




Appendix VI

Monitoring bee poisoning
incidents in UK (2016)



Poisoning of bees by agrochemicals: evidence from monitoring in England and Wales

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Fera Science Ltd.



- The largest and longest serving provider of agri-food research and services in the UK
- Monitoring/Applied R&D for UK Government
 - Evidence base to inform Government policy
- GLP-Compliant CRO
 - Familiar with regulatory system

Wildlife Incident Investigation Scheme (WIIS)

- Investigates suspected pesticide poisoning of non-target mammals, birds and “beneficial insects”
- Funded by levy on pesticide sales
- Remit to investigate lethal poisoning
- Reactive monitoring scheme, running for approximately 35 years
- Beneficial insect cases: mostly honey bees, some bumblebee, no solitary bees or other pollinators
- Increasing sensitivity of chemical analysis methodology - more pesticide detections at lower levels

WIIS



Public, Beekeepers
Report suspected incidents

Bee inspectors

Disease screening

Fera

Analytical investigations

Interpretation

Reporting

Two Fera BEE INCIDENT REPORT forms are displayed side-by-side. The left form is a "WILDLIFE INCIDENT UNIT BEE INCIDENT REPORT" dated 01/06/09. It contains fields for Incident Number, Date Received, Part of Report, Regional Number, Species, Location, and Date Reported. The right form is a "BEE INCIDENT REPORT" dated 18/05/09. It includes a "Summary of field data" section with a description of the incident, an "Analysis: bee disease status: NBU" table, and several "Analysis" sections for various pesticides (neonicotinoid, organochlorine, organophosphate, synthetic pyrethroid) with their respective detection limits and results. The forms are connected by a vertical double-headed arrow.

Chemicals Regulation Directorate

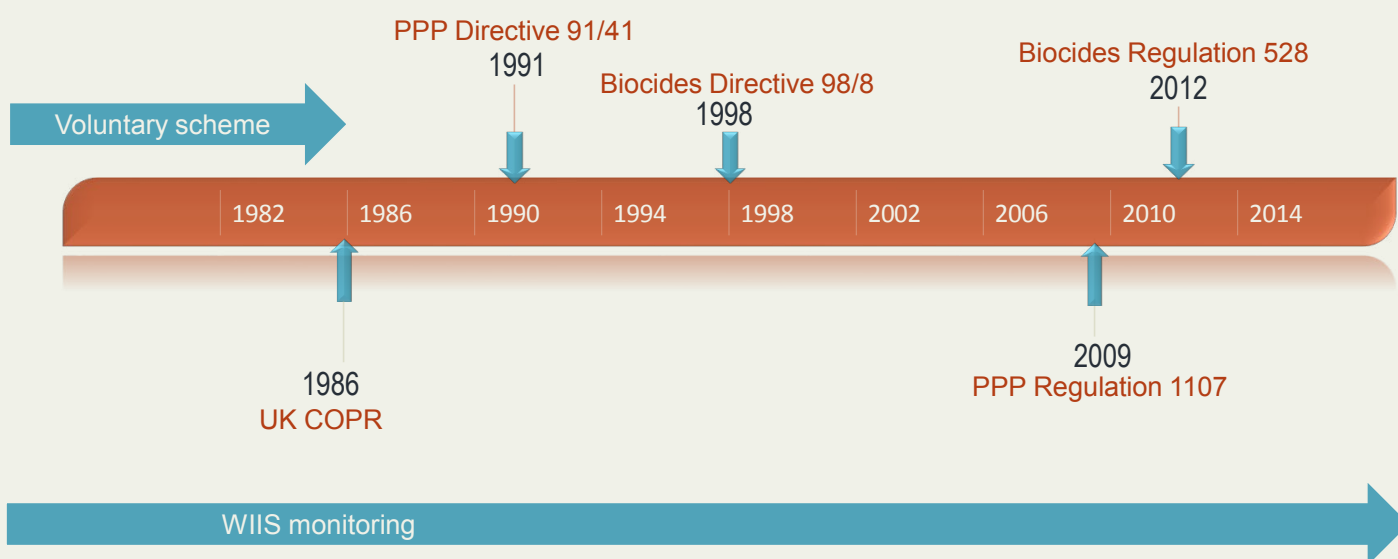
WIIS - Limitations

- Only likely to detect cases when large numbers are acutely poisoned in a small area - 'tip of the iceberg'
- Less likely to detect:
 - Low-level lethal poisoning, even when concentrated in small area
 - Geographically diffuse lethal poisoning -even if large scale - solitary bees unrepresented
 - Chronic poisoning
- Sublethal exposure is detected but:
 - Not random samples - caution in generalising from WIIS data
 - No information on sublethal effects

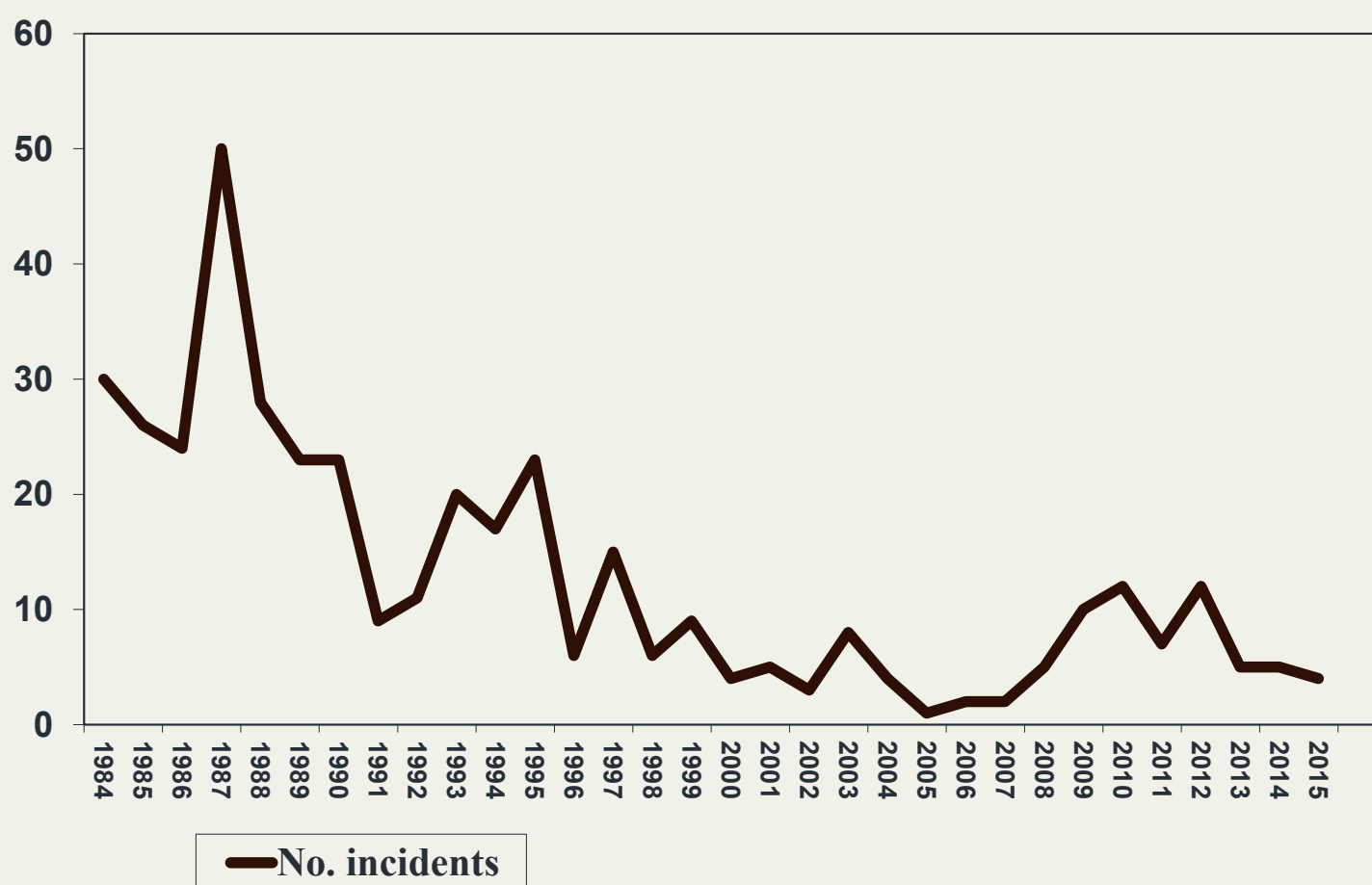
WIIS - Advantages

- Real world data
- Does not rely on pre-identifying exposure routes

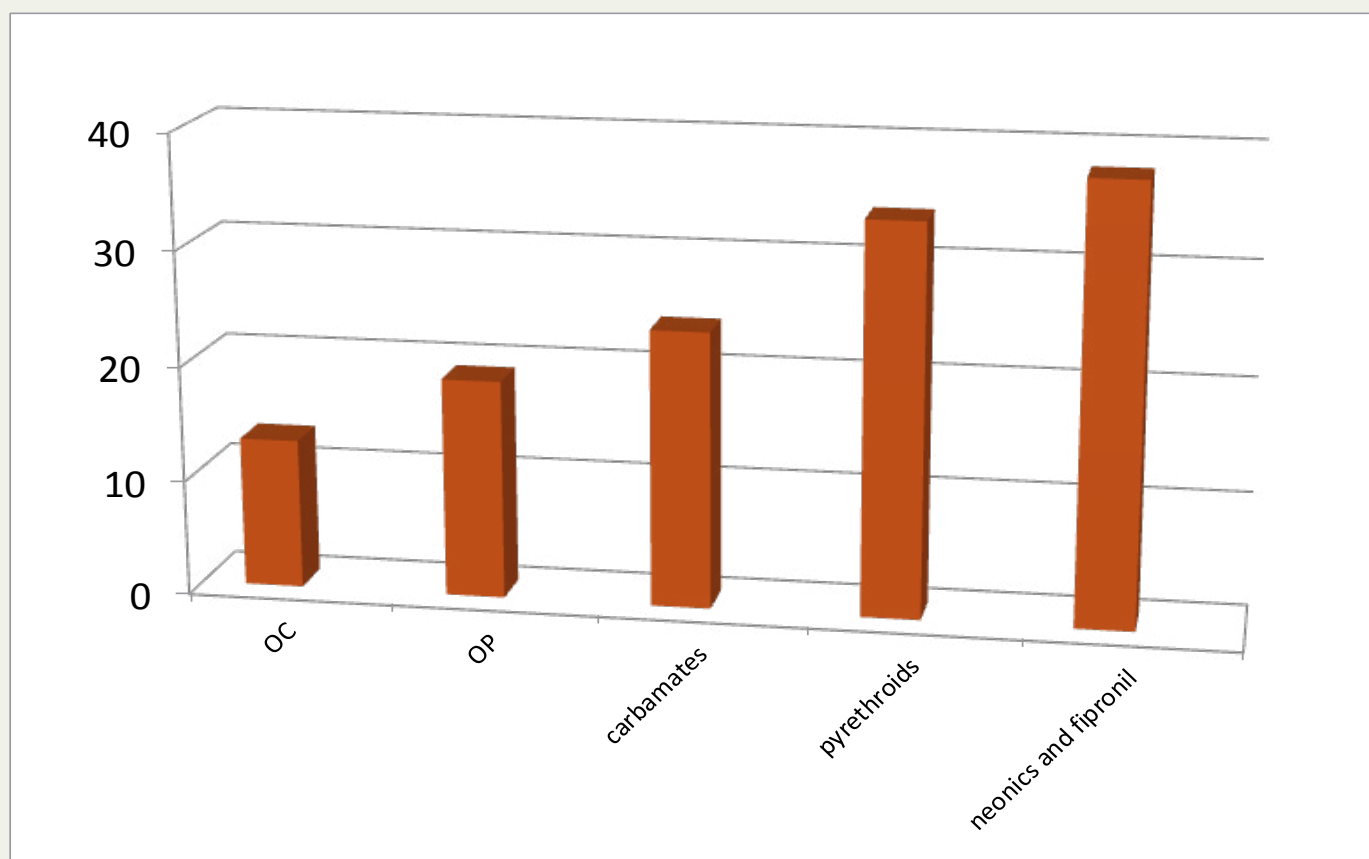
Development of UK pesticide legislation



Bee Poisoning Incidents



WIIS Exposure Data on Bees 2009-2015: Number of Incidents in Which Pesticides Detected (150 Investigated)

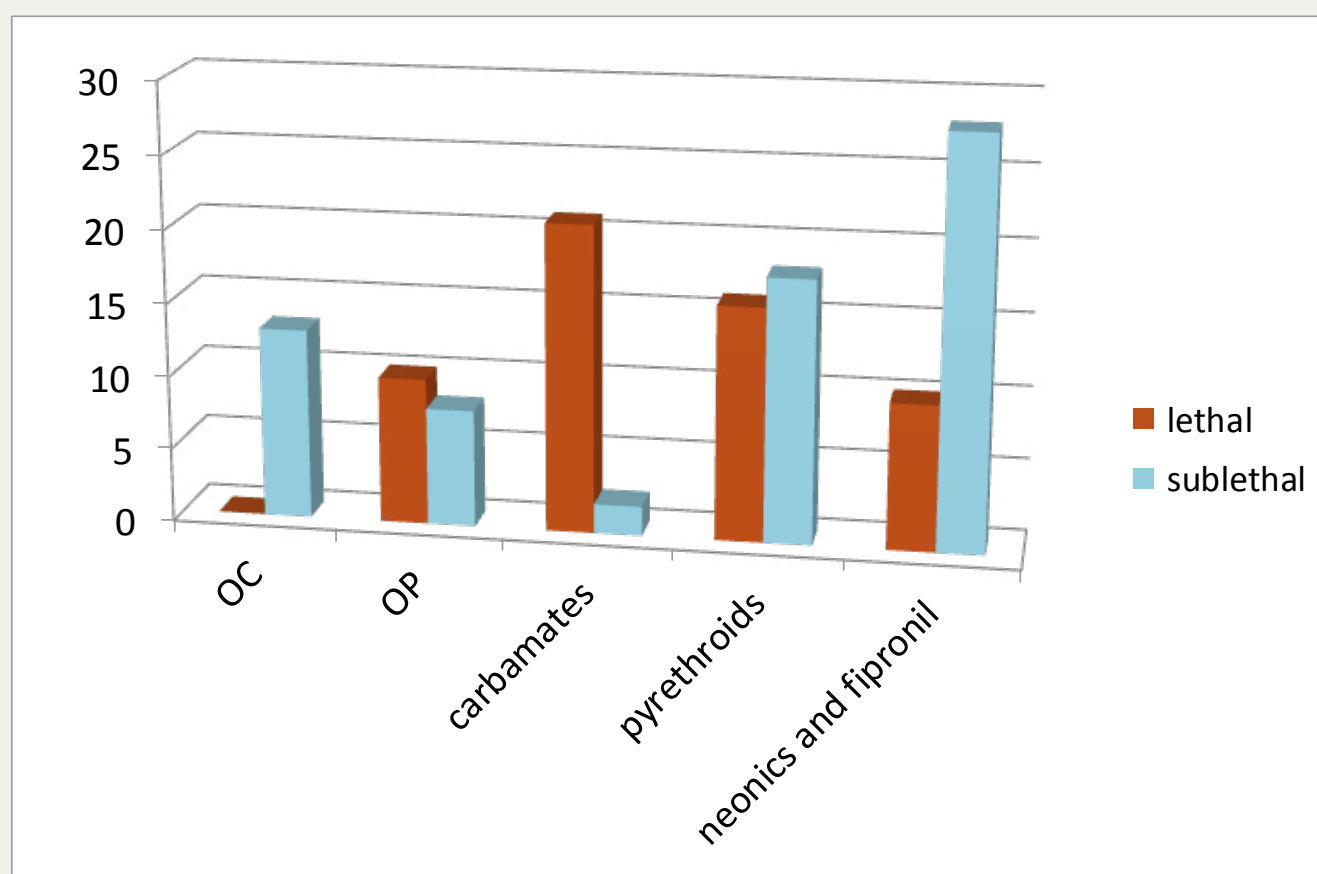




Interpreting Toxicological Significance of Residues in WIIS Bee Samples

- Bee samples submitted to the WIIS have died unexpectedly.
- How do residue concentrations relate to original exposure levels?
- How do exposure levels relate to effects?
- What can be considered typical “background” residues?

WIIS Data on Bees 2009-2015





No ban on pesticides that 'threaten bees'

European and American reports say nerve agents may be a danger, but the UK goes on using them

Colony Collapse Disorder Linked to Neonicotinoids

A controversial type of pesticide has been linked to declining global bee populations. It appears to scramble bees' sense of direction

Pesticides linked to honeybee decline

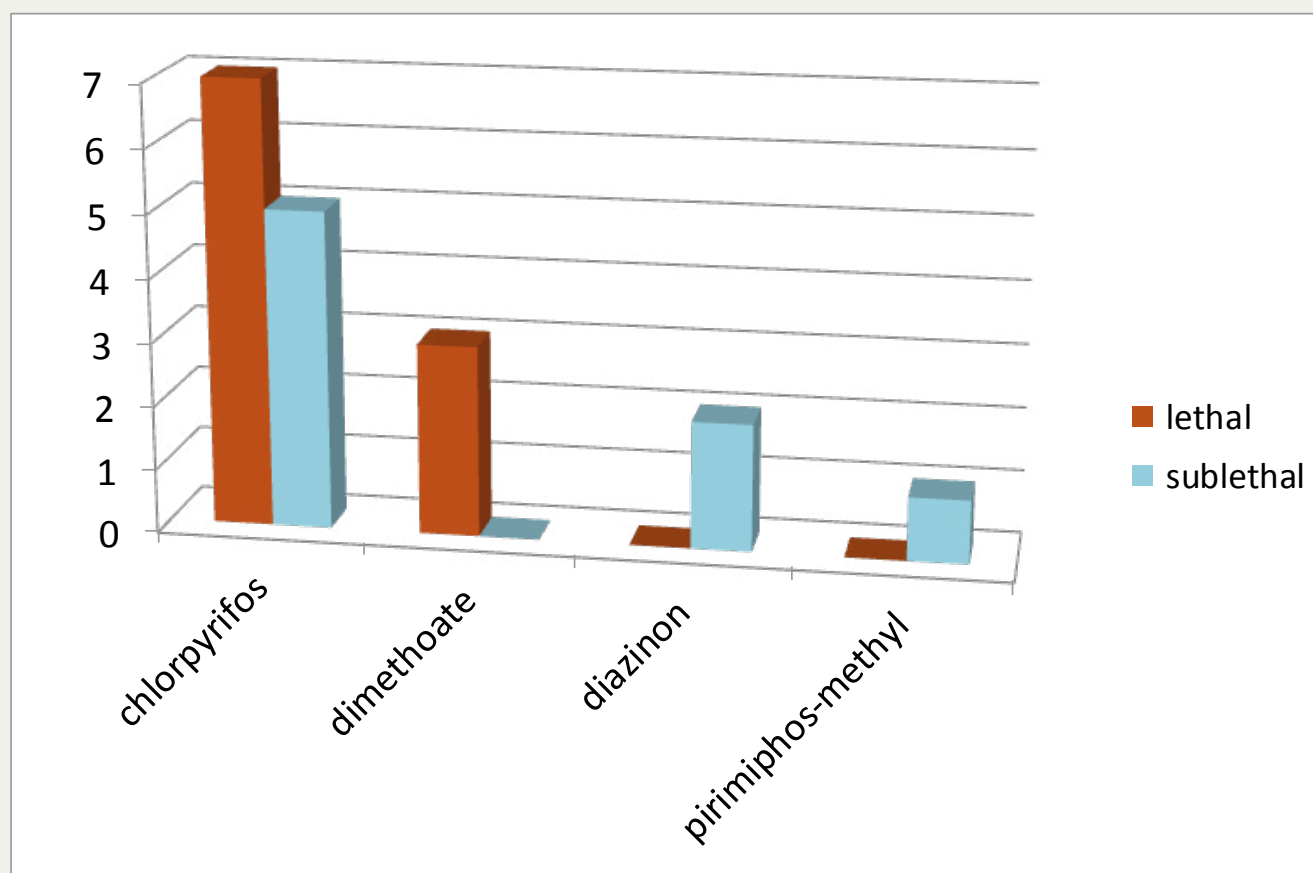
The first study conducted in a natural environment has shown that systemic pesticides damage bees' ability to navigate

The nerve poison harming our bees

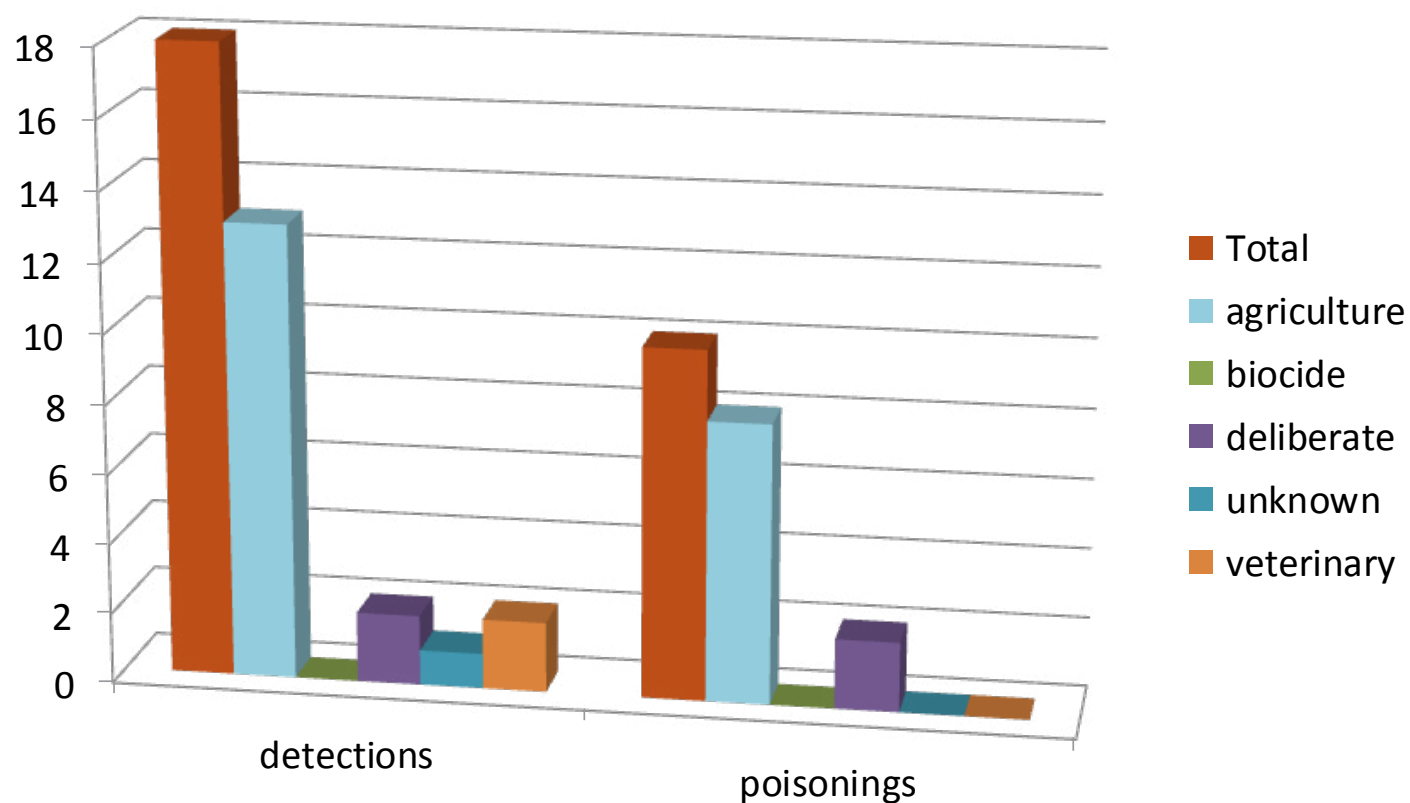
Neonicotinoids were hailed as safe and effective, but they are far from benign.

Pesticides hit queen bee numbers

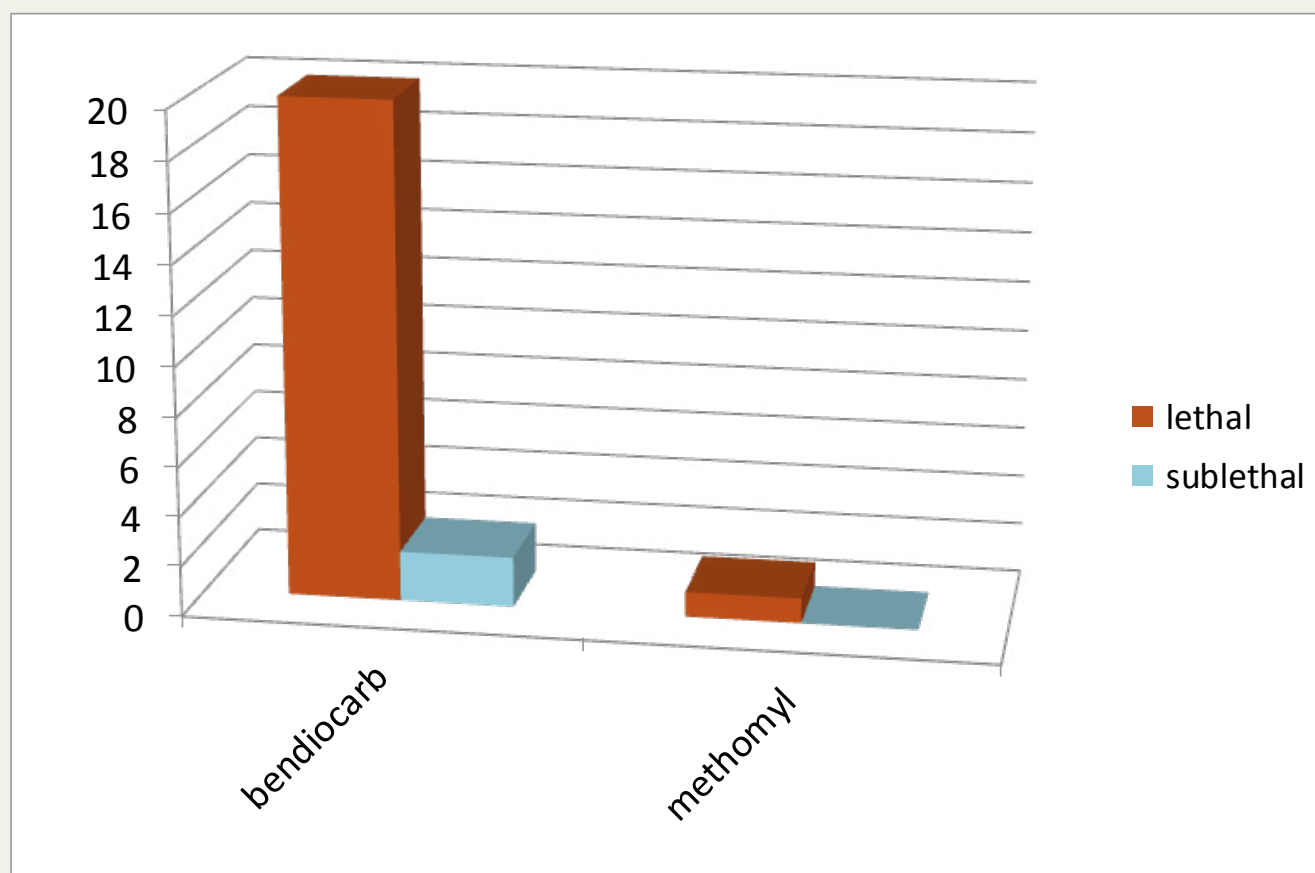
OP Insecticides 2009-2015



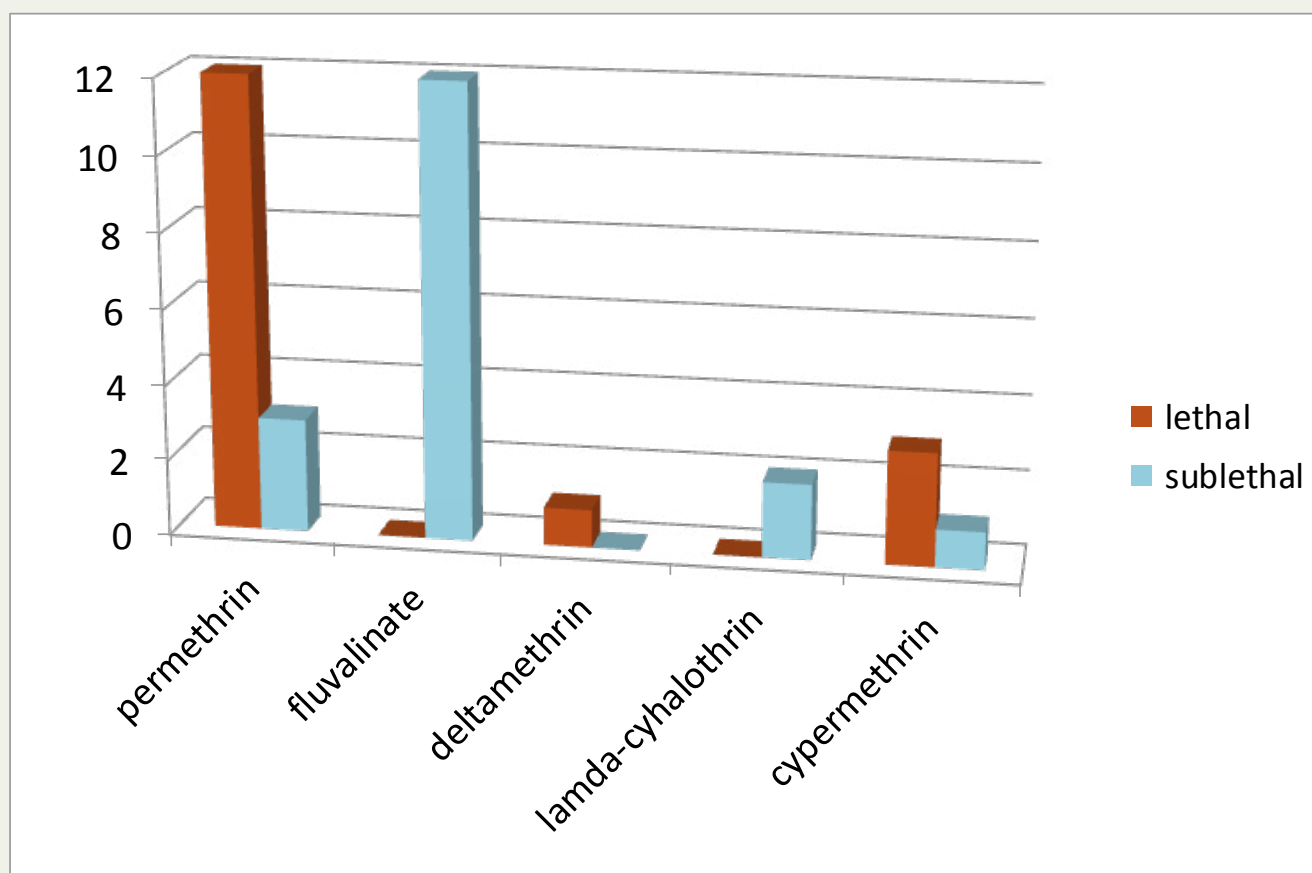
OP Insecticides 2009-2015



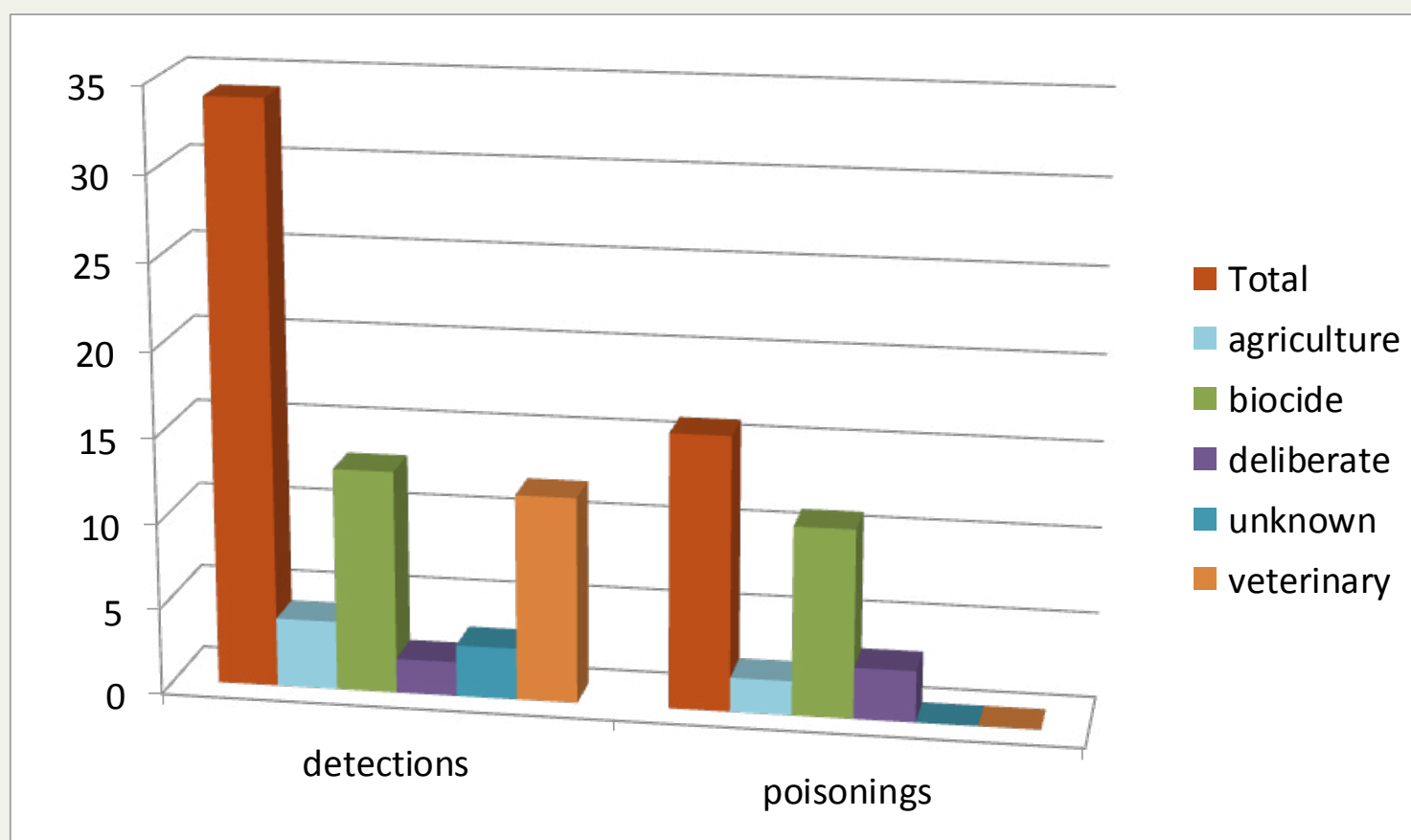
Carbamate Insecticides 2009-2015



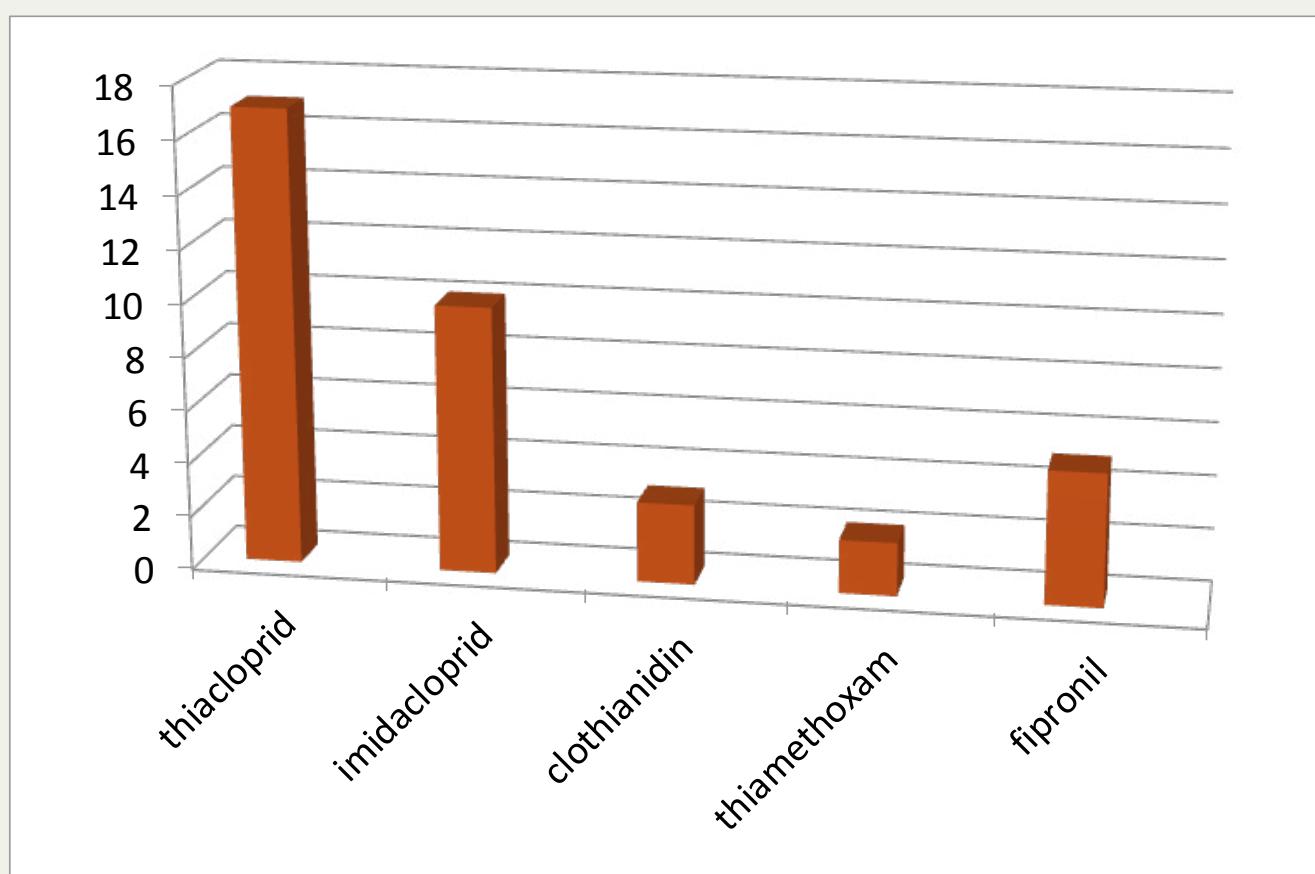
Pyrethroid Insecticides 2009-2015



Pyrethroid Insecticides 2009-2015



Detections Involving Systemic Insecticides 2009-2015

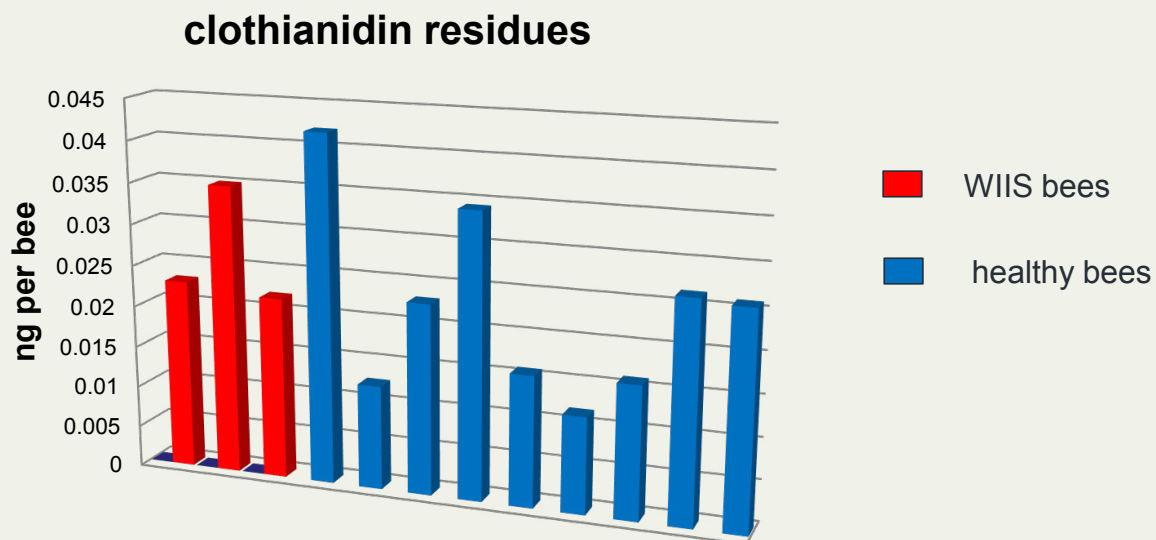


Residues Detected (ng/bee)

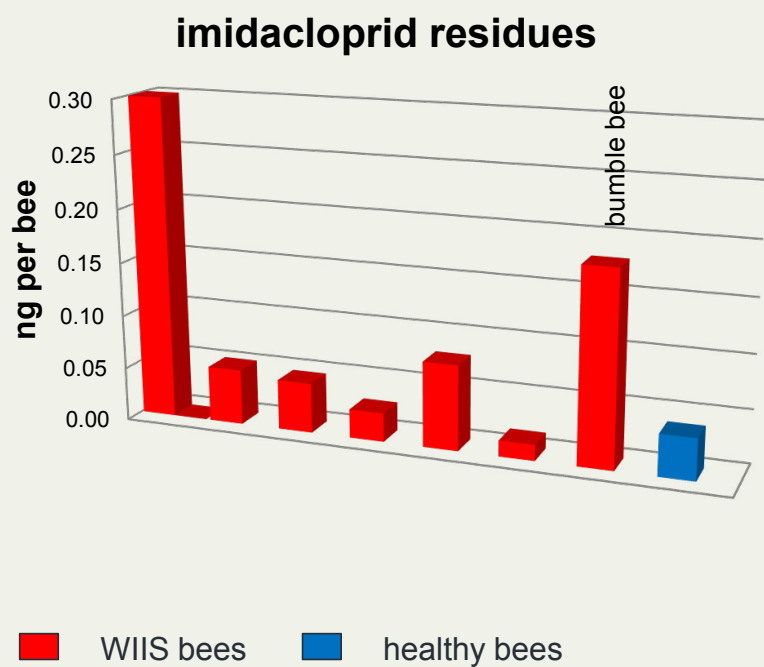
| | Imidacloprid | Thiacloprid | Thiamethoxam | Clothianidin | Fipronil |
|-----------------------------|---------------------|--------------------------------|--------------|---------------------|----------|
| 2009 | 0.2 | - | - | - | - |
| 2010 | 0.05, 0.3 | 0.008, 0.009, 0.04, 0.07, 0.13 | - | - | 0.4, 9.7 |
| 2011 | | 0.006, 0.08, 9.3 | - | - | - |
| 2012 | 0.015, 0.08 | 0.01, 0.02, 0.3 | 0.012 | 0.022, 0.023, 0.035 | 0.4, 2.0 |
| 2013 | - | 9 | - | - | - |
| 2014 | 0.03, 0.3, 0.3, 0.3 | 0.046 | - | - | - |
| 2015 | 4.7 | 0.07, 0.09, 0.4, 0.9 | 0.36 | - | 10 |
| Acute oral LD ₅₀ | 4 | 17300 | 5 | 4 | 4 |

Healthy Honeybee Study

- Bees collected from apparently healthy colonies, in rural and urban locations
 - On-going monitoring for disease (inc viruses)
 - Screened for pesticide residues by WIIS



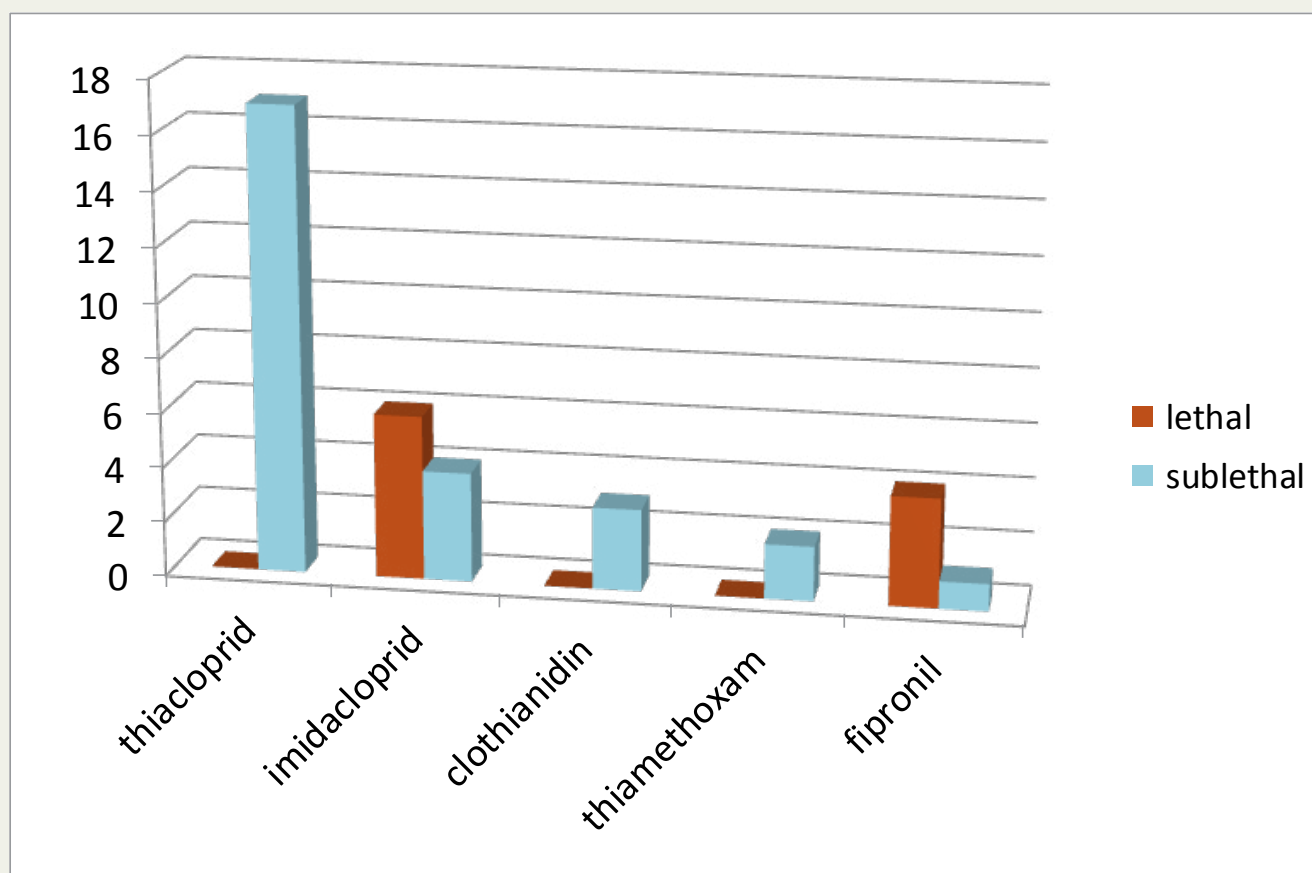
Healthy Honeybee Study



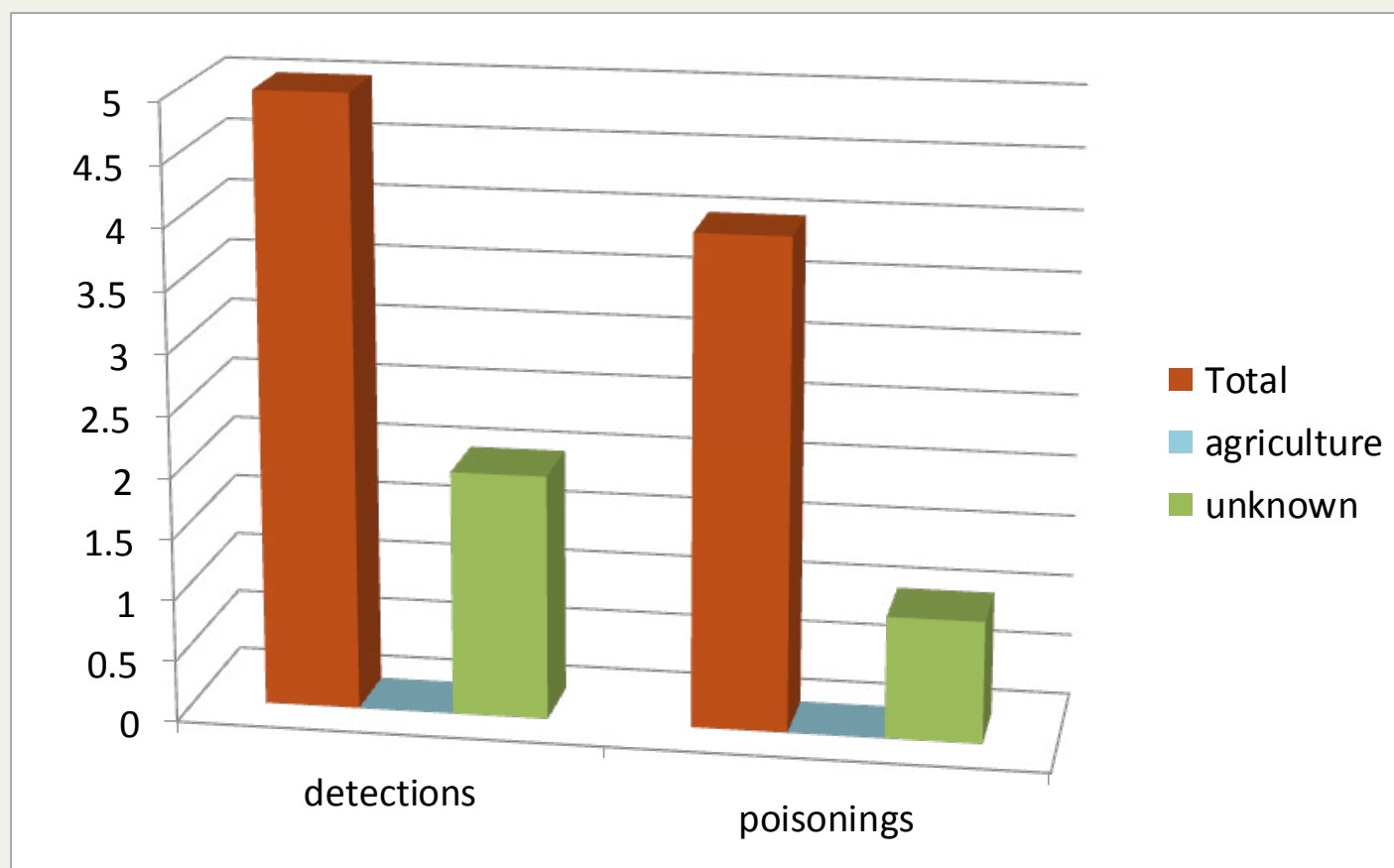
acute oral LD₅₀
4 ng/bee;

subsequent residue
0.28 ng/bee

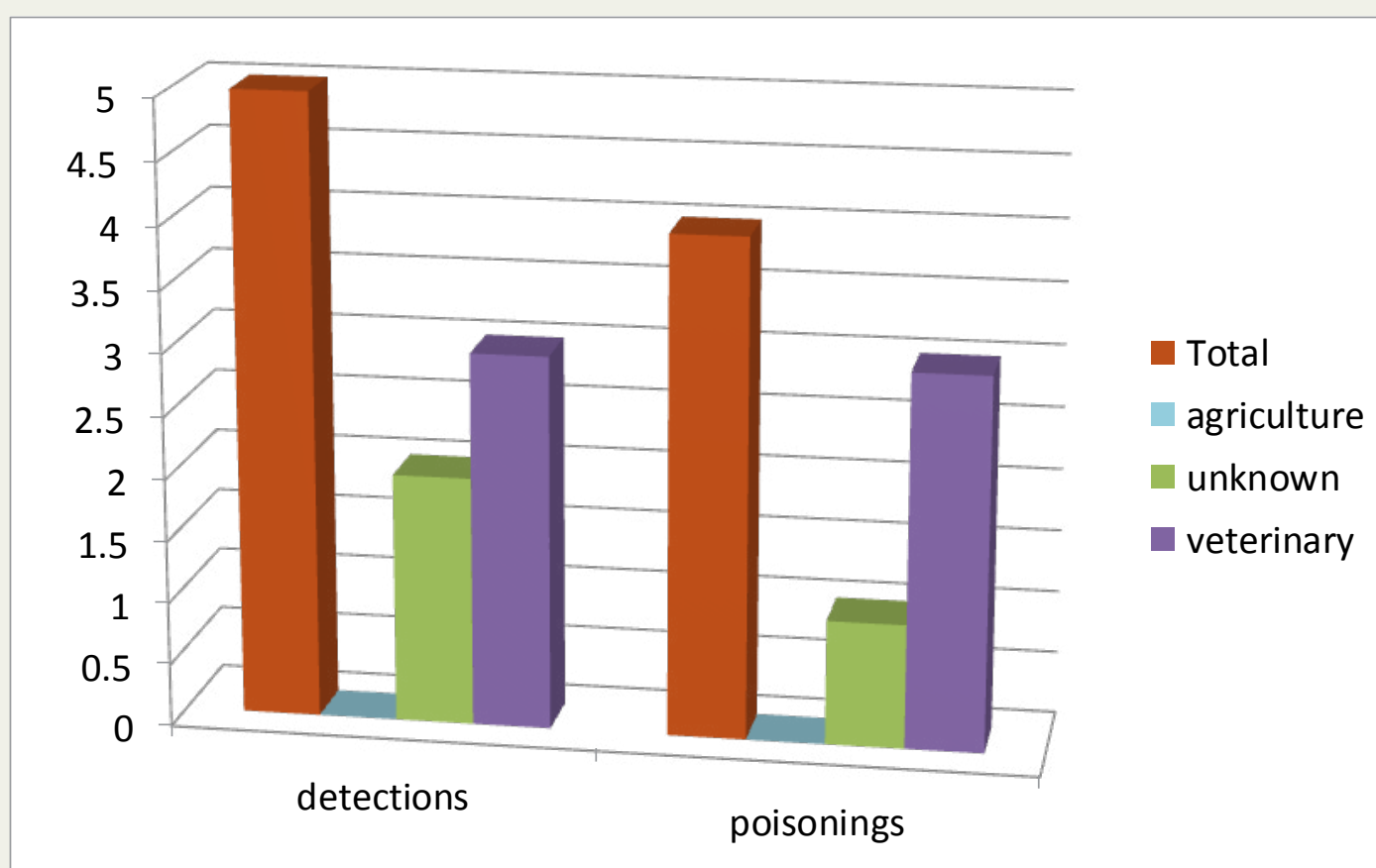
Cases Involving Systemic Insecticides 2009-2015



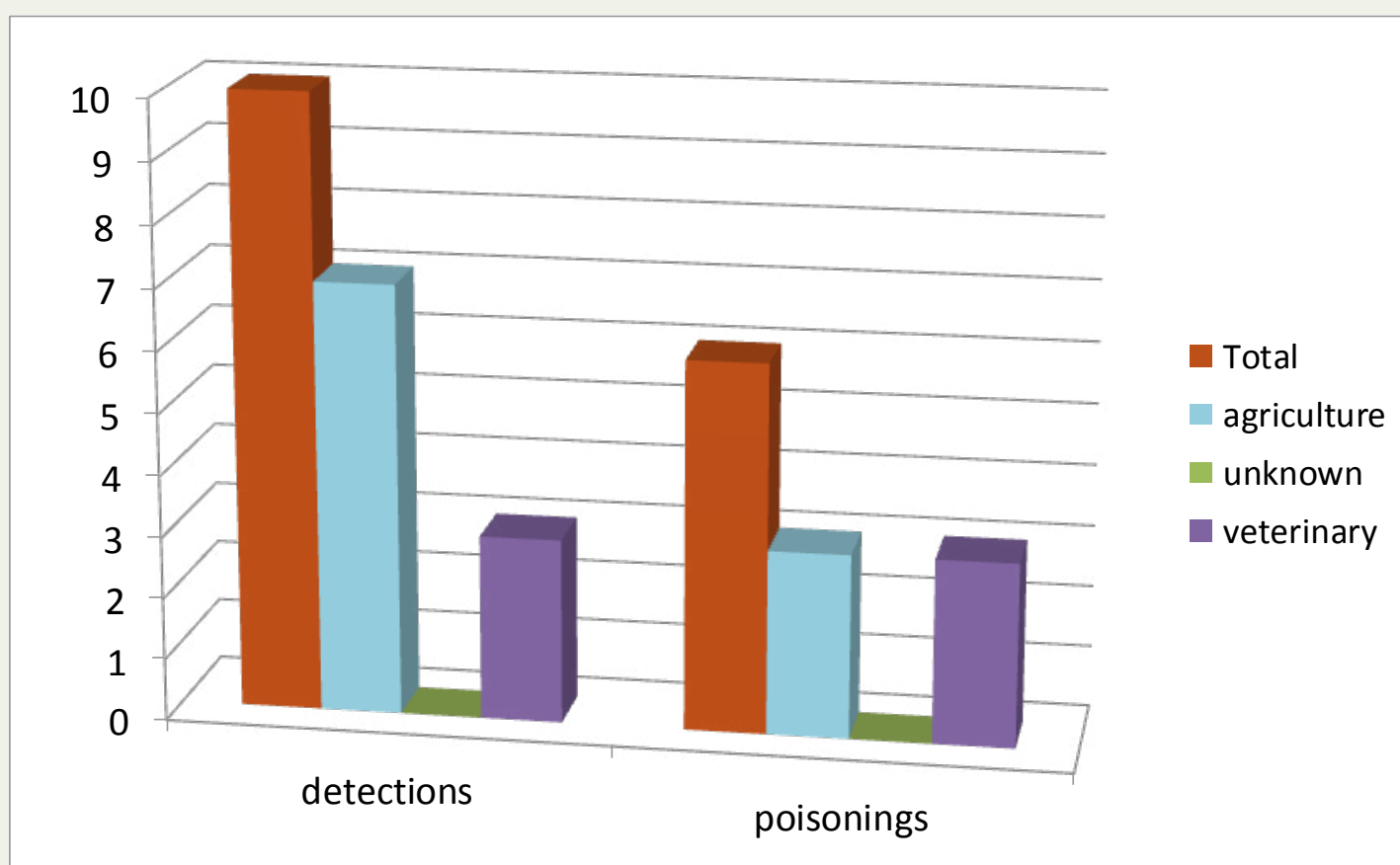
Fipronil 2009-2015



Fipronil 2009-2015



Imidacloprid 2009-2015



Summary of Evidence from WIIS Monitoring

- Cases of lethal poisonings of bees are relatively rare
- Number of cases has decreased since 1980s
- Bees exposed to same chemical from different product types (PPPs, biocides, vet products)
- Biocides > agricultural products = veterinary products
 - Unclear how true this is for sublethal exposure
- Bees can be poisoned by systemic insecticides but general perception of relative risk to bees from neonicotinoids (vs other pesticides) is not supported by WIIS data
- Cannot predict all risks - expect the unexpected!

Thanks to:
Libby Barnett - WIIS Co-ordinator
CRD

You - For Listening!!

