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Recommendation no. 10

of the BPC Ad hoc Working Group on Human Exposure

The most appropriate model to be used for the scenario of non-professional application of paints by brushing and rolling

(Agreed at the Human Health Working Group III on 26 May 2016)

1. Background

Non-professional exposure during painting is assessed in some recent PT7 (Film preservatives) and PT8 (Wood preservatives) active substances using different models. During the BPC Working Group meeting (WG-III-2014) the need for harmonization was recognized and it was agreed to prepare a recommendation for the most appropriate model to be used for non-professional painting by brushing or rolling.

2. Aim of the recommendation

The aim of this recommendation is to suggest the most appropriate model for assessing non-professional painting by brush or roller when using PT7 or PT8 products.

The mixing and loading and cleaning of the brush are not discussed in this recommendation. Applicable models concerning exposure assessment of mixing and loading are given in Biocides Human Health Exposure Methodology document (5). Exposure model for cleaning a brush is given in the HEEG opinion 11 'Exposure model - washing out of a brush'.

This recommendation does not apply to brush/roller application of antifouling paints by the non-professionals. For this scenario a specific model is given in the Biocides Human Health Exposure Methodology document (Non-professionals brushing and roller painting antifouling paint on underside of small boats, outdoor).

3. Discussion

3.1 Applicability to PT7 and PT8 products

Considering the human exposure to compounds from paint products the difference between brushing and use of a roller is negligible (6). Thus, the same data can be used for both application methods. The application techniques are similar or identical (mostly roller and brushes) for decorative paints (PT7) and wood preservatives (PT8). Spraying is more common with wood preservatives.

The difference between PT7 and PT8 product is that the wood preservatives (PT8) are designed to penetrate the wood whereas paints (PT7) are designed to form a film on the surface. The majority of film forming decorative products (PT7) for brush application are different from PT8 products in terms of their rheology and their spattering characteristics, PT8 being more spattering and causing thus higher exposure.

The number of available measurement data of exposure during painting with brush or roller is limited and many of these studies are made several decades ago. These studies are often made using PT8 products and very few data is available on PT7 exposure measurement. A short questionnaire was sent to CEPE (European painting industry association) to evaluate whether measurements made with PT8 products are applicable also for exposure assessment of PT7 products.

Based on the response from CEPE, measurements with PT8 products can still be considered valid because the application technique and viscosity (which effects on the spattering) of the PT8 products has not been changed since 1990's.

PT7 consumer products are often designed for being easy to apply and without spattering according to CEPE. Non-drop rheologies (= less spattering) can be found more often in consumer paints than in paints designed for professionals. The VOC (Volatile Organic Compound) legislation has forced to shift from solvent based to water based products especially in the consumer products and 85 % of consumer paints are nowadays water based.

As a conclusion the PT8 exposure measurement data can be to some extent conservative for PT7 consumer products due to previously mentioned factors.

3.2 Factors affecting the exposure

Dermal exposure is the main route of exposure during painting with wood preservative as shown in the study of Garrod et al. (1) where results indicated that deposition inside gloves or on clothing is likely to be more important as the exposure route, compared with inhalation.

Dermal exposure during brushing/rolling will depend on the position of the user. Dermal exposure is substantially higher when painting overhead (ceiling) than when painting downwards (floor) or to side. During painting overhead predominantly the hands will be dermally exposed. When painting with a wood preservative more than 80 % of the total dermal exposure is onto hands. When painting to the side this percentage ranges from 20 to 40 % (6). The hands showed the highest share with 76 % of the total body exposure also in the Austrian/BfR study where exposure to wood preservative while painting trellis or lattice fence was measured (2). The relative exposure of the face with 0.4 % was almost negligible in this study.

The viscosity of the paint has also an influence on the dermal exposure during brushing/ rolling. If a type of paint is more viscous (i.e. thicker) it is assumed that the dermal exposure will be smaller. Usually the viscosity of wood preservatives will be lower than in decorative paint products. Regarding the exposure models, the viscosity of the paint is taken into consideration only in the Paint Fact Sheet, by applying different default values for dermal contact rate. Distinction is made between low viscous paint products and other paints only for painting overhead. For downward painting and painting directed to the side, it is assumed that dermal exposure is the same for both low viscous paint products and other paints due to lack of information.

In the Austrian/BfR study of human exposure to wood preservative (2) methods to produce data in validated form was studied. The exposure amount of the body part was mainly determined by the factors 'painted object type, wind, painting speediness and formulation of the paint'. The factors 'painted object type and painting speediness' had a significant influence on the exposure of all body parts. The exposure was higher when brushing a trellis fence (more complicated object compared to a lattice fence) or when the brushing was carried out speedily. Also the base of the wood preservative proved to be significant for each part of the body. Body exposure was higher when water-based wood preservative was used compared to spirit-based product. Hand exposure was higher with the spirit-based wood preservative.

Under worst-case conditions (in the Austrian/BfR study: painting complicated object, wind, brushing speedily, inexperienced and small-sized subject, last job of subject, water-based glaze), the potential dermal exposure (body without hand) was approximately 50 times higher than under optimal conditions (simpler object, no wind, brushing neatly, experienced and tall subject, first job of the subject, spirit based primer). This illustrates that the high variability of exposure is only partly due to random effects, whereas

systematic conditions are responsible for at least 50 % of the variability.

In the study of Roff (3) ambient temperature had a dramatic effect on the exposure. Contamination decreased by a factor of x0.83 for every Celsius increase. Temperature dependency was not caused by viscosity or evaporation effects, but was probably caused by the behavior of the subjects. One explanation given in the paper was that subjects brushed more vigorously in the cold than in the warm weather.

When modelling **inhalation exposure** the volatility of the active substance should be taken into consideration. Vapour phase should be evaluated when using volatile active substances. However, it seems that almost all PT7 and PT8 active substances are non-volatile as no active substance with vapour pressure >10 mPa, here as a limit for volatile active substance, was found in a checkup.

3.3 Models

Two models for in-situ application of wood preservatives with a brush by non-professionals are given in the Biocides Human Health Exposure Methodology document. **Consumer Product Painting Model 1** is intended to be used in overhead indoor painting and it includes also decanting. Consumer Product Painting Model 3 is for outdoor painting direct from can. Third non-professional model for brush painting of sheds and fences, where different default values are given for water based and solvent based products for dermal exposure, was presented only in the Technical Notes for Guidance, TNsG 2002 (Consumer Painting Model 2, p. 201)(4).

Consumer Product Painting model 1 is based on the study with 11 measurements with the water-based wood preservative upwards indoors. Rough wooden joists and the undersides of floorboards were brushed overhead indoors. Painting of rougher wood surface would tend to favor generation of aerosols and splashes (1). Exposure measurements were based on the whole body UV-fluorescence and skin washing. This model can be assumed to represent the very worst case while painting.

Consumer Product Painting model 3 is based on the study, where 15 measurements with wood preservatives were made outdoors (dichlofluanid in 13 cases and one with zinc octoate and acypetacs zinc)(1). Six non-zero data (0.5 - 8.03 mg/m3) was detected in the inhalation exposure measurements. Application was made using a brush and wooden fences and rough shed panels were handled. Brushing was made along panels of shed and of horizontal lap fence. Dermal exposure was measured using 6 gauze pads fixed on defined positions on clothes. This method is validated only for spray application and may not be the best measurement technique for spatters.

ConsExpo/Paint Fact Sheet: For brush and roller painting there are five different paint types in ConsExpo: solvent rich, high solid and waterborne paint, waterborne wall paint and two-component paint. Differences in the exposure pattern of the paint products are starting point for this classification. Default values are based on the same studies which are used in the Consumer Product Painting Models given in the Biocides Human Health Exposure Methodology document (earlier TNsG models). Distinction between painting position (overhead or downward and directed to the side) is made. Also, viscosity difference can be taken into account in choosing overhead painting contact rate values.

Dermal exposure during brushing or rolling paint products is calculated using the constant rate model from the ConsExpo. For this model the contact rate parameter (the rate at which the product contacts the skin) is required.

To calculate the inhalation exposure of compounds from paint products, models which describe the evaporation of compounds from a mixture of liquids is used in ConsExpo.

The evaporation from drying paint products can be estimated with these models. The painting time, exposure duration, mass transfer rate and molecular weight of the matrix are some of the parameters needed in the inhalation exposure calculations.

Austrian-BfR/BEAT: Mainly dermal exposure while painting with four different wood preservatives (tolylfluanid, propiconazole, IPBC, permethrin) were studied. Altogether 96 jobs were performed using solvent and water-based paints simulating outdoor situation. Painting situation and the measurement results are as close to reality as possible. Painting was done also in head level and overhead in addition to the painting directed to the side. The influence of the different factors on exposure is described above. Dermal exposure was sampled from gloves, cut offs from overalls (arms, front of the legs and the front of the corpus including the shoulders) and top side of shoe covers. This measurement technique can be considered comprehensive for measuring spatters due to painting.

Indoor decorative painting with PT7 products is given as a worked example in **BEAT**. This worked example is of primary professional use and is thus not applicable to assess non-professional exposure.

Existing models (Consumer Product Painting Models, Austrian/BfR study/BEAT and ConsExpo) are compared in more detail in the **Annex 1**.

The US-EPA Wall Paints Exposure Assessment Model (**WPEM**) is presented in the Biocides Human Health Exposure Methodology document. WPEM estimates only the potential inhalation exposure of consumers and workers to the chemicals emitted from oil-based (alkyd) and latex wall paint which is applied using a roller or a brush indoors. The emissions of chemicals from wall paint is combined with detailed use, workload and occupancy data (e.g. amount of time spent in the painted room, etc.) to estimate exposure. The WPEM provides exposure estimates such as Lifetime and Average Daily Doses, Lifetime and Average Daily Concentrations, and peak concentrations. The output of WPEM was evaluated in a home used by EPA for testing purposes and, in general, the results were within a factor of 2.

The emission algorithms used in the model, and their relationship to chemical properties, are based on chamber tests specific to these types of products involving a limited set of chemicals with a correspondingly limited range of properties (molecular weight and vapour pressure). For alkyd paints, chemicals used as a basis for developing the emissions model have the molecular weights from 87 to 170 g/mol (120-170 g/mol for the subset on which the model was based) and a range of vapor pressures from 0.053 - 2.52 kPa and for latex paints 62 to 216 g/mol and a range of vapor pressures from 0.27 - 26.7 Pa. The emission algorithms are valid only for chemicals that are formulated into alkyd/latex primers or paints. If users have emissions data from chamber studies, they can input these data and use WPEM to estimate exposure.

Within the modeled compartment(s), uniform mixing is assumed; no distinction is made between airborne chemical concentrations in the applicator's breathing zone versus elsewhere in the compartment where paint is applied.

4. Proposal for harmonisation

Dermal exposure is recommended to be evaluated using Austrian/BfR study results, where distinction between water and solvent based product is possible. The evaluation of this study so far has not delivered an appropriate final indicative value. Based on the selective use conditions during the performance of single painting jobs a value from all raw data may not be representative for the totality of all jobs. However, until an extended evaluation of the study is available, the 75th percentile of the raw data should be used as indicative value. In this study the number of dermal exposure measurements is highest and measurement method is more reliable than in the Consumer Product Painting Model 3. In addition, this model does not overestimate exposure compared to the Consumer Product Painting Model 1 where only indoor overhead painting exposure is assumed.

It is proposed to make a distinction concerning the volatility of the active substance when assessing **inhalation exposure**. As a general rule a substance should be considered volatile only if it has a vapour pressure >10 mPa at 20°C (8). Exposure is assessed indoors as a realistic worst case scenario.

The inhalation exposure of non-professional brush or roller painting containing **non-volatile** active substance (vapour pressure < 10 mPa at 20°C) is proposed to be evaluated using Consumer Product Painting Model 3 default value. For **volatile** substances (vapour pressure >10 mPa at 20°C) ConsExpo Evaporation model is recommended to be used for vapour phase. Default values given in the paint product fact sheet (6) should be used for calculations with the ConsExpo. Aerosol phase is not justifiable for volatile substances as the evaporation from such particles is very fast. It should be recognized that almost all PT7 and PT8 active substances are non-volatile. For paints containing PT6 products (with low/volatile active substance) inhalation exposure should be assessed with other models.

The WPEM model could be used for assessing inhalation exposure of substance of concern (e.g. solvents) when painting indoors walls or ceilings (in the product authorization stage.

Table 1. Proposed models for dermal and inhalation exposure evaluation during brush or roller painting.

		Hands	**Body**
Dermal exposure[1]	Water-based paint	4.07 µl/min (75th) [2]	1.7 µl/min (75th) [2]
	Solvent-based paint	9.14 µl/min (75th) [2]	1.12 µl/min (75th) [2]
Reference		Austrian/BfR study (2)	Austrian/BfR study (2)
		Aerosol phase	**Vapour phase**
Inhalation exposure[1]	Low-volatile	1.63 mg/m^3 (50th)	no
	Volatile	no	ConsExpo Evaporation model
Reference		*Consumer Product Painting Model 3 (5)*	-

[1] Indicative values are for in use product.
[2] The density of the paint should be known.

5. References

1. Garrod, A.N.I., Guiver, R,. Rimmer, D.A. (2000). Potential Exposure of Amateurs (Consumers) through Painting Wood Preservative and Antifoulant Preparations. Ann. occup. Hyg., Vol. 44. No. 6, pp. 421-426
2. Humanexposition bei Holzschutzmitteln - (Human exposure to wood preservatives), Federal Institute for Risk Assessment, Berlin (2005)
3. Roff, M.W. (1997). Dermal exposure of amateur or non-occupational users to wood preservative fluids applied by brushing outdoors. Annals of Occupational Hygiene 41(3), 297-311.
4. Technical Notes for Guidance on human exposure to biocidal products 2002;

   http://echa.europa.eu/documents/10162/16960215/bpd_guid_tnsg+human+exposure+2002_en.pdf
5. Biocides Human Health Exposure Methodology v 1.0 (2015)

   http://echa.europa.eu/about-us/who-we-are/biocidal-products-committee/working-groups/human-exposure
6. Paint Products Fact Sheets - ConsExpo; http://www.rivm.nl/dsresource?objectid=rivmp:13109&type=org&disposition=inline
7. BEAT: http://xnet.hsl.gov.uk/download/
8. Curry, P.B., Iyengar, S., Maloney, P.A. and Maroni, M., (1995). 'Methods of Pesticide Exposure Assessment'. Plenum Press, New York. ISBN 0-306-45130-1
9. WPEM: https://www.epa.gov/tsca-screening-tools/wall-paint-exposure-assessment-model-wpem

6. Annex 1

6.1 Comparison of studies to find the most appropriate model to be used for the scenario of non-professional application of paints by brushing and rolling (indoor and outdoor)

Model name in Biocides Human Health Exposure Methodology document	**Roff 1997** **Consumer Product Painting Model 2**	**Garrod 2000** **Consumer Product Painting Model 3**	**HSL 2001** **Consumer Product Painting Model 1**	**Austrian 2005/08** -
Study used in	TNsG 2002 (Consumer brush painting Model 2)	TNsG 2002 (Consumer brush painting Model 3)	TNsG 2002 (Consumer brush painting Model 1)	BEAT (Austrian wood preserv. water-based/solvent-based)
	BEAT (Scenario Fence brushing water/solvent)	TNsG 2007 (Model 2)	TNsG 2007(Model1)	
		BEAT (Scenario Garden Timber Treatment)		
Job	Brushing a wooden trellis fence (worst case fence type) outdoors, incl. decanting, brush, factorial design, artificial wind	Brushing sheds/ summerhouses and fences, outdoor incl. brief mixing & loading phase. Volunteers painting their own fences at home. Detailed description of every job (e.g. "brushing along panels of shed and of horizontal lap fence")	Rough wooden joists and the underside of floor boards, overhead indoors, with water based product (includes decanting)	Painting wooden fences (trellis and lattice), also overhead, with brush, indoors (hall area: 240m²; height: 7m, outside simulation), directly from can, painting under standardized conditions, can be transposed to confined places, Multi-factorial design allowed to reduce number of measurements
Including mixing & loading phase	Yes, decanting of a measured amount into a 3 L plastic beaker	Yes, stirring, a few minutes, M&L phase not sampled separately	Yes	No
Instructions to volunteers	No instructions on brushing technique were given	To take same level of care as normally	Information not available in the short study summary provided by HSE.	Intention and proceeding of the study was explained as well as the hazards of the product but no brushing instruction was given. Users read the label of the product.

Model name in Biocides Human Health Exposure Methodology document	**Roff 1997** **Consumer Product Painting Model 2**	**Garrod 2000** **Consumer Product Painting Model 3**	**HSL 2001** **Consumer Product Painting Model 1**	**Austrian 2005/08** -
Brush	7 cm coarse brush	n.a.		5 or 7 cm brush
Video documentation	Yes			yes
Products used	Solvent and water-based paints, fluorescent dye added	n.a. (product density of 1g/mL)	water based product	Solvent and water-based paints
	Colourless White-spirit based woodworm fluid (Cuprinol Woodworm Killer S, HSE 4693)			Aidol Induline GW-300 Kiefer, Avenarin Langzeit Plus 3 Kiefer, Avenarol Holzschutzgrundierung Farblos, Avenarol Imprägniergrundierung Farblos (all Propiconazol)
	Colourless water-based woodworm-fluid (Permaguard Products microguard Woodworm fluid, HSE 5103)			GORI 28 Imprägniergrund (Tolylfluanid)
				No information on products containing permethrin and IPBC
Active substances (concentration) (Vapour pressure) (no of jobs)	Permethrin (0,2 % w/w) (2.88 E-6 Pa) (24 jobs)	Dichlofluanid (0,21 – 0,4 % or 3,33 – 3,57 g/L) (2.15 E-5 Pa) (13 jobs)	Information not available in the short study summary provided by HSE.	Propiconazole (0,99-1,04 %) (5.6 E-5 Pa) (64 jobs)
		Zinc octoate (8,1 %) (2.06 E-4 Pa (us epa)) (1 job)		Tolylfluanid (0,70 %) (2 E-4 Pa) (16 jobs)
		Acypetacs zinc (1,495 %) (vapor pressure not found) (1 job)		Permethrin (0,25 %) (2.88 E -6 Pa) (8 jobs)
				IPBC (0,45 %) (4.5 E-3 Pa)

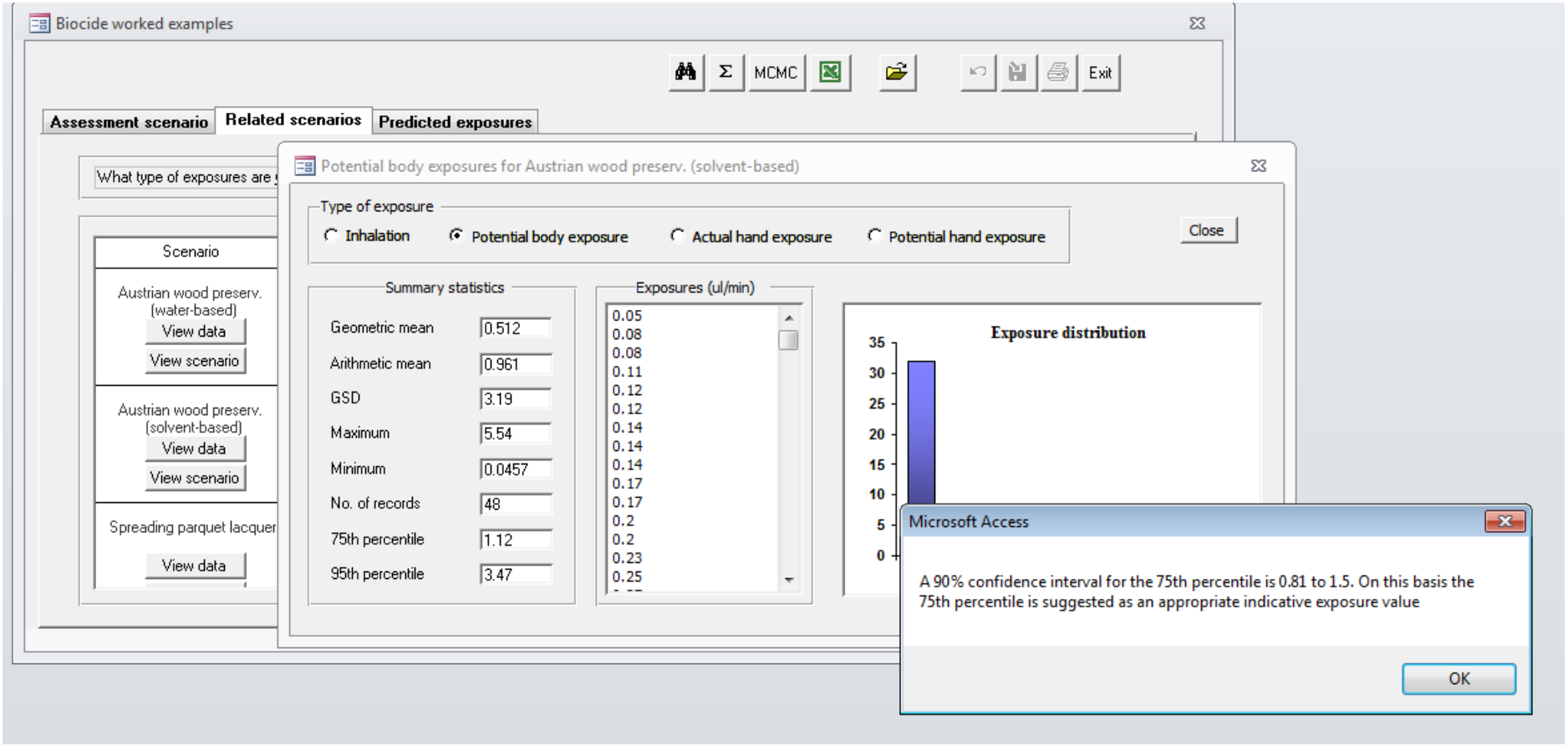
Model name in Biocides Human Health Exposure Methodology document	**Roff 1997** **Consumer Product Painting Model 2**	**Garrod 2000** **Consumer Product Painting Model 3**	**HSL 2001** **Consumer Product Painting Model 1**	**Austrian 2005/08** -
				(8 jobs)
Volume of paint used	Median 1,245 L (Range 0,48 – 2,97 L)	Median 4 L (Range 1-8,5 L)	Median 1.01 L (Range 0.57 - 1.4 L)	n.a., but data had been recorded. In BEAT an overall quantity of 7.3 litres for lattice fences and 4.45 litres for flat panels has been assumed.
Exposure time	30 min or 1 h ("in a half-hour brushing exercise the tree panels were painted for 5 min. each, inside and out")	Median 155 min (Range 76-241 min)	Median 26.5 min (Range 23.3. - 38.5 min)	N.a., but data had been recorded.
Study population	12	15 self-selected volunteers, incl. HSE staff, aware of the purpose of the survey	11 self-selected volunteers, incl. HSE staff, aware of the purpose of the survey	8 volunteers (for series no. 3, 6 of them have been replaced)
Study design	Four two-level categorical factors		Information not available in the short study summary provided by HSE.	Nine times two-level factors design
Total number of jobs	24	15	11	80
Number of studies	1	2 for paint (2 for anti-fouling)	11	4
Sample collection	Clothes: "light clothing" (shirt, long trousers, shoes, cotton gloves) or "minimal clothing" (shorts, t-shirt, shoes)	6 gauze pads fixed on defined positions on clothes (method only validated for spray applications), thin cotton gloves, socks	Light or minimal clothing	Overall (body parts analyzed separately), shoe cover and fleece of mask were analyzed
	Dermal contamination: individuals filmed and photographed under UV A light		Whole body UV fluorescence	
	Hand and wrist contamination: brushing and washing of hands with soap for active substance detection in the washing water		Skin washing	
	Inhalation: IOM total inhalable air sampling heads (6 subjects) with	Inhalation: Drawing air with 0,5 L/min, glass fibre GF/A, Tenax	Information not available in the short study	Inhalation: polyurethane foam & glass fibre filter

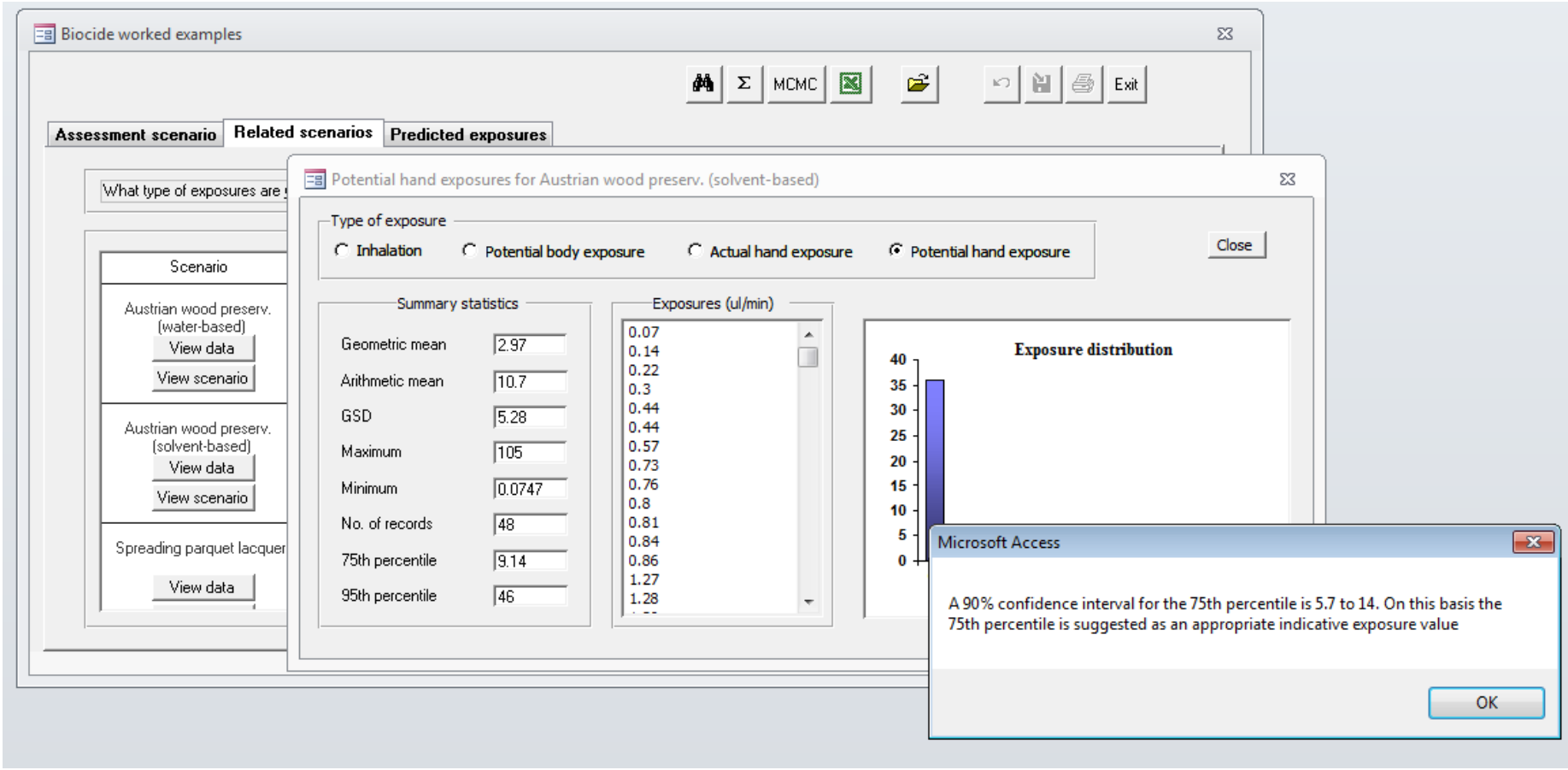
Model name in Biocides Human Health Exposure Methodology document	**Roff 1997** **Consumer Product Painting Model 2**	**Garrod 2000** **Consumer Product Painting Model 3**	**HSL 2001** **Consumer Product Painting Model 1**	**Austrian 2005/08** -
	PTFE filter	tube	summary provided by HSE.	
Analysis	FIVES, fluorescence monitoring technique to detect contamination of paint/fluorescent dye on skin or inhalation filter	Extraction of cloth samples into cyclohexane (dichlorofluanid, acypetacs zinc) or toluene (zinc octoate), GC/MS, ICP-AES (only acypetacs zinc)	Strontium chloride for skin washing determined by atomic emission spectrometry Tinopal or United optpical brightener	Extraction of cloth samples in methanol or acetone, LC-MS/MS, GC/MS
Tracer	Active substance, fluorescence dye	Active substance (dichlorofluanid), methyl octoate (zinc octoate), Zinc & methyl esters (acypetacs zinc)	Strontium chloride for skin washing	Active substance (for tolylfluanid incl. metabolite DMST)
			Information not available in the short study summary provided by HSE.	
Values (percentile) (no. of data)	TNsG Model 2 (2002):	TNsG Model 2 (2007):	TNsG Model 1 (2007):	BEAT:
	Water-based:		*Water-based:*	*Water-based:*
	Hands: 6,32 mg/min (75^{th}) (12)	Hands: 5,91 mg/min (75^{th}) (9)	Hands/forarms: 150 mg/min (75^{th})	Hands (GM): 1,51 µL/min (75^{th}) (32)
	Body (less hands): 13,8 mg/min (75^{th})(8)	Body: 16,9 mg/min (75^{th}) (15)	Legs/feet/face: 35,7 mg/min (75^{th})	Body (GM): 0,793 µl/min (75^{th}) (32)
	Inhalation: no data	Inhalation: 1,63 mg/m^3 (50^{th}) (6)	Inhalation: 3,1 mg/m^3 (75^{th})	Inhalation: no data
	Solvent-based:			*solvent-based:*
	Hands: 19,5 mg/min (75^{th})(12)			data not accessible in beat version available in anses no data actual hands exposure Potential hands exposure:

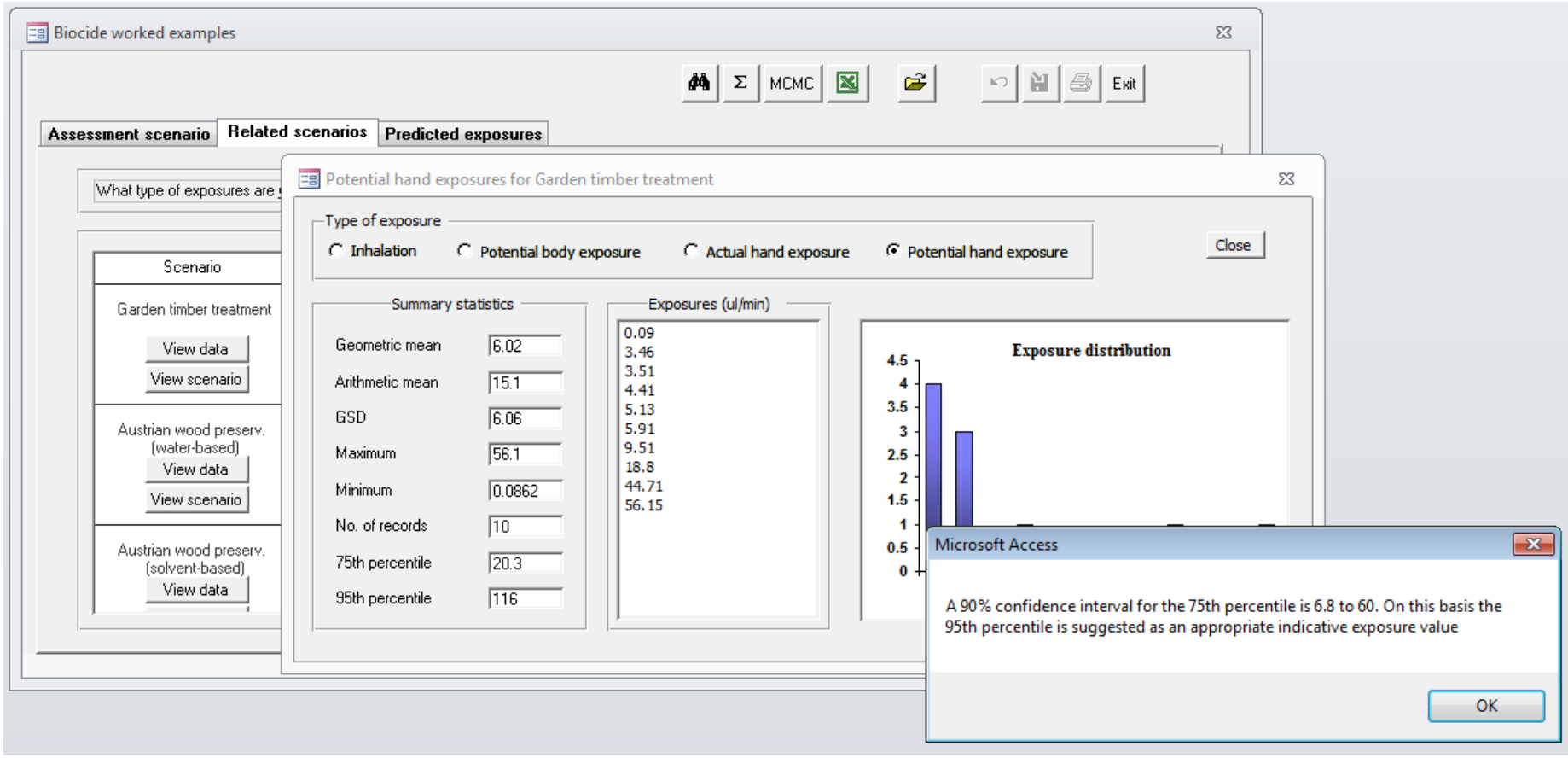
Model name in Biocides Human Health Exposure Methodology document	**Roff 1997** **Consumer Product Painting Model 2**	**Garrod 2000** **Consumer Product Painting Model 3**	**HSL 2001** **Consumer Product Painting Model 1**	**Austrian 2005/08** -
				The 75th percentile and the 90% confidence interval for the 75th percentile era 9.14 (5.7-14)
	Body (less hands): 30,2 mg/min (75th)(7)			The 75th percentile and the 90% confidence interval for the 75th percentile era 1.12 (0.81-1.5)
	Inhalation: no data			
Uncertainties		TNsG 2: "Uncertainty is *moderate.* 90 % C.²I. for 75th: 3.7-9.4 (hands), 7.3-39.2 (body). Indicative exposure based upon 50th of non-zero values (80th overall, 9 zero inhalation exposures out of 15)."	TNsG 1: "Uncertainty is *moderate.* 90 % C.I. for 75th: 116-193 (hands), 21-60 (legs), 1.9-5.1 (inhalation)."	BEAT: "There is CONSIDERABLE uncertainty surrounding the quantity of wood preservative applied this being difficult of determine from the report. An overall quantity of 7.3 litres for lattice fences and 4.45 litres for flat panels has been assumed." (for water & solvent)

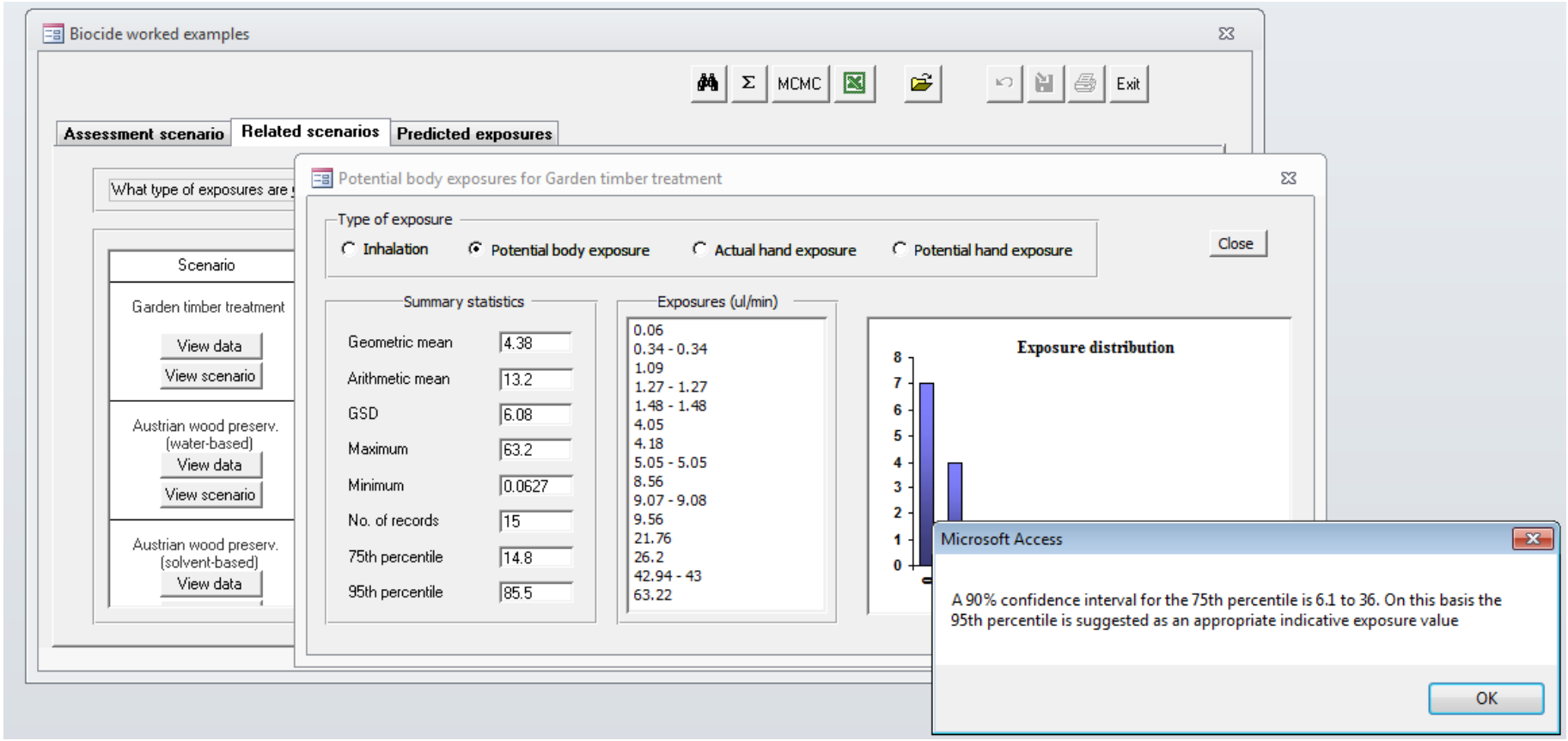
6.2 Consexpo (Paint Products Fact Sheet, p. 19 ff.):

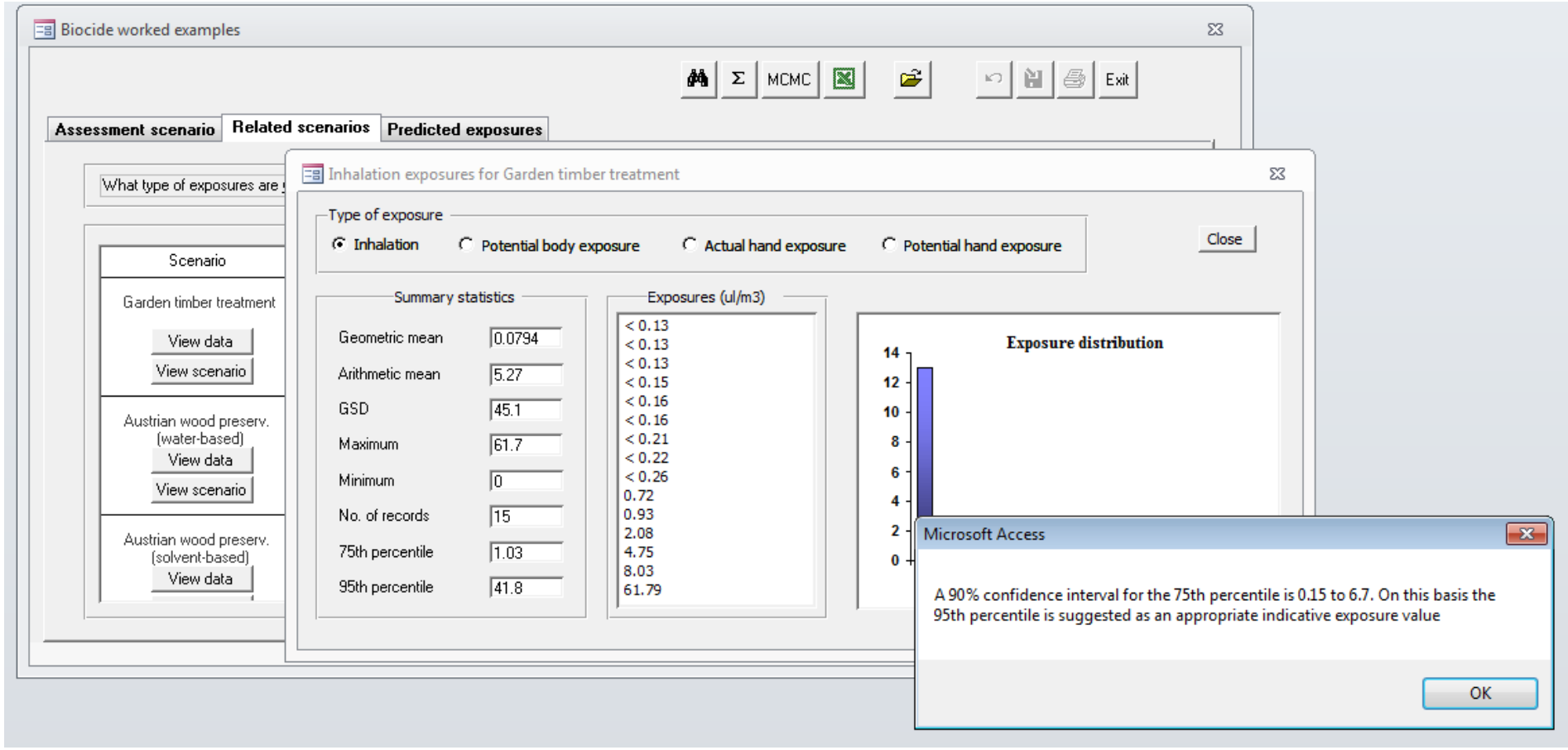
Brush and roller painting is described for five different types of paint (solvent rich, high solid and waterborne paint, waterborne wall paint and two component paint), for each type of paint a scenario is formulated. In Consexpo dermal exposure during brushing / rolling will depend on the position of the user: for the default values a distinction is made between painting overhead and 'other directions' (downward painting and painting directed to the side). Based on the TNsG Studies (HSL 2001, Roff 1997, Garrod 2000), RIVM proposes in the table below dermal contamination. A correction has been added to take into account the fact that users will clean or wipe off their hands if they are seriously stained. Inhalation exposure is modeled with the evaporation module.


Biocide worked examples
MCMC
Exit
Assessment scenario
Related scenarios
Predicted exposures
What type of exposures are
Scenario
Austrian wood preserv. (water-based)
View data
View scenario
Austrian wood preserv. (solvent-based)
View data
View scenario
Spreading parquet lacquer
View data
Potential body exposures for Austrian wood preserv. (solvent-based)
Type of exposure
Inhalation
Potential body exposure
Actual hand exposure
Potential hand exposure
Close
Summary statistics
Geometric mean 0.512
Arithmetic mean 0.961
GSD 3.19
Maximum 5.54
Minimum 0.0457
No. of records 48
75th percentile 1.12
95th percentile 3.47
Exposures (ul/min)
0.05
0.08
0.08
0.11
0.12
0.12
0.14
0.14
0.14
0.17
0.17
0.2
0.2
0.23
0.25
Exposure distribution
35
30
25
20
15
10
5
0
Microsoft Access
A 90% confidence interval for the 75th percentile is 0.81 to 1.5. On this basis the 75th percentile is suggested as an appropriate indicative exposure value
OK


Biocide worked examples
MCMC
Exit
Assessment scenario
Related scenarios
Predicted exposures
What type of exposures are
Scenario
Austrian wood preserv. (water-based)
View data
View scenario
Austrian wood preserv. (solvent-based)
View data
View scenario
Spreading parquet lacquer
View data
Potential hand exposures for Austrian wood preserv. (solvent-based)
Type of exposure
Inhalation
Potential body exposure
Actual hand exposure
Potential hand exposure
Close
Summary statistics
Geometric mean 2.97
Arithmetic mean 10.7
GSD 5.28
Maximum 105
Minimum 0.0747
No. of records 48
75th percentile 9.14
95th percentile 46
Exposures (ul/min)
0.07
0.14
0.22
0.3
0.44
0.44
0.57
0.73
0.76
0.8
0.81
0.84
0.86
1.27
1.28
Exposure distribution
40
35
30
25
20
15
10
5
0
Microsoft Access
A 90% confidence interval for the 75th percentile is 5.7 to 14. On this basis the 75th percentile is suggested as an appropriate indicative exposure value
OK


Biocide worked examples
Σ
MCMC
Exit
Assessment scenario
Related scenarios
Predicted exposures
What type of exposures are
Scenario
Garden timber treatment
View data
View scenario
Austrian wood preserv. (water-based)
View data
View scenario
Austrian wood preserv. (solvent-based)
View data
Potential hand exposures for Garden timber treatment
Type of exposure
Inhalation
Potential body exposure
Actual hand exposure
Potential hand exposure
Close
Summary statistics
Geometric mean 6.02
Arithmetic mean 15.1
GSD 6.06
Maximum 56.1
Minimum 0.0862
No. of records 10
75th percentile 20.3
95th percentile 116
Exposures (ul/min)
0.09
3.46
3.51
4.41
5.13
5.91
9.51
18.8
44.71
56.15
Exposure distribution
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Microsoft Access
A 90% confidence interval for the 75th percentile is 6.8 to 60. On this basis the 95th percentile is suggested as an appropriate indicative exposure value
OK


Biocide worked examples
Σ
MCMC
Exit
Assessment scenario
Related scenarios
Predicted exposures
What type of exposures are
Scenario
Garden timber treatment
View data
View scenario
Austrian wood preserv. (water-based)
View data
View scenario
Austrian wood preserv. (solvent-based)
View data
Potential body exposures for Garden timber treatment
Type of exposure
Inhalation
Potential body exposure
Actual hand exposure
Potential hand exposure
Close
Summary statistics
Geometric mean 4.38
Arithmetic mean 13.2
GSD 6.08
Maximum 63.2
Minimum 0.0627
No. of records 15
75th percentile 14.8
95th percentile 85.5
Exposures (ul/min)
0.06
0.34 - 0.34
1.09
1.27 - 1.27
1.48 - 1.48
4.05
4.18
5.05 - 5.05
8.56
9.07 - 9.08
9.56
21.76
26.2
42.94 - 43
63.22
Exposure distribution
8
7
6
5
4
3
2
1
0
Microsoft Access
A 90% confidence interval for the 75th percentile is 6.1 to 36. On this basis the 95th percentile is suggested as an appropriate indicative exposure value
OK


Biocide worked examples
Σ
MCMC
Exit
Assessment scenario
Related scenarios
Predicted exposures
What type of exposures are
Scenario
Garden timber treatment
View data
View scenario
Austrian wood preserv. (water-based)
View data
View scenario
Austrian wood preserv. (solvent-based)
View data
Inhalation exposures for Garden timber treatment
Type of exposure
Inhalation
Potential body exposure
Actual hand exposure
Potential hand exposure
Close
Summary statistics
Geometric mean 0.0794
Arithmetic mean 5.27
GSD 45.1
Maximum 61.7
Minimum 0
No. of records 15
75th percentile 1.03
95th percentile 41.8
Exposures (ul/m3)
< 0.13
< 0.13
< 0.13
< 0.15
< 0.16
< 0.16
< 0.21
< 0.22
< 0.26
0.72
0.93
2.08
4.75
8.03
61.79
Exposure distribution
14
12
10
8
6
4
2
0
Microsoft Access
A 90% confidence interval for the 75th percentile is 0.15 to 6.7. On this basis the 95th percentile is suggested as an appropriate indicative exposure value
OK

o0o