CUMULATIVE AND AGGREGATED EXPOSURE TO PESTICIDES (ACROPOLIS PROJECT)

Partners: RIVM, FERA, University of Milan, CRD, IRAS, INRAN, NIPH, DLO, NFA, Freshfel Europe and University of Ghent

Associated partners: DTU (Denmark), CSL (Cyprus), ANSES (France), FVC (Latvia), Banaki (Greece), AGES (Austria), BfR (Germany)

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Aims of EU project ACROPOLIS

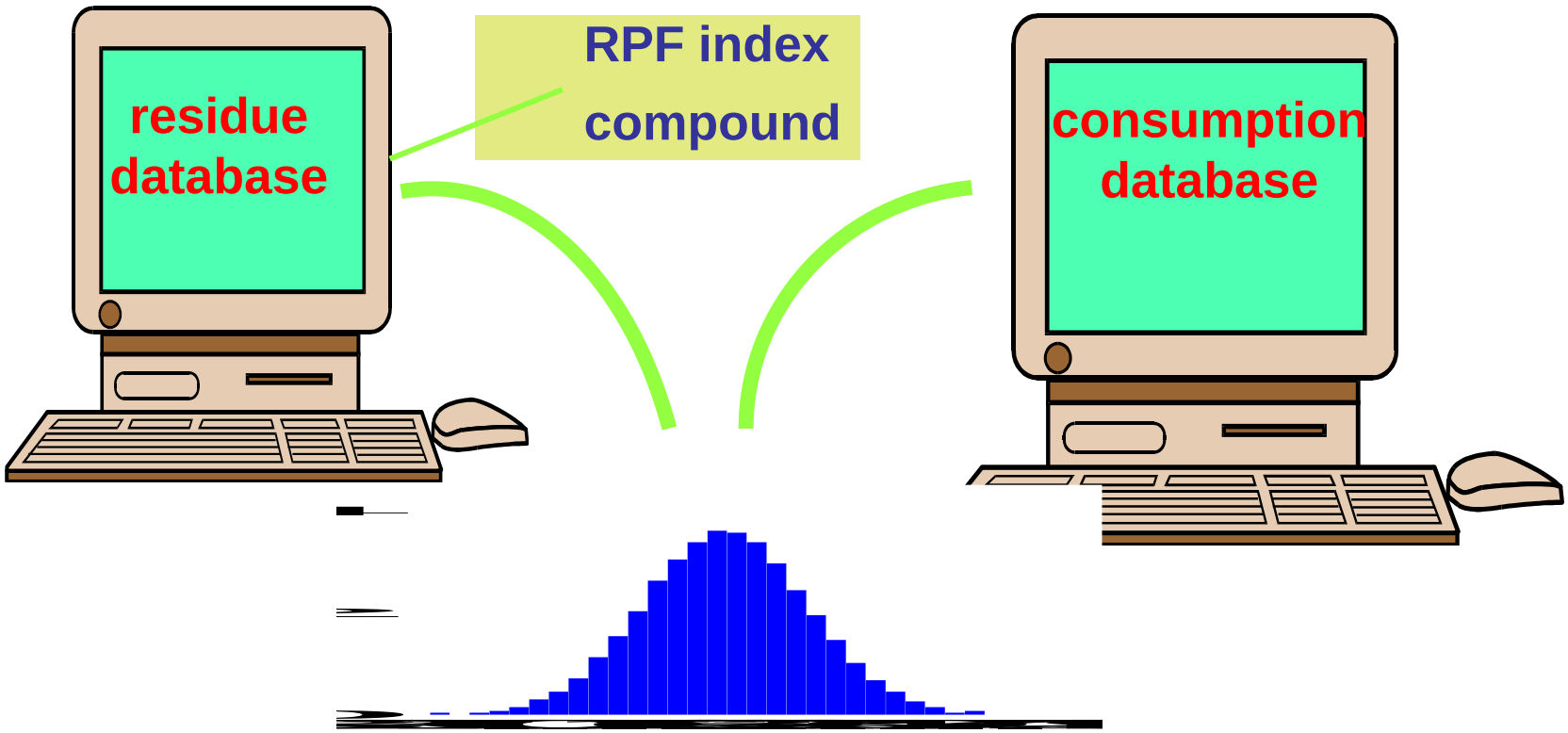
- Improved cumulative **exposure** assessment and cumulative hazard assessment;
- To integrate **cumulative and aggregate risk models** in a web-based tool, including accessible data for all stakeholders;
- **Improving the understanding** of cumulative risk assessment methodology of different **stakeholders**.

GREENPEACE

HSE

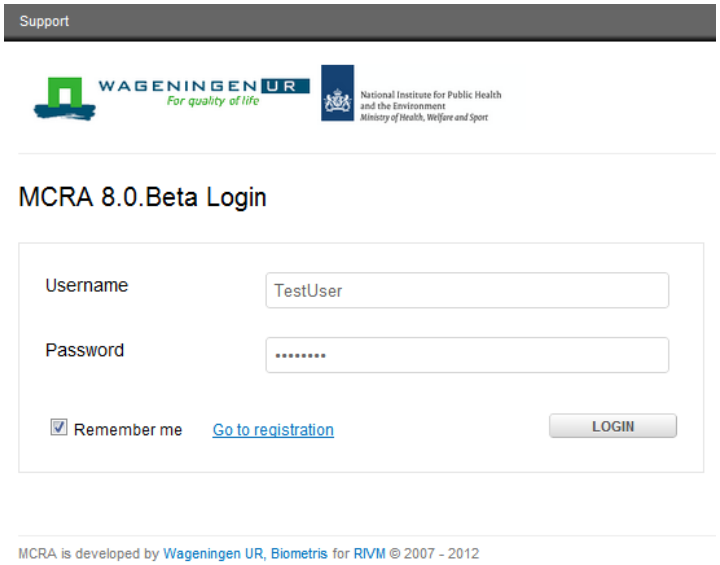
efsa
European Food Safety Authority

Probabilistic modeling cumulative exposure



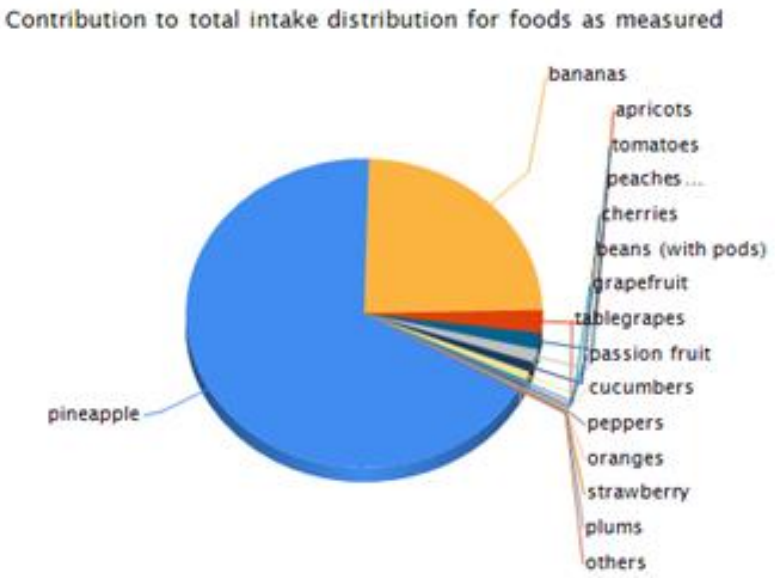
99, 99.9, and/or 99.99 percentile

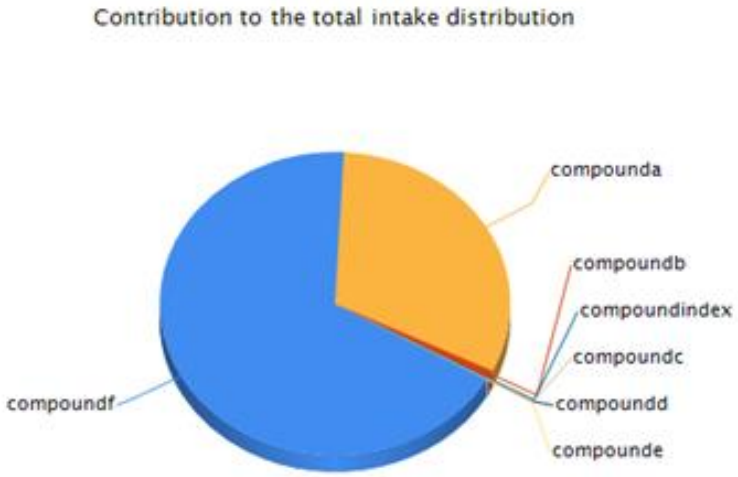
ACROPOLIS IT Tool (MCRA 8)



- Link relevant data to MCRA
- Select relevant values/options
- Select correct model and model parameters
- Generate and download output

Output (1): Contribution foods and compounds to cumulative exposure of triazoles





Source: Boon et al., FCT 2014

Output (2): Number of person-days per million exposure to triazoles

Exposure (µg/kg bw/day)	Percentage of reference dose	Margin of Exposure	Percentage	Lower Bound (p2.5)	Upper Bound (p97.5)	Number of people per million exceeding individual days
5	1.00 %	1E+04	94.74 %	93.74	95.82	52,580
50	10.00 %	1000	100.00 %	99.99	100	10
250	50.00 %	200	100.00 %	100	100	0
500	100.00 %	100	100.00 %	100	100	0
1000	200.00 %	50	100.00 %	100	100	0
2500	500.00 %	20	100.00 %	100	100	0

Source: Boon et al., FCT 2014

Validation

- DEEM-FCID is standard of US-EPA

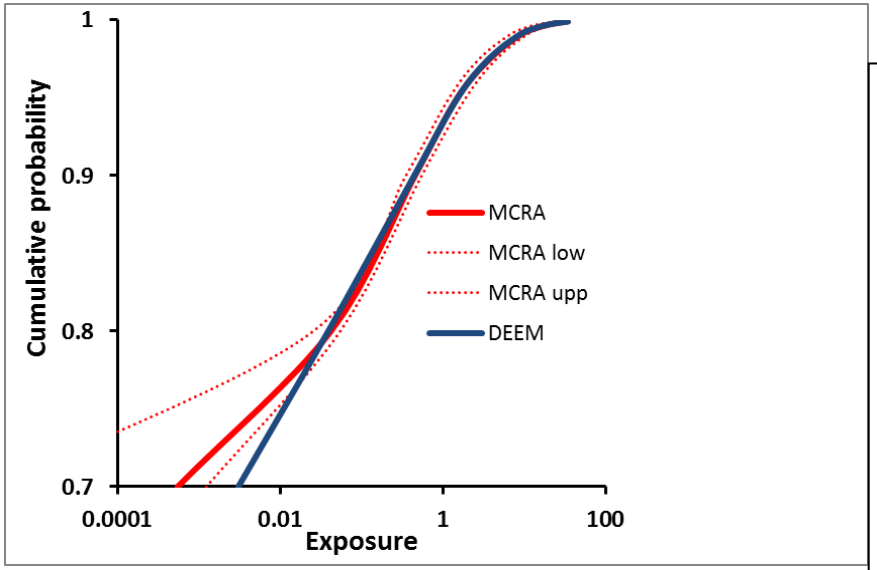
DEEM-FCID

Ver. 3.16, 03-08-d

Food translations based on EPA/USDA FCID recipe set as of February 2012

Dietary Exposure Evaluation Model

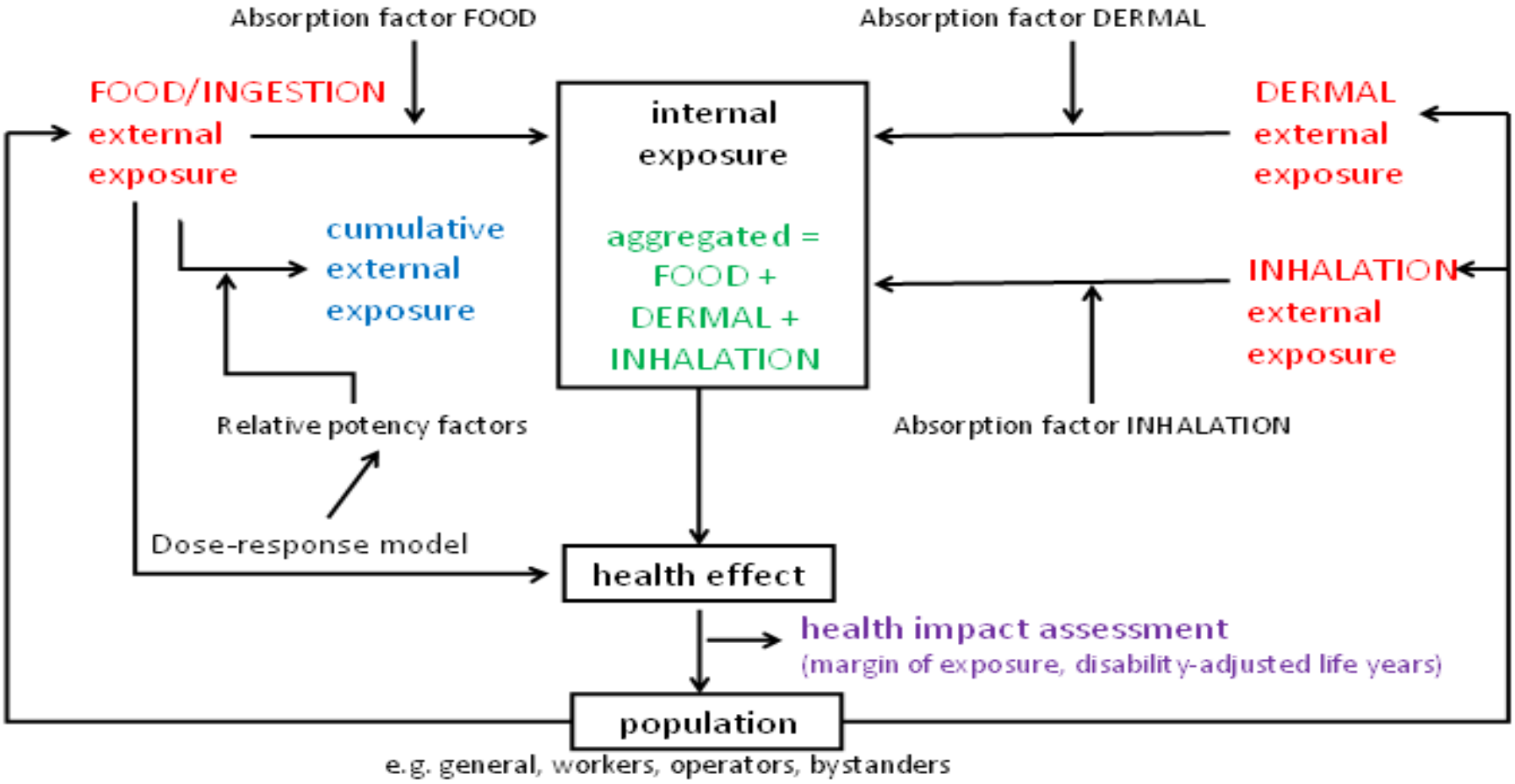
Based on NHANES 2-day food consumption data for 2003-2008



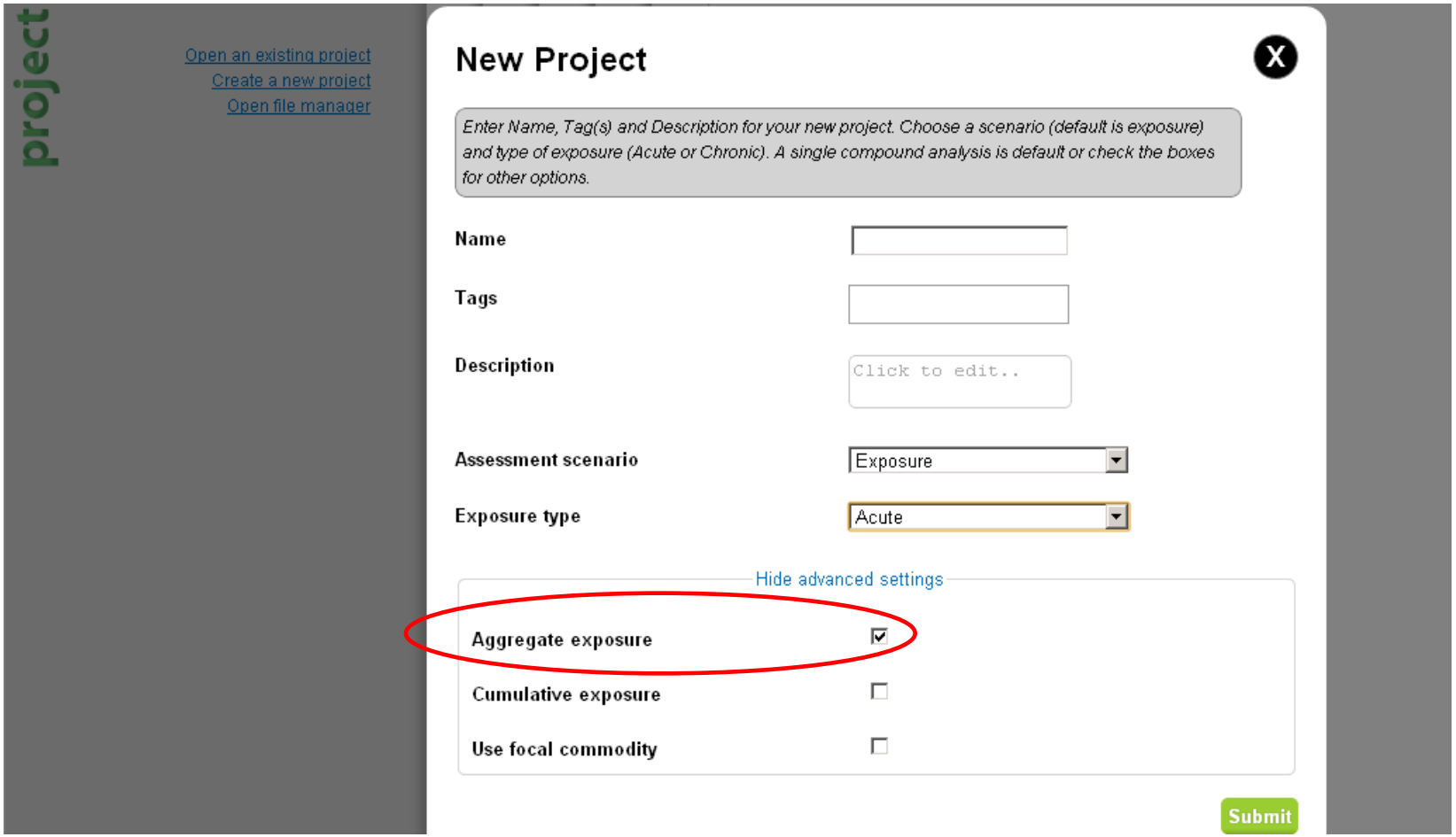
Source: v.d. Voet et al., FCT 2014

- Validation result: Good agreement MCRA and DEEM
- DEEM less precise at low exposures due to binning
- Not a problem because upper tail is relevant

Cumulative and aggregate assessments



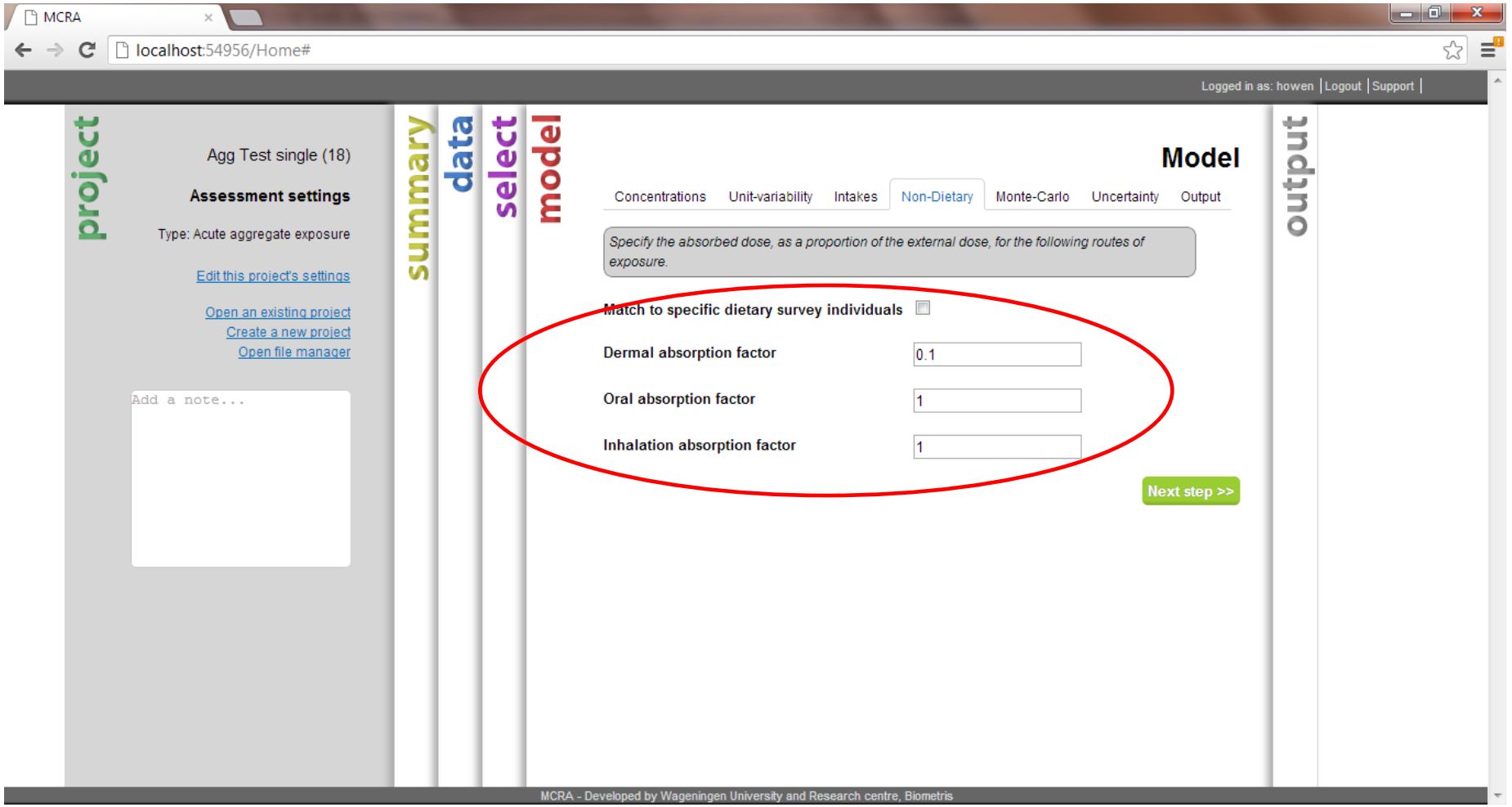
MCRA8 interface aggregate exposure



MCRA8 – model components

User supplies file of non-dietary exposure data (mdb, xls or csv)

Specify absorption factors



Case studies for testing aggregate model

- Probabilistic (variability between individuals)
  - Indoor spray and amateur use – ConsEXPO multiple routes
- Exposure residents + dietary exposure
  - EFSA guidance
  - EFSA calculator
  - BROWSE (workers, bystanders and residents)

Exposure assessment using ConsExpo

- Consumer products (e.g. cosmetics, amateur use, paints, plastics etc.)
- Measurements of concentrations in relevant places, under relevant conditions

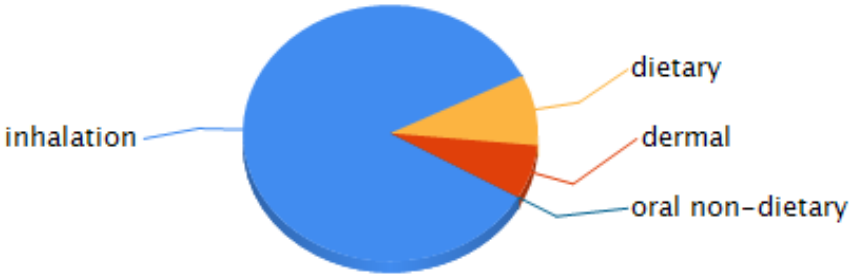
But:

- So many products, large variation in consumer behavior, and a large variation in exposure conditions

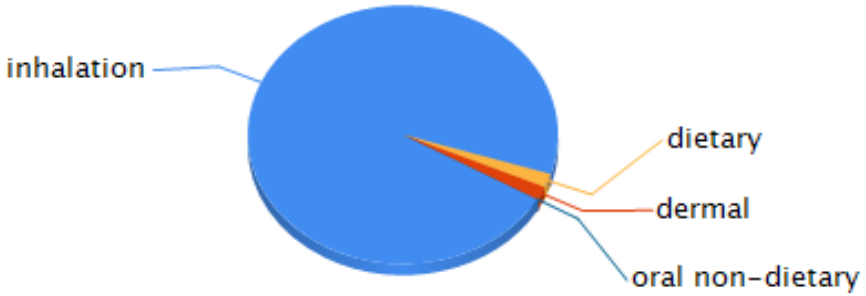
NL Consumer

- NL females (19-30) users of amateur biocides
  - Dermal and inhalation of bitertanol
  - Single spray per day, variability in spray conditions, modelled in ConsExpo

Adsorbed dose total distribution



upper part of the distribution



Source: Kennedy et al FCT 2014

Residents

- Dutch Health Council recommendations
- Consortium set-up by RIVM
  - Collection of urine
  - Identification of pesticides of concern
  - Collecting information on behavior
  - Collecting information on exposure via skin or inhalation
  - Food information
- Learn from experience in UK and others

EFSA guidance for workers, operators, bystanders and residents

- Harmonized approach
  - deterministic (but probabilistic might be a future refinement)
  - different models e.g. Dutch model, German model, EUROPOEM, UK POEM harmonized
  - new data and models included
- Acute versus chronic
  - different percentiles
  - different timeframes
- Consensus about default values
- EFSA calculator

EFSA calculator and ACROPOLIS

Substance name	captan	
Product name	captosan 500 SC	
AOEL	0.457	mg/kg bw/day
AAOEL	0.457	mg/kg bw/day
Crop type	Pome fruit	
Substance properties		
Formulation type	e concentrates, emulsifiable concentrate, etc.	
Miniumum volume water for application (liquids)	750	L/ha
Maximum application rate of active substance	1.875	kg a.s. /ha
50% Dissipation Time DT50	10	days
Initial Dislodgeable Foliar Residue	3	µg/cm2 of foliage/kg a.s. applied/ha
Dermal absorption of product	1.00%	
Dermal absorption of in-use dilution	10.00%	
Oral absorption of active substance	100.00%	
Inhalation absorption of active substance	100.00%	
Vapour pressure of active substance	non volatile and semivolatile (<5*10-3Pa)	
Scenario		
Indoor or Outdoor application	Outdoor	
Application method	Upward spraying	
Application equipment	Vehicle-mounted	
Buffer strip	2-3	m
Number of applications	10	
Interval between multiple applications	10	days
Season (upward spraying high crops only)	not relevant	

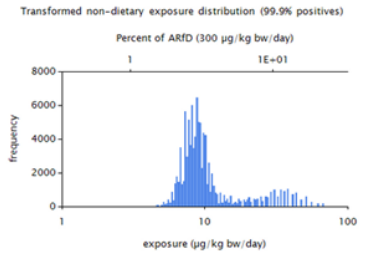
Case study captan

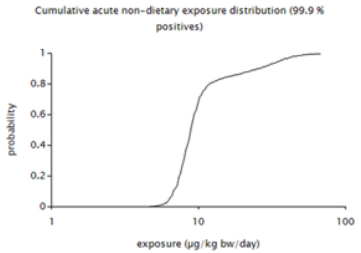
EFSA Guidance

Aggregated internal dose captan

Non-dietary

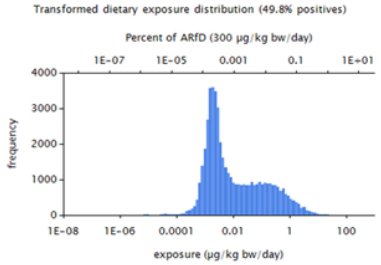
total

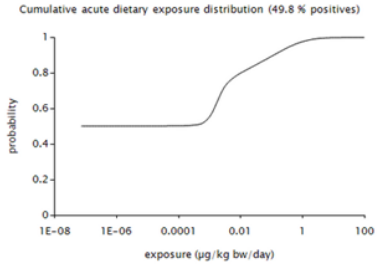




Dietary

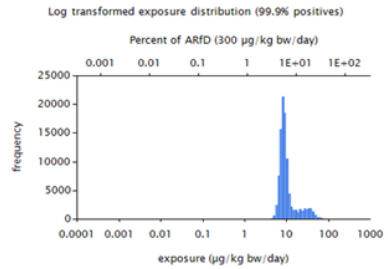
total

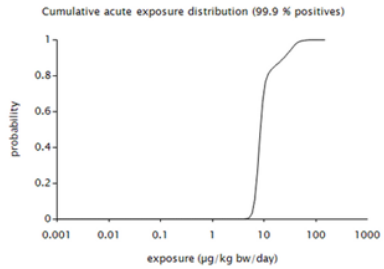




Aggregate

total





Project abstract

The BROWSE project is supported by the EU 7th Framework Programme and will:

- Review, improve and extend the models currently used in the risk assessment of plant protection products (PPPs) to evaluate the exposure of operators, workers, residents and bystanders.
- Use the new and improved exposure models to contribute to the implementation of Regulation 1107/2009 on authorisation of PPPs, replacing Directive 91/414/EC.
- Use the new and improved exposure models to contribute to the implementation of the Thematic Strategy on the Sustainable Use of Pesticides.
- Involve all relevant stakeholders and end-users and take full account of relevant gender issues in developing the exposure models and policy tools.

Read the project abstract in full

Priorities for training and communication

BROWSE Work Package 6 aims to contribute to achieving the objectives of the EU Directive on Sustainable Use of Pesticides. The first results from this work have been published in the journal Science of the Total Environment. See Project News for more details.

Priorities for training and communication | 4th BROWSE project meeting | Stakeholder Workshop

Deterministic versus probabilistic

Table 2: Mean and quantile summaries of output from the BREAM model (ml spray liquid). The modelled population corresponds to children; each exposed to a single boom spray event, under varying wind angle, wind speed and boom height conditions

		Mean	75th percentile	95th percentile
Adult	Dermal (external)	0.28	0.35	0.79
	Dermal (internal)	0.028	0.035	0.079
Child	**Dermal (external)**	**0.22**	**0.27**	**0.61**
	Dermal (internal)	0.022	0.027	0.061

Source: Kennedy et al FCT 2014

Internal dose different routes/models

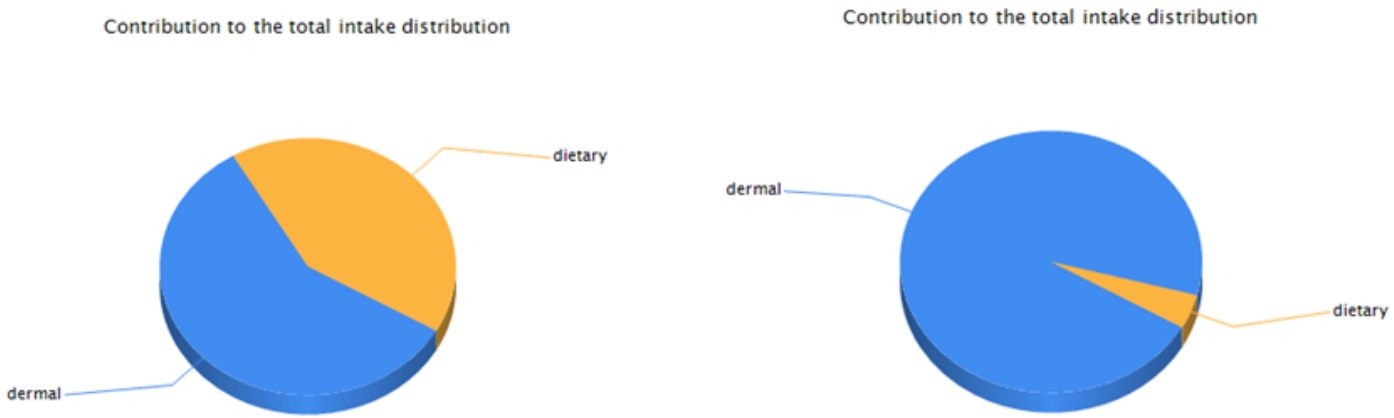


Figure 6: Distribution of acute aggregate exposure and percentage of dietary vs. dermal exposure in UK/NL child bystander case study, with either a conservative deterministic choice (right) and a variability distribution choice (left) for dermal exposure. Inhalation exposure is not included.

Source: Kennedy et al FCT 2014

DG SANCO and ACROPOLIS

- The European Commission sets the level of protection

- all member states are trained
- linking innovation with practical needs of DG SANCO
- discussion in SCFCAH (e-working group)
- optimal and practical approach

Source: ACROPOLIS stakeholder conference 15-10-2014

Current and future organization

- DG SANCO, EFSA and RIVM cooperation dietary exposure
  - Form 'proof of principle' to a full production server
  - Partnership agreement EFSA and ACROPOLIS follow-up
  - E-working group DG SANCO to set the level of protection
- Aggregated exposure assessment still in its infancy
  - Model(s) are available and accessible to all stakeholders
  - Data is not always there and new data is welcome
  - Regulatory settings needs to be discussed
- Link between ACROPOLIS and Browse should be further explored by EFSA, national food authorities and/or industry

Thanks to all the people involved