

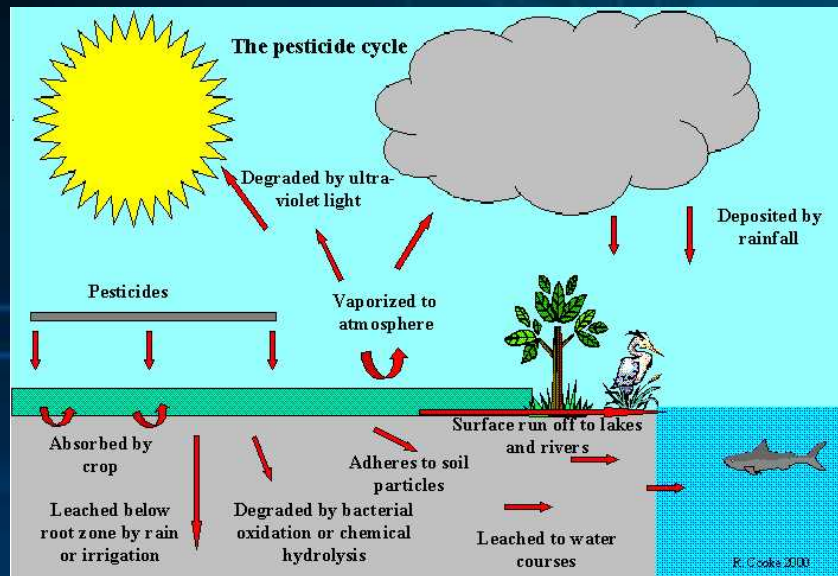
*Food Research Institute, Bratislava*



# **Monitoring and risk assessment of pesticides in the Slovak Republic**

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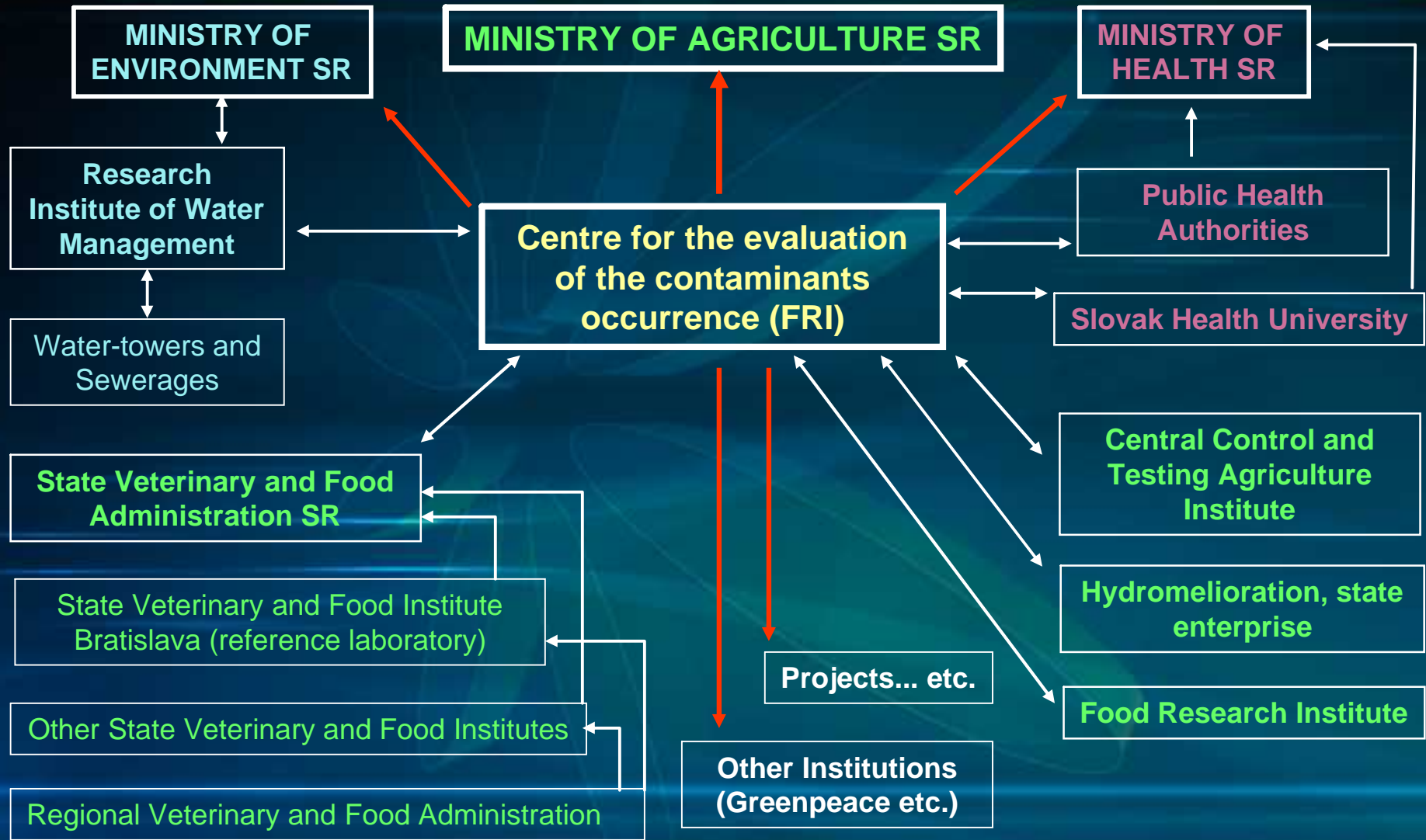
## Introduction



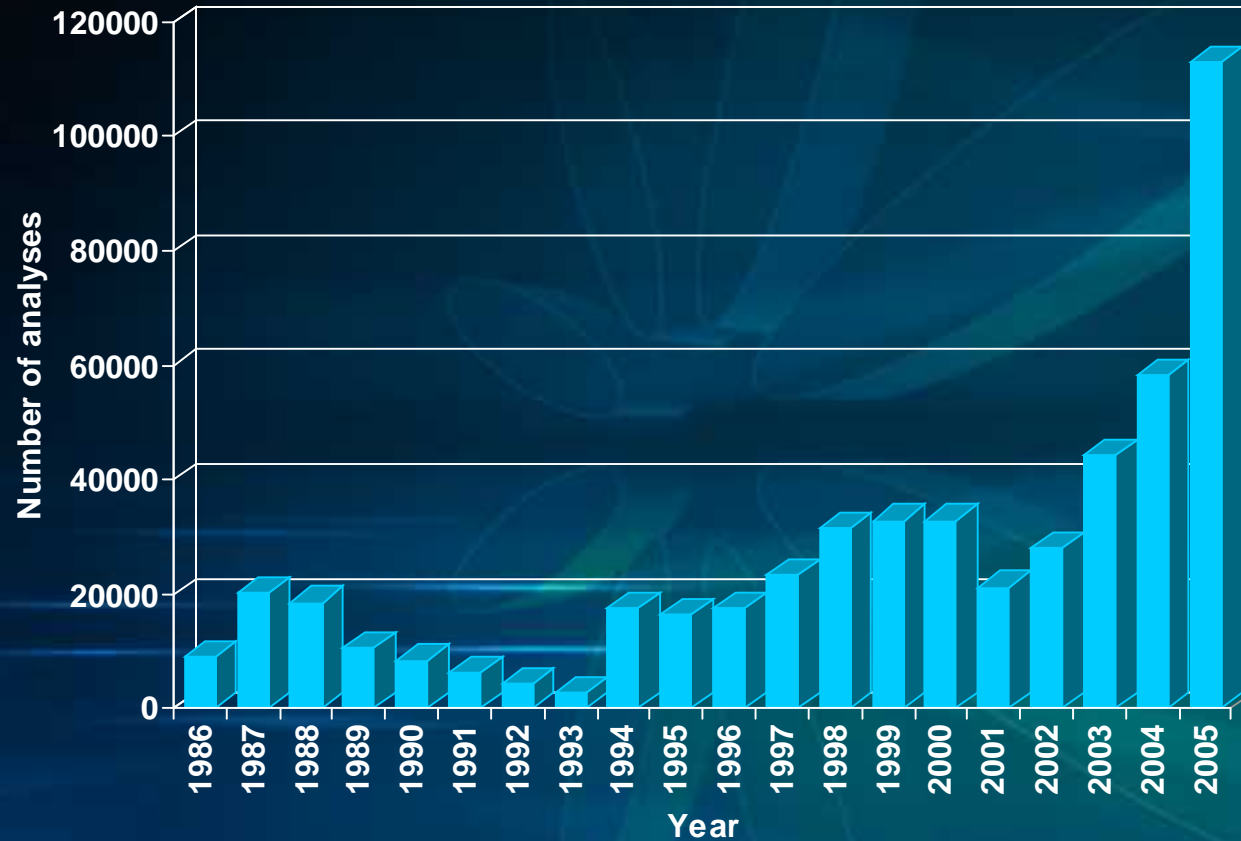
**Principles of Good Agricultural Practices (GAP):**  
Plant protection products should be used “as little as possible, but as much as necessary”.

- National official legislative acts: more than 270 substances are permitted
- Cases of inappropriate use of agrochemicals
- Residues of compounds whose use was banned
- Higher concentration than permitted level
- MRL - Maximum residue limit (mg/kg of edible portion or lipid portion)
- Defined MRL are usually lower than the upper safety limits
- Significance of these doses for human health risk must not be disregarded, since these substances can be ingested via some food commodities daily over a lifetime.

# Monitoring system of pesticide residues in the Slovak Republic (data inputs and outputs)

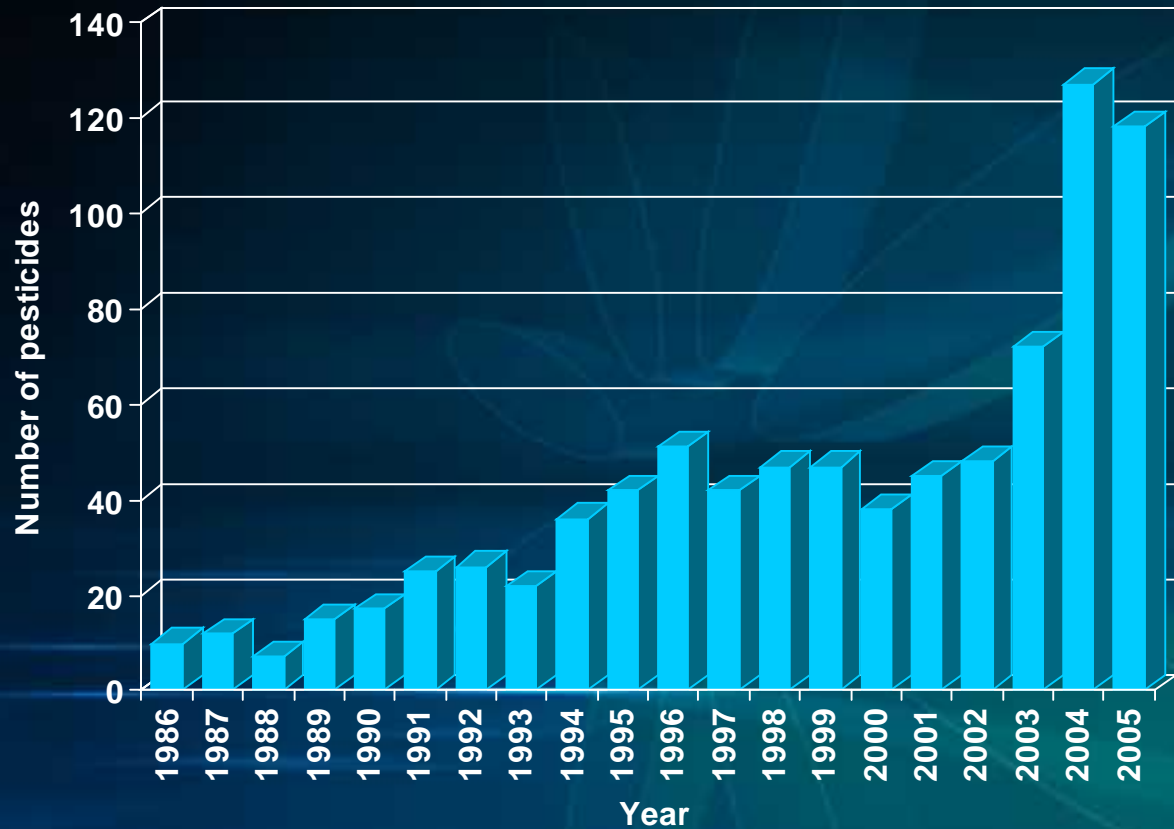


## Number of analyses in the Slovak Republic (1986 – 2005)



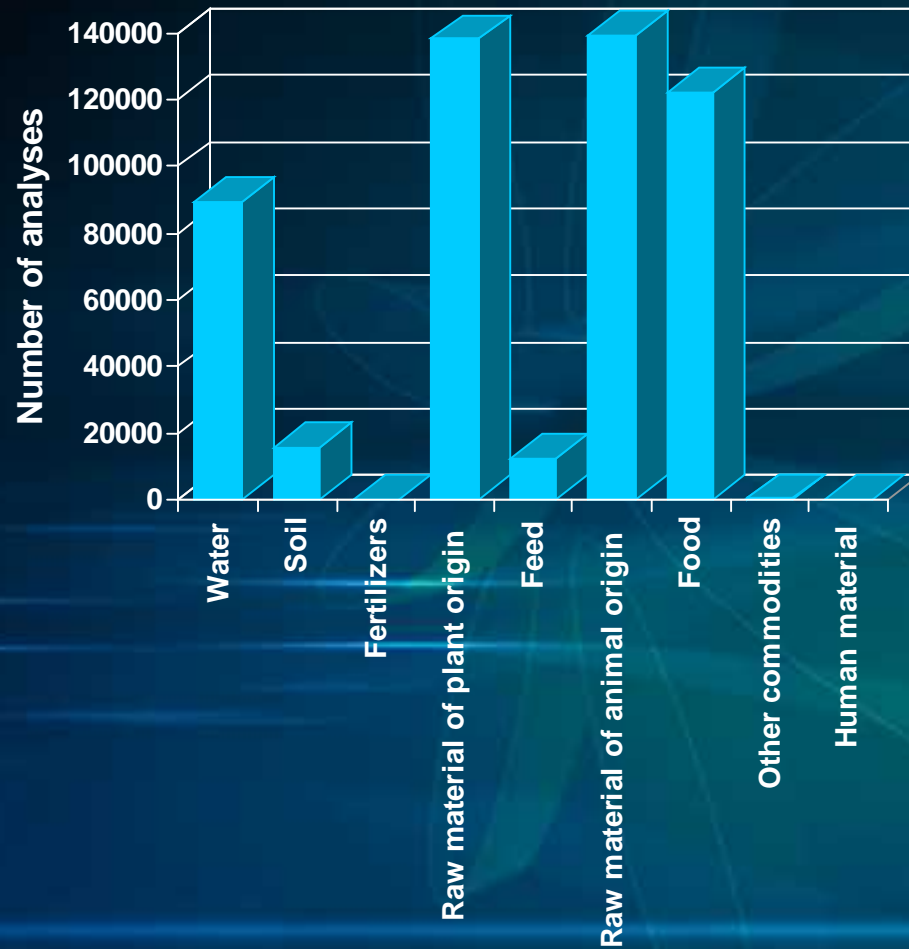
- Since 1986, total of 517000 analyses (various pesticides in various commodities)
- During the period of observation, the number of analyses has increased from the previous 9000 in 1986 to 112800 in 2005
- 2003 – 2005: Rapid increase in the number of analyses (Slovak Republic → EU)

## Number of pesticides observed in the Slovak Republic (1986 – 2005)



- 160 various types of pesticides (during the last 20 years)
- First analyses - persistent chlorinated pesticides
- In 1986 only 9 types of pesticides were observed (isomers of DDT, isomers of HCH, HCB and Aldrin)
- The range of the observed pesticides has increased
- Until 2003 up to 50 various types of pesticides
- After joining EU (in 2004) this number jumped to 127
- In 2005 total of 118 various types (chlorinated pesticides, organophosphate and carbamate insecticides, etc.)

## Commodities analyzed on occurrence of pesticide residues



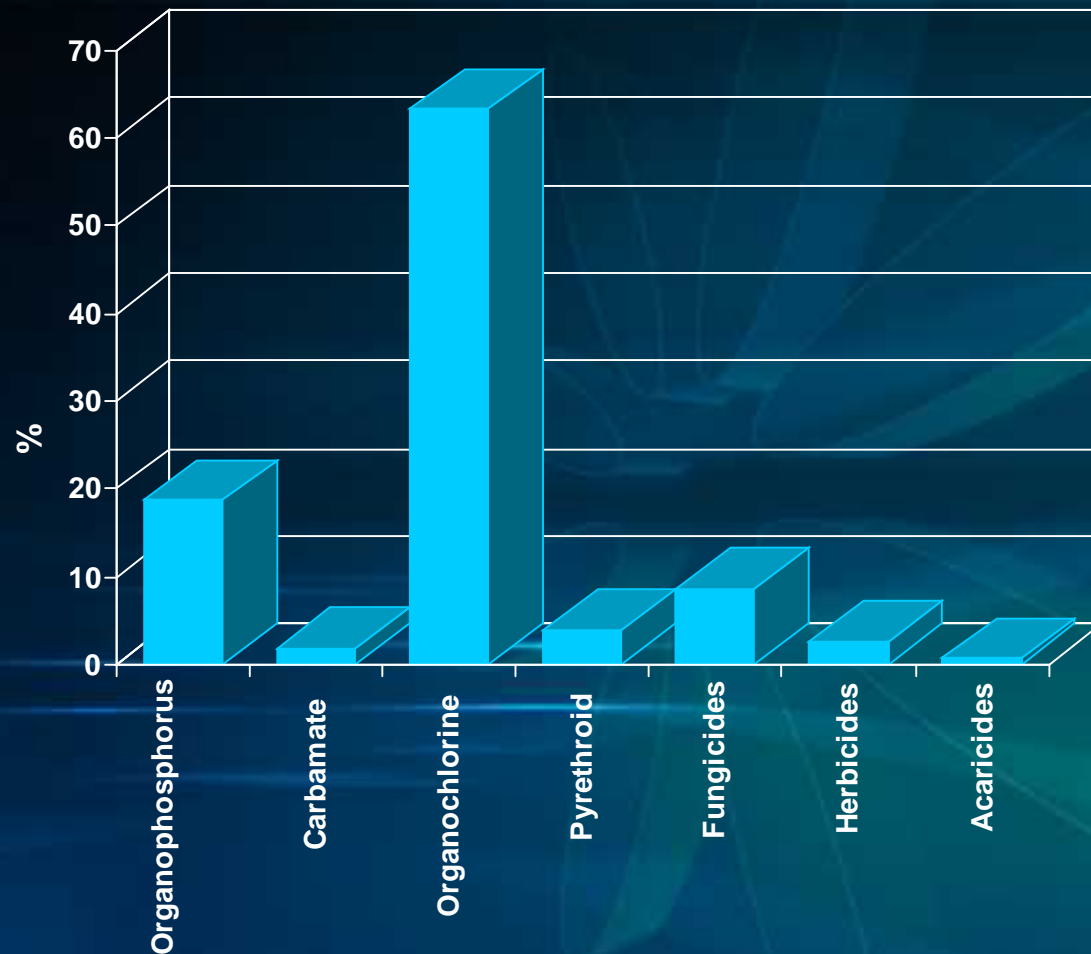
- Water, agricultural soil, feed, raw material of animal and plant origin, food commodities and samples of human material (breast milk, human fat)

### Observed commodities:

- Food commodities and food raw materials (77%)
- Water (12.3%)
- Soil, feed and other commodities (11%)



## Share of various types of pesticides



### Organochlorinated pesticides:

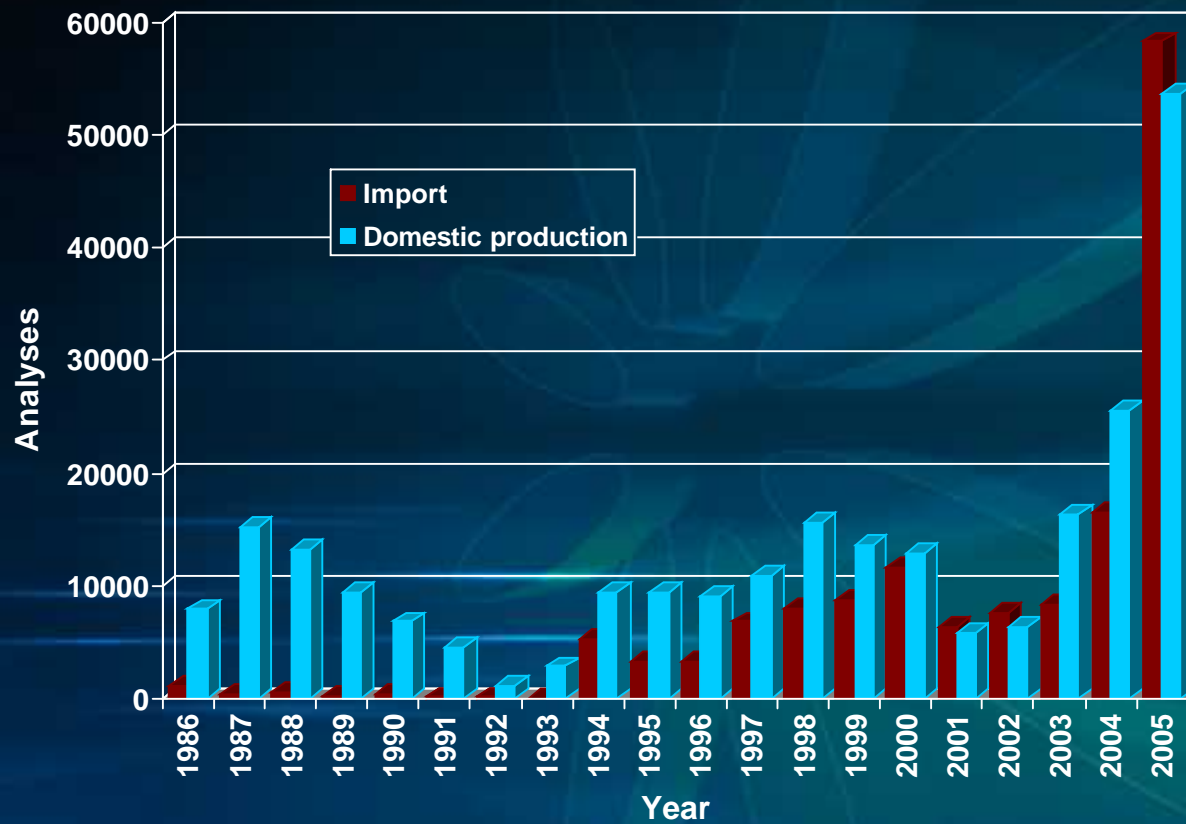
- Observed in soil, water, fertilizers, feed and food and raw material of animal origin
- 42 types of analyzed pesticides
- 63.3% of all performed analyses

### Residues of organophosphorus pesticides:

- Mostly analyzed in food and raw material of plant origin from domestic production or import
  - 41 types of analyzed pesticides
  - 18.7% of all performed analyses
- The share of remaining 77 types of analyzed pesticides in SR was only 16,3% of all performed analyses.



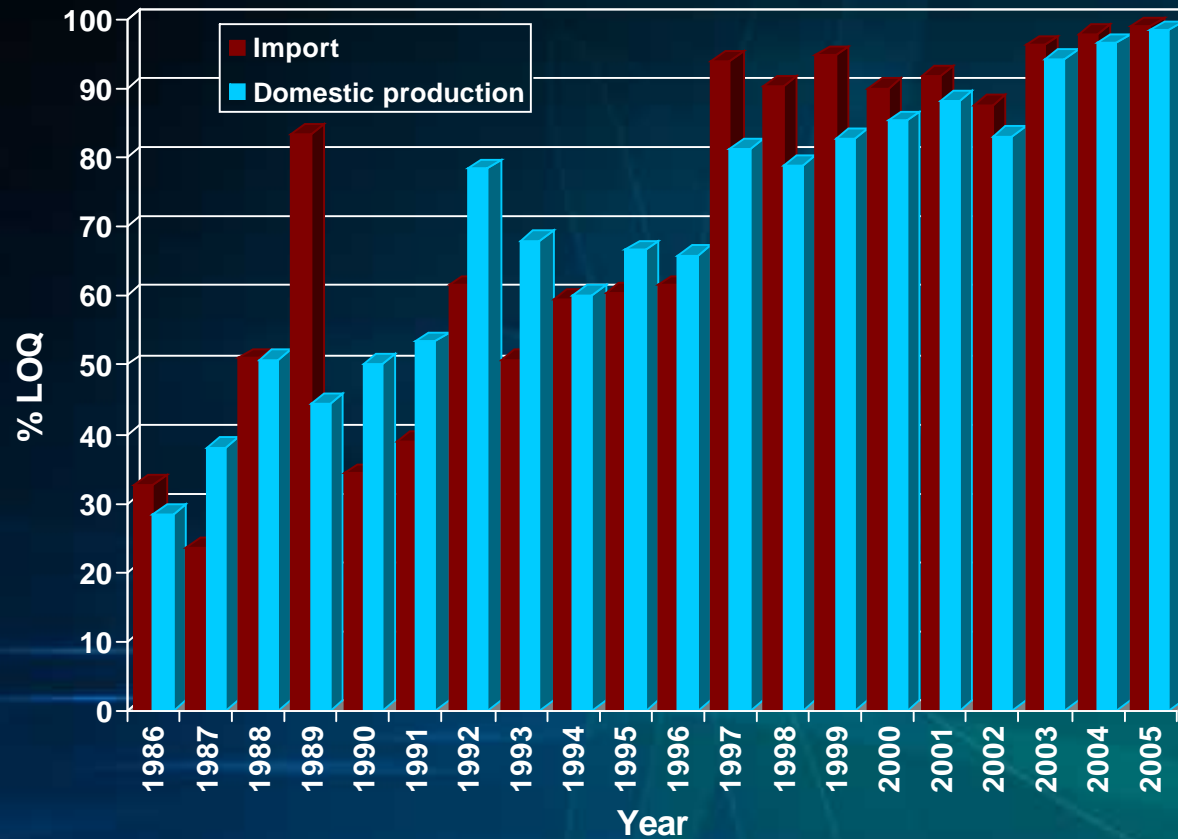
## Commodities from domestic production and commodities from import (1986-2005)



- Commodities from import: raw material of plant and animal origin, food and feed.
- At the beginning of the observation of pesticides residues, the majority of analyzed samples was from domestic production.
- In 1993 the share of samples from import was only 2.2%.
- After 1993 the number of samples from import was in increase and in 2005 number of analyzed samples from import exceeded the number of samples from domestic production.
- The share of samples from import in 2005 was 52,1%.



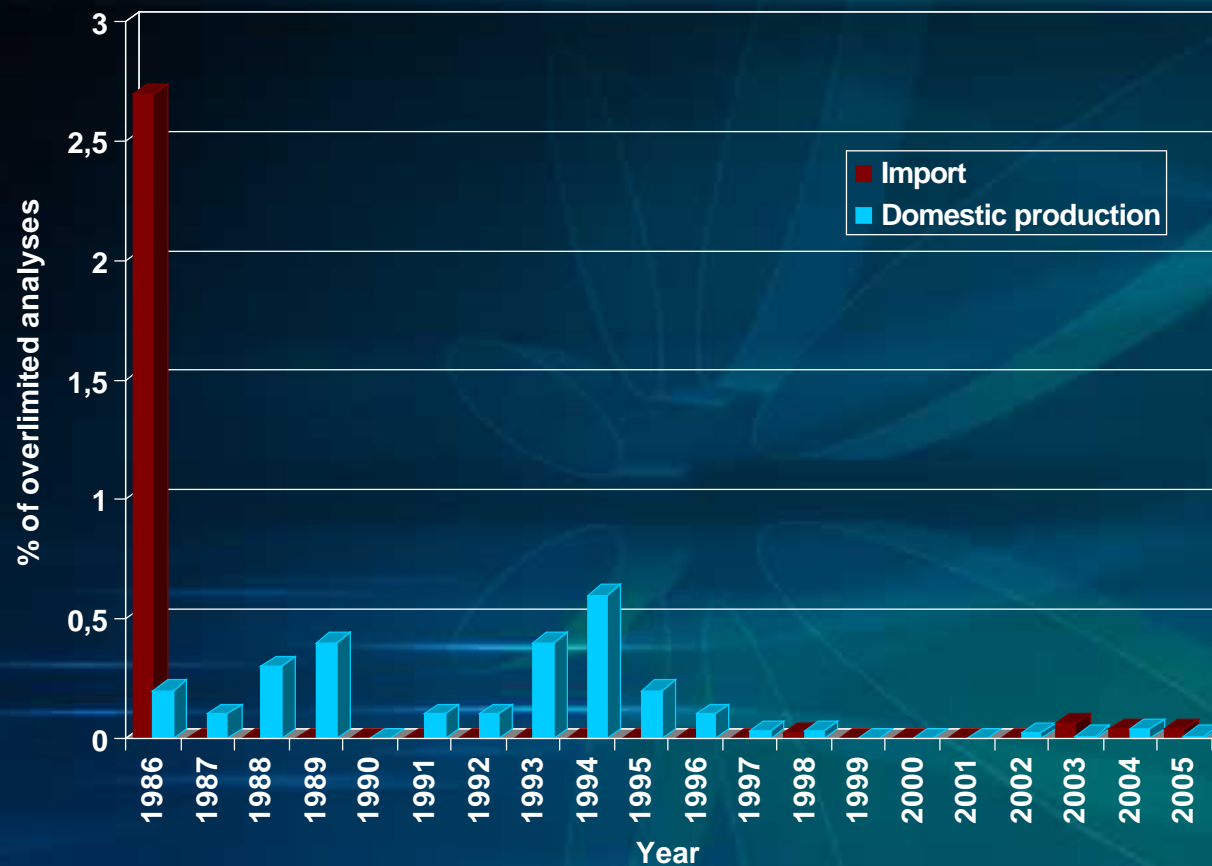
## Percentage of findings below the limit of quantification



- At the beginning of the observation, only 30% of analyzed samples were below the limit of quantification (LOQ)
- The number of findings below the limit of quantification was progressively in increase.
- In 2005 more than 98% of findings were below LOQ.



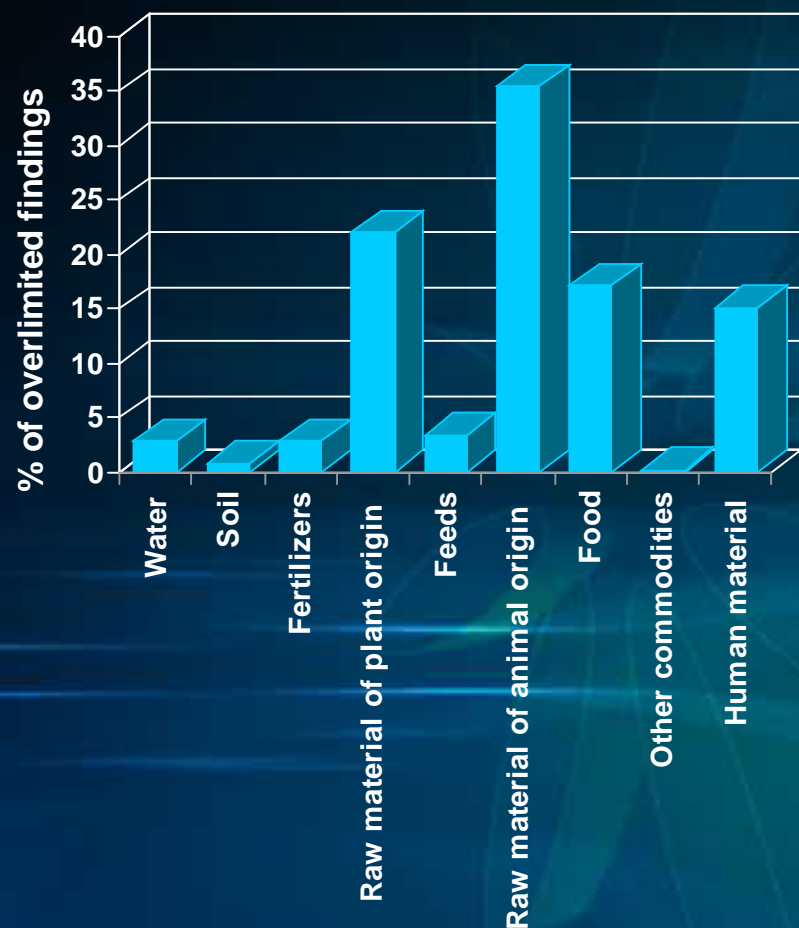
## Share of overlimited findings of pesticides residues



- 350 overlimited findings (0,07%) out of 517000 performed analyses (1986-2005)
- In 1994 - the highest number of overlimited findings (57)
- Major contribution of commodities from the private production and samples of human material (breast milk).
- Regarding commodities from import, the highest share of the overlimited findings was stated in 1986 (DDT in lunch-meat imported from China).

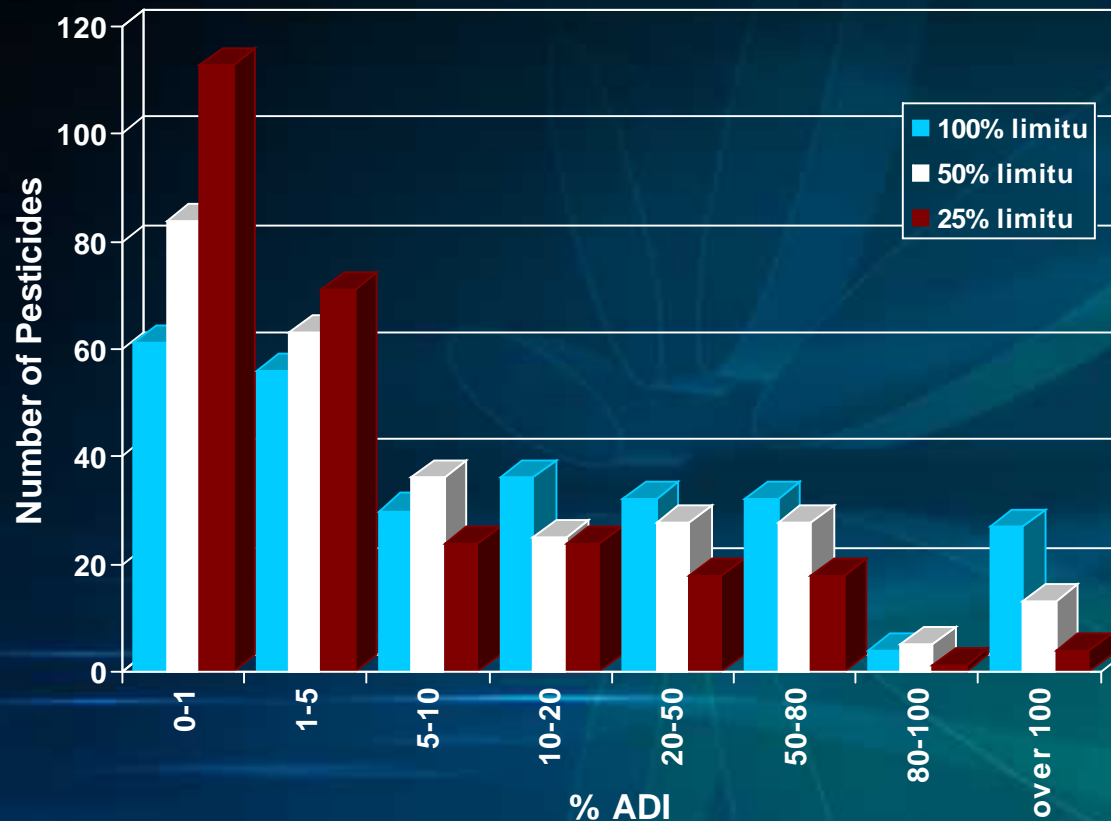


## Overlimited findings in respect of various types of commodities



- The highest share of overlimited analyses (35,4% of all the overlimited analyses) - in raw material of animal origin
- DDT, Hexachlorobenzene, Gama HCH mostly in milk and beef.
- 22% of all the overlimited analyses - the share of overlimited analyses in raw material of plant origin (mostly in fruit and vegetables).
- 27 types of pesticides were found (Phenytrothion, Dichlorvos etc.)
- Breast milk was contaminated with Hexachlorobenzene.
- excessive amount of this pesticide in breast milk in comparison to cow's or sheep's milk.
- 0,70 mg/kg fat - in breast milk and
- 0,02 mg/kg fat - in cow's milk (mean value of the concentration)
- Regarding food commodities, the overlimited findings of chlorinated pesticides - in butter, cheese and meat tins (mostly until 1996).

## Theoretical maximum daily intake (TMDI) of pesticides residues via dietary pathway



- Theoretical maximum daily intake (TMDI) via dietary pathway
- 263 pesticides evaluated
- Presumptions that the concentration of the contaminants is 100% MRL, 50% or 25% of the MRL that was set by The Food Codex of the Slovak Republic.
- TMDI based on 100% MRL  $\Rightarrow$  ADI (acceptable daily intake) was exceeded in case of 10% of all the evaluated pesticides.
- TMDI based on 50% MRL  $\Rightarrow$  ADI was exceeded in case of 12 analyzed pesticides.
- TMDI based on 25% MRL  $\Rightarrow$  ADI was exceeded in case of 4 pesticides (Demeton-S-methyl, Parathion-methyl, Campechlor a Dichlorvos).

## Compounds with the TMDI value > ADI value (TMDI calculated from 50% MRLs)

PESTICIDES	% ADI
Demeton-S-methyl	344.2
Parathion-methyl	257.7
Campechlor	257.1
Dichlorvos	225.4
Aldrin, Dieldrin	196.0
Fenitrothion	150.4
Thiram	133.9
Azinphos methyl	129.0
Heptachlor	125.5
Ethion	122.8
Omethoate	112.9
Dicofol	102.0

- According to the results, obtained from the evaluation of TMDI from values of 50% MRLs, in case of 12 pesticides (4.6% of all the pesticides evaluated in the study) ADI value was exceeded.
- The highest value of TMDI was calculated for Demeton-S-methyl. This compound, however has not been analyzed in SR.
- According to data amount in respect of particular pesticides listed in the table, the evaluation of real exposure doses will be possible in case of Parathion-methyl, Dichlorvos, Aldrin, Dieldrin, Fenitrothion and Heptachlor.
- The following pesticides has not been observed in SR: Demeton-S-methyl, Campechlor, Thiram.
- For the rest of the pesticides from the table, there is insufficiency of data amount in the database. Therefore the evaluation of real exposure to these compounds cannot be done.

## Conclusion:

- Permanent attention to observations of food chain contamination in the Slovak Republic has been implemented to guarantee safe food production and protect individual compounds of environment, with the prior aim to protect health of consumers.
- In present days more than 517000 analyses of pesticides and more than 160 types of pesticides are observed in state control.
- Commodities controlled in the Slovak Republic: water, soil, fertilizers, feeds, raw materials of plant and animal origin, human materials and other commodities.
- The number of overlimited findings of pesticides has decreased.
- The number of findings below the limit of quantification has increased.
- The study proves the importance of organized and planned monitoring of food contaminants involving data interpretation, with potential impacts upon legislative feedback.



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**Thank you for your attention**

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