- The U.S. recorded 206,000 cases of diphtheria in 1921, resulting in 15,520 deaths. Starting in the 1920s, diphtheria rates dropped quickly in the U.S. and other countries that began widely vaccinating.

Between 2004 and 2008, no cases of diphtheria were recorded in the U.S.

- However, the disease continues to play a role globally.

In 2011, 4,887 cases of diphtheria were reported worldwide to the World Health Organization (WHO), but many more cases likely go unreported.

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In the EU/EEA.

The reported number of cases of diphtheria remains low.

During 2009–2013, 102 cases of diphtheria were reported in the EU/EEA with 55 cases of C. diphtheriae. There has been an increase in the number of C. diphtheriae cases reported at EU level since 2011.

Latvia is the only EU Member State that reports indigenous transmission.

In a recent European study, ten European countries each screened between 968 and 8551 throat swabs from patients with upper respiratory tract infections for C. diphtheriae during 2007–2008.

Six toxigenic strains of C. diphtheriae were identified: two from symptomatic patients in Latvia and four from Lithuania (two cases, two carriers).

Among the toxigenic isolates, the Sankt Petersburg epidemic clone that caused large diphtheria outbreaks in Russia and the NIS* countries in the 1990s was still in circulation .

Carriage rates among household contacts of a laboratory-confirmed case may be as high as 25% .

A case of diphtheria in Spain

15 June 2015

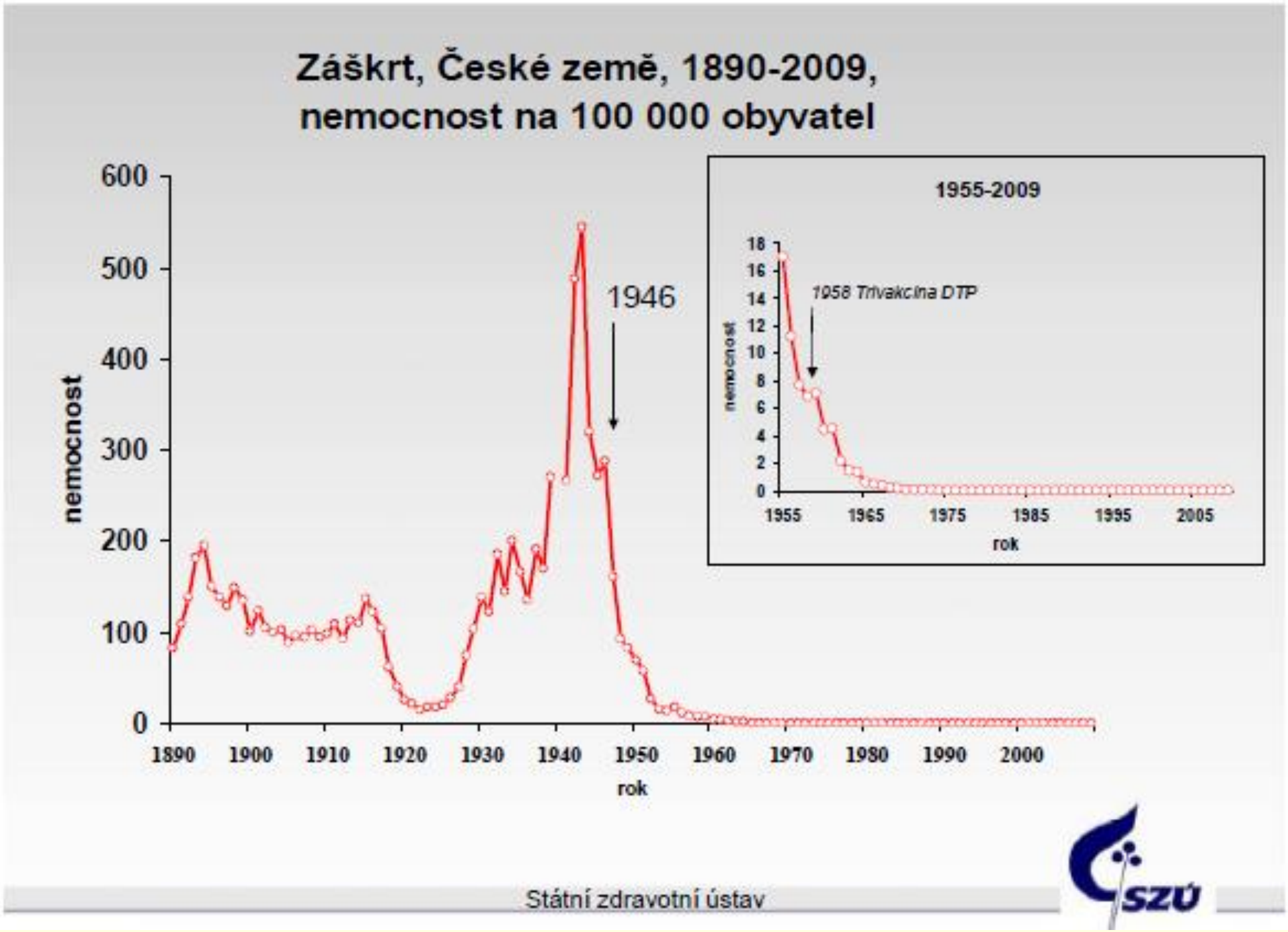
The detection, management and public health response to the first case of diphtheria in Spain in nearly 30 years has highlighted challenges for preparedness against diphtheria in the European Union.

The case is a 6-year-old unvaccinated child. A case of diphtheria in an unvaccinated individual within a highly protected population is not unexpected, because vaccinated people can be asymptomatic carriers of toxigenic C. diphtheriae.

The challenges for diphtheria case management, preparedness and public health response experienced in Spain are shared by many EU Member States. The most urgent critical issue is the shortage of diphtheria antitoxin (DAT) for immediate use when clinicians suspect diphtheria.

DAT must be given as early as possible to be effective, often on the suspicion of diphtheria before a laboratory confirmation.

EU Member States have for a number of years reported difficulties with sourcing and maintaining adequate stockpiles of DAT for emergency use, a problem they share with many countries around the world. EU Member States have on occasion been forced to arrange emergency deliveries of DAT for patients with diphtheria.


Záškrt, České země, 1890-2009,
nemocnost na 100 000 obyvatel
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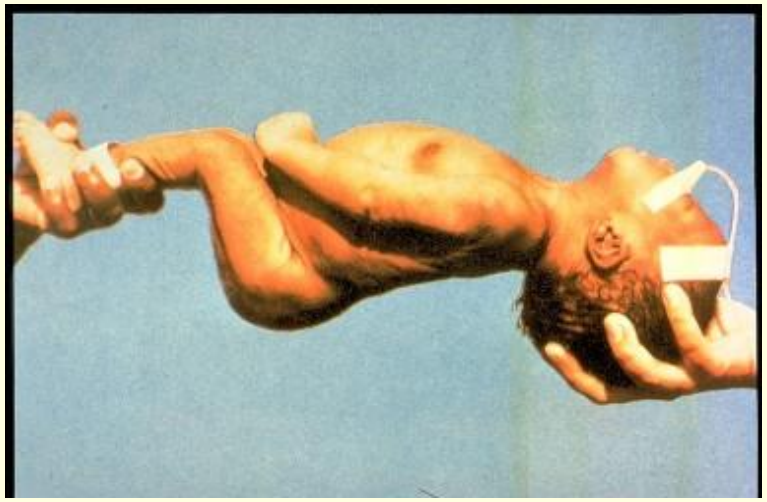
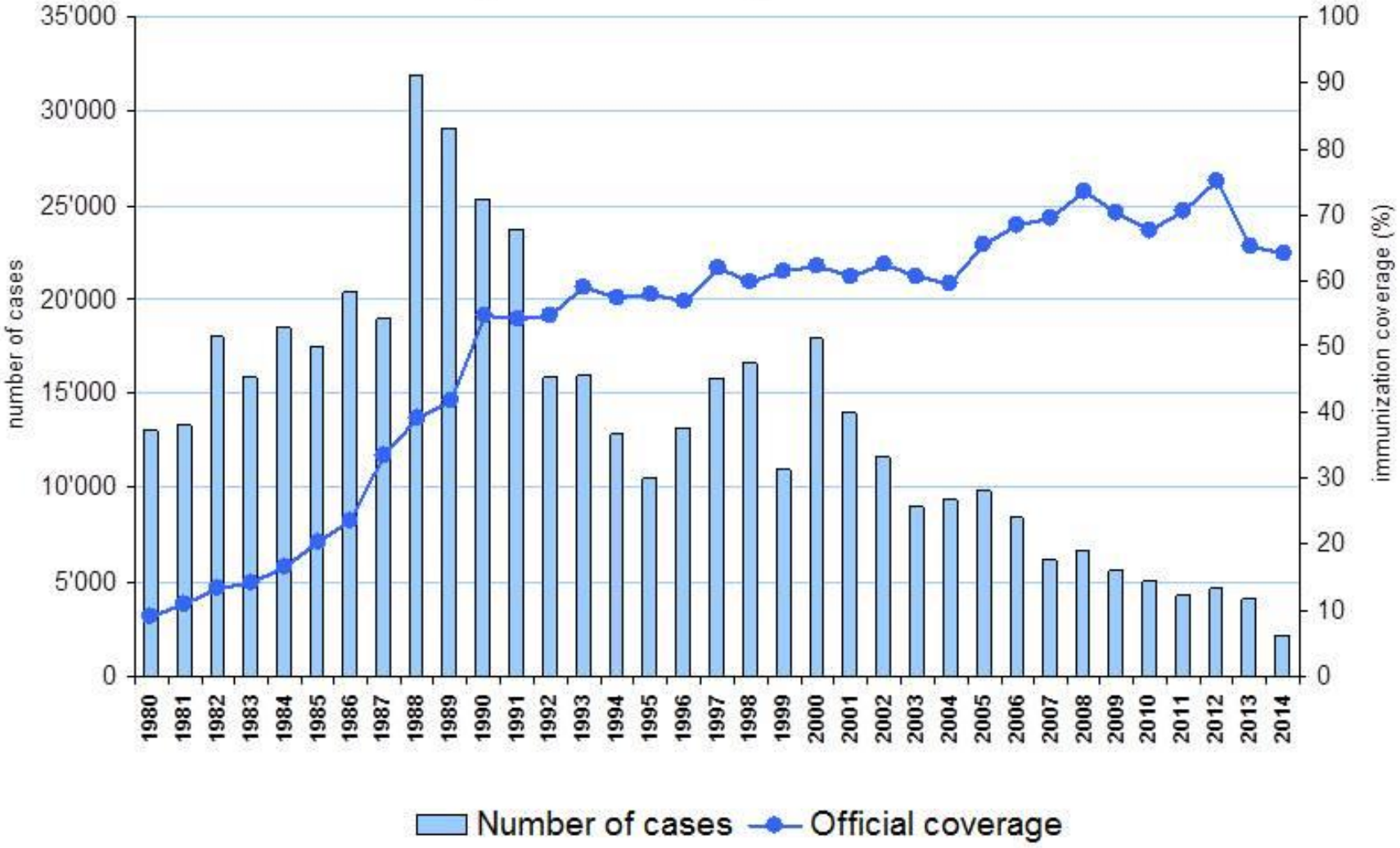
1958 Trivakcina DTP
Státní zdravotní ústav
SZÚ

Remembering an Old Disease

Tetanus:



Neonatal tetanus global annual reported cases and TT2plus coverage, 1980-2014



Source: WHO/IVB database, 2015
194 WHO Member States.
Data as of July 2015

Date of slide: 14 July 2015

WHO

TETANUS DISEASE

- Tetanus, commonly called lockjaw, is caused by a bacterium that is mostly present in soil, manure, and in the digestive tracts of humans and animals. Tetanus bacteria enter the body through a wound - sometimes as small as a pinprick or deep scratch but most often through a deep puncture wound or laceration such as those made by rusty nails or dirty knives. Such wounds are difficult to clean adequately and, if tetanus bacteria were present on the nail or knife, the bacteria can remain deep in the wound where they can grow and produce several toxins that attack the body's red and white blood cells and central nervous system. Tetanus bacteria do not grow well in the presence of oxygen, which is why deep puncture wounds are a perfect environment for them to grow in.

TETANUS DISEASE

- The incubation period for symptoms of tetanus to begin can range from one to three weeks. The first symptoms are likely to be headache, irritability, fever, chills, and muscular stiffness of the jaw and neck. As the poison increases and spreads, the body becomes rigid and locked in spasm with head drawn back, legs and feet extended, arms stiff, hands clenched and the jaw unable to open with difficulty in swallowing. The stomach muscles also become rigid and convulsions may occur.

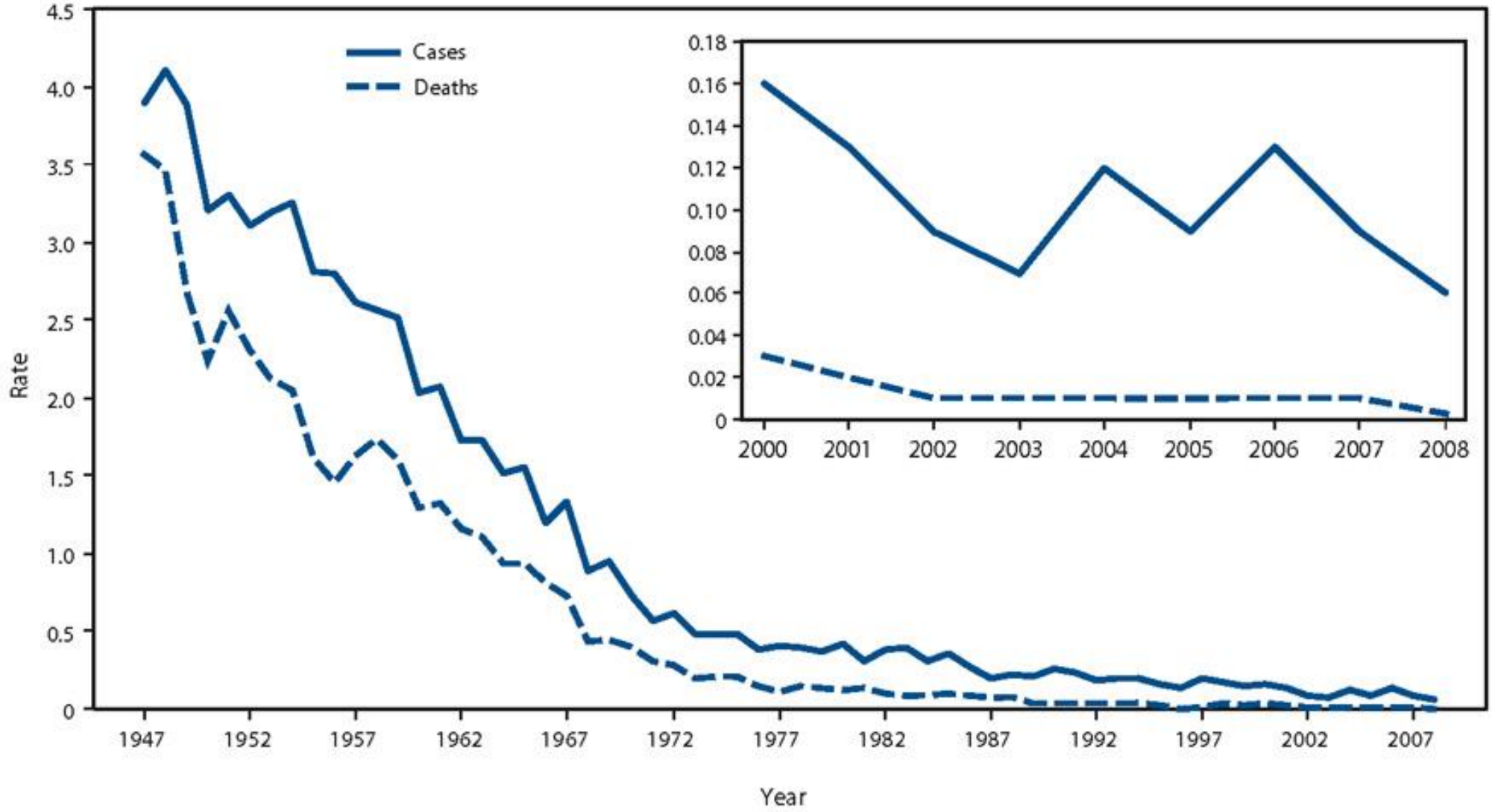
TETANUS DISEASE

- In 1948 there were 601 cases of tetanus reported in the U.S., the highest number of cases reported in one year. In 2002 there were 25 cases of tetanus and 3 deaths reported in the U.S. Tetanus is a much more serious problem in underdeveloped countries, especially among newborn babies born in unsanitary conditions whose umbilical cords can become infected with tetanus.

TETANUS DISEASE

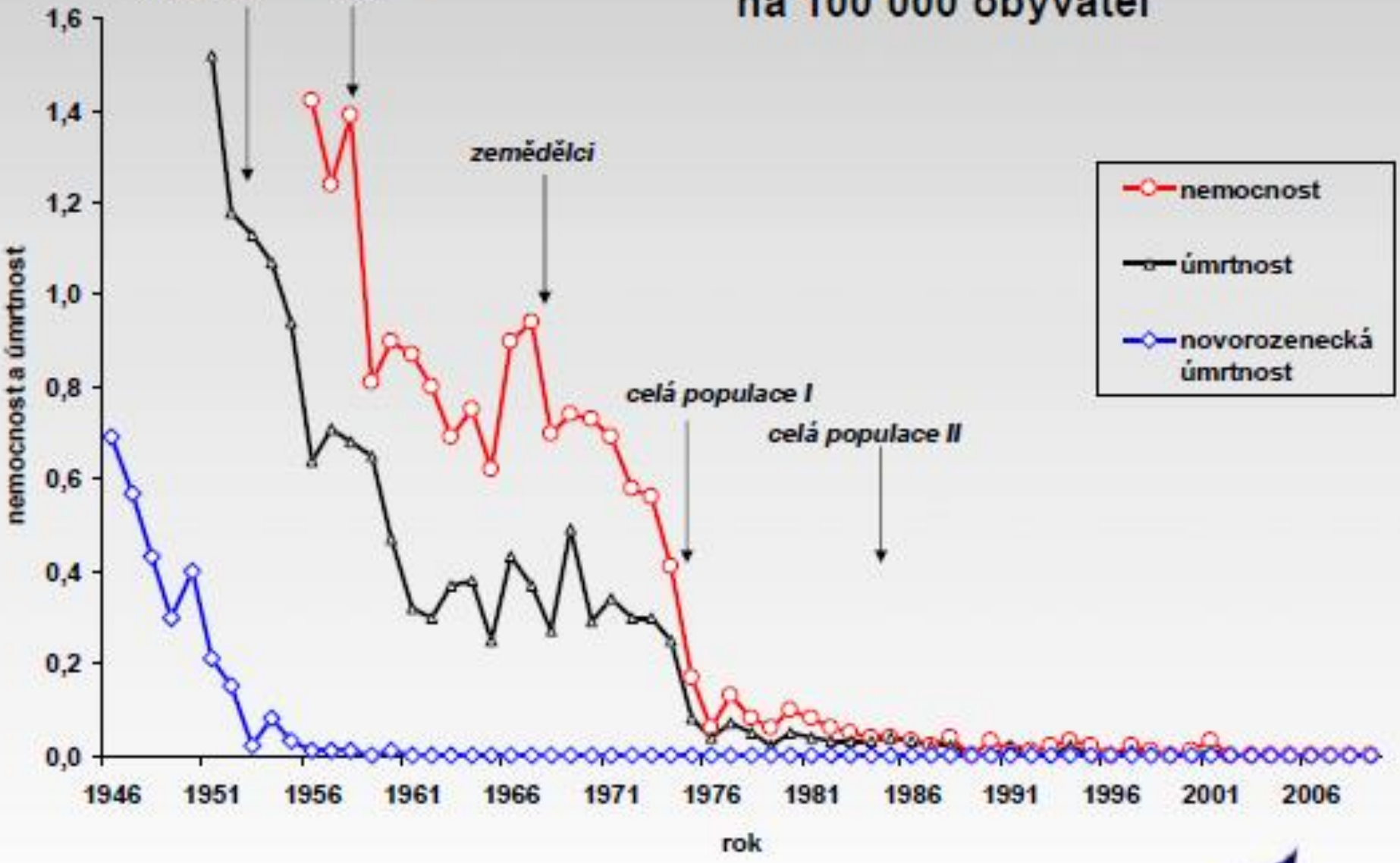
- **TETANUS VACCINE:** The most common reactions reported to occur following DT vaccine include swelling and pain at the injection site; sleepiness; irritability; vomiting; loss of appetite; persistent crying; and fever.
- Paleness, cold skin, collapse, rash, and joint pain have also been reported.
- In 1994 the Institute of Medicine concluded that there is compelling scientific evidence to conclude that tetanus, DT and Td vaccines can cause Guillain-Barre syndrome including death; brachial neuritis; and death from anaphylaxis (shock).

Tetanus—United States, 1947-2008



* Per 1 million population.

Tetanus, ČR, 1946-2009, nemocnost a úmrtnost na 100 000 obyvatel

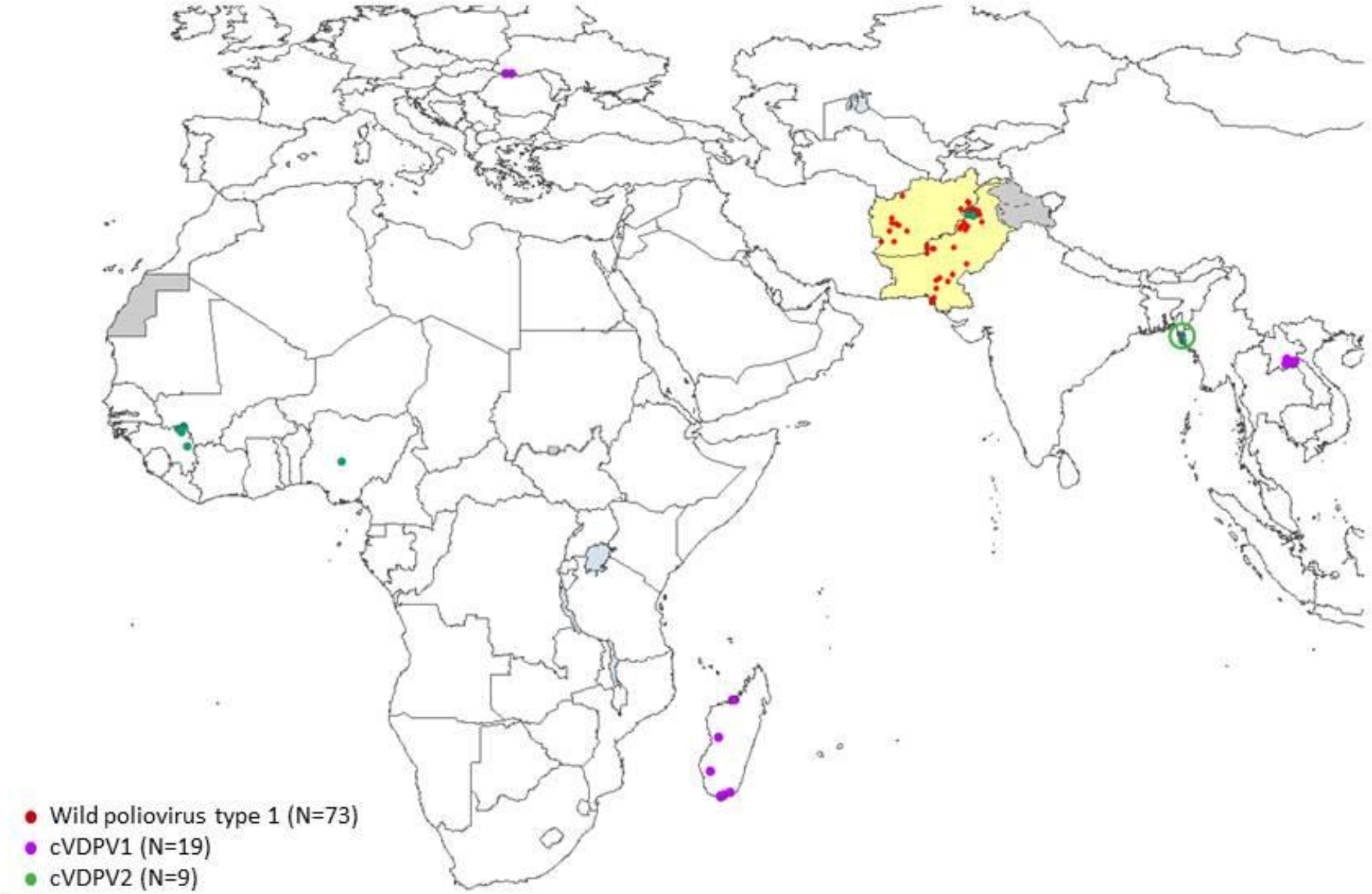


Remembering an Old Disease

Poliomyelitis:

The highly infectious poliovirus, the cause of polio, once crippled 13,000 to 20,000 people every year in the United States. In 1 out of 200 cases, this virus attacks the spinal cord, paralyzing limbs or leaving victims unable to breathe on their own. In 1954, the year before the first polio vaccine was introduced, doctors reported more than 18,000 cases of paralyzing polio in the United States. Just 3 years later, vaccination brought that figure down to about 2,500. Today, the disease has been eliminated from the Western Hemisphere, and public health officials hope to soon eradicate it from the globe. In 2001, only 537 cases of polio were reported worldwide, according to WHO.

Wild Poliovirus & cVDPV Cases[1], 2015
01 January – 31 December



[1]Excludes viruses detected from environmental surveillance.

Data in WHO HQ as of 02 February 2016

Poliomyelitis

Morbid changes occur
mainly in the gray matter of the spinal cord.

The infectious agent:
There are three types of polioviruses
-1, 2 and 3.

Virus excretion: 1 week from the nasopharynx,
6 weeks of stool.

80% of cases are asymptomatic.

- Polio Viruses, which are endemic or epidemic areas
- spreading in a population,we are known as **wild polioviruses**.

- Among them were for the purpose of preparing
live vaccines repeated passaging the virus in cell cultures
resulting strain called **vaccinal.**

Polio eradication

In 1988, the forty-first World Health Assembly adopted a resolution for the worldwide eradication of polio, the Global Polio Eradication Initiative (GPEI). Since then, the number of cases has fallen by over 99% from an estimated 350 000 to 416 reported cases in 2013.

In 2014, only three countries in the world remained polio-endemic: Nigeria, Pakistan and Afghanistan.

In 2015 to date, two countries have together reported 37 cases: Pakistan (29 cases) and Afghanistan (eight cases), all due to wild poliovirus type 1.

The last natural circulation of WPV2 was in India in 1999 and the last WPV3 case was detected in Nigeria in November 2012.

- Since then, WPV1 has been the only circulating wild type virus.

The last case of endemic paralytic polio in the WHO European Region (i.e. with the source of the infection originating in the Region) was reported in Turkey in November 1998,

and the Region was declared polio-free in June 2002.

The most recent outbreaks linked to importations into the WHO European Region occurred in 2010 in Tajikistan and in 2013–2014 in Israel where WPV1 was circulating in the environment without causing clinical cases .

The most recent polio outbreaks in what today constitutes EU/EEA were in the Netherlands in 1992, in a religious community opposed to vaccination,

and in 2001, when three polio cases were reported among Roma children in Bulgaria .

On 5 May 2014, WHO declared the international spread of wild poliovirus in 2014 a Public Health Emergency of International Concern (PHEIC) following the confirmed circulation of wild poliovirus in several countries and the documented exportation of wild poliovirus to other countries.

The Polio Eradication and Endgame Strategic Plan 2013–2018 sets out the actions required for a polio-free world by 2018 and beyond.

Outbreak of circulating vaccine-derived poliovirus type 1 (cVDPV1) in Ukraine

2 September 2015

Two cases of paralytic poliomyelitis caused by circulating vaccine-derived poliovirus type 1 (cVDPV1) were confirmed in Ukraine on 28 August 2015.

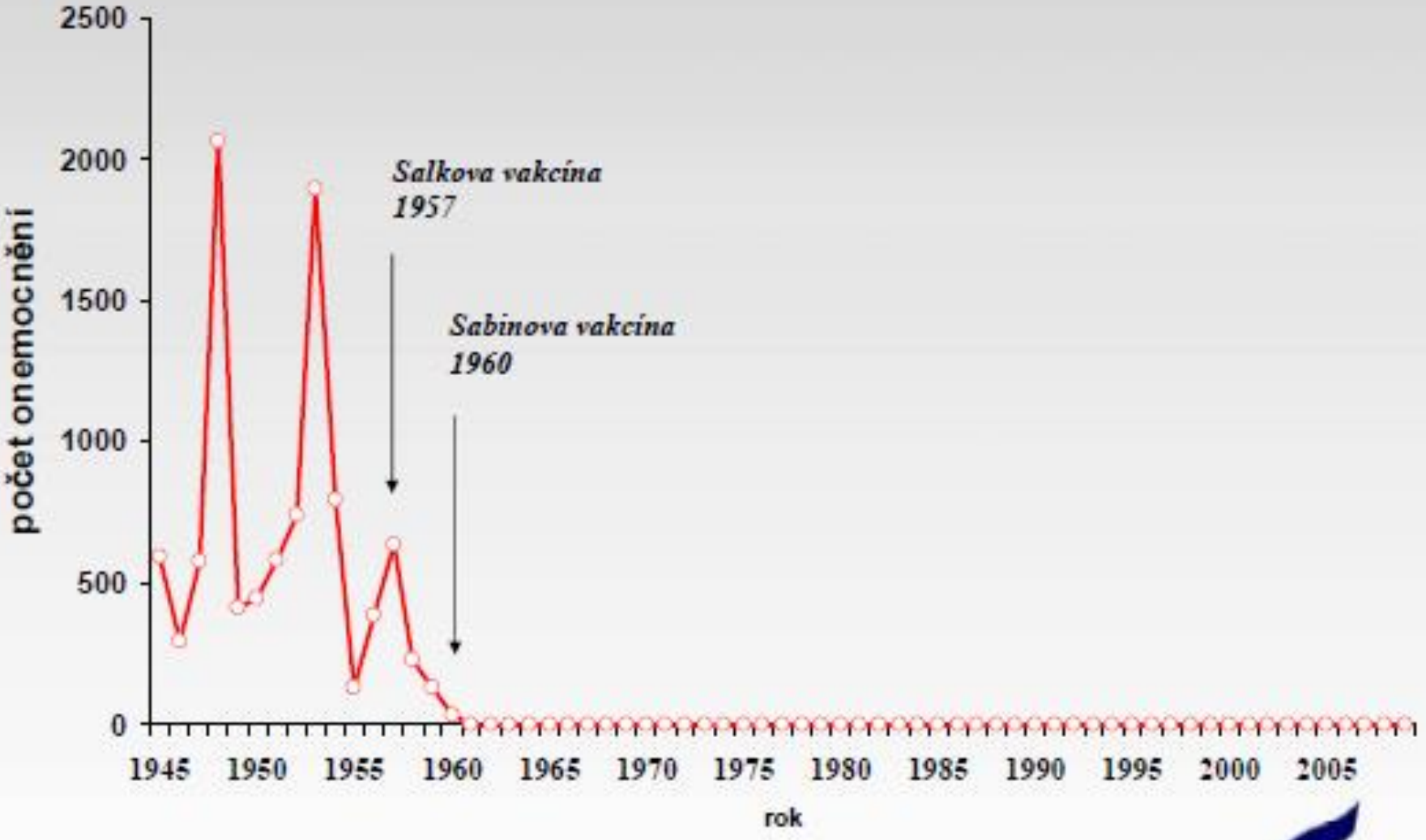
The cases, a 4-year-old child and a 10-month-old infant, had onset of paralysis on 30 June and 7 July respectively and the positive stool samples were collected from 5–10 July 2015.

The genetic similarity between the isolates indicates active transmission of cVDPV1.

Both children are from the Zakarpatskaya oblast [region], in south-western Ukraine, bordering Romania, Hungary, Slovakia and Poland.

Ukraine has been at high risk of vaccine-preventable diseases outbreaks for several years due to persistent low routine vaccination coverage.

Polio (A80), Česká republika, hlášená onemocnění 1945-2009



Pertussis

Pertussis is an acute bacterial infection of the respiratory tract, caused by the bacterium *Bordetella pertussis*. The disease is characterised by a severe cough, which can last two months or even longer.

Humans are the only reservoir. Infected adults usually have only mild symptoms, but can shed bacteria for weeks. Following infection (by inhalation of droplets), susceptible individuals develop symptoms after an incubation period of about 10 days. The typical paroxysmal cough is usually seen in young children. Babies less than six months old may not cough, but they manifest dyspnea and paroxysmal asphyxia and are the most likely to die of the disease unless they receive suitable treatment.

Affected children are also exposed to complications such as pneumonia, atelectasia, weight loss, hernia, seizures, encephalopathy (probably due to hypoxia). Antibiotics may reduce the duration of the disease, especially if administered in its early stages.

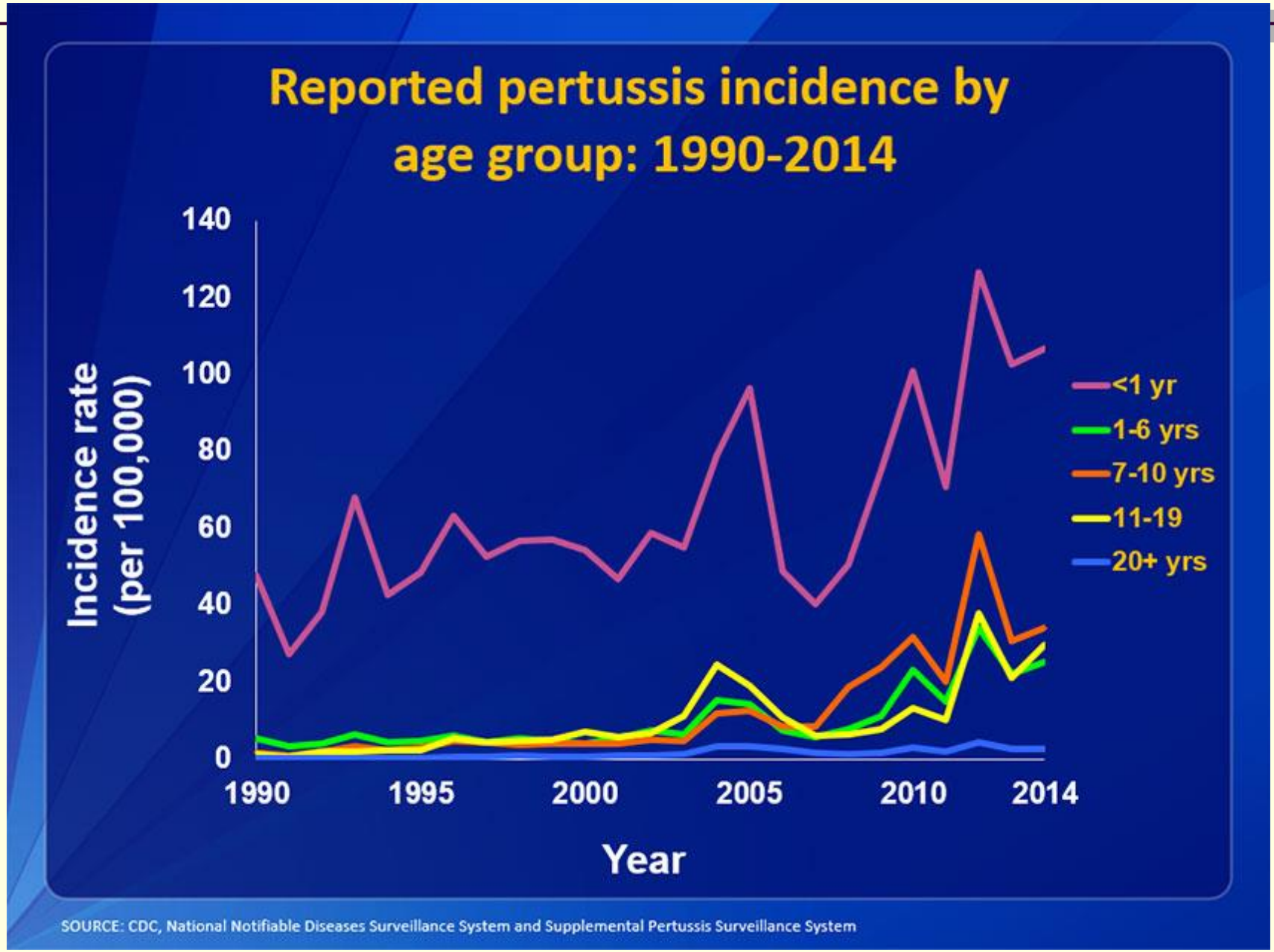
Bordetella pertussis

Sekvenací oblastí genomu *ptxP, ptxA, prnA* a *fim3* u kmenů *B. pertussis* izolovaných v ČR v období 1967–2010 byly potvrzeny změny alelických variant těchto oblastí.

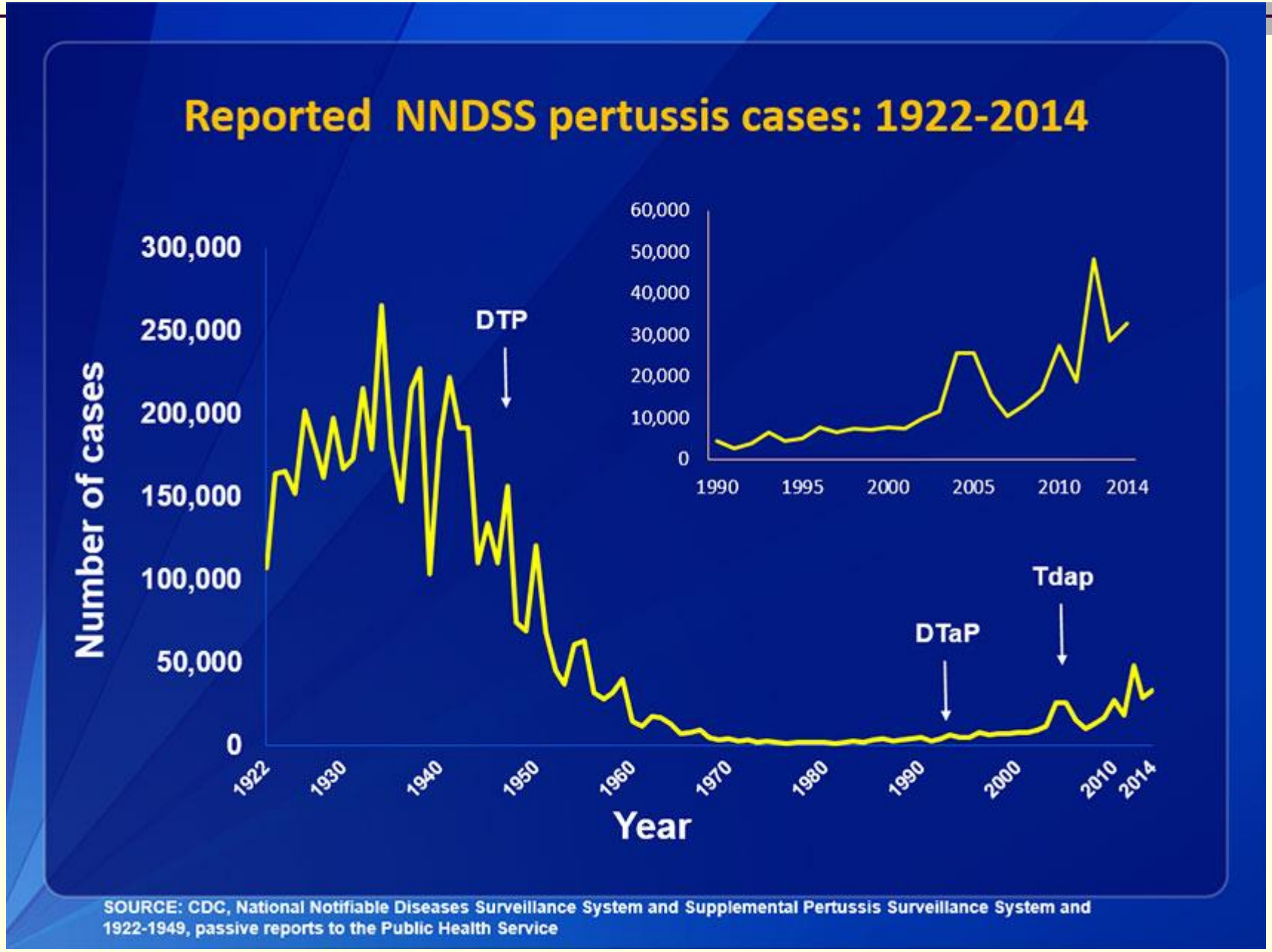
Výskyt kmenů nesoucích nové alelické varianty narůstá po roce 1995 na úkor kmenů nesoucích varianty původní.

Výsledky studie lze interpretovat jako částečný genetický únik patogenních kmenů *B. pertussis* mimo účinnost pertusových vakcín.

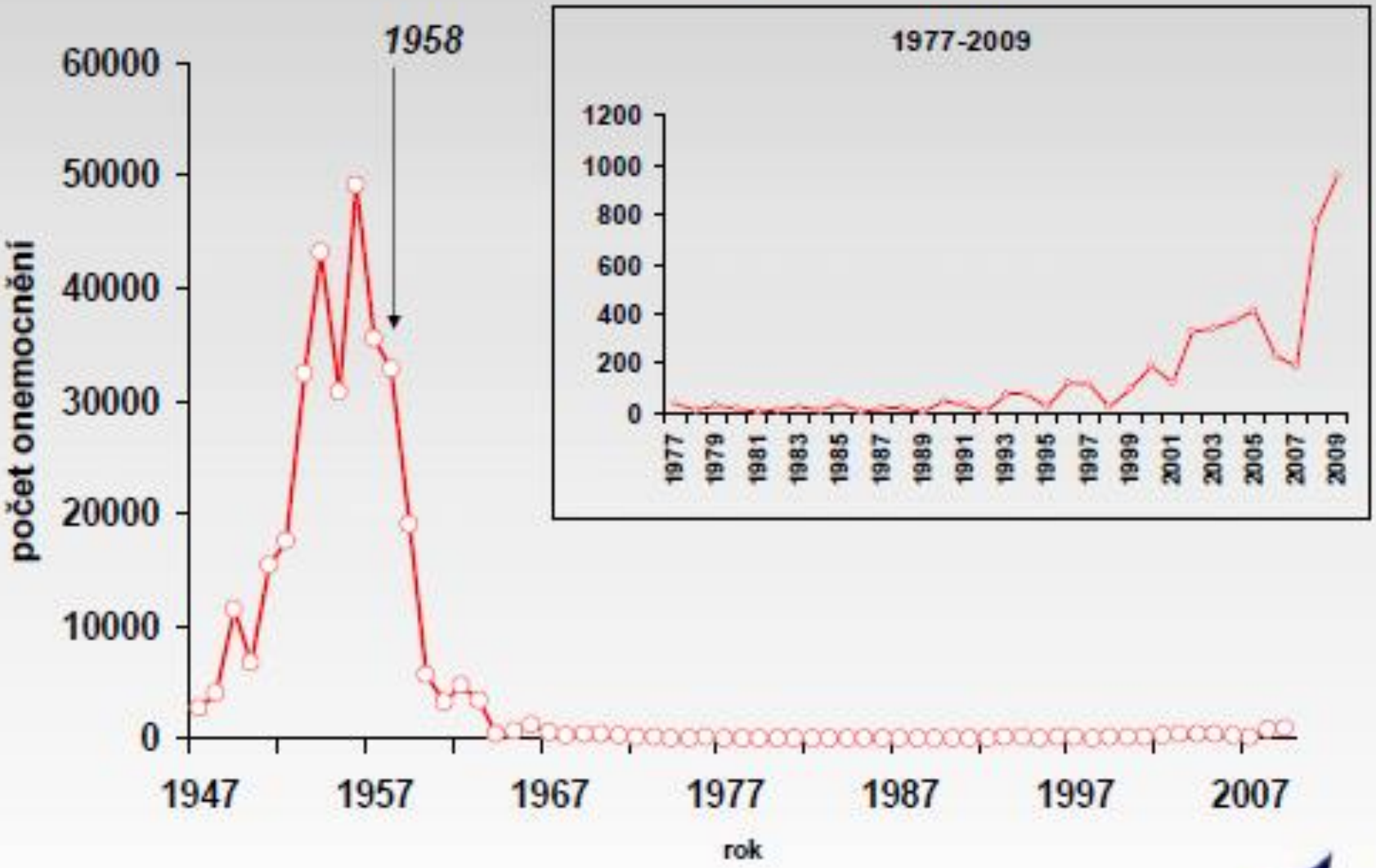
This graph shows reported pertussis incidence (per 100,000 persons) by age group in the United States from 1990–2014. Infants aged <1 year, who are at greatest risk for serious disease and death, continue to have the highest reported rate of pertussis. School-aged children 7 to 10 years continue to contribute a significant proportion of reported pertussis cases.



This graph illustrates the number of pertussis cases reported to CDC from 1922 to 2014. Following the introduction of pertussis vaccines in the 1940s when case counts frequently exceeded 100,000 cases per year, reports declined dramatically to fewer than 10,000 by 1965. During the 1980s pertussis reports began increasing gradually, and by 2014 more than 32,000 cases were reported nationwide.



Dávivý kašel - pertuse (A37.0), Česká republika, 1947-2009



- **Doporučení k očkování těhotných žen proti pertusi.**
- Členům NIKO budou cestou SZÚ (MUDr. Fabiánová) zaslány podklady a pracovní verze připravovaného doporučení očkování těhotných proti pertusi k připomínkování. Materiál bude projednán na dalším zasedání NIKO.

Measles

During the 12-month period from July 2014 to June 2015, a total of 4 224 cases was reported by 30 EU/EEA countries. Twenty-three countries reported consistently throughout this period.

- Germany accounted for 58.2% of the cases reported during this period.

In 10 of the countries reporting consistently, the measles notification rate was less than one case per million population, including six countries which reported zero cases during the 12-month period.

The diagnosis of measles was confirmed by positive laboratory results (serology, virus detection or isolation) in 63.4% of all cases.

Of all cases, 89.2% had a known vaccination status and of these, 83.8% were unvaccinated.

In the target group for routine childhood MMR vaccination (1–4-year-old children), 76.9% of the cases were unvaccinated.

One measles-related death was reported during the period July 2014–June 2015, and eight cases were complicated by acute measles encephalitis.

Since the previous report, outbreaks of measles have been detected in several countries in the WHO European Region: Austria, Belarus, Lithuania, Denmark, Norway, the United Kingdom, France, Sweden and Belgium.

Outside of Europe, measles outbreaks are reported from the Democratic Republic of Congo, Guinea, Sudan, South Sudan, Brazil, Australia, Mali, Algeria, Chile, Peru, Cameroon, Taiwan, Iraq and Malaysia.

SPALNIČKY

Vysoký výskyt v rozvojových zemích i v Evropě (2015: úmrtí 15 měs. dítěte v Berlíně)

V České republice se spalničky prakticky nevyskytují, v případě ojedinělých onemocnění se jedná v naprosté většině o importovaná onemocnění.

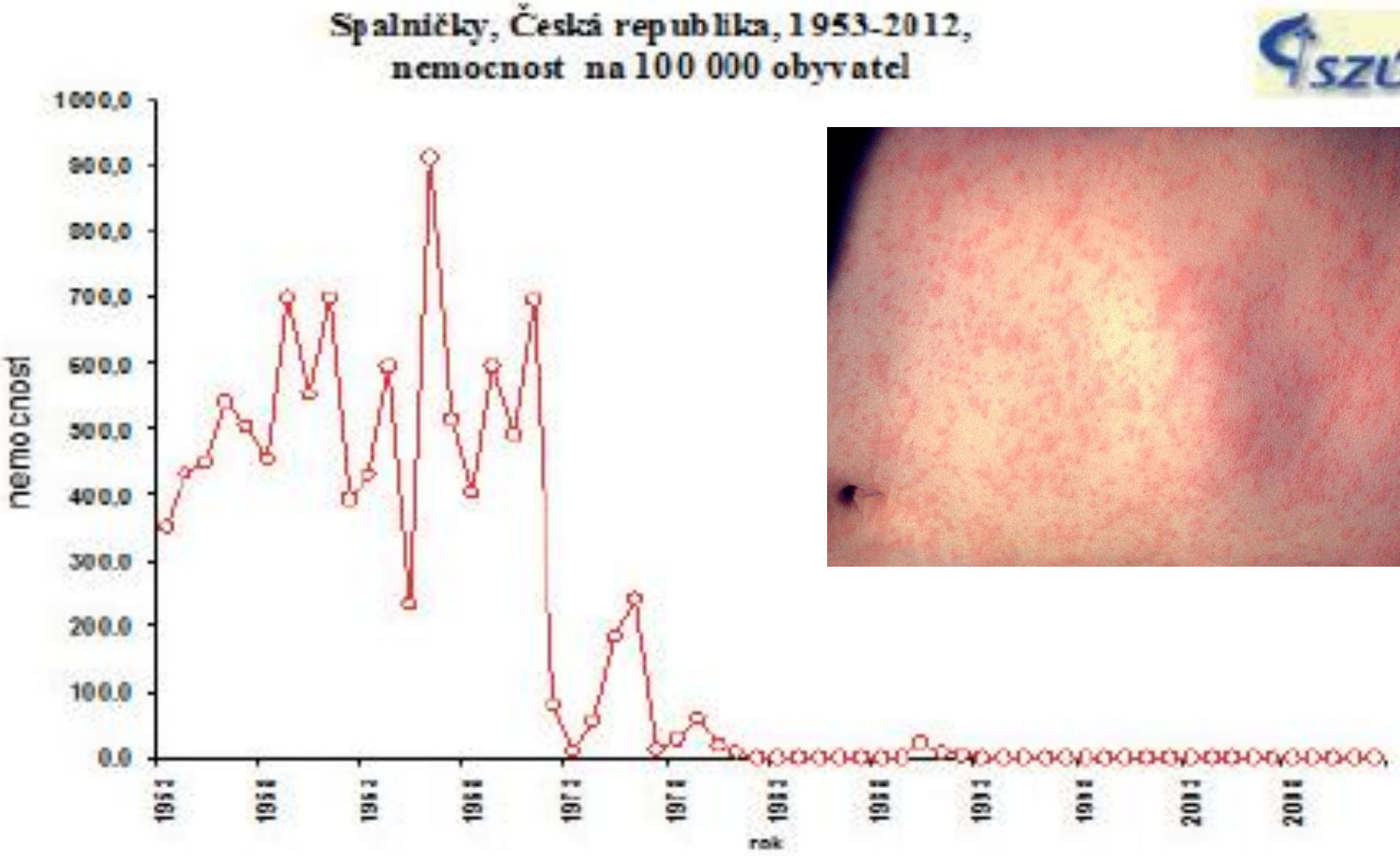
ČR – nejsou podmínky pro plošné epidemie

ALE 20% osob ve věku 35 – 44 let nemá protilátky

Ohroženi: zdravotníci, mladí dospělí, děti neimunních matek, ojediněle i očkované děti

Graf č. 5 Zvládnutí spalniček očkováním

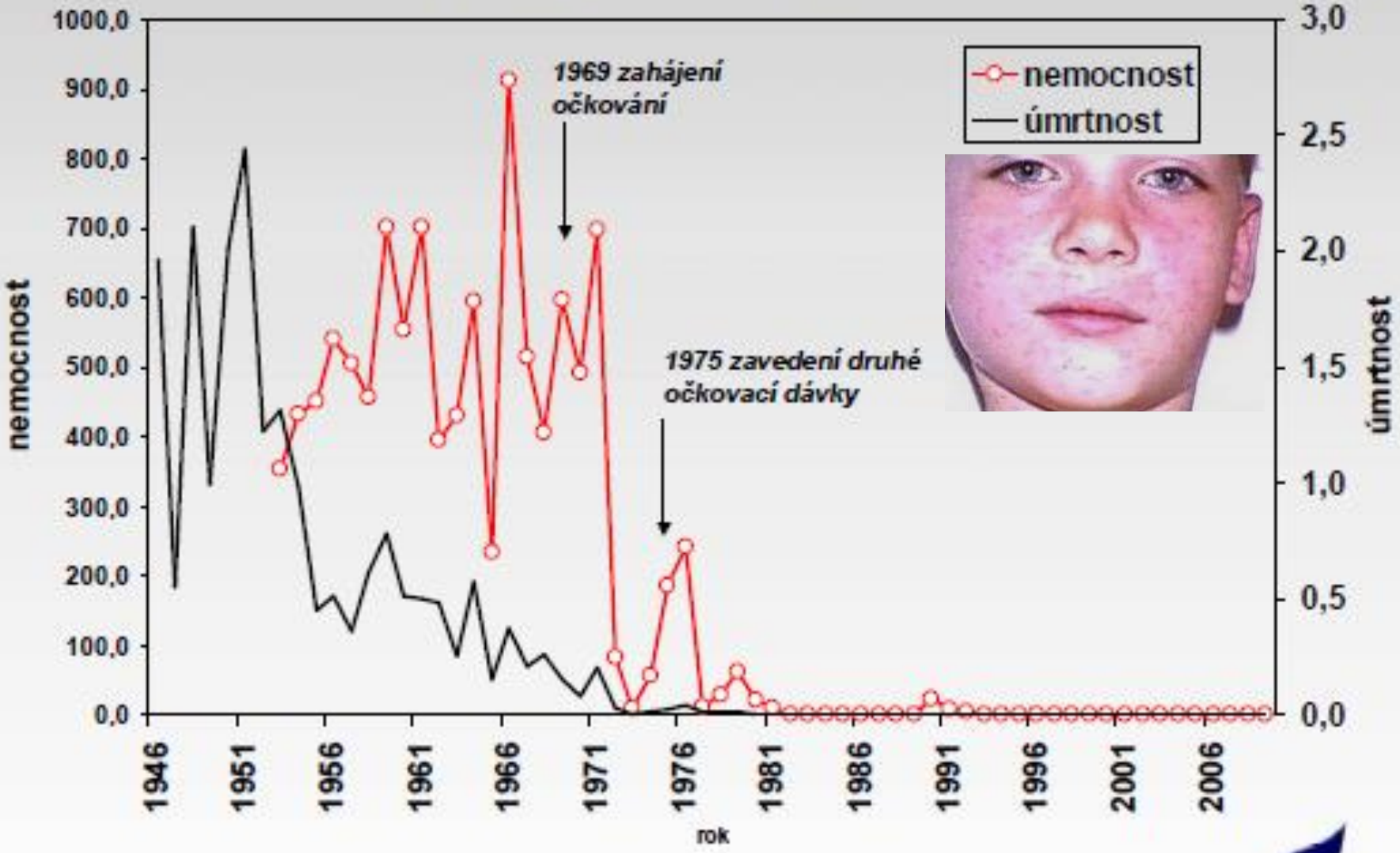
Dokud bylo očkování nepovinné, patřily spalničky mezi nejčastější příčiny smrti u dětí do 5 let. Jednalo se hlavně o navazující zápaly plic, průdušnice, mozku nebo srdečního svalu.Jedna dávka očkovací látky se ukázala jako nedostatečná, proto bylo zavedeno očkování druhou dávkou.



Zdroj: SZÚ

Zdraví 2020 – Národní strategie ochrany a podpory zdraví a prevence nemocí

Spalničky, nemocnost a úmrtnost, ČR, 1953-2009 nemocnost a 1946-2009 úmrtnost na 100 000 obyvatel



MUMPS - NORWAY: INCREASED INCIDENCE

Date: Fri 6 Nov 2015

Around 80 cases of the mumps (called kusma in Norwegian) have been recorded in Norway recently, mostly among college students. The outbreak began in Trondheim, but residents of Oslo, Bergen and elsewhere along the west coast have also fallen ill.

Doctors in Trondheim alerted state officials at the Institute for Public Health (Folkehelseinstituttet) late last week. By then, cases were spreading beyond Trondheim. All students suffering symptoms that can be confused with flu were urged to undergo testing. Dr Karin Ronning of the health institute said the outbreak is believed to have been brought in by foreign students.

"Since 1969, all children in Norway have been offered vaccination against measles via the Childhood Immunisation Programme. The measles vaccine is given in the form of 2 doses of MMR vaccine at 15 months and at 11 years (Grade 6). If there is an increased risk of infection, the vaccine may be given as early as 9 months, but a booster dose at

- 15 months of age is recommended.„
- There is an option in Norway to not take vaccines, thus outbreaks such as this current one may occur. Nonetheless, the case count has dropped significantly since 1960; see the URL above for Figure 1 - Cases of measles per 100 000 inhabitants in Norway from 1900 to 2014. Source:
- Statistics Norway (1900-1974) and MSIS (1975-2014), and Figure 2 - vaccination coverage for measles vaccine, 2014, 2-year-olds (per cent). Coverage for the entire country (hele landet) and by county.
- Figure: norgeshelsa.no. Source: Norwegian Immunisation Registry (SYSVAK). - Mod.LK

Zarděnky, Česká republika, 1961-2009, nemocnost na 100 000 obyvatel

Rubella

• Twenty-eight EU/EEA countries reported a total of 2 808 rubella cases during the period July 2014 to June 2015.

• In 18 of the countries reporting consistently, the rubella notification rate was less than one case per million population, including 11 countries reporting zero cases during the 12-month period.

• Poland accounted for 93.9% of all reported rubella cases in the 12-month period.

The highest number of cases was observed in 5–9- and 1–4-year-olds. 28.5% of the cases were unvaccinated.

However, this figure needs to be interpreted with caution as only 37 cases were confirmed through laboratory testing.

• No outbreaks of rubella have been detected by epidemic intelligence since the last report.

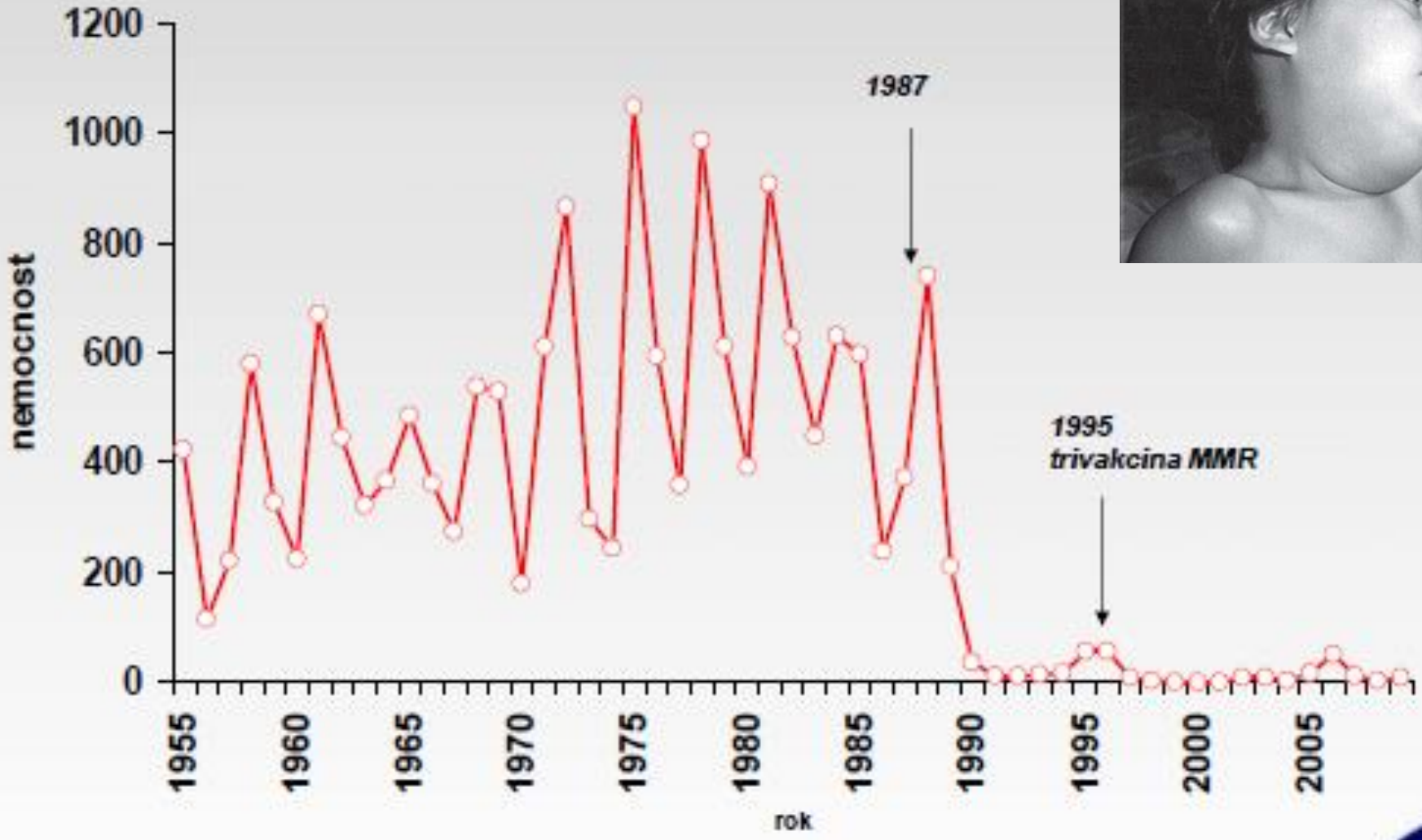
MUMPS

Mumps is an acute illness caused by the mumps virus. It is characterised by fever and swelling of one or more salivary glands (mumps is the only cause of epidemic infectious parotitis).

Humans are the only reservoirs of the virus, which is transmitted from person to person via droplets and/or saliva. Following infection, the incubation period lasts on average 16–18 days. Salivary glands apart, other organs may be involved and symptoms might include infection in the testicles (in post-pubertal males), prostate gland, thyroid gland, and pancreas. Brain involvement is frequent, but mostly without symptoms. Brain infection is believed to occur in only one in 10 000 cases, but it often leads to death.

Mumps is preventable by a vaccine, which is most often administered in association with anti-rubella and anti-measles vaccines (MMR).

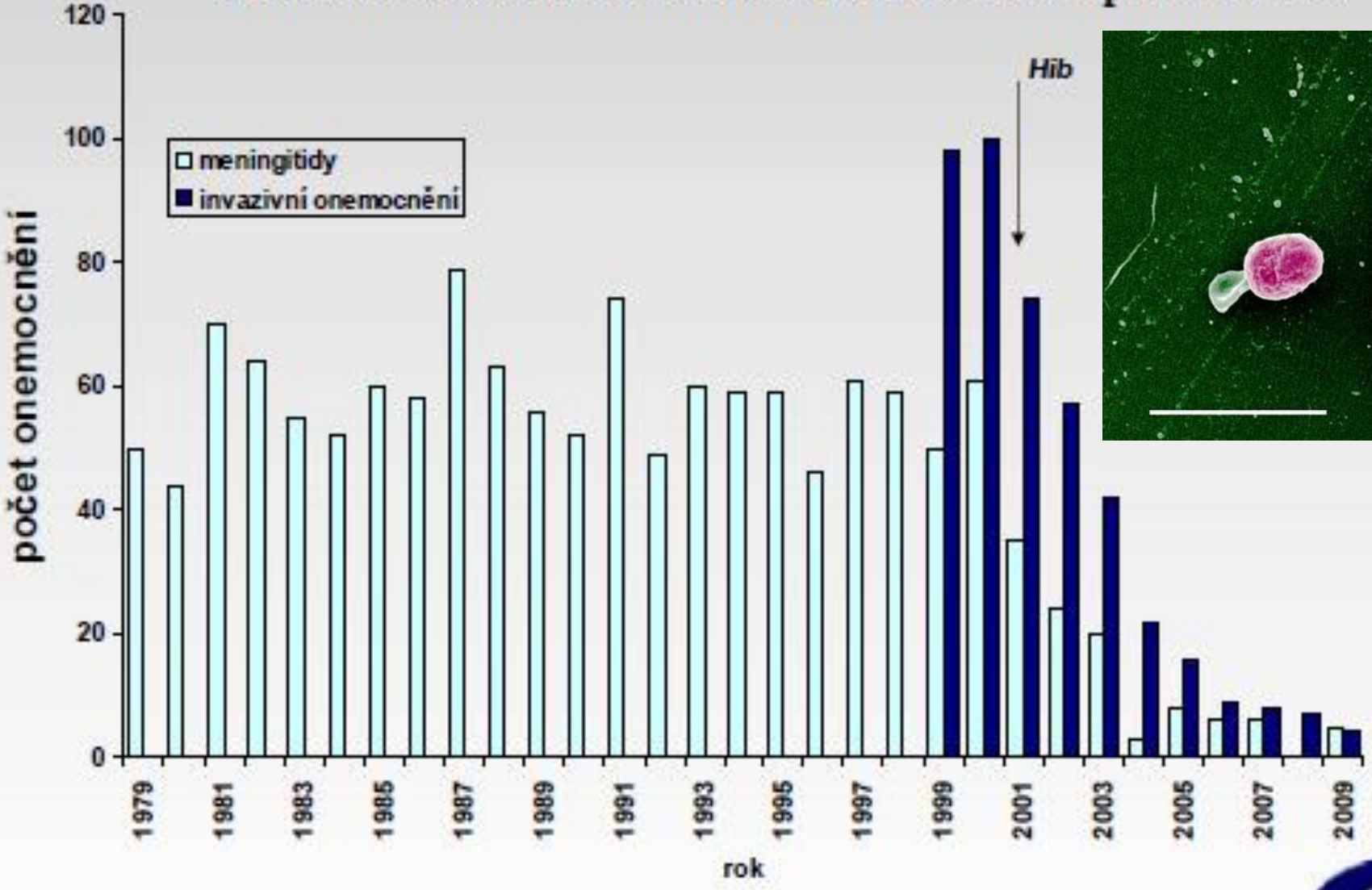
Příušnice, ČR, 1955-2009, nemocnost na 100 000 obyvatel



***Haemophilus influenzae* type b (Hib).**

Other familiar diseases that vaccines protect against include chickenpox, hepatitis A and B, and ***Haemophilus influenzae* type b (Hib)**. Hib causes meningitis, an inflammation of the fluid-filled membranes that surround the brain and spinal cord. Meningitis can be fatal, or it can cause severe disabilities such as deafness or mental retardation. This disease has nearly disappeared among babies and children in the United States since the Hib vaccine became widely used in 1989.

Hemofilové bakteriální meningitidy (do roku 1998) a invazivní hemofilová onemocnění B96.3 v Epidatu v ČR



Invasive Haemophilus influenzae disease

Invasive Haemophilus influenzae disease has become rare; the notification rate in Europe was 0.49 per

100 000 population, with a slightly ascending trend which may be attributed to improved surveillance in most countries.

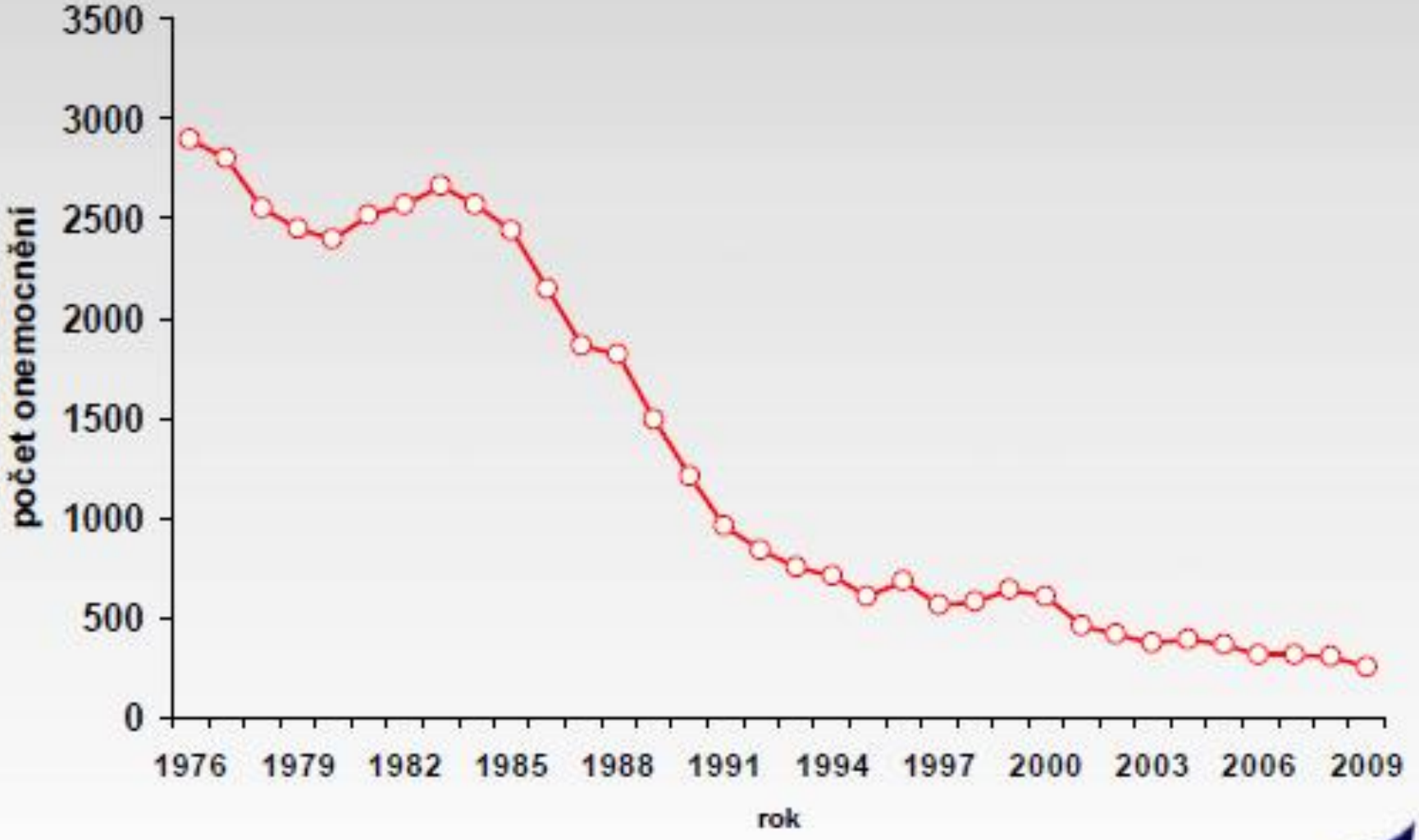
- Country-specific rates were highest in northern Europe and in the United Kingdom;

age-specific rates were highest in children under one year and adults aged 65 years or over.

- The national immunisation schedules of all EU/EEA countries include the Hib vaccine, which has led to a
  - progressive reduction of type b serotype infections.
- Even though there appears to be a trend towards an increase in disease due to non-capsulated (nontypeable) strains, European data is too scarce to draw conclusions on serotype replacement.
- Continued monitoring of strains, together with their associated clinical syndromes, is essential for assessing the effect of interventions.

In 2012, 2 545 confirmed cases of invasive Haemophilus influenzae disease (all serotypes) were reported by 27 countries, 24 of which have surveillance systems with national coverage. Belgium, France and Spain reported data from sentinel surveillance and therefore had to be excluded from the notification rates analysis, while no confirmed cases were reported from Malta for 2012.

Akutní hepatitida B (B16), Česká republika, 1976-2009, počet hlášených nových onemocnění



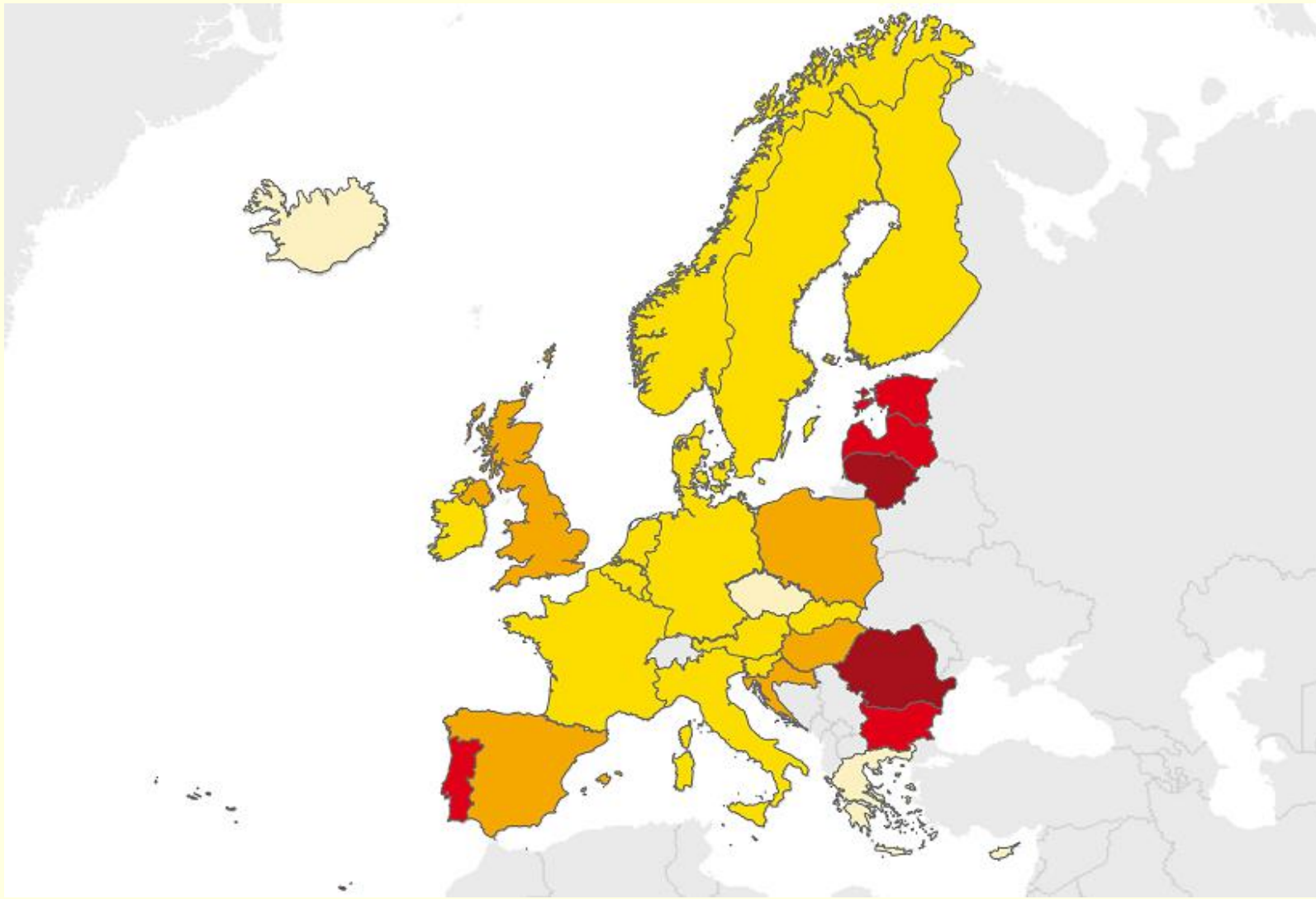
Očkování proti TBC

- Od 1. 11. 2010 platí novela vyhlášky č. 299/2010 Sb., kterou se mění vyhláška č. 537/2006 Sb., o očkování proti infekčním nemocem, podle které je očkování **povinné pouze** pro děti s těmito indikacemi:
- jeden nebo oba z rodičů nebo sourozenec nebo člen domácnosti, v níž dítě žije, měl/má aktivní tuberkulózu,
- dítě, jeden nebo oba z rodičů nebo sourozenec dítěte nebo člen domácnosti, v níž dítě žije, se narodil nebo souvisle déle než 3 měsíce pobývá/pobýval ve státě s vyšším výskytem TBC než 40 případů na 100 tis. obyvatel (Min. zdravotnictví každoročně uveřejní seznam států s vyšším výskytem tuberkulózy do 30 dnů od aktualizace provedené WHO), seznam států na www.mzcr.cz
- dítě bylo v kontaktu s nemocným tuberkulózou.

TB notifications by country

- In 2013, 64 844 TB cases were reported in the EU/EEA.
- The notification rate was 12.7 per 100 000 population (range 3.4–83.5).

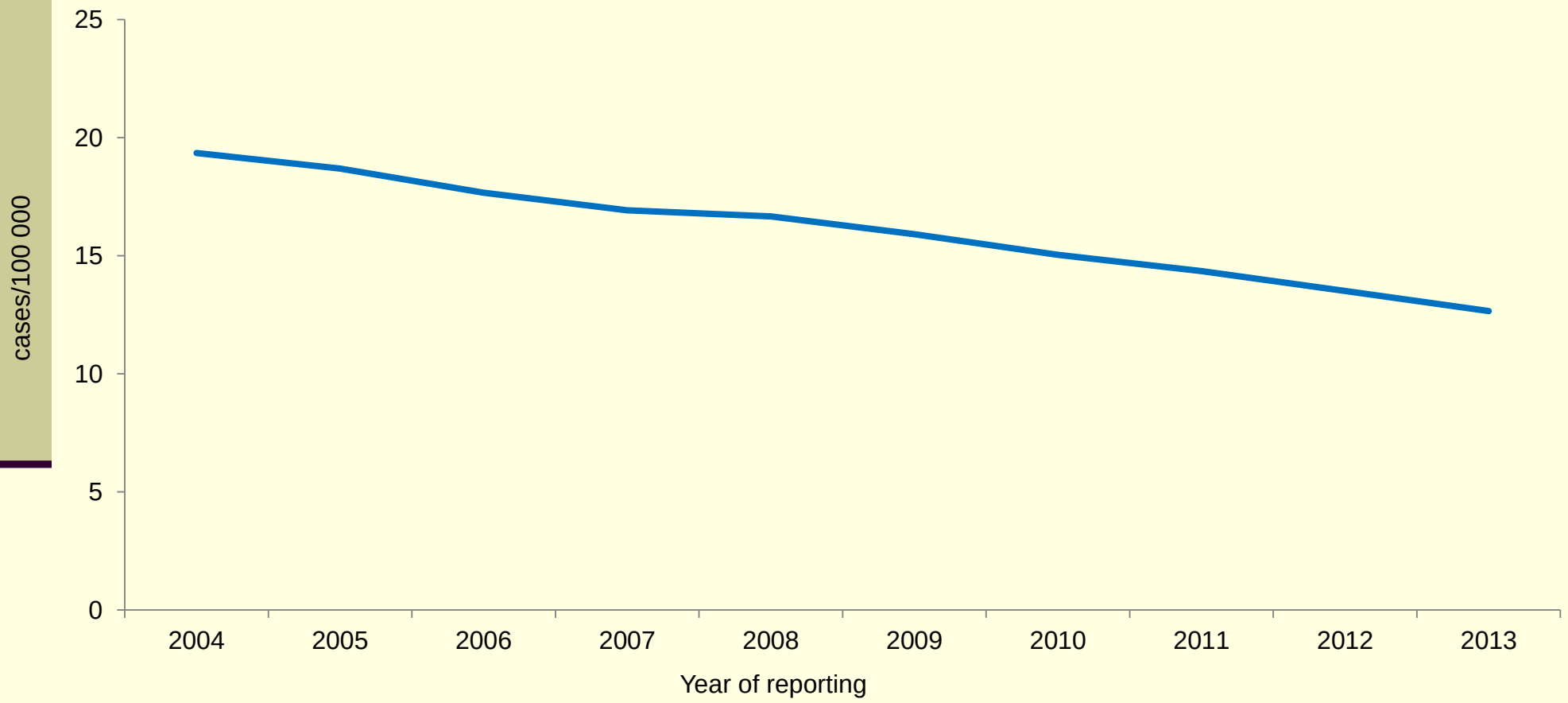
Figure 1: TB notification rate per 100 000 population by country, EU/EEA, 2013



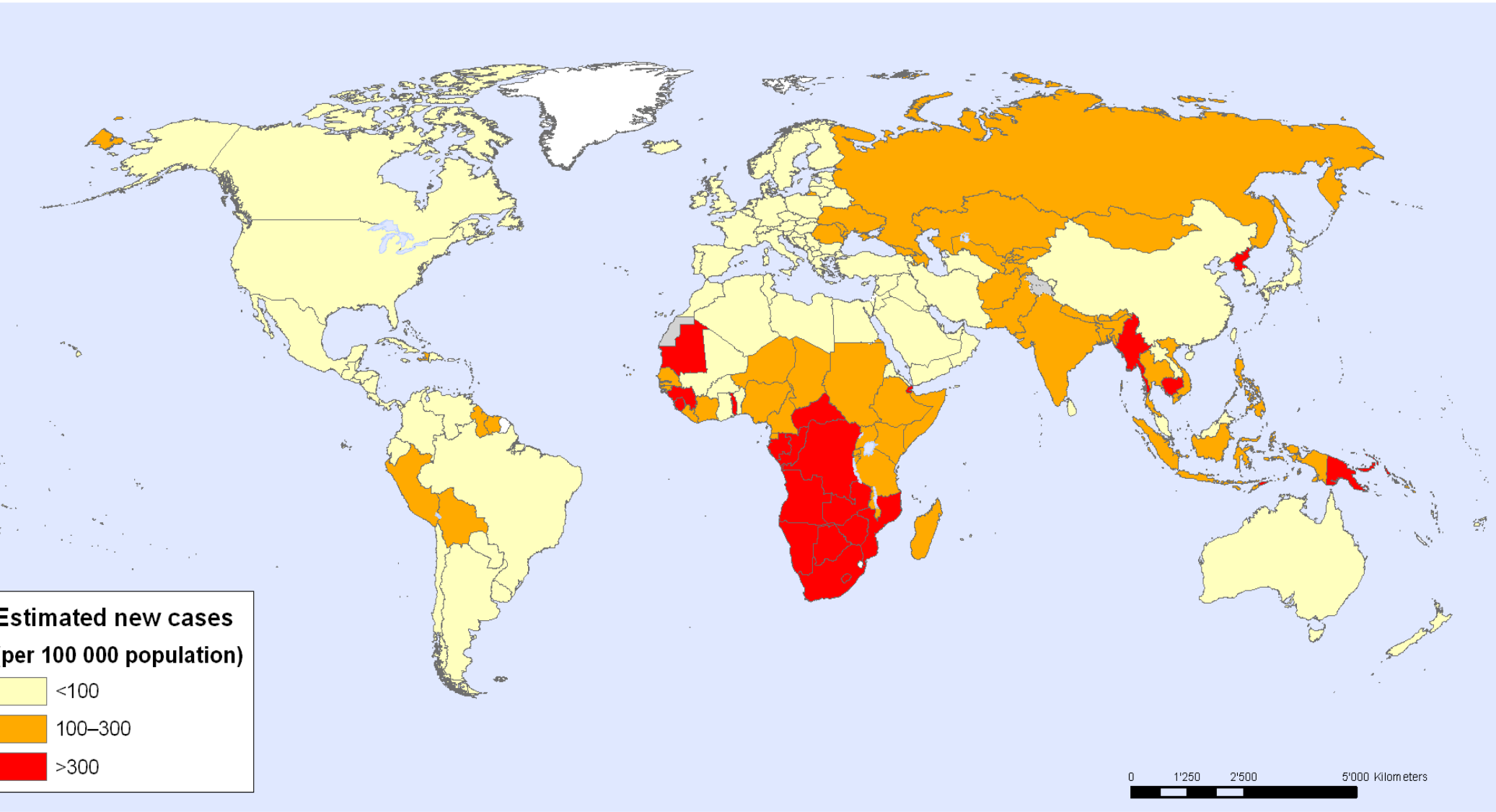
TB notification rate over time

- The TB notification rate has decreased from 19.3 per 100 000 population in 2004 to 12.7 in 2013.

Figure 2: TB notification rate per 100 000 population in EU/EEA 2004–2013



Tuberculosis, estimated new cases, 2010

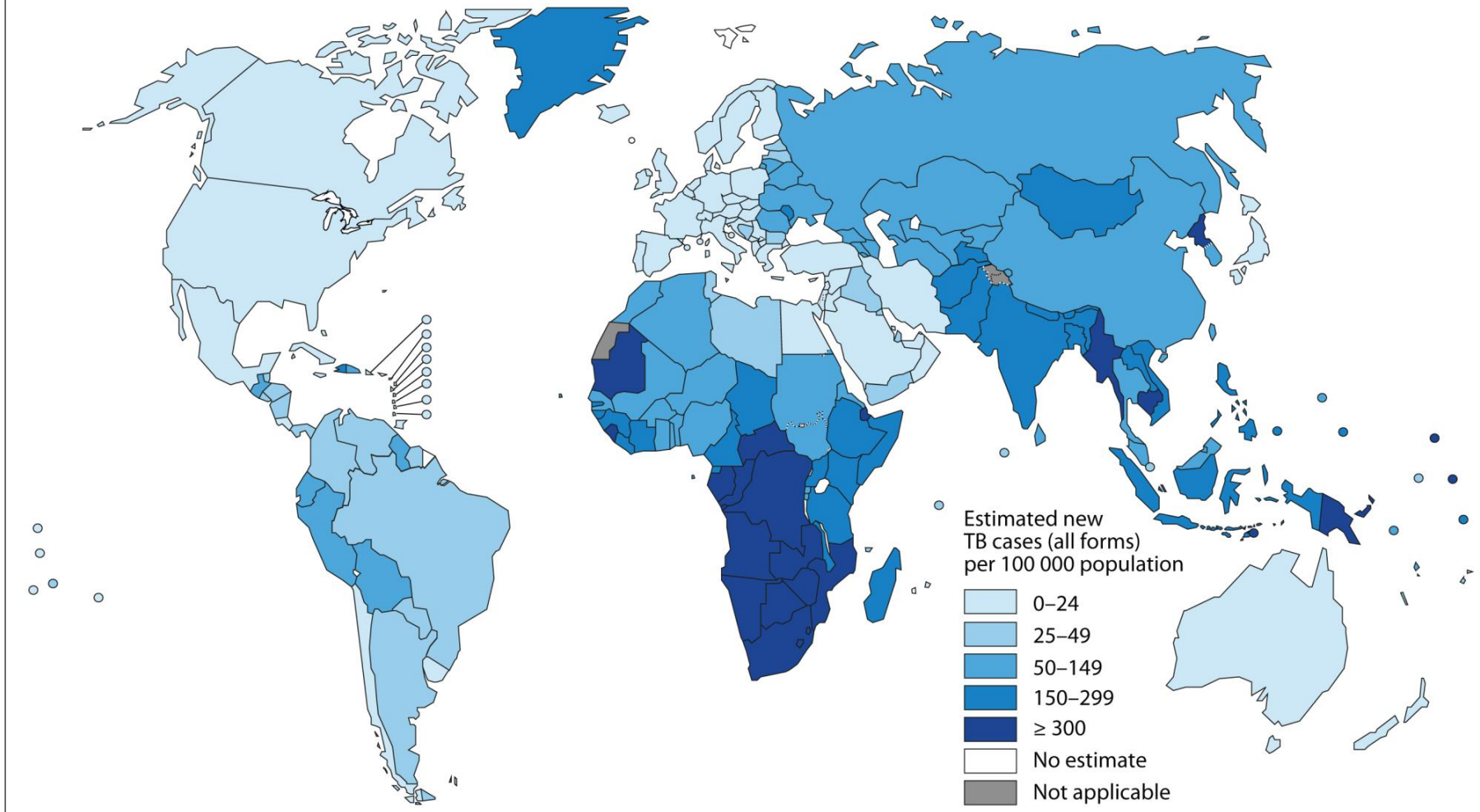


The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

Estimated tuberculosis (TB) incidence rates, 2011



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Source: *Global Tuberculosis Report 2012*. WHO, 2012.

World Health Organization

WHO bije na poplach: 4400 lidí denně umírá na tuberkulózu

Světová zdravotnická organizace (WHO) ve středu (28:10.2015) vyzvala k dalšímu boji proti tuberkulóze (TBC), která stále patří k hlavním příčinám úmrtí ve světě a na kterou denně umírá 4400 lidí.

Toto číslo je podle autorů zprávy WHO o to „nepřijatelnější" a smutnější, že v současnosti již lze diagnostikovat a vyléčit téměř všechny nemocné TBC.

Dosavadní úsilí proti TBC umožnilo, aby se úmrtnost na toto onemocnění ve světě od roku 1990 snížila o polovinu. Situace se zlepšila hlavně po roce 2000. Nové diagnostické a léčebné metody umožnily zachránit na 43 miliónů životů. Podle WHO je však třeba pokračovat a zesílit boj proti TBC, který nyní brzdí hlavně nedostatek peněz.

Loni se objevilo 9,6 miliónu nových případů onemocnění. Více než polovina současných případů TBC připadá na Čínu, Indii, Indonésii, Nigérii a Pákistán, upřesnila WHO.

Počty onemocnění v ČR trvale klesají, loni bylo hlášeno 512 případů. Česko tak patří se 4,8 případu na 100 000 obyvatel k zemím s nejnižším výskytem TBC na světě.

Vaccine-Preventable Infectious Diseases:

- Anthrax
- Bacterial meningitis
- Chickenpox
- Cholera
- Diphtheria
- Haemophilus influenzae type b
- Hepatitis A
- Hepatitis B
- Influenza
- Measles
- Mumps
- Pertussis
- Pneumococcal pneumonia
- Polio
- Rabies
- Rubella
- Tetanus
- Yellow fever

- Tbc

Immunity

- Self vs. nonself
- Protection from infectious disease
- Usually indicated by the presence of antibody
- Very specific to a single organism

Principles of Vaccination

- Protection produced by the person's own immune system
- Usually permanent
- Protection transferred from another person or animal
- Temporary protection that wanes with time

Passive Immunisation

- Transfer of antibody produced by one human or other animal to another
- Temporary protection
- Transplacental most important source in infancy

Sources of Passive Immunity

- Almost all blood or blood products
- Homologous pooled human antibody (immune globulin)
- Homologous human hyperimmune globulin
- Heterologous hyperimmune serum (antitoxin)

Monoclonal Antibody

- Derived from a single type, or clone, of antibody-producing cells (B cells)
- Antibody is specific to a single antigen or closely related group of antigens
- Used for diagnosis and therapy of certain cancers and autoimmune and infectious diseases

Active Immunisation

- A live or inactivated substance (e.g., protein, polysaccharide) capable of producing an immune response
- Protein molecules (immunoglobulin) produced by B lymphocytes to help eliminate an antigen

Contraindications

- Generaly
  - Acute illnes
  - Reaction after last vaccination
  - Anaphylactic reactions
  - Recovery time
  - Incubation period of some infectious diseases
  - Pregnancy
  - Immunosupression – therapy
  - Hemoblastosis and other oncologic disease

Contraindications

- Specific
  - Depends on the types of vaccine (exampl.- alergic reaction on the some substances

Apliccation

- Under aseptic conditions !
- i.m.
- s.c.
- intradermal (epidermis)
- p.o.
- scarification
- …..

After aplication - 30 min - under oversight !

Reaction after apliccation

- Fysiolocal reaction
  - Local
    - erythema, swelling, soreness …
  - Generally
    - higher temperature, fever, tiredness, hedeache,
    - pain of the muscles, joints,
    - Indigestion
- Alergic reaction

Vaccination

- Active immunity produced by vaccine
- Immunity and immunologic memory similar to natural infection but without risk of disease

Live Attenuated Vaccines

- Attenuated (weakened) form of the "wild" virus or bacterium
- Must replicate to be effective
- Immune response similar to natural infection
- Usually effective with one dose*

Live Attenuated Vaccines

- Severe reactions possible
- Interference from circulating antibody
- Fragile – must be stored and handled carefully

Live Attenuated Vaccines

- Viral — measles, mumps, rubella, vaccinia, varicella, yellow fever, intranasal influenza, (oral polio) (rotavirus)
- Bacterial — BCG, oral typhoid

Inactivated Vaccines

- Cannot replicate
- Less interference from circulating antibody than live vaccines
- Generally require 3-5 doses
- Immune response mostly humoral
- Antibody titer diminishes with time

Inactivated Vaccines

- Viral — polio, hepatitis A, rabies (influenza)
- Bacterial — (pertussis) (typhoid) (cholera) (plague)

Inactivated Vaccines

- Subunit — hepatitis B, influenza, acellular pertussis, (Lyme) (HPV)
- Toxoid — diphtheria, tetanus

Polysaccharide Vaccines

- pneumococcal
- meningococcal
- *Salmonella* Typhi (Vi)

- *Haemophilus influenzae* type b
- pneumococcal
- meningococcal

Pure Polysaccharide Vaccines

- Not consistently immunogenic in children <2 years of age
- No booster response
- Antibody with less functional activity
- Immunogenicity improved by conjugation

Immunisation in Czech Republic

Regulary vaccination – (refunding the state)

- (TBC) form 2010 only by indicated group
- Diphteria, Tetanus, Pertussis, Hemophillus influenzae B, Poliomyelitis, Viral hepatitis B (VHB),
- Morbilli, Rubeola, Parotitis epidemica

- Inluenza, Pneumoccus (for specific groups – by low)
- VHB (healths workers)

TBC	only - indication
Di,Te,P(a), Hib, VHB,IPV	from 13th week 3 times in 1 year (each after 1 months) 4th dosis 6th months after 3th dosis
MMR	1st dosis from 15th months 2nd dosis from 6th to 10th months after 1st dosis
Di,Te,P(a)	5 years
Di,Te,P(a),IPV	10 years
VHB	12 years
Te	25 years, revaccination each after 10 - 15 years

Poznámka: TBC , Di (Diphteria), Tetanus (Te), P (Pertussis), Hib (Haemophilus influenzae b), HB (VHB), IPV (poliomyelitis), MMR (measles, mumps, Rubella).

Illness	The beginning of vaccination
Variolla	1919
Diphtheria	1946
TBC	1953
Tetanus	1956
Pertussis	1958
Poliomyelitis	1960
Morbilli	1969
Parotitis	1987
Rubella	1982 (12 years girls) 1986 (2 years children)
Haemophilus influenzae b	2001
VHB	2001

Očkování před cestou do zahraničí

Povinná očkování proti:

- **žluté zimnici** při cestách do zemí Afriky a Střední a Jižní Ameriky a
- **meningokokové meningitidě (A,C, Y, W - 135)** při cestách do Saudské Arábie.

Typhus abdominalis

TYPHIM Vi je vakcína připravená z purifikovaného Vi kapsulárního polysacharidu získaného extrakcí ze *Salmonella typhi*.

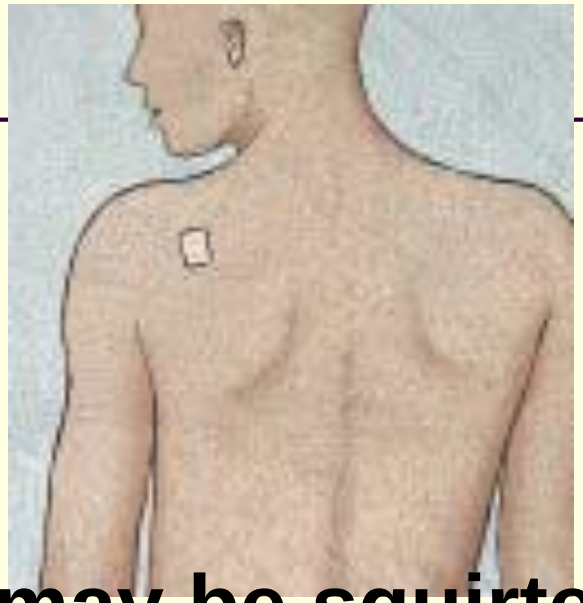
Prevence břišního tyfu u dospělých osob a dětí nad 2 roky věku, zvláště lidí cestujících do endemických oblastí, migrujících, zdravotnických pracovníků a vojáků.

- Ochranu zajišťuje jedna dávka vakcíny.
- Přeočkování se provádí každé tři roky, jestliže riziko nákazy tyfem stále trvá.

Nová vakcína proti HPV – Gardasil 9,

Vakcína proti Clostridium difficile

Vakcína proti autismu ??



Future vaccines may be squirted up the nose, worn as a patch, or eaten at the dinner table.