



Federal Agency  
for the Safety of the Food Chain

# Exposure assessment of the Belgian population to pesticide residues - 2005

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Policy Control, Scientific Secretary

Federal Agency for the Safety of the Food Chain

# Structure of the presentation

- Introduction
- Data bases - structure & harmonization
- Exposure assessment - deterministic & probabilistic
- Conclusions & Perspective



# Introduction

Monitoring programme:

- Authorization, registration?
- Exceeding of the MRL ?
- detection frequency

GAP, controlled field experiments



Toxicological data, insights



Public health safety?

*Exposure < toxicological endpoints (ADI, ARfD)*



# Introduction

*Exposure = consumption x residue level*

## → National Food Consumption Survey 2004 (IPH)

- commodity / person / day
- 6015 interviews, > 15 y, whole year

## → Pesticide monitoring programme 2005 (FASFC)

- residue / commodity
- Analytical method (LOR)
- 1496 samples, 200 pesticides  $\approx$  134 940 residue/matrix



# Data bases

## Reporting ↔ Data bases ↔ Exposure assessment

### ■ Selection:

- 25 residues more frequently found (> 2% of detected samples)
- ≠ residues in 1 sample: “authorized combinations (Fytoweb, June 2005)

### ■ Harmonization of databases (compatibility?):

#### *Pesticide residue data*

- food items & residue codes (language, plural, groups, ...)
- addition of ‘non-detects’
- filtering of contra-analysis

#### *Food consumption data*

- grouping of commodities
- level of detail?



# Data bases

Microsoft Excel - imazalil\_04.xls

Bestand Bewerken Beeld Invoegen Opmaak Extra Data Venster Help Adobe PDF

F23 = 120

|    | A         | B             | C           | D             | E        | F            | G    | H         | I     | J     | K    | L               | M             | N    | O         | P       | Q   |
|----|-----------|---------------|-------------|---------------|----------|--------------|------|-----------|-------|-------|------|-----------------|---------------|------|-----------|---------|-----|
|    | Food Item | Food Code ISP | Food Code A | authorization | Residue  | Residue Code | LOQ  | resultaat | Cclow | Ccmid | Ccup | Tolerance level | Sample number | Year | Date      | Origin  | Lab |
| 1  |           |               |             |               |          |              |      |           |       |       |      |                 |               |      |           |         |     |
| 2  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 3  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 4  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 5  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 6  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 7  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 8  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 9  | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 10 | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 11 | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 12 | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 13 | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 14 | appel     | 182           | 55          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 |                 | created       | 2005 | created   | created | LOP |
| 15 | appelsien | 163           | 43          | ok            | imazalil | 120          | 0,19 | 1,69      | 1,69  | 1,69  | 1,69 | 5               | 21149         | 2005 | 27-JAN-04 | ES      | LOP |
| 16 | appelsien | 163           | 43          | ok            | imazalil | 120          | 0,19 | 1,78      | 1,78  | 1,78  | 1,78 | 5               | 95803         | 2005 | 23-FEB-04 | IT      | LOP |
| 17 | appelsien | 163           | 43          | ok            | imazalil | 120          | 0,19 | 1,72      | 1,72  | 1,72  | 1,72 | 5               | 107704099     | 2005 | 06-DEC-04 | ES      | LOP |
| 18 | appelsien | 163           | 43          | ok            | imazalil | 120          | 0,19 | 1,71      | 1,71  | 1,71  | 1,71 | 5               | 121104027     | 2005 | 08-JUN-04 | ES      | LOP |
| 19 | appelsien | 163           | 43          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 | 5               | created       | 2005 | created   | created | LOP |
| 20 | appelsien | 163           | 43          | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 | 5               | created       | 2005 | created   | created | LOP |
| 21 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,29      | 0,29  | 0,29  | 0,29 | 2               | 20888         | 2005 | 22-JAN-04 | CM      | LOP |
| 22 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,14      | 0,14  | 0,14  | 0,14 | 2               | 21148         | 2005 | 27-JAN-04 | CO      | LOP |
| 23 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,17      | 0,17  | 0,17  | 0,17 | 2               | 21432         | 2005 | 09-FEB-04 | CO      | LOP |
| 24 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,39      | 0,39  | 0,39  | 0,39 | 2               | 21478         | 2005 | 10-MAY-04 | CO      | LOP |
| 25 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,25      | 0,25  | 0,25  | 0,25 | 2               | 21663         | 2005 | 24-MAR-04 | CO      | LOP |
| 26 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,74      | 0,74  | 0,74  | 0,74 | 2               | 107704097     | 2005 | 06-DEC-04 | CO      | LOP |
| 27 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 | 2               | 107704098     | 2005 | 13-DEC-04 | VE      | LOP |
| 28 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,24      | 0,24  | 0,24  | 0,24 | 2               | 121304154     | 2005 | 26-OCT-04 | EC      | LOP |
| 29 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,23      | 0,23  | 0,23  | 0,23 | 2               | 121304203     | 2005 | 22-NOV-04 | CO      | LOP |
| 30 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,16      | 0,16  | 0,16  | 0,16 | 2               | 140604001     | 2005 | 22-JUN-04 | HN      | LOP |
| 31 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,29      | 0,29  | 0,29  | 0,29 | 2               | 140604008     | 2005 | 17-AUG-04 | CO      | LOP |
| 32 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 | 2               | 140604009     | 2005 | 17-AUG-04 | CR      | LOP |
| 33 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,25      | 0,25  | 0,25  | 0,25 | 2               | 140604015     | 2005 | 07-SEP-04 | PA      | LOP |
| 34 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,18      | 0,18  | 0,18  | 0,18 | 2               | 140604051     | 2005 | 18-OCT-04 | CR      | LOP |
| 35 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0         | 0     | 0,095 | 0,19 | 2               | 140604055     | 2005 | 16-NOV-04 | CI      | LOP |
| 36 | Banaan    | 183           | 7           | ok            | imazalil | 120          | 0,19 | 0,18      | 0,18  | 0,18  | 0,18 | 2               | 140604056     | 2005 | 16-NOV-04 | HN      | LOP |

raw / calcul / Results / Report

Tekenen AutoVormen

Gereed

# Exposure assessment

- I. Deterministic approach
- II. Probabilistic approach



# Exposure assessment

## I. Deterministic approach

→ 'point estimate' approach

average concentration  $\alpha$  x consumption (average, P97.5, ...)

Body weight



Total intake of residue  $\alpha$   
=  $\Sigma$  intakes for commodities considered

- Less need for extensive database
- Relatively easy to carry out
- Exposure = single estimate
- Output is easy to understand and interpret

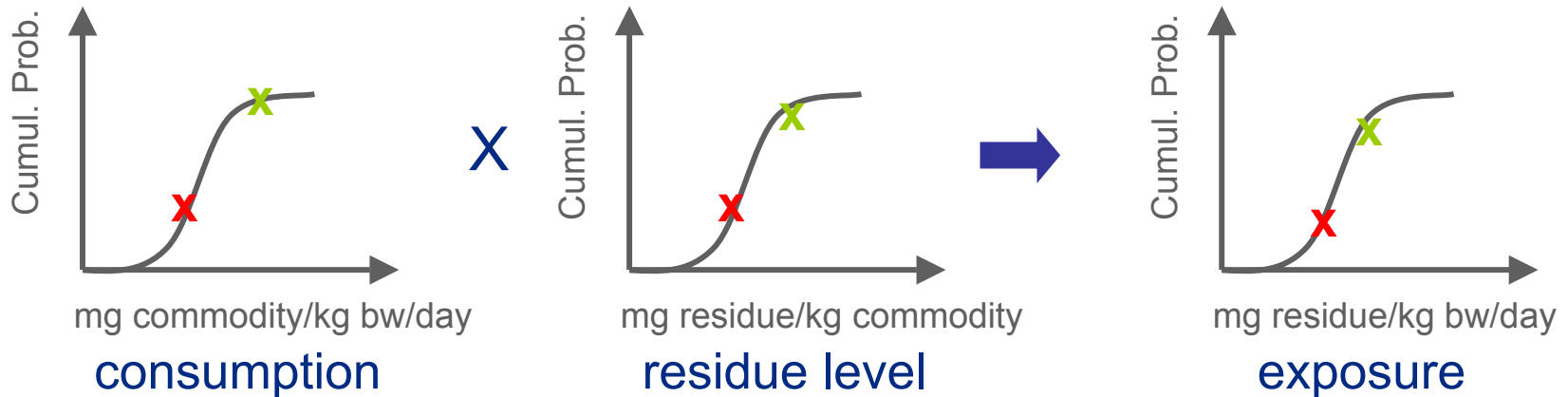




# Exposure assessment

## II. Probabilistic approach

➔ Monte Carlo



- All available data and knowledge are used
- Exposure = distribution
- probabilities



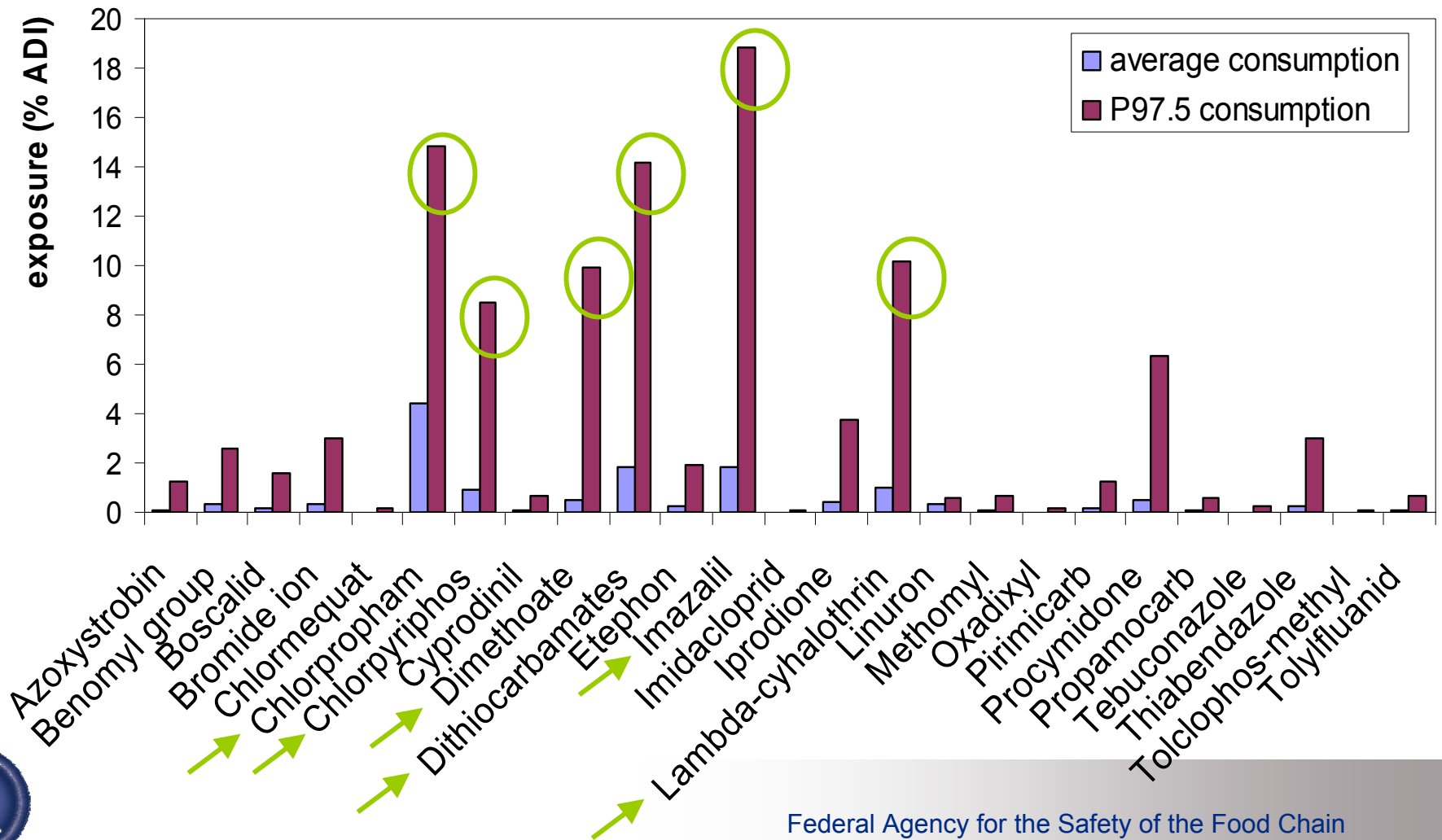
# Exposure assessment

- residues  $<$  LOR ('non-detects'):
  - lower bound: 0
  - middle bound : LOR/2
  - upper bound: LOR (worst case scenario)
- zero-consumption days incl.:  
'average' diet for long-term exposure assessment



# Exposure assessment

## I. Deterministic approach: screening



# Exposure assessment

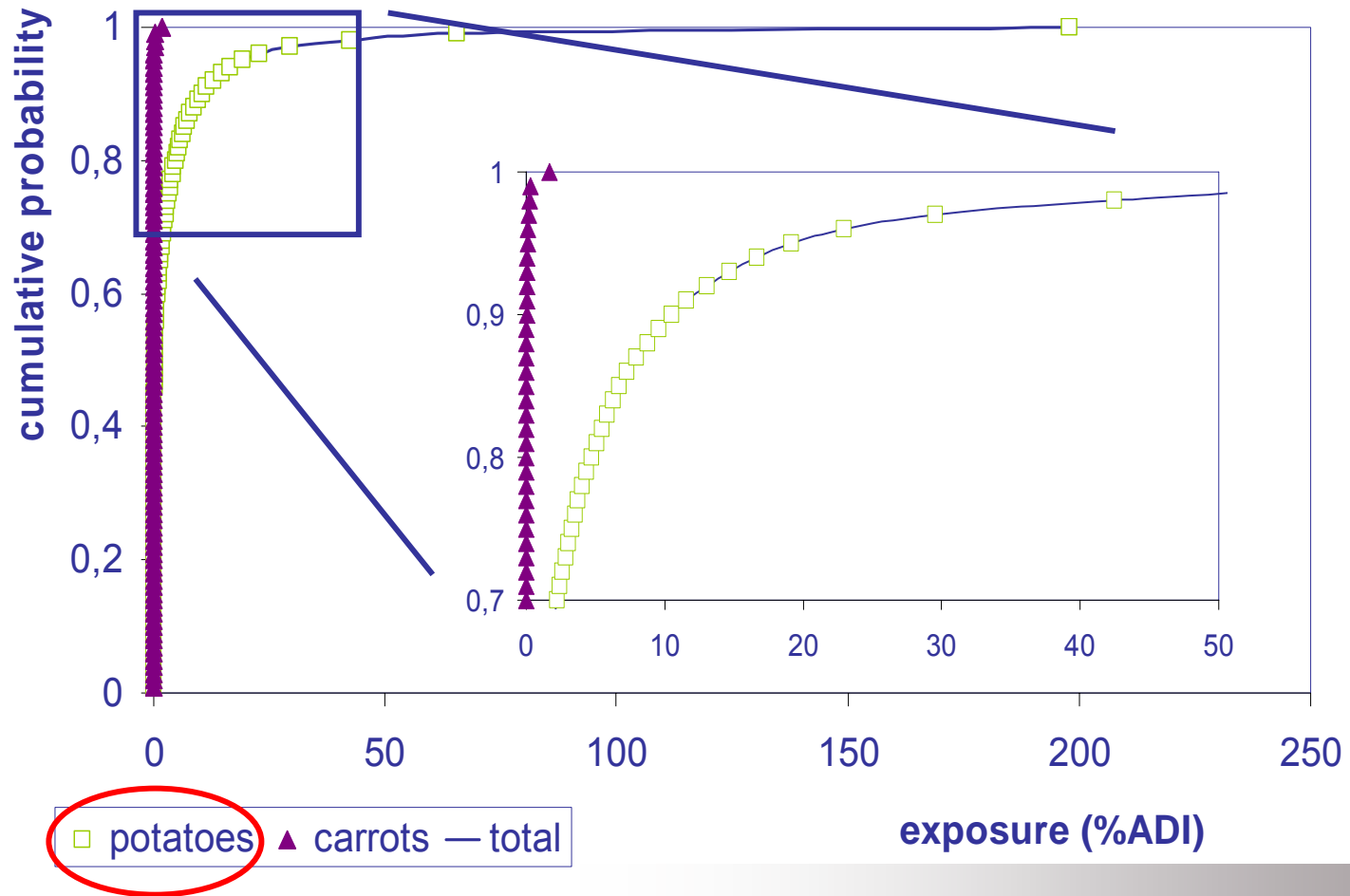
## I. Probabilistic approach

|                           | Detection frequency (%) | Average |       |      | P97.5 |       |       | P99.9  |        |        |
|---------------------------|-------------------------|---------|-------|------|-------|-------|-------|--------|--------|--------|
|                           |                         | 0       | LOR/2 | LOR  | 0     | LOR/2 | LOR   | 0      | LOR/2  | LOR    |
| <b>Chlorpropham</b>       | 41.3<br>(104)           | 4.26    | 4.26  | 4.49 | 34.65 | 34.40 | 36.20 | 119.61 | 133.41 | 153.35 |
| <b>Imazalil</b>           | 26<br>(323)             | 1.65    | 2.14  | 2.58 | 15.99 | 16.82 | 17.36 | 54.19  | 52.35  | 59.55  |
| <b>Dimethoate</b>         | 9.6<br>(197)            | 0.25    | 0.44  | 0.63 | 0.00  | 1.63  | 3.25  | 55.92  | 56.61  | 63.70  |
| <b>Dithiocarbamates</b>   | 16.4<br>(861)           | 0.26    | 1.83  | 3.41 | 2.22  | 5.27  | 9.55  | 11.66  | 11.74  | 18.68  |
| <b>Chlorpyrifos</b>       | 5.3<br>(509)            | 0.05    | 0.79  | 1.51 | 0.68  | 3.24  | 5.96  | 3.62   | 6.54   | 10.62  |
| <b>Lambda-cyhalothrin</b> | 1.9<br>(855)            | 0.01    | 1.04  | 2.05 | 0.00  | 4.45  | 8.87  | 1.63   | 8.93   | 17.04  |



# Exposure assessment

## Chlorpropham



# Exposure assessment

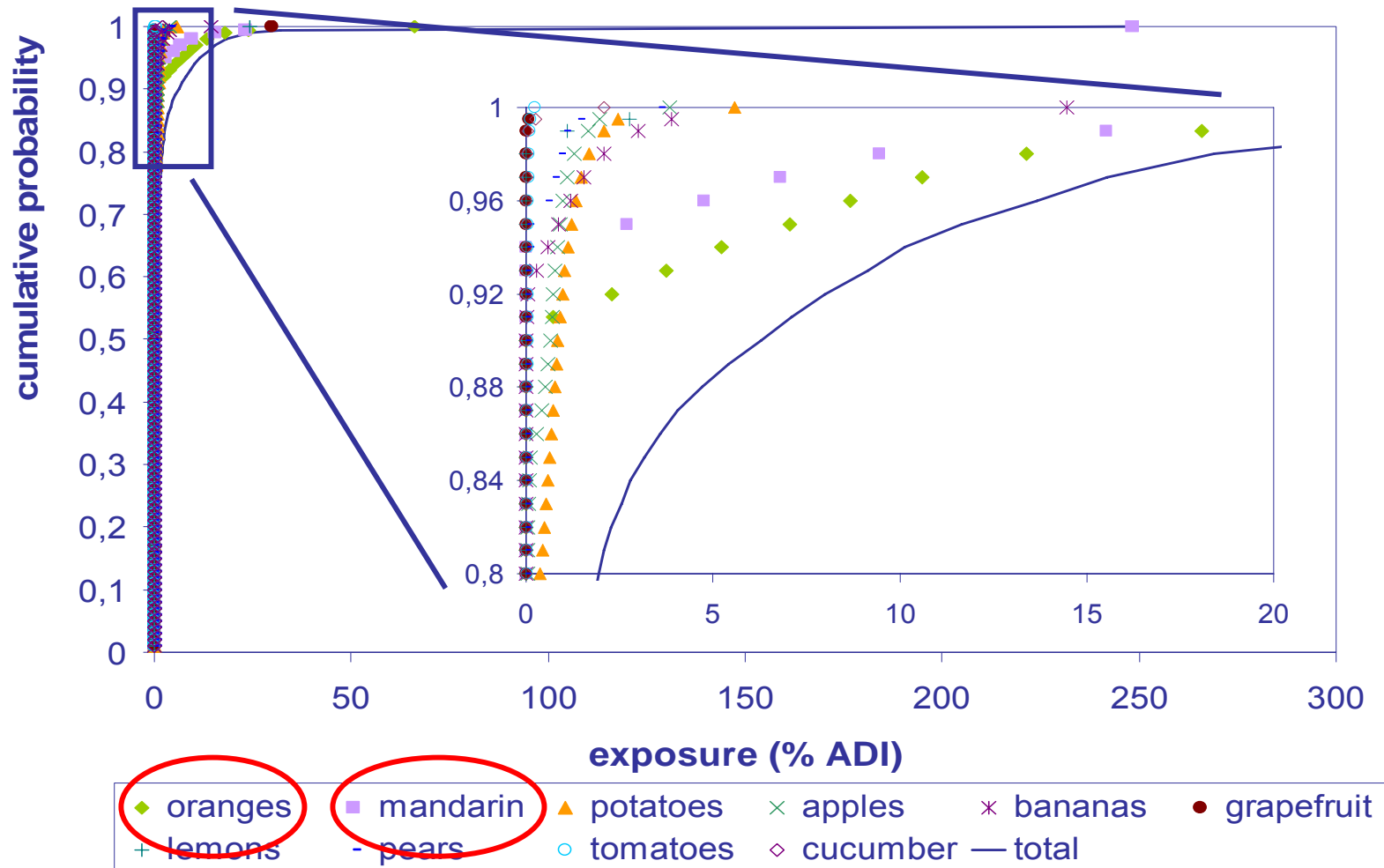
## I. Probabilistic approach

|                           | Detection frequency (%) | Average |       |      | P97.5 |       |       | P99.9  |        |        |
|---------------------------|-------------------------|---------|-------|------|-------|-------|-------|--------|--------|--------|
|                           |                         | 0       | LOR/2 | LOR  | 0     | LOR/2 | LOR   | 0      | LOR/2  | LOR    |
| <b>Chlorpropham</b>       | 41.3<br>(104)           | 4.26    | 4.26  | 4.49 | 34.65 | 34.40 | 36.20 | 119.61 | 133.41 | 153.35 |
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| <b>Chlorpyrifos</b>       | 5.3<br>(509)            | 0.05    | 0.79  | 1.51 | 0.68  | 3.24  | 5.96  | 3.62   | 6.54   | 10.62  |
| <b>Lambda-cyhalothrin</b> | 1.9<br>(855)            | 0.01    | 1.04  | 2.05 | 0.00  | 4.45  | 8.87  | 1.63   | 8.93   | 17.04  |



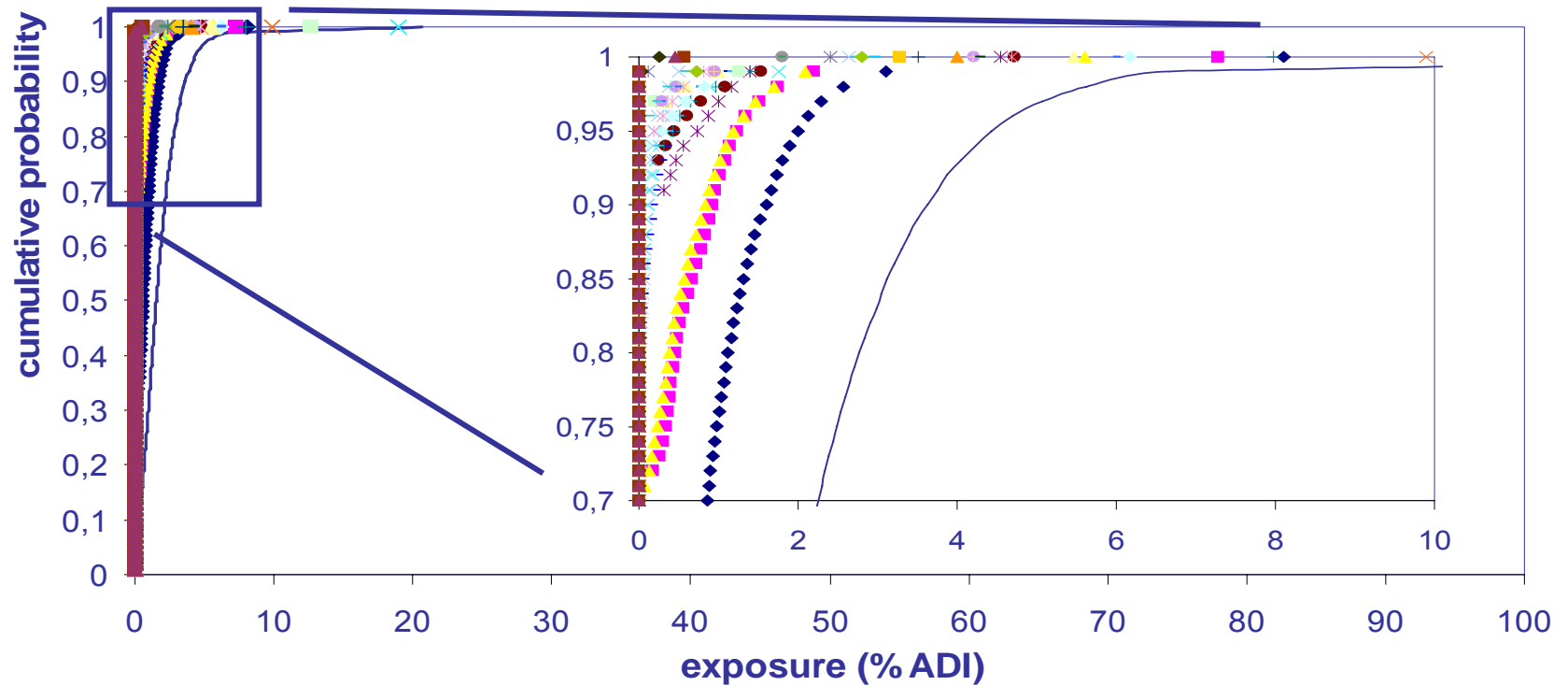
# Exposure assessment

## Imazalil



# Exposure assessment

## Dithiocarbamates



|              |                  |                |            |            |             |
|--------------|------------------|----------------|------------|------------|-------------|
| ◆ potatoes   | ■ apples         | ▲ tomatoes     | × lettuce  | × oranges  | ● cos       |
| + pears      | - carrots        | - beans        | ◆ cabbages | ■ leek     | ▲ grapes    |
| × onions     | × madarin        | ● strawberries | + peaches  | - peas     | - cucumbers |
| ◆ nectarin   | ■ grapefruit     | ▲ endives      | × apricot  | * celery   | ● cherries  |
| + watermelon | - lamb's lettuce | - currants     | ◆ lemons   | ■ radishes | ▲ cress     |
| — total      |                  |                |            |            |             |



# Conclusions & Perspectives

- Pesticide monitoring program FASFC 2005

Detection frequency = 56%

exceeding % of the MRL = 7.9%



Chronic exposure seems generally under control

- Possible lacunes/improvements:

- Only fruit and vegetables
- Processing factors
- Storage, transport, shelf life, lab-to-lab variation, analytical method, ...



# Conclusions & Perspectives

- Further research
  - sensitive population (children, pregnant women, ...)
  - cumulative exposure assessment
  - comparing (years, trends – evolution)



# Thank you for your attention

## Acknowledgement

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Claeys W., de Voghel S., Schmit J.-F., Vromman V. & Pussemier L.  
Exposure assessment of the Belgian population through fruit and vegetable consumption.

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