

# Pesticides: regulation, science and perception

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# Pesticides

- Pesticides protect plants from pests & diseases
  - Widely used in agriculture, the amenity sector, and domestic gardens
- Effective crop protection is essential
  - Diversity of pest diseases and weed challenges in food production, public spaces, sporting facilities, roads, railways and airport environs, etc.
- Pesticides can present potential hazards to human health
  - Therefore regulation is necessary

# Hazards and perceptions (USA)

Hazard	Odds of death	Deaths	News items/death
Skin cancer	29,500	9559	0.01
Food poisoning	55,000	5127	0.05
Cycling	578,000	488	0.48
Heat exposure	950,000	297	0.77
Children falling from windows	2,400,000	25	3.53
Fireworks	71,200,000	4	14.90
Amusement parks	72,300,000	4	25.89
Snake bites	19,300,000	15	7.46
Drowning while boating	400,900	703	2.40
West Nile Virus	1,000,000	282	7.94
Shark attacks	578,000,000	0.5	552.0

# Risk management objectives

- The primary aim of UK pesticide legislation is to ensure high standards of protection for people
- EU Directive 91/414/EEC requires that when used properly products must not harm human health

# Regulatory outcomes

- HSE's Chemicals Regulation Directorate uses appropriate science + independent advice to seek to ensure:
  - High standards of protection for people
  - Properly used products do not harm human health

# Regulation across the EU

- Harmonised EU approach 91/414/EEC
  - Data requirements, proper use, risk assessment, decision criteria
- List of acceptable active substances
  - Established by risk assessment
    - “one safe use”
- Pre-marketing risk assessment and MS licensing of individual products
  - Following harmonised approach

# Pesticides risk assessment

- Hazard identification & dose-response assessment
  - Setting health based reference values at which no adverse health effect expected
- Exposure assessment
- Risk acceptable if exposure is not above reference value
  - i.e. not full risk characterisation

# Active substance toxicity data

- ADME
- Acute – single high dose (oral, dermal, inhalation)
- Repeat dose (>2 species) – 28 / 90days - rats & dogs (mice?)
- Chronic / carcinogenicity (2 species) - rats & mice
- Genotoxicity (genotoxic carcinogens not approved)
- Developmental (2 species) – rat & rabbit
- Reproduction (2 generation) - rat
- Special studies (e.g. tumour mechanism, neurotoxicity)
- Human data (if available)
- Typically 3 dose levels + controls
  - Toxic effects and No Observed Adverse Effect Levels

# Product toxicity data

- Acute oral
- Acute dermal
- [Acute inhalation - rarely]
- Eye irritation
- Skin irritation
- Skin sensitisation
- Dermal penetration
  - (*in vivo* + *in vitro*)

# Human exposure assessments

- Operators, workers, bystanders, residents, consumers
- Routes
  - Dermal, oral, inhalation, dietary
- Duration
  - Single events, repeated, and continuous

# Regulatory decisions

- Authorisation possible where health based reference values not exceeded
  - Predicted exposures  $\leq 1/100^{\text{th}}$  of doses which caused no effects
    - (typically  $\leq 1/1000^{\text{th}}$  of doses causing minor effects)

# Principles

- Precautionary principle
- Important that controls are proportionate to the risks being addressed
  - Inappropriate regulation/controls may compromise ability to control pests, weeds and diseases, increase food costs and reduce quality and security of supply, without reducing risks

# Independent advice

- **Advisory Committee on Pesticides**
  - Multidisciplinary scientific committee, toxicology, medicine, exposure, agronomy, ecotoxicology, fate, chemistry, etc
- **Committee on Toxicity**
- **Committee on Carcinogenicity**
- **Committee on Mutagenicity**

# Advancing framework

- Multiple substances
- Review refinement of procedures
  - ACP/COT bystander/residential risk assessment WG
  - ACP health incident investigation/reporting WG
- Defra R&D programme
  - E.g improvement/validation exposure models

# Post authorisation

- Industry obligation to report adverse data
  - Toxicological data
  - Human health incidents
- HSE Pesticide Incidents Appraisal Panel
- NHS Poison Centres' inquiries
- CRD monitor scientific literature
  - Epidemiology, case reports, toxicology
- ACP regularly considers all above
  - Hospital episodes statistics

# Pesticide incidents UK

- Industry returns
  - 2005, 164 incidents
    - 98 amateur 61 professional products
    - 14 hospitalised (relatively minor cases)
    - 1 attempted suicide
    - 1 death
- HSE PIAP
  - ~80 investigated/year
  - ~20 associations “likely” or “confirmed”

## Pesticide incidents UK (cont)

- Hospital episode statistics 1998-2003
  - 237 admissions, 89 poisoning confirmed
  - 54% mishaps, 26% poor storage/transport
  - 2 incidents spray drift
  - 3 cases intensive care
  - No fatalities
- Incidents relate to acute effects
  - No associations with particular substances/products
- Longer-term health effects?

# Possible future changes

- Toxicokinetics
  - PBPK modelling
- 3Rs
  - Replacement, refinement & reduction of animals in research
- Probabilistic modelling
- Risk Communication
  - Social scientists?
  - Social/economic benefits?

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Pesticides	?	?	?



Thank you for your  
attention

