Monitoring of human enteroviruses in the Slovak Republic:
before and after the change of polio vaccination strategy

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Introduction

➢ *Human enteroviruses (EVs)* belong to the *Picornavirus* family, genus *Enterovirus* and species *Enterovirus A-D*. *EV-C* species contains 23 serotypes including coxsackieviruses (CVs), echoviruses, polioviruses (PVs) and the numbered enteroviruses (EVs).

➢ *EVs* are associated with diverse clinical syndromes ranging from minor febrile illness to severe, potentially fatal conditions (e.g., aseptic meningitis, encephalitis, paralysis, myocarditis).

➢ They are transmitted by the faecal-oral route and excreted in stools for several weeks after the acute phase of the infection.

➢ Circulation of EVs can be detected in sewage.

Surveillance of Polioviruses and other Human enteroviruses

➢The WHO region was declared and certified as polio free in 2002.

➢Surveillance of polioviruses and other EVs (non-polio enteroviruses NPEV) has been included by the WHO in the Global Polio Eradication Initiative (GPEI), supplementing surveillance of acute flaccid paralysis (AFP) of cases aged less than 15 years.

➢ In Slovak republic vaccination strategy was changed from OPV to IPV in 2005, after vaccine derived polioviruses (VDPV) emerged in several sewage waters from two localities in the Western Slovakia.

The aim of this work is to describe the circulation pattern of PV and NPEV observed during the sewage water surveillance in Slovak republic and to compare the changes in the pattern which occurred before and after the change of polio vaccination strategy in 2005.

Material and methods

We cover the period from 2001 to 2016, which shows a range from 'before and after' the change in polio vaccination strategy, in the Slovak Republic.

Samples from the sewage treatment plants of 48 localities from Western (24), Central (10) and Eastern (14) regions were tested.

Sewage sample collection was performed every two months from each locality. From January 2004 to April 2005, sampling in the Western region was performed on a weekly basis because PV2-VDPVs were isolated in two localities.

Samples (1liter) were concentrated by centrifugation using the two phase of separation with polyethylene-glycol and dextran, as recommended WHO.

WHO standard procedures were followed for virus isolations and identifications, by using two cell lines RD (human rhabdomyosarcoma cells) and L20B (mouse L cells expressing the human poliovirus receptor CD155), that have been recommended by the WHO for isolation of PVs.

Typing of all isolates was performed by microneutralization test using type-specific antisera and by indirect fluorescence test according the manual WHO.

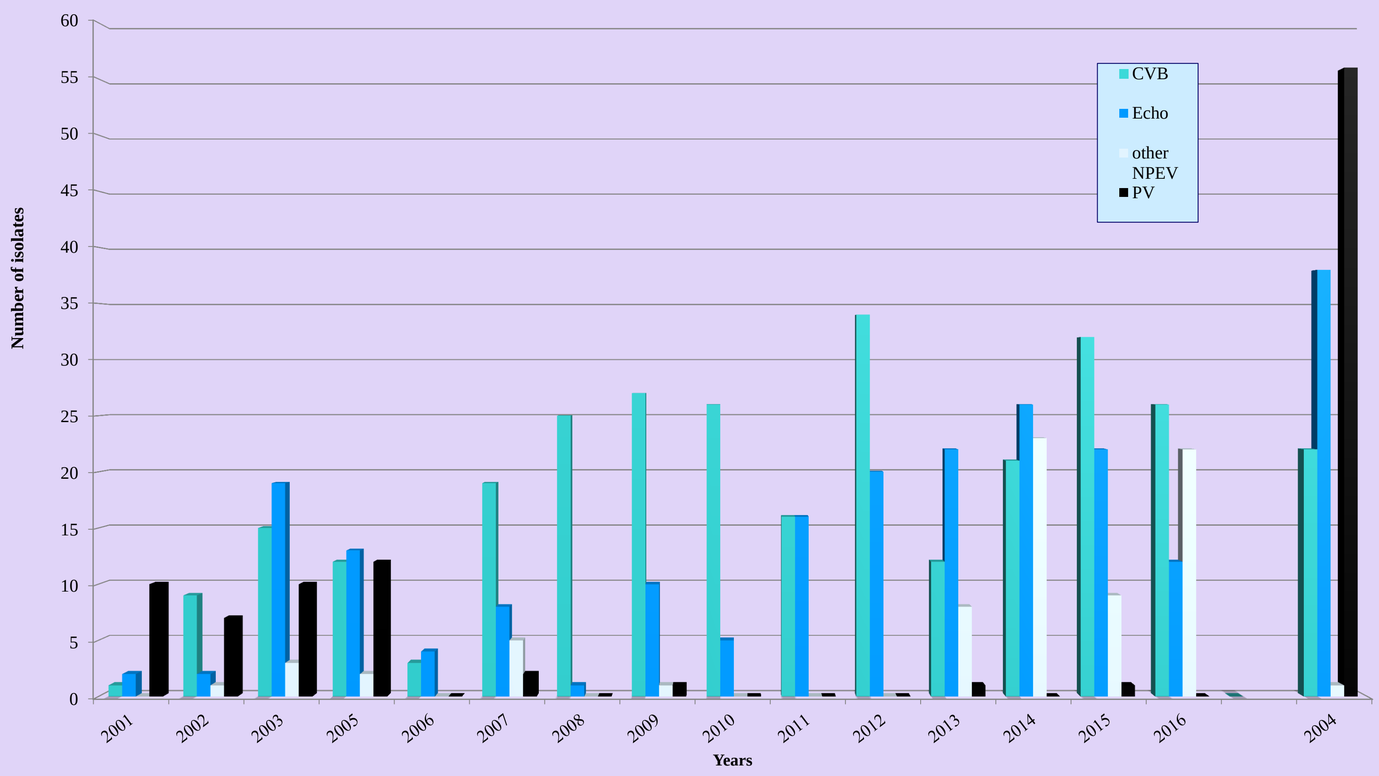
Results:

During 2001-2016,

- 870 human enteroviruses (EVs) were detected in sewage water:
  - 357 (41%) coxsackie B viruses (CBV),
  - 309 (36%) echoviruses,
  - 76 (9%) NPEV not-typed and 114 (13%) Sabin-like PVs (PV1, 2, 3) including vaccine-derived poliovirus (VDPV) isolates.
- The percentage of PV isolates fell from 66% to 30% during 2001–2005 and thereafter to zero.
- CBV5, echoviruses 3 and 11 were the NPEVs endemic during the study period.
- CVB2, 3, 4 and echoviruses 6, 7, 19, 25, 30 isolations were also frequent.
- The PV/NPEV ratio showed a marked change after 2006.
- The last PVs (PV2 and PV3, SL strains) were isolated in 2013 and 2015 in Western Slovakia.

This work has some limitations for NPEV surveillance, because only two cell lines were used throughout the study. These cell lines are recommended by WHO for PV isolations, but are less suitable for isolation of NPEV.

Graph: Comparison of polioviruses, coxsackie B viruses and echoviruses in sewage water during 2001-2016



Conclusions:

We have shown that the changes in the vaccination program of oral polio vaccine towards inactivated polio vaccine in the year 2005 changed the balance of circulating serotypes from Sabin-like PV and VDPV towards the NPEV.

In September 2015, wild PV type 2 was officially declared eradicated. According to the WHO Global Action Plan to minimize poliovirus facility-associated risk after type-specific eradication of wild polioviruses, Slovak republic disposed off all material containing PV2.

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