

# REGISTRATION REPORT

## **Part B**

### **Section 6**

#### **Mammalian Toxicology**

Detailed summary of the risk assessment

Product code: **Nordox 75 WG**

Chemical active substance(s):

Copper (I) oxide ( $\text{Cu}_2\text{O}$ ), 750 g/kg

## NATIONAL ASSESSMENT

Poland

(Authorization in accordance to Art. 43)

Applicant: Nordox AS

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## Version history

When	What
31/01/2022	Original version from the applicant Nordox AS for Art. 43 submission. All new data and information are marked in yellow.
12/2022	Version evaluated by PL zRMS
06/2023	Version revised by PL zRMS to take into account comments of cMS

## Table of Contents

<b>6</b>	<b>Mammalian Toxicology (KCP 7) .....</b>	<b>7</b>
6.1	Summary .....	7
6.2	Toxicological Information on Active Substance(s) .....	11
6.3	Toxicological Evaluation of Plant Protection Product.....	11
6.4	Toxicological Evaluation of Groundwater Metabolites.....	12
6.5	Dermal Absorption (KCP 7.3) .....	13
6.5.1	Justification for proposed values - Copper .....	14
6.6	Exposure Assessment of Plant Protection Product (KCP 7.2).....	16
6.6.1	Selection of critical use(s) and justification.....	16
6.6.2	Operator exposure (KCP 7.2.1) .....	16
6.6.2.1	Estimation of operator exposure .....	16
6.6.2.2	Measurement of operator exposure.....	18
6.6.3	Worker exposure (KCP 7.2.3) .....	18
6.6.3.1	Estimation of worker exposure .....	18
6.6.3.2	Refinement of generic DFR value (KCP 7.2) .....	23
6.6.3.3	Measurement of worker exposure.....	23
6.6.4	Resident and bystander exposure (KCP 7.2.2) .....	24
6.6.4.1	Estimation of resident and bystander exposure .....	24
6.6.4.2	Measurement of resident and/or bystander exposure.....	27
6.6.5	Combined exposure .....	28
<b>Appendix 1</b>	<b>Lists of data considered in support of the evaluation.....</b>	<b>29</b>
<b>Appendix 2</b>	<b>Detailed evaluation of the studies relied upon.....</b>	<b>34</b>
A 2.1	Statement on bridging possibilities.....	34
A 2.2	Acute oral toxicity (KCP 7.1.1) .....	34
A 2.3	Acute percutaneous (dermal) toxicity (KCP 7.1.2) .....	34
A 2.4	Acute inhalation toxicity (KCP 7.1.3) .....	34
A 2.5	Skin irritation (KCP 7.1.4).....	34
A 2.6	Eye irritation (KCP 7.1.5).....	34
A 2.7	Skin sensitisation (KCP 7.1.6).....	34
A 2.8	Supplementary studies for combinations of plant protection products (KCP 7.1.7) .....	34
A 2.9	Data on co-formulants (KCP 7.4) .....	34
A 2.9.1	Material safety data sheet for each co-formulant.....	34
A 2.9.2	Available toxicological data for each co-formulant.....	35
A 2.10	Studies on dermal absorption (KCP 7.3) .....	35
A 2.10.1	Dermal absorption, in vitro using human skin.....	35
A 2.11	Other/Special Studies .....	55
<b>Appendix 3</b>	<b>Exposure calculations .....</b>	<b>56</b>
A 3.1	Operator exposure calculations (KCP 7.2.1.1) .....	56
A 3.2	Worker exposure calculations (KCP 7.2.3.1) .....	60
A 3.3	Resident exposure calculations (KCP 7.2.2.1).....	65

<b>Appendix 4</b>	<b>Exposure calculation done by zRMS using dermal absorption for concentrate of 1% and for dilution 9% .....</b>	<b>72</b>
	Operator exposure calculations (KCP 7.2.1.1).....	72
<b>Appendix 5</b>	<b>Detailed evaluation of exposure and/or DFR studies relied upon (KCP 7.2, KCP 7.2.1.1, KCP 7.2.2.1, KCP 7.2.3.1) .....</b>	<b>93</b>

### **Submission and Evaluation of Copper compounds under Art.43 of 1107/2009**

**General observation:** Deviation from standard Guidance Documents and EFSA conclusion is necessary and unavoidable for Copper.

The RMS and EFSA are held to assess plant protection products according to the existing methodology described in a series of guidance documents (GDs). Those have been developed for synthetic, organic molecules, and are in most cases not applicable to minerals and Copper. This has led to an EFSA conclusion that indicated a number of critical concerns, or assessments that could not be finalized, which do not reflect any realistic risk, but rather illustrate the inappropriateness of the current GDs for the assessment of Copper. This can easily be seen in a number of endpoints that suggest a high risk exists at concentrations below natural background of this essential micronutrient. **This has been recognized by EFSA, the RMS and several MS (see comments from DE and IT in the Peer review Report), and the EU Commission has mandated EFSA with the development with a Copper specific guidance (Mandate No. 2019-0036).**

Art.43 submissions and their evaluation by MS are unfortunately due before this GD will be available. The current EFSA conclusion and list of endpoints could at best be considered as a first tier, and applicants as well as MS are required to deviate from the standard procedures described in the GD for the following reasons:

- The current GD do not consider bio-availability; for an essential, ubiquitous micronutrient that is a metal it is indispensable to provide assessment methodologies that consider the bioavailability and the potentially toxic fraction in each real-world exposure scenario. Total concentrations do not result in any meaningful outcome.
- Data normalisation to enable comparison of toxicological lab and field data as well as data obtained with different bioavailable fractions is a pre-requisite to allow a realistic assessment of potential risk. Simplistic worst-case scenarios will always indicate a high risk already at naturally occurring concentrations.
- For a homeostatically tight controlled essential element the application of assessment factors is meaningless. The question whether an excess exposure or deficiency leads to an adverse disruption of the homeostatic control cannot be approached in this way. Further, the exceptional data richness of the Copper dossier and more than 100 years of experience with the use as fungicide make safety factors unnecessary.

These unique features of Copper are already considered in the assessment of Copper under separate legislation (REACH, BPD). While COM directed EFSA in their mandate to take advantage of those methodologies, TF members have to anticipate their use and in their proposed assessments of the critical areas of concern identified in the EFSA conclusion. This should be reviewed once the new GD is available and no use should be cancelled until then.

### **Submission and Evaluation of Copper compounds under Art.43 of 1107/2009**

**General observation:** Copper compounds should not be considered as Candidate for Substitution (CfS).

The implementing Regulation (EU) 2018/1981 is renewing the approval of the active substance Copper compounds as candidate for substitution (CfS), in accordance with Regulation (EC) 1107/2009. Whereas (12) considers that Copper compounds are persistent and toxic in accordance with points 3.7.2.1 and 3.7.2.3 of Annex II to Regulation (EC) 1107/2009 (PBT assessment), and fulfil the condition set in the second indent of point 4 of Annex II to Regulation (EC) 1107/2009.

The EUCuTF disagrees with the approval as CfS. The conditions in Annex to Regulation (EC) 1107/2009 lack the exemption of inorganic compounds like Copper minerals from the PBT assessment as it has been established under other chemical legislations like REACH and BPD. As laid down in those legislations, the term persistence is meaningless for an element or mineral, due to its natural occurrence. Persistence per se is therefore not a relevant parameter and consequently a PBT assessment is not carried out for inorganic compounds under REACH and BPD. The recent mandate from COM to EFSA directs the development of a guidance towards methods and procedures available under those legislations better adapted for the assessment of inorganic compounds, where the relevant parameter is their bioavailability. This should include an exempt statement regarding the PBT assessment to harmonize the assessment of the same compounds under different legislations.

It should be noted that persistence of minerals is considered not relevant for being categorized as low-risk active substance according to Regulation (EU) 2017/1432. This is clearly not compatible with the same parameter leading to a classification as CfS under the same Regulation (EC) 1107/2009.

The EUCuTF is of the opinion that Copper compounds should not be considered CfS, and have lodged an action for annulment against Regulation (EU) 2018/1981 and renewing the approval of the active substance Copper compounds as candidate for substitution (case number T-153/19 European Union Task Force v. European Commission).

## 6 Mammalian Toxicology (KCP 7)

### 6.1 Summary

**Table 6.1-1: Information on Nordox 75 WG\***

Product name and code	Nordox 75 WG
Formulation type	Water dispersible granule [Code: WG]
Active substance(s) (incl. content)	Copper (I) oxide; 750 g/kg
Function	Fungicide and bactericide
Product already evaluated as the 'representative formulation' during the approval of the active substance(s)	Yes
Product previously evaluated in another MS according to Uniform Principles	Greece (authorization number: 60765 / Re-approval date: 17.12.2018) France (authorization number: 2010130 / First date of approval: 13.10.2003) France (authorization number: 2110180 / First date of approval: 30.11.2011) Spain (authorization number: 22560 / Re-approval date: 14.11.2018) Portugal (authorization number: APV3468 / Year of approval: 2003) Italy (authorization number: 10632 / Re-approval date: 30.01.2019)

\* Information on the detailed composition of Nordox 75 WG can be found in the confidential dRR Part C.

### Justified proposals for classification and labelling

According to the criteria given in Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008, the following classification and labelling with regard to toxicological data is proposed for the preparation:

**Table 6.1-2: Justified proposals for classification and labelling for Nordox 75 WG according to Regulation (EC) No 1272/2008**

Hazard class(es), categories	Aquatic Acute 1 Aquatic Chronic 2
Hazard pictograms or Code(s) for hazard pictogram(s)	GHS09
Signal word	Warning
Hazard statement(s)	H410 – very toxic to aquatic life with long lasting effects
Precautionary statement(s)	P273 P501
Additional labelling phrases	To avoid risks to man and the environment, comply with the instructions for use. [EUH401]

**Table 6.1-3: Summary of risk assessment for operators, workers, residents and bystanders for Nordox 75 WG**

	Result	PPE / Risk mitigation measures
Operators	Acceptable	None
Workers	Acceptable	Pome fruit (use 1,2): Work wear Vine (use 3): Work wear Strawberry (use 4): None Fruiting vegetables (use 5, 8, 9): None Bulb vegetables (use 6): None Leaf vegetables (lettuce, scarole/ use 7): None Ornamentals (use 10): Work wear
Residents	Acceptable	None
Bystanders	Acceptable	None

No unacceptable risk for operators, workers, residents and bystanders was identified when the product is used as intended. No specific PPE is necessary.

A summary of the critical uses and the overall conclusion regarding exposure for operators, workers and residents/bystanders is presented in the following table.

**Table 6.1-4 Critical uses and overall conclusion of exposure assessment**

(dermal absorption: concentrate – 0.1%, dilution 1%)



1	2	3	4	5	6	7	8	9	10			
Use-No.	Crops and situa- tion (e.g. growth stage of crop)	F, Fn, Fpn G, Gn, Gpn or I **	Application		Application rate		PH I (d)	Remarks:  (e.g. safener/syn- ergist (L/ha))  critical gap for op- erator, worker, resident or by- stander exposure based on [Expo- sure model]	Acceptability of exposure as- sessment			
			Method / Kind  (incl. applica- tion technique ***)	Max. num- ber (min. in- terval be- tween appli- cations)  a) per use b) per crop/ season	Max. applica- tion rate kg as/ha	Water L/ha  min / max			Operator	Worker	Residents	Bystander
1-2	Pome fruit	F	HC, TM	2 (14)	1.25	500/ 1000	144	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A
3	Vine	F	HC, TM	2 (7)	1.2	200/ 400	21	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A
4	Strawberry	F	LC, TM	3 (7)	1.0	200/ 1000	3	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A
5, 8, 9	Fruiting vegeta- bles (tomato, egg- plant, pepper, cu- cumber, pumpkin, courgettes melon)	F	LC, TM	3 (7)	1.0	200/ 1000	10	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A
6	Bulb vegetables (shallots, onion, garlic)	F	LC, TM	3 (7)	1.0	200/ 1000	3	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A
7	Leaf vegetables (lettuce, scarole)	F	LC, TM	3 (7)	1.0	300/ 1000	3	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A
10	Ornamentals	F	HC, TM	3 (7)	1.0	200/ 1000	--	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	A	A	A	A

\* Use number(s) in accordance with the list of all intended GAPs in Part B, Section 0 should be given in column 1

\*\* F: professional field use, Fn: non-professional field use, Fpn: professional and non-professional field use, G: professional greenhouse use, Gn: non-professional greenhouse use, Gpn: professional and non-professional greenhouse use, I: indoor application

\*\*\* e.g. LC: low crops, HC: high crop, TM: tractor-mounted, HH: hand-held

Explanation for column 10 "Acceptability of exposure assessment"

A	Exposure acceptable without PPE / risk mitigation measures	
R	Further refinement and/or risk mitigation measures required	
N	Exposure not acceptable/ Evaluation not possible	

**Table 6.1-5A Critical uses and overall conclusion of exposure assessment**

(dermal absorption: concentrate – 1%, dilution 9%)

1	2	3	4	5	6	7	8	9	10			
Use-No.	Crops and situa- tion (e.g. growth stage of crop)	F, Fn, Fpn G, Gn, Gpn or I **	Application		Application rate		PH I (d)	Remarks:  (e.g. safener/syn- ergist (L/ha))  critical gap for op- erator, worker, resident or by- stander exposure based on [Expo- sure model]	Acceptability of exposure as- sessment			
			Method / Kind  (incl. applica- tion technique ***)	Max. num- ber (min. in- terval be- tween applica- tions)  a) per use b) per crop/ season	Max. applica- tion rate kg as/ha	Water L/ha  min / max			Operator	Worker	Residents	Bystander
1-2	Pome fruit	F	HC, TM	2 (14)	1.25	500/ 1000	144	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	N	A	A
3	Vine	F	HC, TM	2 (7)	1.2	200/ 400	21	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	N	A	A
4	Strawberry	F	LC, TM	3 (7)	1.0	200/ 1000	3	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	R	A	A
5, 8, 9	Fruiting vegeta- bles (tomato, egg- plant, pepper, cu- cumber, pumpkin, courgettes melon)	F	LC, TM	3 (7)	1.0	200/ 1000	10	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	R	A	A
6	Bulb vegetables (shallots, onion, garlic)	F	LC, TM	3 (7)	1.0	200/ 1000	3	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	R	A	A
7	Leaf vegetables (lettuce, scarole)	F	LC, TM	3 (7)	1.0	300/ 1000	3	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	R	A	A
10	Ornamentals	F	HC, TM	3 (7)	1.0	200/ 1000	--	Operators, workers, bystanders and res- idents (EFSA- OPEX model)	R	N	A	A

\* Use number(s) in accordance with the list of all intended GAPs in Part B, Section 0 should be given in column 1

\*\* F: professional field use, Fn: non-professional field use, Fpn: professional and non-professional field use, G: professional greenhouse use, Gn: non-professional greenhouse use, Gpn: professional and non-professional greenhouse use, I: indoor application

\*\*\* e.g. LC: low crops, HC: high crop, TM: tractor-mounted, HH: hand-held

Explanation for column 10 "Acceptability of exposure assessment"

A	Exposure acceptable without PPE / risk mitigation measures	
R	Further refinement and/or risk mitigation measures required	
N	Exposure not acceptable/ Evaluation not possible	

### Data gaps

Data gaps should be listed in the summary to give an overview (especially for cMS).

Noticed data gaps are: none

## 6.2 Toxicological Information on Active Substance(s)

Information regarding classification of the active substances and on EU endpoints and critical areas of concern identified during the EU review are given in Table 6.2-1.

**Table 6.2-1: Information on active substance**

	<b>Copper(I) oxide</b>
Common Name	Cuprous oxide
CAS-No.	1317-39-1
<b>Classification and proposed labelling</b>	
With regard to toxicological endpoints (according to the criteria in Reg. 1272/2008, as amended)	Acute oral Cat. 4 Acute inhalation Cat. 4 Eye Dam. <del>irritation</del> Cat. 1 H302: Harmful if swallowed H332: Harmful if inhaled H318: Causes serious eye damage
Additional C&L proposal	None
<b>Agreed EU endpoints</b>	
AOEL systemic	0.08 mg/kg bw/d (based on human data)
Reference	EFSA Conclusion, 2018
<b>Conditions to take into account/critical areas of concern with regard to toxicology</b>	
According to EFSA Conclusion for active substance	Risks to vineyard workers

## 6.3 Toxicological Evaluation of Plant Protection Product

A summary of the toxicological evaluation for Nordox 75 WG is given in the following tables. Full summaries of studies on the product that have not been previously considered within an EU peer review process are described in detail in Appendix 2.

The following tests were performed on Nordox 75 WG: acute LD<sub>50</sub> oral (rat), acute LD<sub>50</sub> dermal (rat), acute LC<sub>50</sub> inhalation (rat), skin irritation (rabbit), eye irritation (rabbit) and sensitization of the skin (maximisation test on guinea pig). Nordox 75 WG was a representative formulation in the EU review of Copper compounds. The acute toxicity studies for Nordox 75 WG were evaluated during the review and were considered adequate. Thus, the studies are not described in detail in this document.

**Table 6.3-1: Summary of evaluation of the studies on acute toxicity including irritancy and skin sensitisation for Nordox 75 WG**

Type of test, species, model system (Guideline)	Result	Acceptability	Classification (acc. to the criteria in Reg. 1272/2008)	Reference
LD <sub>50</sub> oral, rat (OECD 401)	3165 mg/kg bw	Yes	None	xxx (2000) EU agreed dRAR, Vol.3, B6

				(2016)
LD <sub>50</sub> dermal, rat (OECD 402)	> 2000 mg/kg bw	Yes	None	Xxx (2000) EU agreed dRAR, Vol.3, B6 (2016)
LC <sub>50</sub> inhalation, rat (OECD 403)	> 5 mg/L air	Yes	None	xxx (2000) EU agreed dRAR, Vol.3, B6 (2016)
Skin irritation, rabbit (OECD 404)	Non-irritant	Yes	None	xxx (2000) EU agreed dRAR, Vol.3, B6 (2016)
Eye irritation, rabbits (US EPA equivalent to EC method B5)	Non-irritant	Yes	None	xxx (1999) EU agreed dRAR, Vol.3, B6 (2016)
Skin sensitisation, guinea pig (OECD 406, M&K)	Non-sensitising	Yes	None	xxx (2000) EU agreed dRAR, Vol.3, B6 (2016)
Supplementary studies for combinations of plant protection products	No data – not required			

**Table 6.3-2: Additional toxicological information relevant for classification/labelling of Nordox 75 WG**

	Substance (concentration in product, % w/w)	Classification of the substance (acc. to the criteria in Reg. 1272/2008)	Reference	Classification of product (acc. to the criteria in Reg. 1272/2008)
Toxicological properties of active substance(s) (relevant for classification of product)	Copper (I) oxide (85% (w/w))	Acute oral Cat.4 (H302) Acute inhalation Cat.4 (H332) Eye Dam. <del>irritation</del> Cat.1 (H318)	EFSA Journal 2018;16(1)5152	None
Toxicological properties of non- active substance(s) (relevant for classification of product)	Confidential information, please refer to Part C			
Further toxicological information	Confidential information, please refer to Part C			

## 6.4 Toxicological Evaluation of Groundwater Metabolites

Copper is an element and therefore the formation of metabolites or breakdown products is not possible.

## 6.5 Dermal Absorption (KCP 7.3)

A summary of the dermal absorption rates for the active substance in Nordox 75 WG are presented in the following table.

**Table 6.5-1: Dermal absorption rates for active substances in Nordox 75 WG**

	Copper	
	Value	Reference
Concentrate	0.1 %	Maas (2016, 2020) New studies reported in Appendix 2
Dilution	1 % (Dilution factor 1:1500)	Maas (2016, 2020) New studies reported in Appendix 2
Concentrate	1 %	Appendix A - List of end points for the active substance and the representative formulation. EFSA (European Food Safety Authority), 2018. Conclusion on the peer review of the pesticide risk assessment of the active substance copper compounds. EFSA Journal 2018;16(1):5152, 119 pp.
Dilution	9 %	

### zRMS:

Dermal absorption of copper (as Copper (I) oxide) from a product Nordox 75 WG determined in this registration report according to the Triple pack' approach based on acceptable studies and interpreted in line with current EU guidelines to be used for risk assessment are: 0.1% for the concentrate and 1% for the dilution. Since Triple pack' approach is valid for determination of dermal absorption to be used for health risk according to EU Guidance on dermal absorption (EFSA Journal 2017;15(6):4873) therefore these end-points were used for exposure and risk assessment.

On the other hand it is noted that in Conclusion on the peer review of the pesticide risk assessment of the active substance copper compounds. EFSA Journal 2018;16(1):5152, 119 pp "*Appendix A - List of end points for the active substance and the representative formulation*" it is recommended to use as default values of dermal absorption of copper of 1% from the concentrated products and 9% from dilution (0.33g Cu/L). The detailed information how these values were derived is not provided in this document. The absorption values proposed in EFSA Journal 2018;16(1):5152, 119 pp "*Appendix A - List of end points for the active substance and the representative formulation*" can only be obtained if residues of Cu in the pooled tape strips and in the stripped skin found in *in vitro studies* are taken as absorbable which is highly improbable noting that inorganic compounds of copper are not water soluble and not lipid soluble, and they form solid residues when a spray droplets dried up on leaves surface.

As pointed out by xxx (2020) (KCP 7.3/04) such high dermal absorption could only be possible if all residues of Cu in the pooled tape strips and in the stripped skin in *in vitro* studies will be absorbed into blood, which is rather not probable for insoluble inorganic copper compounds. In the *in vivo* study in rats (KCP 7.3/03) the amount of the applied dose of <sup>65</sup>Cu in the stripped skin was very low; the largest amount being observed in dilution II at 24 hours (0.3%). The amount present in the stratum corneum showed no clear decrease over time and the majority remained in the upper layers. For all 3 dose levels the amount of <sup>65</sup>Cu located in the stratum corneum was not available for absorption under the conditions of the study (KCP 7.3/03). For these reasons zRMS do not consider that these values of dermal absorption of copper of 1% from the concentrated products and 9% from dilution as over conservative, should be used for exposure and risk assessment, however the relevant calculation were done for comparative purposes.

## 6.5.1 Justification for proposed values - Copper

The proposed dermal absorption rates for Copper are based on dermal absorption studies on a formulation containing Copper hydroxide.

The study results are summarised in the following table. Full summaries of studies on the dermal absorption of Copper that have not previously been evaluated within an EU peer review process are described in detail in Appendix 2.

It has already been established during the EU peer review that, given the nature of the active substance ( $\text{Cu}^{2+}$ ), dermal penetration factors for both concentrate and in-use spray dilutions from these studies are justifiably relevant to all forms of Copper (oxide, hydroxide, oxychloride, tribasic sulphate and Bordeaux Mixture) and all formulation types (WP, WG, and SC). Therefore, the results of the studies below are relevant for Nordox 75 WG.

### zRMS:

The dermal absorption values used for estimation exposure were derived in Triple pack' approach based on studies presented in Appendix A 2.10 and in EFSA Journal 2018;16(1):5152, 119 pp "Appendix A - List of end points for the active substance and the representative formulation"

**Table 6.5-2: Summary of the results of submitted dermal absorption studies for Copper**

Test	Concentrate	Spray dilution (dilution factor)	Formulation in study	Acceptability of study	Justification provided on representativity of study formulation for current product	Acceptability of justification	Reference*
<i>In vitro</i> (human)	0.39% for the neat formulation (350 g/kg)	2.8% for the intermediate dose (3 g/L) 7.5% for the low dose (0.3 g/L)	53.8WG (DPX-GFJ52 (35% as metallic copper))	Yes	See point A.2.10	Yes	KCP 7.3/01 xxx (2016)
<i>In vitro</i> (rat)	2.6% for the neat formulation (350 g/kg)	3.6% for the intermediate dose (3 g/L) 14% for the low dose (0.3 g/L)	53.8WG (DPX-GFJ52 (35% as metallic copper))	Yes	See point A.2.10	Yes	KCP 7.3/02. xxx (2016)
<i>In vivo</i> (rat)	<0.051% for the neat formulation (350 g/kg)	not determined	53.8WG (DPX-GFJ52 (35% as metallic copper))	Yes	See point A.2.10	Yes	KCP 7.3/03 xxx (2016)
<i>In vitro</i> (human)	0.1 %	0.5 % (1:1500)	SPU-08740-F Copper	Supplementary	Yes (see Appendix	Justification not accepted.	xxx, 2018

Test	Concentrate	Spray dilution (dilution factor)	Formulation in study	Acceptability of study	Justification provided on representativity of study formulation for current product	Acceptability of justification	Reference*
			hydroxide 50 WP)		A 2.10) No (study not provided in Appendix A 2.10)	Endpoint cannot be used for current product.	
In vitro (human)	0.4 %	9 % (0.3g Cu/L)	•DPX-GFJ52 (Copper hydroxide 53.8WG)	Supplementary	Yes (see Appendix A 2.10) No (study not provided in Appendix A 2.10)	Justification not accepted. Endpoint cannot be used for current product.	xxx, 2017*
In vitro (human)	0.6 % 0.1 %	8.9 % 3.5 %	•Copper hydroxide 50 WP. •Flowbrix	Supplementary	Yes (see Appendix A 2.10) No (study not provided in Appendix A 2.10)	Justification not accepted. Endpoint cannot be used for current product.	xxx, 2015*
In vitro (human)	0.09 %	5.68 % (1.5 g/L)	•Copper hydroxide 250 g Cu/L, SC. •Copper hydroxide 50 WP •H1B10 Copper hydroxide 25% WG •Copper Ox-ychloride 37.5 NC WG •Flowbrix •Bordeaux mixture 20% Cu WP •BBC/Bouillie Bordelaise •Nordox 75 WG	Supplementary	Yes (see Appendix A 2.10) No (study not provided in Appendix A 2.10)	Justification not accepted. Endpoint cannot be used for current product.	xxx 2012*

\* indicates that a study was reviewed at EU level

## 6.6 Exposure Assessment of Plant Protection Product (KCP 7.2)

**Table 6.6-1: Product information and toxicological reference values used for exposure assessment**

Product name and code	Nordox 75 WG
Formulation type	WG
Category	Fungicide and bactericide
Active substance(s) (incl. content)	Copper 750 g/kg
AOEL systemic	0.08 mg/kg bw/d
Inhalation absorption	100 %
Oral absorption	50 %
Dermal absorption	Concentrate: 0.1 % Dilution: 1 % (1:1500 dilution)

### 6.6.1 Selection of critical use(s) and justification

The critical GAP used for the exposure assessment of the plant protection product is shown in Table 6.1-4. A list of all intended uses within the zone is given in Part B, Section 0.

### 6.6.2 Operator exposure (KCP 7.2.1)

#### 6.6.2.1 Estimation of operator exposure

A summary of the exposure models used for estimation of operator exposure to the active substances during application of Nordox 75 WG according to the critical use(s) is presented in Table 6.6-2. The outcome of the estimation is presented in Table 6.6-3 (acute exposure) and Table 6.6-4 (longer term exposure). Detailed calculations are in Appendix 3.

**Table 6.6-2: Exposure models for intended uses**

Critical use(s)	<p>Pome fruit: 1.25 kg a.s./ha</p> <p>Vine: 1.2 kg a.s./ha</p> <p>Strawberry: 1.0 kg a.s./ha</p> <p>Fruiting vegetables: 1.0 kg a.s./ha</p> <p>Bulb vegetables: 1.0 kg a.s./ha</p> <p>Leaf vegetables: 1.0 kg a.s./ha</p> <p>Ornamentals: 1.0 kg a.s./ha</p>
Model(s)	<p>Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products; EFSA Journal 2014;12(10):3874</p> <p>calculator version: 30/03/2015</p>

**Table 6.6-3: Estimated operator exposure (acute exposure)**

An AAOEL was not allocated during the peer review for the renewal of approval of Copper (EFSA, 2017). Therefore, estimates of the acute exposure to operators has not been conducted.



**Table 6.6-4: Estimated operator exposure (longer term exposure)**

(dermal absorption: concentrate – 0.1%, dilution 1%)

Model data	Level of personal protective equipment	Operator exposure [mg/kg bw/day]	% of systemic AOEL
<b>Pome fruit (also covering vine), application rate 1.25 kg a.s./ha, upward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.0307472	38.43
<b>Strawberry (also covering leaf and bulb vegetables), application rate 1.0 kg a.s./ha, downward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.0048473	6.06
<b>Fruiting vegetables, application rate 1.0 kg a.s./ha, downward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.0048473	6.06
<b>Ornamentals, application rate 1.0 kg a.s./ha, upward spraying</b>			
Vehicle-mounted 10 ha/day 60 kg bodyweight	Potential exposure	0.0252322	31.54

The risks posed to operators from the application of Nordox 75 WG are considered to be acceptable.

**Table 6.6-5A: Estimated operator exposure (longer term exposure)**

for comparison (dermal absorption: concentrate –1%, dilution 9%)

Model data	Level of personal protective equipment	Operator exposure [mg/kg bw/day]	% of systemic AOEL
<b>Pome fruit, application rate 1.25 kg a.s./ha, upward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.23098	288.73
	Work wear M/L and A Gloves during mixing and loading	0.06522	81.53
<b>Grapes (Vine), application rate 1.20 kg a.s./ha, upward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.22719	283.99
	Work wear M/L and A Gloves during mixing and loading	0.06182	77.28
<b>Strawberry (also covering leaf and bulb vegetables, fruiting vegetables), application rate 1.0 kg a.s./ha, downward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.044138	55.17
	Work wear M/L and A Gloves during mixing and loading	0.0125416	15.68
<b>Ornamentals, application rate 1.0 kg a.s./ha, upward spraying</b>			
Vehicle-mounted 50 ha/day 60 kg bodyweight	Potential exposure	0.1905899	238.24
	Work wear M/L and A Gloves during mixing and loading	0.0524304	65.54

Model data	Level of personal protective equipment	Operator exposure [mg/kg bw/day]	% of systemic AOEL
Vehicle-mounted 10 ha/day 60 kg bodyweight			

The risks posed to operators from the application of Nordox 75 WG are considered to be acceptable, provided that they wore a work wear covering arms, body and legs during M/L and A and gloves during mixing and loading.

### 6.6.2.2 Measurement of operator exposure

Since the operator exposure estimations carried out indicated that the acceptable operator exposure level (AOEL) will not be exceeded under conditions of intended uses and consideration of the above mentioned personal protective equipment (PPE), a study to provide measurements of operator exposure was not necessary and was therefore not performed.

#### zRMS:

Dermal absorption of copper (as copper (I) oxide) from a product Nordox 75 WG determined in this registration report according to the 'Triple pack' approach based on acceptable studies and interpreted in line with current EU guidelines to be used for risk assessment are: 0.1% for the concentrate and 1% for the dilution. This approach is considered valid for determination of dermal absorption in case of this application of Nordox 75 WG therefore these endpoints are used for exposure estimation

Taking into account dermal absorption 0.1% for concentrate and 1% for dilution the potential exposure to copper (as copper (I) oxide), estimated with EFSA AOEM model, of operator applying Nordox 75 WG in vehicle-mounted sprayer on pome fruits at application rate of 1.25 kg a.s./ha, upward spraying, on grapes at application rate of 1.20 kg a.s./ha, upward spraying, on strawberry, leaf, bulb and fruiting vegetables at rate 1.0 kg a.s./ha, downward spraying and on ornamentals at application rate 1.0 kg a.s./ha, upward spraying are all below AOEL, thus these applications do not cause unacceptable risk for operator for not wearing any PPE.

In case the higher dermal absorption of 1% from concentrate and 9% from the dilution (9%) is assumed then the exposure of operator is below AOEL for all these applications foreseen in GAP when operator is wearing work wear covering arms, body and legs during mixing/loading and application and protective gloves during mixing/loading.

## 6.6.3 Worker exposure (KCP 7.2.3)

### 6.6.3.1 Estimation of worker exposure

Table 6.6-6 shows the exposure model(s) used for estimation of worker exposure after entry into a previously treated area or handling a crop treated with Nordox 75 WG according to the critical use(s). The outcome of the estimation is presented in Table 6.6-7 (acute exposure) and Table 6.6-8 (longer term exposure). Detailed calculations are in Appendix 3.

**Table 6.6-6: Exposure models for intended uses**

<b>Critical use(s)</b>	<p>Pome fruit: 2 x 1.25 kg a.s./ha, 14 day interval</p> <p>Vine: 2 x 1.2 kg a.s./ha, 7day interval</p> <p>Strawberry: 3 x 1.0 kg a.s./ha, 7day interval</p> <p>Fruiting vegetables: 3 x 1.0 kg a.s./ha, 7day interval</p> <p>Bulb vegetables: 3 x 1.0 kg a.s./ha, 7day interval</p> <p>Leaf vegetables: 3 x 1.0 kg a.s./ha, 7day interval</p> <p>Ornamentals: 3 x 1.0 kg a.s./ha, 7day interval</p>
<b>Model</b>	Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products; EFSA Journal 2014;12(10):3874 calculator version: 30/03/2015

**Table 6.6-7: Estimated worker exposure (acute exposure)**

An AAOEL was not allocated during the peer review for the renewal of approval of Copper (EFSA, 2017). Therefore, estimates of the acute exposure to workers has not been conducted.

**Table 6.6-8: Estimated worker exposure (longer term exposure)– default values**

(dermal absorption: concentrate – 0.1%, dilution 1%)

<b>Model data</b>	<b>Level of PPE</b>	<b>Total absorbed dose [mg/kg bw/day]</b>	<b>% of systemic AOEL</b>
<b>Pome fruit, application rate 2 x 1.25 kg a.s./ha</b>			
<b>AOEM Model</b> Searching, reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 22500 cm <sup>2</sup> /person/h	0.1939089	<b>242.39</b>
	<b>Work wear</b> (arms, body and legs covered) TC: 4500 cm <sup>2</sup> /person/h	0.0387818	<b>48.48</b>
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: 2250 cm <sup>2</sup> /person/h	0.0193909	<b>24.24</b>
<b>Vine, application rate 2 x 1.2 kg a.s./ha</b>			
<b>AOEM Model</b> Hand harvesting/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 30000 cm <sup>2</sup> /person/h	0.2664961	<b>333.12</b>
	<b>Work wear</b> (arms, body and legs covered) TC: 10100 cm <sup>2</sup> /person/h	0.0897203	<b>112.15</b>
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: n.a. cm <sup>2</sup> /person/h	n.a.	<b>n.a.</b>
<b>Strawberry, application rate 3 x 1.0 kg a.s./ha</b>			
<b>AOEM Model</b> Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 5800 cm <sup>2</sup> /person/h	0.0597238	<b>74.65</b>
	<b>Work wear</b> (arms, body and legs covered) TC: 3000 cm <sup>2</sup> /person/h	0.0257430	<b>32.18</b>
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b>	0.0059724	<b>7.47</b>

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
	TC: 750 cm <sup>2</sup> /person/h		
<b>Fruiting vegetables, application rate 3 x 1.0 kg a.s./ha</b>			
<b>AOEM Model</b> Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 12500 cm <sup>2</sup> /person/h	0.0597238	74.65
	<b>Work wear</b> (arms, body and legs covered) TC: 1400 cm <sup>2</sup> /person/h	0.0257430	32.18
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: n.a. cm <sup>2</sup> /person/h	0.0059724	7.47
<b>Bulb vegetables, application rate 3 x 1.0 kg a.s./ha</b>			
<b>AOEM Model</b> Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 5800 cm <sup>2</sup> /person/h	0.0597238	74.65
	<b>Work wear</b> (arms, body and legs covered) TC: 2500 cm <sup>2</sup> /person/h	0.0257430	32.18
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: 580 cm <sup>2</sup> /person/h	0.0059724	7.47
<b>Leaf vegetables, application rate 3 x 1.0 kg a.s./ha</b>			
<b>AOEM Model</b> Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 5800 cm <sup>2</sup> /person/h	0.0597238	74.65
	<b>Work wear</b> (arms, body and legs covered) TC: 2500 cm <sup>2</sup> /person/h	0.0257430	32.18
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: 580 cm <sup>2</sup> /person/h	0.0059724	7.47
<b>Ornamentals, application rate 3 x 1.0 kg a.s./ha</b>			
<b>AOEM Model</b> Cutting, sorting, bundling, carrying/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Potential</b> TC: 1400 cm <sup>2</sup> /person/h	0.1441609	180.20
	<b>Work wear</b> (arms, body and legs covered) TC: 5000 cm <sup>2</sup> /person/h	0.0514860	64.36
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: 1400 cm <sup>2</sup> /person/h	0.0144161	18.02

#### Refinements for the assessment in vine

**Table 6.6-9: Estimated worker exposure (longer term exposure) for the use in vine – with refined DT<sub>50</sub> (EU agreed)\***

(dermal absorption: concentrate – 0.1%, dilution 1%)

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
<b>Vine, application rate 2 x 1.2 kg a.s./ha</b>			

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
<b>AOEM Model</b> Searching, reaching, picking/Outdoor Work rate: 8 hours/day <b>DT<sub>50</sub>: 7 days</b> <b>DFR: 3 µg/cm<sup>2</sup>/kg a.s./ha</b>	<b>Potential</b> TC: 22500 cm <sup>2</sup> /person/h <b>Work wear</b> (arms, body and legs covered) TC: 4500 cm <sup>2</sup> /person/h <b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: 2250 cm <sup>2</sup> /person/h	0.2160000  0.0727200  n.a.	<b>270.00</b>  90.90  n.a.

\* Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products; EFSA Journal 2014;12(10):3874, Appendix D

**Table 6.6-10: Estimated worker exposure (longer term exposure) for the use in vine – with refined DT<sub>50</sub> and DFR values**

(dermal absorption: concentrate – 0.1%, dilution 1%)

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
<b>Vine, application rate 2 x 1.2 kg a.s./ha</b>			
<b>AOEM Model</b> Hand harvesting/Outdoor Work rate: 8 hours/day <b>DT<sub>50</sub>: 7 days</b> <b>DFR: 1.9 µg/cm<sup>2</sup>/kg a.s./ha</b>	<b>Potential</b> TC: 30000 cm <sup>2</sup> /person/h <b>Work wear</b> (arms, body and legs covered) TC: 10100 cm <sup>2</sup> /person/h <b>Work wear</b> (arms, body and legs covered) <b>and gloves</b> TC: n.a. cm <sup>2</sup> /person/h	0.1368000  0.0460560  n.a.	<b>171.00</b>  57.57  n.a.

**Table 6.6-11: Estimated worker exposure (longer term exposure) for the use in vine – with provisional new TC values for vineyards**

(dermal absorption: concentrate – 0.1%, dilution 1%)

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
<b>Vine, application rate 2 x 1.2 kg a.s./ha</b>			
<b>AOEM Model</b> Hand harvesting/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha <b>New TC values*</b>	<b>Potential</b> TC: <b>9800 cm<sup>2</sup>/person/h*</b> (95 <sup>th</sup> percentile) <b>Work wear</b> (arms, body and legs covered) TC: <b>4600 cm<sup>2</sup>/person/h*</b> (95 <sup>th</sup> percentile) <b>Full clothing with gloves</b> TC: <b>1100 cm<sup>2</sup>/person/h*</b> (95 <sup>th</sup> percentile)	0.0870554  0.0408627  0.0097715	<b>108.82</b>  51.08  12.21

\* Note: New transfer coefficient (TC) values for worker re-entry activities in vineyards were used on the refinement assessment. (HSE, draft report, *in press*).

The risks posed to professional workers re-entering areas treated with Nordox 75 WG are considered to be acceptable providing normal work-wear is worn.

**Table 6.6-11: Estimated worker exposure (longer term exposure)– default values**

For comparison (dermal absorption: concentrate –1%, dilution 9%)

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
Pome fruit, application rate 2 x 1.25 kg a.s./ha			
AOEM Model Searching, reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	Work wear (arms, body and legs covered) and gloves	0.1745180	218.15
Vine, application rate 2 x 1.2 kg a.s./ha			
AOEM Model Hand harvesting/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	Work wear (arms, body and legs covered)	0.8074831	1009.35
	Work wear (arms, body and legs covered) and gloves	No TC available for this assessment	
Strawberry, application rate 3 x 1.0 kg a.s./ha			
AOEM Model Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	Work wear (arms, body and legs covered)	0.2780246	347.53
	Work wear (arms, body and legs covered) and gloves	0.0695061	86.88
Fruiting vegetables, application rate 3 x 1.0 kg a.s./ha			
AOEM Model Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	Work wear (arms, body and legs covered)	0.2316872	286.61
	Work wear (arms, body and legs covered) and gloves	0.0537514	67.19
Bulb vegetables, application rate 3 x 1.0 kg a.s./ha			
AOEM Model Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	Work wear (arms, body and legs covered)	0.2316872	286.61
	Work wear (arms, body and legs covered) and gloves	0.0537514	67.19
Leaf vegetables, application rate 3 x 1.0 kg a.s./ha			
AOEM Model Reaching, picking/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	Work wear (arms, body and legs covered)	0.2316872	289.61
	Work wear (arms, body and legs covered) and gloves	0.0537514	67.19
Ornamentals, application rate 3 x 1.0 kg a.s./ha			

Model data	Level of PPE	Total absorbed dose [mg/kg bw/day]	% of systemic AOEL
<b>AOEM Model</b> Cutting, sorting, bundling, carrying/Outdoor Work rate: 8 hours/day DT <sub>50</sub> : 30 days DFR: 3 µg/cm <sup>2</sup> /kg a.s./ha	<b>Work wear</b> (arms, body and legs covered)	0.4633743	579.22
	<b>Work wear</b> (arms, body and legs covered) <b>and gloves</b>	0.1297448	162.18

### 6.6.3.2 Refinement of generic DFR value (KCP 7.2)

A proposal to refine the DFR was made during the review of the information submitted by the EUCuTF for the renewal of approval of Copper.

A study was conducted to compare two methods of spraying a 20 % solution of Copper sulphate onto vines (tractor mounted tunnel sprayer or pneumatic nebulizer) at 500 g/ha (xxx, 2013), see RAR Vol 3 (PPP) B.6.4.1/01. The average leaf deposits were between 3.1 and 9.6 µg/cm<sup>2</sup> equating to a DFR of between 0.6 and 1.9 µg/cm<sup>2</sup>/kg a.s. applied.

For the refinement of the worker exposure, the upper value of this range of DFR values was taken, i.e. 1.9 µg/cm<sup>2</sup>/kg a.s. applied.

### 6.6.3.3 Measurement of worker exposure

Since the worker exposure estimations carried out indicated that the acceptable operator exposure level (AOEL) will not be exceeded under normal conditions of intended uses and considering the above-mentioned PPE, a study to provide measurements of worker exposure is not necessary and was therefore not performed.

#### zRMS:

**Taking into account the dermal absorption 0.1% for concentrate and 1% for dilution** the exposure estimated with EFSA AOEM model to copper (as copper (I) oxide), of worker wearing work wear covering arms, body and legs and entering for 8 hour for various tasks a field of all crops foreseen in GAP to be treated with Nordox 75 WG (pome fruits at application rate of 1.25 kg a.s./ha, grapes at application rate of 1.20 kg a.s./ha, strawberry, leaf, bulb and fruiting vegetables at rate 1.0 kg a.s./ha and ornamentals at application rate 1.0 kg a.s./ha) are all below AOEL, thus these applications do not cause unacceptable risk for worker wearing appropriate work wear.

**In case the higher dermal absorption of 1% from concentrate and 9% from the dilution 9%)** is assumed then the exposure of worker, estimated with EFSA AOEM model, to copper (as copper (I) oxide) is only below AOEL when worker is wearing a work wear covering arms, body and legs and protective gloves and is entering a fields of low berries, fruiting vegetables, bulb vegetables and leaf vegetables, treated with Nordox 75 WG at application rate 3 x 1.0 kg a.s./ha. The exposure of worker wearing a work wear covering arms, body and legs and protective gloves and entering for 8 hours a field of pome fruits treated with Nordox WG 75 at application rate of 2 x 1.25 kg a.s./ha, or vineyards treated at a rate of 2 x 1.20 kg a.s./ha or ornamentals treated at a rate 3 x 1.0 kg a.s./ha is above the AOEL, thus it is not acceptable.

## 6.6.4 Resident and bystander exposure (KCP 7.2.2)

### 6.6.4.1 Estimation of resident and bystander exposure

The acute exposure assessment for bystanders covers the exposure that a resident could reasonably be expected to incur in a single day. Therefore, there is no need for a separate acute risk assessment for residents.

No bystander risk assessment is required for PPPs that do not have significant acute toxicity or the potential to exert toxic effects after a single exposure. Exposure in this case will be determined by average exposure over a longer duration, and higher exposures on one day will tend to be offset by lower exposures on other days. Therefore, exposure assessment for residents also covers bystander exposure.

Table 6.6-12 shows the exposure model(s) used for estimation of resident and bystander exposure to Copper. The outcome of the estimation is presented in Table 6.6-13: Estimated resident exposure (longer term exposure) Table 6.6-13 (longer term resident exposure). Detailed calculations are in Appendix 3.

**Table 6.6-12: Exposure models for intended uses**

<b>Critical use(s)</b>	<p>Pome fruit: 2 x 1.25 kg a.s./ha</p> <p>Vine: 2 x 1.2 kg a.s./ha</p> <p>Strawberries: 3 x 1.0 kg a.s./ha</p> <p>Fruiting vegetables: 3 x 1.0 kg a.s./ha</p> <p>Bulb vegetables: 3 x 1.0 kg a.s./ha</p> <p>Leaf vegetables: 3 x 1.0 kg a.s./ha</p> <p>Ornamentals: 3 x 1.0 kg a.s./ha</p>
<b>Model</b>	Guidance on the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products; EFSA Journal 2014;12(10):3874

**Table 6.6-13: Estimated resident exposure (longer term exposure)**

(dermal absorption: concentrate – 0.1%, dilution 1%)

Model data	Exposure pathway	Total absorbed dose [mg/kg/day]	% of systemic AOEL
<b>Pome fruit, application rate 2 x 1.25 kg a.s./ha</b>			
Residents (adult) Body weight: 60 kg Buffer strip: 5 m	Spray drift (75 <sup>th</sup> percentile)	0.0020111	2.51
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0004139	0.52
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0020199	2.52
	<b>All pathways (mean)</b>	<b>0.0034751</b>	<b>4.34</b>
Residents (children) Body weight: 10 kg Buffer strip: 5 m	Spray drift (75 <sup>th</sup> percentile)	0.0038733	4.84
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0033510	4.19
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0036358	4.54
	<b>All pathways (mean)</b>	<b>0.0090579</b>	<b>11.32</b>
<b>Vine, application rate 2 x 1.2 kg a.s./ha</b>			
Residents (adult) Body weight: 60 kg Buffer strip: 5 m	Spray drift (75 <sup>th</sup> percentile)	0.0048266	6.03
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0000830	0.10



Model data	Exposure pathway	Total absorbed dose [mg/kg/day]	% of systemic AOEL
Residents (children) Body weight: 10 kg Buffer strip: 5 m	Entry into treated crops (75 <sup>th</sup> percentile)	0.0020820	2.60
	All pathways (mean)	0.0051403	6.43
	Spray drift (75 <sup>th</sup> percentile)	0.0092960	11.62
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0006716	0.84
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0037476	4.68
	All pathways (mean)	0.0108250	13.53
Strawberry, application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0003295	0.41
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0001754	0.22
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0024134	3.02
	All pathways (mean)	0.0024427	3.05
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0014507	1.81
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0014200	1.77
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0043441	5.43
	All pathways (mean)	0.0063964	8.00
Fruiting vegetables, application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0003295	0.41
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0001754	0.22
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0024134	3.02
	All pathways (mean)	0.0024427	3.05
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0014507	1.81
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0014200	1.77
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0043441	5.43
	All pathways (mean)	0.0063964	8.00
Bulb vegetables, application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0003295	0.41
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0001754	0.22
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0024134	3.02
	All pathways (mean)	0.0024427	3.05
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0014507	1.81
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0014200	1.77
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0043441	5.43
	All pathways (mean)	0.0063964	8.00
Leaf vegetables, application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0002197	0.27
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0001754	0.22
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0024134	3.02
	All pathways (mean)	0.0023894	2.99
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	Spray drift (75 <sup>th</sup> percentile)	0.0009671	1.21
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0014200	1.77
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0043441	5.43
	All pathways (mean)	0.0061220	7.65
Ornamentals, application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 5 m	Spray drift (75 <sup>th</sup> percentile)	0.0040222	5.03
	Vapour (75 <sup>th</sup> percentile)	0.0002300	0.29
	Surface deposits (75 <sup>th</sup> percentile)	0.0000720	0.09

Model data	Exposure pathway	Total absorbed dose [mg/kg/day]	% of systemic AOEL
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0024134	3.02
	<b>All pathways (mean)</b>	0.0048670	6.08
Residents (children) Body weight: 10 kg Buffer strip: 5 m	Spray drift (75 <sup>th</sup> percentile)	0.0077466	9.68
	Vapour (75 <sup>th</sup> percentile)	0.0010700	1.34
	Surface deposits (75 <sup>th</sup> percentile)	0.0005832	0.73
	Entry into treated crops (75 <sup>th</sup> percentile)	0.0043441	5.43
	<b>All pathways (mean)</b>	0.0102064	12.76

**Table 6.6-14A: Estimated resident exposure (longer term exposure)**

(dermal absorption: concentrate – 1%, dilution 9%)

Model data	Exposure pathway	Total absorbed dose [mg/kg/day]	% of systemic AOEL
<b>Pome fruit, application rate 2 x 1.25 kg a.s./ha</b>			
Residents (adult) Body weight: 60 kg Buffer strip: 5 m	<b>All pathways (mean)</b>	0.02886951	36.09
Residents (children) Body weight: 10 kg Buffer strip: 5 m	<b>All pathways (mean)</b>	0.05569225	69.62
<b>Vine, application rate 2 x 1.2 kg a.s./ha</b>			
Residents (adult) Body weight: 60 kg Buffer strip: 5 m	<b>All pathways (mean)</b>	0.0430630	53.83
Residents (children) Body weight: 10 kg Buffer strip: 5 m	<b>All pathways (mean)</b>	0.0794910	99.36
<b>Strawberry, application rate 3 x 1.0 kg a.s./ha</b>			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	<b>All pathways (mean)</b>	0.0188178	23.52
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	<b>All pathways (mean)</b>	0.0381617	47.70
<b>Fruiting vegetables, application rate 3 x 1.0 kg a.s./ha</b>			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	<b>All pathways (mean)</b>	0.0188178	23.52
Residents (children)			

Model data	Exposure pathway	Total absorbed dose [mg/kg/day]	% of systemic AOEL
Body weight: 10 kg Buffer strip: 2-3 m	All pathways (mean)	0.0381617	47.70
<b>Bulb vegetables</b> , application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	All pathways (mean)	0.0188178	23.52
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	All pathways (mean)	0.0381617	47.70
<b>Leaf vegetables</b> , application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 2-3 m	All pathways (mean)	0.0185639	23.20
Residents (children) Body weight: 10 kg Buffer strip: 2-3 m	All pathways (mean)	0.0366624	45.83
<b>Ornamentals</b> , application rate 3 x 1.0 kg a.s./ha			
Residents (adult) Body weight: 60 kg Buffer strip: 5 m	All pathways (mean)	0.0408297	51.04
Residents (children) Body weight: 10 kg Buffer strip: 5 m	All pathways (mean)	0.0752880	94.11

**Table 6.6-15: Estimated bystander exposure (acute exposure)**

An AAOEL was not allocated during the peer review for the renewal of approval of Copper (EFSA, 2017). Therefore, estimates of the acute exposure to workers has not been conducted for Copper.

#### 6.6.4.2 Measurement of resident and/or bystander exposure

Since the resident and bystander exposure estimations carried out indicated that the acceptable operator exposure level (AOEL) for Copper will not be exceeded under conditions of intended uses and considering above mentioned risk mitigation measures, a study to provide measurements of resident/bystander exposure was not necessary and was therefore not performed.

**zRMS:**

**Taking into account the dermal absorption 0.1% for concentrate and 1% for dilution**, the exposure of child and adult residents to copper (as copper (I) oxide), which was estimated with EFSA AOEM model, due to application of a product Nordox WG 75 according to GAP on pome fruits at application rate of 1.25 kg a.s./ha, on grapes at application rate of 1.20 kg a.s./ha, on strawberry and leaf, bulb and fruiting vegetables at rate 1.0 kg a.s./ha, and on ornamentals at application rate 1.0 kg a.s./ha are all well below AOEL, thus these applications do not cause unacceptable risk for child and adult residents

**In case the higher dermal absorption of 1% from concentrate and 9% from the dilution 9%)** is assumed then the exposure of child and adult residents to copper (as copper (I) oxide), which was estimated with EFSA AOEM model, due to application of a product Nordox WG 75 according to GAP on pome fruits at application rate of 1.25 kg a.s./ha, on grapes at application rate of 1.20 kg a.s./ha, on strawberry and leaf, bulb and fruiting vegetables at rate 1.0 kg a.s./ha, and on ornamentals at application rate 1.0 kg a.s./ha are all below AOEL, thus these applications do not cause unacceptable risk for child and adult residents

No bystander acute exposure estimation for Nordox WG 75 is required since no acute acceptable operator exposure value (AAOEL) has been set for copper (as copper (I) oxide), an active substance of Nordox WG 75. Therefore, as indicated in the EU guidance (SANTE-10832-2015 rev. 1.7; 24 January 2017), no unacceptable risk is expected for bystanders due to short-term single exposure to copper as a result of application of Nordox WG 75 with accordance with intended use within good agricultural practice.

Summing up application of a product Nordox WG 75 in line with GAP does not pose an unacceptable health risk for residents and bystanders.

#### 6.6.5 Combined exposure

Not relevant. The product contains only one active substance.

## Appendix 1 Lists of data considered in support of the evaluation

### List of data submitted by the applicant and relied on

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 7.3/01	xxx	2016	<i>In vitro</i> percutaneous absorption of copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8WG (35% as metallic copper), through human skin Du-Pont-42821 xxx, The Netherlands GLP: Y Unpublished	N	EUCuTF
KCP 7.3/02	xxx	2016	<i>In vitro</i> percutaneous absorption of copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8WG (35% as metallic copper), through rat skin Du-Pont-42649 xxx, The Netherlands GLP: Y Unpublished	N	EUCuTF
KCP 7.3/03	xxx	2016	<i>In vivo</i> percutaneous absorption of copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8WG (35% as metallic copper), in rats Du-Pont-42648 xxx, The Netherlands GLP: Y Unpublished	N	EUCuTF

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 7.3/04	xxx	2020	The fate of test item residues in the skin membranes in <i>in vitro</i> dermal absorption studies; impact on the risk assessment of inorganic copper salts n.a. xxx GLP: N Unpublished	N	EUCuTF

**List of data submitted or referred to by the applicant and relied on, but already evaluated at EU peer review**

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 6.3	xxx	2000	Cobre Nordox 75 WG acute oral toxicity study in the rat 7671/T/082/2000 GLP: Y Unpublished	Y	Nordox
KCP 6.3	xxx	2000	Nordox Super 75 WG: acute dermal toxicity (limit test) in the rat 148/024 GLP: Y Unpublished	Y	Nordox

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title Company Report No. Source (where different from company) GLP or GEP status Published or not</b>	<b>Vertebrate study Y/N</b>	<b>Owner</b>
KCP 6.3	xxx	2000	Nordox Super 75 WG: acute inhalation toxicity (nose only) study in rat 148/025 GLP: Y Unpublished	Y	Nordox
KCP 6.3	xxx	2000	Nordox Super 75 WG: acute dermal irritation test in the rabbit 148/026 GLP: Y Unpublished	Y	Nordox
KCP 6.3	xxx	1999	Nordox 75 DF: Primary eye irritation 6886 GLP: Y Unpublished	Y	Nordox
KCP 6.3	xxx	2000	Nordox Super 75 WG: Magnusson and Kligman maximisation study in the guinea pig 148/027 GLP: Y Unpublished	Y	Nordox
KCP 7.2/01	xxx	2013	Checking the distribution quality of agrochemicals in the vineyard through the use of field monitoring - xxx, Italy GLP: No Published (Acta. Hort. <b>978</b> , p237-243)	N	!
KCP 7.3/05	xxx	2012	<i>In vitro</i> dermal absorption of Copper (Cu) from 8 formulations through human skin 9062 TNO, The Netherlands GLP: Y Unpublished	N	EUCuTF

Data point	Author(s)	Year	Title Company Report No. Source (where different from company) GLP or GEP status Published or not	Vertebrate study Y/N	Owner
KCP 7.3/06	xxx	2015	<i>In vitro</i> percutaneous absorption of Copper, formulated as Copper hydroxide 50 WP or Copper oxychloride SC, through human and rat skin V20600/19 xxx The Netherlands GLP: Y Unpublished	N	EUCuTF
KCP 7.3/07	xxx	2017	<i>In vitro</i> percutaneous absorption of Copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8 WG (35% as metallic Copper), through human skin V20600/08 xxx, The Netherlands GLP: Y Unpublished	N	EUCuTF
KCP 7.3/08	xxx	2017	Dermal absorption of Copper compounds, a critical analysis N/A EUCuTF GLP: N Unpublished	N	EUCuTF

The following tables are to be completed by MS



**List of data submitted by the applicant and not relied on**

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title</b> <b>Company Report No.</b> <b>Source (where different from company)</b> <b>GLP or GEP status</b> <b>Published or not</b>	<b>Vertebrate study</b> <b>Y/N</b>	<b>Owner</b>
KCP XX	Author	YYYY	Title Company Report N Source GLP/non GLP/GEP/non GEP Published/Unpublished	Y/N	Owner

**List of data relied on not submitted by the applicant but necessary for evaluation**

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title</b> <b>Company Report No.</b> <b>Source (where different from company)</b> <b>GLP or GEP status</b> <b>Published or not</b>	<b>Vertebrate study</b> <b>Y/N</b>	<b>Owner</b>
KCP XX	Author	YYYY	Title Company Report N Source GLP/non GLP/GEP/non GEP Published/Unpublished	Y/N	Owner

## **Appendix 2 Detailed evaluation of the studies relied upon**

### **A 2.1 Statement on bridging possibilities**

Not relevant.

### **A 2.2 Acute oral toxicity (KCP 7.1.1)**

Not relevant for Nordox 75 WG because it was the representative for the EU evaluation.

### **A 2.3 Acute percutaneous (dermal) toxicity (KCP 7.1.2)**

Not relevant for Nordox 75 WG because it was the representative for the EU evaluation.

### **A 2.4 Acute inhalation toxicity (KCP 7.1.3)**

Not relevant for Nordox 75 WG because it was the representative for the EU evaluation.

### **A 2.5 Skin irritation (KCP 7.1.4)**

Not relevant for Nordox 75 WG because it was the representative for the EU evaluation.

### **A 2.6 Eye irritation (KCP 7.1.5)**

Not relevant for Nordox 75 WG because it was the representative for the EU evaluation.

### **A 2.7 Skin sensitisation (KCP 7.1.6)**

Not relevant for Nordox 75 WG because it was the representative for the EU evaluation.

### **A 2.8 Supplementary studies for combinations of plant protection products (KCP 7.1.7)**

None.

### **A 2.9 Data on co-formulants (KCP 7.4)**

#### **A 2.9.1 Material safety data sheet for each co-formulant**

Information regarding material safety data sheets of the co-formulants can be found in the confidential dossier of this submission (Registration Report - Part C).

## A 2.9.2 Available toxicological data for each co-formulant

Available toxicological data for each co-formulant can be found in the confidential dossier of this submission (Registration Report - Part C).

## A 2.10 Studies on dermal absorption (KCP 7.3)

Given the inherent properties of Copper, the penetration of  $\text{Cu}^{2+}$  ions across the dermis of human skin is independent of the different forms of the active substance (e.g Copper hydroxide, tribasic Copper sulphate, Bordeaux Mixture, Copper oxychloride or Copper oxide) or of the formulation type (WG, WP or SC) applied to the dermis. This principle was accepted during the review of the renewal of approval of Copper. The studies below use a formulation containing Copper hydroxide and can be taken as representative for all formulations containing the forms of Copper supported for the EU approval by the EUCuTF. Please note that it is not appropriate to use the data below as surrogate data for formulations containing a form of Copper that differs from the five forms that was supported during the renewal of approval of Copper.

### A 2.10.1 Dermal absorption, in vitro using human skin

Comments of zRMS:	<p>There are three studies of copper dermal absorption presented in this report:  <i>In vitro</i> percutaneous absorption of copper, formulated as copper hydroxide 53.8WG (DPX-GFJ52 (35% as metallic copper) through human skin (xxx, 2016) KCP 7.3/01  <i>In vitro</i> percutaneous absorption of copper, formulated as copper hydroxide 53.8WG (DPX-GFJ52 (35% as metallic copper) through rat skin ( xxx, 2016) KCP 7.3/02  <i>In vivo</i> percutaneous absorption of copper, formulated as copper hydroxide 53.8WG (DPX-GFJ52 (35% as metallic copper) in rats ( xxx, 2016) KCP 7.3/03</p> <p>All these studies were performed in line with relevant OECD guidelines and in GLP conditions and are acceptable.</p> <p>The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable from the neat formulation was 0.39%, while from spray dilution ( 0.3 g/L) 7.5 % . It is noted that ca. 99.9% of potentially absorbable copper was found in the pooled tape strips 3+ 15 and in the stripped skin, while less than 0.01% of the applied doses were in the receptor fluid and receptor chamber wash, in which in some case the amount of copper was below LoQ KCP 7.3/01).</p> <p>The mean percentage of potentially absorbable of copper<sup>65</sup> through rat skin in vitro from the concentrate (350 g/kg) was 2.6 % and from spray dilution ( 0.3 g/L) 14.0 % (KCP 7.3/02). It is noted again that majority of absorbable copper was found in the in the pooled tape strips 3+ 15 and in the stripped skin, while in total 0.0261% of the applied dose as the concentrate or 4.8442% of the applied dose as spray dilution (0.3g/L) were found respectively in the receptor fluid and receptor chamber wash.</p> <p>Dermal absorption of copper through rat skin in vivo for the concentrate (350 g/kg) was &lt; 0.0521 % and for spray dilution ( 0.3 g/L) was not possible to determine due to high levels of background endogenous copper in the matrices (KCP 7.3/03), therefore a worst-case value of 1.9% representing the mean missing recovery was used for calculation of dermal absorption in the triple pack approach, which is extremely conservative approach.</p>
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	<p>In accordance with the EU guidelines (EFSA Journal 2017;15(6):4873) the Triple pack' approach has been used to estimate dermal absorption of copper to be used for regulatory purpose. The existing <i>in vivo</i> data in rats (KCP 7.3/03) were corrected for the ratio of dermal absorption between <i>in vitro</i> through rat skin (KCP 7.3/02) and through human skin (KCP 7.3/01) according to the following formula:</p> <p><i>In vivo human % absorption = in vivo rat % absorption/in vitro rat % absorption x in vitro % human absorption</i></p> <p><i>Dermal absorption from Concentrate: = &lt; 0.0521 %/2.6% x 0.39% = &lt; 0.008%</i></p> <p><i>Dermal absorption from the highest dilution = 1.9%/14.0% x 7.5% = 1.0%</i></p> <p>According to the Triple pack' approach based on available data a dermal absorption for the highest dilution through human skin to be used for risk assessment was &lt; 0.008% for the concentrate and 1.0 % for the dilution.</p> <p>In the analysis of existing studies on dermal penetration of inorganic copper from the copper-containing agrochemical formulation xxx (2020) (KCP 7.3/04), the researcher who performed or participated in many of these studies pointed out that it questionable whether Cu retained in upper layers of skin are absorbable to blood and further on notes that:</p> <p>-“no notable absorption into the receptor fluid was observed following the application of various copper-containing agrochemical to human skin <i>in vitro</i>.”</p> <p>-“Despite slightly raised skin levels of copper following repeated application, still no absorption into the receptor fluid occurred.”</p> <p>-“A rat <i>in vivo</i> study using <sup>65</sup>Cu, that studied the absorption of copper until 144h, again confirmed that no absorption of copper into blood occurs following application of a Copper hydroxide-containing concentrate formulation, while absorption from the diluted product (i.e. 1.9%) could only be, very conservatively, estimated based on the “missing” recovery.”</p> <p>Dermal penetration by Cu inorganic compounds which are not lipophilic and not soluble in water do not have any specific driving force which would induced a movement of Cu from the outer surface of the skin into the circulatory system, eventually leading to systemic exposure towards Cu, therefore it is doubtful whether Cu retained in the pooled tape strips and in the stripped skin will be absorbed into blood. In a way it has been confirmed in the <i>in vivo</i> study of dermal absorption in rats in which no notable dermal absorption was noted.</p> <p>In the opinion of xxx (2020) (KCP 7.3/04) based on a generally accepted triple-pack-approach, a dermal absorption value of 0.1% for the concentrate and 1% for diluted products containing inorganic copper compounds, is considered adequately worst case.</p> <p>zRMS concurs with this opinion which is in agreement with the data presented in the submitted studies.</p>
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#### Reference

#### Report

#### Guideline(s)

#### KCP 7.3/01

*In vitro* percutaneous absorption of copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8WG (35% as metallic copper), through human skin  
xxx (2016)  
Du-Pont-42821

OECD 428 (2004); OECD Assessment No 28, (2004); EFSA Panel on Plant

Protection Products and their Residues (PPR): Guidance on Dermal Absorption (2017)

Deviations	No
GLP	Yes
Acceptability	Yes
Duplication (if vertebrate study)	Not relevant

**Material and methods:**

**Human skin:** Source: TNO xxx  
Number and sex: 4 female donors.  
Anatomical region: Abdomen and/or breast.  
Thickness: Dermatomed to 200 to 400 µm.

**Test Material:**

Non-radiolabelled: Copper hydroxide

Radiolabelled: <sup>65</sup>Copper hydroxide

**Formulation:**

The formulation used in this experiment was Copper hydroxide 53.8 WG containing nominal 53.8% <sup>65</sup>Copper hydroxide (equivalent to 35% metallic copper).  
It was used at three nominal concentrations of copper hydroxide: neat (317 ± 17 g/kg) with 2 spray dilutions of 3 g <sup>65</sup>Copper. L<sup>-1</sup> and 0.3 g <sup>65</sup>Copper. L<sup>-1</sup>.

**Test system:**

A flow-through diffusion cell system (Perm Gear Inc., Riegelsville, PA, USA) was used to study the absorption of the test substance. Approximately 20 h prior to exposure, the split-thickness skin membranes were placed in the 9 mm flow through automated diffusion cells to hydrate the skin. The skin surface temperature was set at 32 ± 1 °C and the humidity was ambient. Following application of the test preparations, the actual temperature was recorded at 15-minute intervals during the study in a diffusion cell containing a non-exposed skin membrane. The receptor fluid was pumped at a speed of approximately 1.2 mL.h<sup>-1</sup> and consisted of Phosphate buffered saline (PBS) containing 0.01% sodium azide (w/v), supplemented with 6% polyoxy-ethylene 20-oleyl glycol (PEG) (w/v), pH 7.2.  
In the flow through cells used the volume of receptor fluid in the receptor chamber beneath the skin was approximately 0.2 mL. At a flow rate of 1.2 mL.h<sup>-1</sup>, this volume was replenished continuously (6 times/hour) such that the rate of diffusion into the receptor fluid did not become a rate limiting step.

**Skin integrity:**

After placing the skin membranes in the diffusion cells, membrane integrity was assessed. 200 µL saline (containing 0.01% sodium azide) and titrated water was applied in the donor compartment of the flow through diffusion cells. The compartment was covered with a glass slide. Samples of the receptor fluid (approx. 1.8 mL/hour) were collected every hour up to three hours following application and measured for radioactivity using liquid scintillation counting

(LSC). Titrated water remaining at the application site was removed and the skin dried with cotton swabs. Membranes were stored overnight to allow wash-out.

Membranes with a permeability coefficient ( $K_p$ ) for water less than  $2.5 \times 10^{-3} \text{ cm.h}^{-1}$  were taken forward for use in the study.

Skin membranes from one donor for dilution II did not meet the integrity criteria; therefore, exposure to skin samples from a second donor was performed one week later.

**Treatment:**

The undiluted concentrate (powder) was distributed over the skin and wetted using a minimal volume of artificial sweat (to mimic conditions on the skin under occlusive clothing conditions).

For the dilutions, the dose preparations were applied to the split-thickness skin sample with a pipette at the rate of approximately  $10 \mu\text{L}/\text{cm}^2$  exposed skin.

The exposure period was 6-hours for all skin preparations.

**Sampling:**

24-hours following application, the mass balance was determined, which comprised measurements from the receptor fluid, skin wash, receptor compartment wash, donor compartment wash, pooled tape strips and stripped skin.

Receptor fluid samples were collected at 0-1, 1-2, 2-4, 4-6, 6-12- and 12-24-hours following application. Following 6-hours' exposure, the unabsorbed test substance was removed with mild soap and cotton swabs and dried. A second skin wash was similarly performed at 24-hours post-application and the diffusion cell was dismantled (receptor and donor compartments were washed with ethanol and water).

Each skin membrane was tape stripped 15 times (unless epidermis rupture occurred). Tape strips were pooled as 1, 2, 3, 4, 5, 6-10 and 11-15. Following tape stripping the membranes were collected and stored until analysis.

**Radioassay:**

The amounts of radioactivity in the membrane integrity test samples were determined by liquid scintillation counting (LSC).

The amount of copper was determined at mass 65 m/z and mass 63 m/z using a double focusing high resolution inductively coupled plasma spectrometry (HR-ICP-MS) in medium mode (resolution, 40000) in all collected samples.

**Results:**

Copper was demonstrated to be sufficiently soluble in the receptor fluid to avoid any risk of back diffusion.

Measurements of the homogeneity of the three concentrations of formulation applied indicated that it was acceptable.

Mean recovery was above 95% in all cases, being approximately 107% for the concentrate (350 g/kg) and both spray dilutions (3 and 0.3 g/L). Therefore, no adjustments for low recovery were required.

The study results are presented in the following Tables:

Distribution of radioactivity (% dose applied)										N= 8 K N° = 0.84
Donor N°	1	1	2	2	3	3	4	4		
Sex	F	F	F	F	F	F	F	F		
Cell N°	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	MEAN±SD	
Skin wash 6h	97.2	96.0	87.9	108.7	110.4	101.7	128.3	114.8	105.6±12.7	
Skin wash 24h	0.6	0.4	0.4	0.1	0.2	0.3	0.1	0.1	0.3±0.2	
Tape strip 1	0.84	0.42	0.10	0.06	0.42	0.73	0.04	0.05	0.33±0.32	
Tape strip 2	0.09	0.06	0.03	0.02	0.11	0.06	0.02	0.02	0.05±0.04	
Total tape strips 1 + 2	0.93	0.48	0.13	0.08	0.53	0.79	0.06	0.07	0.38±0.35	
Donor chamber	0.16	0.04	0.37	0.01	0.11	0.10	0.01	0.00	0.101±0.124	
<b>TOTAL NON-ABSORBED</b>	<b>98.89</b>	<b>96.92</b>	<b>88.8</b>	<b>108.89</b>	<b>111.24</b>	<b>102.89</b>	<b>128.47</b>	<b>114.97</b>	<b>106.38±12.30</b>	
Stripped skin	0.36	0.19	<0.00	0.00	0.33	0.30	0.04	0.04	0.16±0.15	
Tape strip 3	0.03	0.02	0.00	0.01	0.05	0.03	0.01	0.02	0.02±0.01	
Tape strip 4	0.01	0.01	0.00	0.00	0.03	0.01	--	--	0.01±0.01	
Tape strip 5	0.02	0.01	<0.00	<0.00	0.02	0.01	--	--	0.01±0.01	
Tape strip 6-10	--	0.06	0.01	<0.00	0.05	0.05	--	--	0.03±0.03	
Tape strip 11-15	--	--	<0.00	<0.00	0.05	0.01	--	--	0.02±0.02	
TOTAL Tape strips 3+ <sup>a</sup>	0.06	0.1	0.01	0.01	0.2	0.07	0.01	0.02	0.07±0.07	
<b>TOTAL DOSE SITE</b>	<b>0.78</b>	<b>0.48</b>	<b>0.01</b>	<b>0.01</b>	<b>0.91</b>	<b>0.68</b>	<b>0.09</b>	<b>0.1</b>	<b>0.22±0.21</b>	
Receptor fluid (0 - 12h)	0.0008	0.0006	0.0011	<0.0006	<0.0008	0.0007	0.0067	<0.0006	0.0015±0.0021	
Receptor fluid (0 - 24h)	<0.0013	<0.0011	0.0023	<0.011	0.0023	0.0013	0.0073	<0.0011	0.0022±0.0021	
%Ratio receptor 12h/24h	61	55	48	5	35	54	92	55	68	
Receptor chamber wash	0.000	0.000	<0.000	<0.000	0.000	<0.000	<0.000	<0.000	<0.00±0.00	
<b>TOTAL DIRECT</b>	<b>0.0021</b>	<b>0.0017</b>	<b>0.0034</b>	<b>0.0116</b>	<b>0.0031</b>	<b>0.002</b>	<b>0.014</b>	<b>0.0017</b>	<b>0.0050±0.0049</b>	
<b>POTENTIAL (dose site+ receptor)</b>	<b>0.7821</b>	<b>0.4817</b>	<b>0.0134</b>	<b>0.0216</b>	<b>0.9131</b>	<b>0.682</b>	<b>0.104</b>	<b>0.1017</b>	<b>0.3875±0.3710</b>	
POTENTIAL (skin+ receptor)	0.3621	0.1917	0.0034	0.0116	0.3331	0.302	0.054	0.0417	0.1625±0.1529	
<b>TOTAL RECOVERY</b>	<b>99.6721</b>	<b>97.4017</b>	<b>88.8134</b>	<b>108.9116</b>	<b>112.1531</b>	<b>103.57</b>	<b>128.57</b>	<b>115.0717</b>	<b>106.771±12.240</b>	
<b>Evaluation according to EFSA Guidance</b>										
Absorption >75% within half of study duration?					No. (include tape strip values except 1 & 2)					
Recovery <95%?					No					
<b>Total % Potentially Absorbable adjusted according to EFSA (2017)</b>					0.22 ± 0.21 = 0.22 + 0.1764 (k=0.84) = 0.39%					
<sup>a</sup> : tape-strips excluding numbers 1 & 2 which are considered to be non-absorbed dose.										

Distribution of radioactivity (% dose applied)										N= 8 K N° = 0.84
Donor N°	1	1	2	2	3	3	4	4		
Sex	F	F	F	F	F	F	F	F		
Cell N°	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	MEAN±SD	
Skin wash 6h	80.7	99.9	102.4	108.2	99.2	106.8	126.2	102.9	103.3±12.5	
Skin wash 24h	2.0	1.5	0.4	1.9	1.3	1.1	2.5	1.5	1.5±0.6	
Tape strip 1	0.12	<0.11	<0.11	0.31	<0.11	<0.11	0.48	0.20	0.19±0.14	
Tape strip 2	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.45	<0.12	<0.15±0.12	
Total tape strips 1 + 2	0.23	0.22	0.22	0.42	0.22	0.22	0.93	0.32	0.35±0.25	
Donor chamber	0.03	0.02	0.03	0.19	0.03	0.02	0.05	0.04	0.05±0.06	
<b>TOTAL NON-ABSORBED</b>	<b>82.96</b>	<b>101.64</b>	<b>103.05</b>	<b>110.71</b>	<b>100.75</b>	<b>108.14</b>	<b>129.68</b>	<b>104.76</b>	<b>105.21±12.93</b>	
Stripped skin	4.2	2.0	<0.1	0.2	0.7	1.2	1.1	0.6	1.3±1.3	
Tape strip 3	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.14	<0.12	<0.11±0.01	
Tape strip 4	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.26	<0.12	<0.13±0.05	
Tape strip 5	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	0.14	<0.12	<0.11±0.01	
Tape strip 6-10	--	0.15	<0.11	0.14	0.15	<0.11	--	<0.12	<0.13±0.02	
Tape strip 11-15	--	--	--	--	<0.11	<0.11	--	--	<0.11±0.00	
TOTAL Tape strips 3+ <sup>a</sup>	0.33	0.48	0.44	0.47	0.59	0.55	0.54	0.48	0.49±0.08	
<b>TOTAL DOSE SITE</b>	<b>4.53</b>	<b>2.48</b>	<b>0.44</b>	<b>0.67</b>	<b>1.29</b>	<b>1.75</b>	<b>1.64</b>	<b>1.08</b>	<b>1.74±1.30</b>	
Receptor fluid (0 - 12h)	<0.0006	<0.0007	0.0009	0.0021	0.0010	<0.0005	0.0017	0.0026	0.0013±0.0008	
Receptor fluid (0 - 24h)	<0.0011	<0.0012	0.0022	0.0027	0.0016	0.014	0.0022	0.0031	0.0019±0.0007	
%Ratio receptor 12h/24h	54	58	50	78	63	36	77	84	68	
Receptor chamber wash	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	0.003	<0.001±0.001	
<b>TOTAL DIRECT</b>	<b>0.0017</b>	<b>0.0019</b>	<b>0.0031</b>	<b>0.0048</b>	<b>0.0026</b>	<b>0.0145</b>	<b>0.0039</b>	<b>0.0087</b>	<b>0.0052±0.0044</b>	
<b>POTENTIAL (dose site+ receptor)</b>	<b>4.5317</b>	<b>2.4819</b>	<b>0.4431</b>	<b>0.6748</b>	<b>1.2926</b>	<b>1.7645</b>	<b>1.6439</b>	<b>1.0887</b>	<b>1.7402±1.2981</b>	
POTENTIAL (skin+ receptor)	4.2017	2.0019	0.1031	0.2048	0.7026	1.2145	1.1039	0.6087	1.2677±1.3318	
<b>TOTAL RECOVERY</b>	<b>87.49</b>	<b>104.12</b>	<b>103.49</b>	<b>111.38</b>	<b>102.04</b>	<b>109.90</b>	<b>131.32</b>	<b>105.85</b>	<b>106.95±12.23</b>	
<b>Evaluation according to EFSA Guidance</b>										
Absorption >75% within half of study duration?					No. (include tape strip values except 1 & 2)					
Recovery <95%?					No					
<b>Total % Potentially Absorbable adjusted according to EFSA (2017)</b>					1.7402±1.2981 1.7402 + 1.09 (k=0.84) 2.8%					
<sup>a</sup> : tape-strips excluding numbers 1 & 2 which are considered to be non-absorbed dose.										



**Distribution of radioactivity at 24 hours after dose application of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation (Dilution II) to human skin samples (All cells).**

Distribution of radioactivity (% dose applied)										N= 8 K N° = 0.84
Donor N°	1	1	2	2	3	3	4	4		
Sex	F	F	F	F	F	F	F	F		
Cell N°	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	MEAN±SD	
Skin wash 6h	93.1	77.0	91.0	98.3	97.0	88.5	90.0	86.4	90.1±6.7	
Skin wash 24h	9.8	10.0	5.7	5.1	7.7	6.6	7.3	7.7	7.49±1.76	
Tape strip 1	<1.07	<1.07	<1.07	<1.07	<1.07	<1.09	<1.36	<1.37	<1.15±0.13	
Tape strip 2	<1.07	<1.07	<1.07	<1.07	<1.07	<1.09	<1.36	<1.37	<1.15±0.13	
Total tape strips 1 + 2	2.14	2.14	2.14	2.14	2.14	2.18	2.72	2.74	2.29±0.27	
Donor chamber	0.30	0.34	0.28	0.21	0.36	0.22	0.63	0.56	0.36±0.15	
TOTAL NON-ABSORBED	105.34	89.48	99.12	105.72	107.2	97.5	100.65	97.4	100.31±5.83	
Stripped skin	2.4	1.5	<1.0	<1.0	<1.0	<1.1	2.8	3.8	1.83±1.06	
Tape strip 3	<1.07	<1.07	<1.07	<1.07	1.23	<1.09	<1.36	<1.37	<1.17±0.13	
Tape strip 4	<1.07	<1.07	<1.07	<1.07	<1.07	<1.09	<1.36	<1.37	<1.15±0.13	
Tape strip 5	<1.07	<1.07	<1.07	<1.07	<1.07	<1.09	<1.36	<1.37	<1.15±0.13	
Tape strip 6-10	<1.07	<1.07	<1.07	<1.07	<1.07	<1.09	<1.36	<1.37	<1.15±0.13	
Tape strip 11-15	<1.07	<1.07	<1.07	<1.07	<1.07	<1.09	--	<1.37	<1.12±0.11	
TOTAL Tape strips 3+ <sup>a</sup>	5.35	5.35	5.35	5.35	5.51	5.45	5.44	6.85	5.58±0.52	
TOTAL DOSE SITE	7.75	6.85	6.35	6.35	6.51	6.55	8.24	10.65	7.41±1.48	
Receptor fluid µg (0 - 12h)	0.0008	0.0010	0.0007	0.0008	0.0010	0.0007	0.0011	<0.0006	0.0008±0.0002	
Receptor fluid µg (0 - 24h)	0.0018	0.0016	<0.0013	<0.0014	<0.0016	<0.0013	<0.0017	<0.0011	<0.0015±0.0002	
% Ratio receptor 12h/24h	44	63	54	57	63	54	65	55	53	
Receptor fluid (%)	0.07	0.06	<0.05	<0.05	<0.06	<0.05	<0.08	<0.06	<0.06±0.01	
Receptor chamber wash	<0.004	<0.004	0.008	<0.003	<0.004	0.013	<0.003	<0.003	<0.005±0.003	
TOTAL DIRECT	0.074	0.064	0.058	0.053	0.064	0.063	0.083	0.063	0.0653±0.0093	
POTENTIAL (dose site+ receptor)	7.824	6.914	6.408	6.403	6.574	6.613	8.323	10.713	7.4715±1.4872	
POTENTIAL (skin+ receptor)	2.474	1.564	1.058	1.053	1.064	1.163	2.883	3.863	1.9±1.1.064	
TOTAL RECOVERY	113.16	96.39	105.53	112.12	113.77	104.11	108.97	108.11	107.8±5.8	
Evaluation according to EFSA Guidance										
Absorption >75% within half of study duration?					No. (include tape strip values except 1 & 2)					
Recovery <95%?					No					
Total % Potentially Absorbable adjusted according to EFSA (2017)					7.4715±1.4872 = 7.5%					
<sup>a</sup> : tape-strips excluding numbers 1 & 2 which are considered to be non-absorbed dose.										

**Conclusion:**

The dermal penetration through human dermatomed skin of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation was investigated at three nominal concentrations corresponding to the neat product (350 g /kg) and to two representative spray dilutions of 3 g/L and 0.3 g/L.

**Concentrate**

The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable for the neat formulation applying the EFSA guidance (2017) to the study data was 0.39%.

**Intermediate Dose level (Spray dilution at 3 g/L)**

The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable for the spray dilution at 3 g/L applying the EFSA guidance (2017) to the study data was 2.8%.

#### Low Dose level (Spray dilution at 0.3 g/L)

The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable for the spray dilution at 0.3 g/L applying the EFSA guidance (2017) to the study data was 7.5%.

Therefore, the following dermal absorption values can be proposed for Copper hydroxide in the WG 53.8 formulation:

- 0.39% for the neat formulation (350 g/kg)
- 2.8% for the intermediate dose (3 g/L)
- 7.5% for the low dose (0.3 g/L)

Although the above values have been determined in accordance with the EFSA guidance on dermal absorption (2017), it is noted that this is overly conservative in the case of copper, as the amount retained in the stratum corneum and stripped skin is not likely to be available for systemic absorption over time.

<b>Reference</b>	<b>KCP 7.3/02</b>
<b>Report</b>	<i>In vitro</i> percutaneous absorption of copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8WG (35% as metallic copper), through rat skin xxx (2016) Du-Pont-42649
<b>Guideline(s)</b>	OECD 428 (2004); OECD Assessment No 28, (2004); EFSA Panel on Plant Protection Products and their Residues (PPR): Guidance on Dermal Absorption (2017)
<b>Deviations</b>	No
<b>GLP</b>	Yes
<b>Acceptability</b>	Yes
<b>Duplication (if vertebrate study)</b>	Not relevant

#### **Material and methods:**

**Rat skin:** Source: xxx  
Number and sex: 3 male rats, 10-12 weeks old.  
Anatomical region: Dorsal.  
Thickness: Dermatomed to 200 to 400 µm.

#### **Test Material:**

**Non-radiolabelled:** Copper hydroxide

**Radiolabelled:** <sup>65</sup>Copper hydroxide

#### **Formulation:**

The formulation used in this experiment was Copper hydroxide 53.8 WG containing nominal 53.8% <sup>65</sup>Copper hydroxide (equivalent to 35% metallic copper).  
It was used at three nominal concentrations of copper hydroxide: neat (317 ± 17 g/kg) with 2 spray dilutions of 3 g <sup>65</sup>Copper. L<sup>-1</sup> and 0.3 g <sup>65</sup>Copper. L<sup>-1</sup>.



**Test system:**

A flow-through diffusion cell system (Perm Gear Inc., Riegelsville, PA, USA) was used to study the absorption of the test substance. Approximately 20 h prior to exposure, the split-thickness skin membranes were placed in the 9 mm flow through automated diffusion cells to hydrate the skin. The skin surface temperature was set at  $32 \pm 1^\circ\text{C}$  and the humidity was ambient. Following application of the test preparations, the actual temperature was recorded at 15-minute intervals during the study in a diffusion cell containing a non-exposed skin membrane. The receptor fluid was pumped at a speed of approximately  $1.2 \text{ mL}\cdot\text{h}^{-1}$  and consisted of Phosphate buffered saline (PBS) containing 0.01% sodium azide (w/v), supplemented with 6% poly-oxy-ethylene 20-oleyl glycol (PEG) (w/v), pH 7.2.

In the flow through cells used the volume of receptor fluid in the receptor chamber beneath the skin was approximately 0.2 mL. At a flow rate of  $1.2 \text{ mL}\cdot\text{h}^{-1}$ , this volume was replenished continuously (6 times/hour) such that the rate of diffusion into the receptor fluid did not become a rate limiting step.

**Skin integrity:**

After placing the skin membranes in the diffusion cells, membrane integrity was assessed. 200  $\mu\text{L}$  saline (containing 0.01% sodium azide) and titrated water was applied in the donor compartment of the flow through diffusion cells. The compartment was covered with a glass slide. Samples of the receptor fluid (approx. 1.8 mL/hour) were collected every hour up to three hours following application and measured for radioactivity using liquid scintillation counting (LSC). Titrated water remaining at the application site was removed and the skin dried with cotton swabs. Membranes were stored overnight to allow washout.

Membranes with a permeability coefficient ( $K_p$ ) for water less than  $2.5 \times 10^{-3} \text{ cm}\cdot\text{h}^{-1}$  were taken forward for use in the study. Skin membranes used for replicates B-5 and C-7 were erroneously included when they should have been excluding following integrity tests. They were excluded from the calculations.

**Treatment:**

The undiluted concentrate (powder) was distributed over the skin and wetted using a minimal volume of artificial sweat (to mimic conditions on the skin under occlusive clothing conditions).

For the dilutions, the dose preparations were applied to the split-thickness skin sample with a pipette at the rate of approximately  $10 \mu\text{L}/\text{cm}^2$  exposed skin.

The exposure period was 6-hours for all skin preparations.

**Sampling:**

24-hours following application, the mass balance was determined, which comprised measurements from the receptor fluid, skin wash, receptor compartment wash, donor compartment wash, pooled tape strips and stripped skin.

Receptor fluid samples were collected at 0-1, 1-2, 2-4, 4-6, 6-12- and 12-24-hours following application. Following 6-hours' exposure, the unabsorbed test substance was removed with mild soap and cotton swabs and dried. A second skin wash was similarly performed at 24-hours post-application and

the diffusion cell was dismantled (receptor and donor compartments were washed with ethanol and water).

Each skin membrane was tape stripped 15 times (unless epidermis rupture occurred). Tape strips were pooled as 1, 2, 3, 4, 5, 6-10 and 11-15. Following tape stripping the membranes were collected and stored until analysis.

**Radioassay:**

The amounts of radioactivity in the membrane integrity test samples were determined by liquid scintillation counting (LSC).

The amount of copper was determined at mass 65 m/z and mass 63 m/z using a double focusing high resolution inductively coupled plasma spectrometry (HR-ICP-MS) in medium mode (resolution, 40000) in all collected samples.

**Results:**

Copper was demonstrated to be sufficiently soluble in the receptor fluid to avoid any risk of back diffusion.

Measurements of the homogeneity of the three concentrations of formulation applied indicated that it was acceptable.

The study results are presented in the following Tables:

**Distribution of radioactivity at 24 hours after dose application of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation (undiluted concentrate) to rat skin samples (All cells).**

	Distribution of radioactivity (% dose applied)								N= 7 K N° = 0.92
Donor N°	1	1	2	2	3*	3	1	2	
Sex	M	M	M	M	M	M	M	M	
Cell N°	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	MEAN±SD
Skin wash 6h	118.2	108.3	116.1	101.7	99.2	98.5	108.6	97.8	107.0±8.1
Skin wash 24h	1.5	1.2	1.7	1.9	1.1	0.9	1.0	0.9	1.3±0.4
Tape strip 1	0.20	0.13	0.16	0.16	0.08	0.14	0.13	0.17	0.16±0.03
Tape strip 2	0.10	0.10	0.06	0.07	0.06	0.05	0.06	0.10	0.08±0.02
Total tape strips 1 + 2	0.3	0.23	0.22	0.23	0.14	0.19	0.19	0.27	0.23±0.04
Donor chamber	0.01	0.00	0.00	0.03	0.03	0.01	0.00	0.00	0.008±0.010
TOTAL NON-ABSORBED	120.01	109.73	118.02	103.86	100.47	99.6	109.79	98.97	108.57±8.34
Stripped skin	1.42	0.38	2.47	1.43	1.61	0.57	1.73	1.26	1.32±0.70
Tape strip 3	0.04	0.13	0.10	0.22	0.02	0.04	0.29	0.29	0.16±0.11
Tape strip 4	0.09	0.20	0.08	0.08	0.01	0.06	--	--	0.10±0.05
Tape strip 5	0.12	0.16	0.07	0.06	0.01	0.06	--	--	0.09±0.05
Tape strip 6-10	--	0.15	0.23	0.12	0.05	0.07	--	--	0.14±0.07
Tape strip 11-15	--	--	0.33	0.15	0.02	0.05	--	--	0.18±0.14
TOTAL Tape strips 3+ <sup>a</sup>	0.25	0.64	0.81	0.63	0.11	0.28	0.29	0.29	0.46±0.23
TOTAL DOSE SITE	1.67	1.02	3.28	2.06	1.72	0.85	2.02	1.55	1.78±0.81
Receptor fluid µg (0 - 12h)	0.004	0.020	0.115	0.129	15.826	0.057	1.356	0.032	0.24±0.49
Receptor fluid µg (0 - 24h)	0.008	0.068	0.399	0.133	15.829	0.077	2.163	0.034	0.41±0.78
%Ratio receptor 12h/24h	50	29	29	97	97	74	63	94	56
Receptor fluid (%)	0.001	0.004	0.027	0.008	1.161	0.005	0.131	0.002	0.025±0.047
Receptor chamber wash	0.00	0.00	0.001	0.001	0.309	0.003	0.00	0.00	0.001±0.001
TOTAL DIRECT	0.001	0.004	0.028	0.009	1.47	0.008	0.131	0.002	0.0261±0.0471
POTENTIAL (dose site+ receptor)	1.671	1.024	3.308	2.069	3.19	0.858	2.151	1.552	1.8047±0.8203
POTENTIAL (skin+ receptor)	1.421	0.384	2.498	1.439	3.08	0.578	1.861	1.262	1.3490±0.7221
TOTAL RECOVERY	121.68	110.75	121.33	105.93	103.66	100.46	111.94	100.52	110.37±8.81
Evaluation according to EFSA Guidance									
Absorption >75% within half of study duration?					No, (include tape strip values except 1 &2)				
Recovery <95%?					No				
Total % Potentially Absorbable adjusted according to EFSA (2017)					1.8±0.82 = 1.8 + 0.75 (K=0.92) 2.6%				
<sup>a</sup> : tape-strips excluding numbers 1 & 2 which are considered to be non-absorbed dose.									

\*replicate A-5 was excluded from the calculations owing to a deviating absorption profile caused by damaged membrane integrity.

**Distribution of radioactivity at 24 hours after dose application of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation (Dilution I) to rat skin samples (All cells).**

Distribution of radioactivity (% dose applied)										N= 6 K N° = 1
Donor N°	1	1	2	2	3*	3	3*	1		
Sex	M	M	M	M	M	M	M	M		
Cell N°	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	MEAN±SD	
Skin wash 6h	97.8	91.5	78.3	81.8	67.4	84.9	78.0	103.7	89.7±9.8	
Skin wash 24h	6.1	9.5	10.7	9.6	4.6	8.4	10.9	11.4	9.3±1.9	
Tape strip 1	1.18	4.66	3.74	5.32	2.73	2.33	5.24	4.14	3.56±1.54	
Tape strip 2	0.74	2.09	3.63	2.62	1.24	2.19	2.90	2.94	2.37±0.97	
Total tape strips 1 + 2	1.92	6.75	7.37	7.94		4.52		1.08	5.93±2.29	
Donor chamber	0.04	0.05	0.04	0.04	0.05	0.05	0.06	0.08	0.05±0.01	
TOTAL NON-ABSORBED	105.86	107.8	96.41	99.38		97.87		116.26	103.93±7.55	
Stripped skin	1.6	0.5	2.6	2.9	2.4	1.2	2.7	1.5	1.7±0.9	
Tape strip 3	0.46	1.40	1.46	1.39	0.97	1.50	2.54	2.06	1.38±0.52	
Tape strip 4	0.67	1.51	1.36	0.52	1.17	1.55	0.93	1.20	1.14±0.44	
Tape strip 5	0.31	0.92	4.02	0.64	0.46	0.93	0.83	0.78	1.27±1.37	
Tape strip 6-10	--	1.21	3.31	0.58	2.37	1.64	--	0.70	1.49±1.10	
Tape strip 11-15	--	--	--	--	0.79	0.47	--	--	0.47	
TOTAL Tape strips 3+ <sup>a</sup>	1.44	5.04	10.15	3.13		6.09		4.74	5.10±2.96	
TOTAL DOSE SITE	3.04	5.54	12.75	6.03		7.29		6.24	6.82±3.23	
Receptor fluid µg (0 - 12h)	0.01	0.07	0.28	0.20	5.97	0.15	1.75	0.04	0.12±0.10	
Receptor fluid µg (0 - 24h)	0.01	0.09	0.41	0.20	5.97	0.16	2.22	0.04	0.15±0.14	
%Ratio receptor 12h/24h	100	77	68	100	100	94	79	100	80	
Receptor fluid (%)	0.039	0.365	1.593	0.775	23.126	0.613	8.597	0.174	0.59±0.56	
Receptor chamber wash	0.001	<0.001	0.006	0.036	0.303	0.002	0.007	0.008	0.009±0.014	
TOTAL DIRECT	0.04	0.366	1.599	0.811		0.615		0.182	0.6022±0.5632	
POTENTIAL (dose site+ receptor)	3.08	5.906	14.349	6.841		7.905		6.422	7.4172±3.7605	
POTENTIAL (skin+ receptor)	1.64	0.866	4.199	3.711		1.815		1.682	2.3188±1.3194	
TOTAL RECOVERY	108.94	113.71	110.76	106.22		105.78		122.68	111.35±6.29	
Evaluation according to EFSA Guidance										
Absorption >75% within half of study duration?					Yes (exclude all tape strips)					
Recovery <95%?					No					
Total % Potentially Absorbable adjusted according to EFSA (2017)					2.3188±1.3194 (k=1) 3.6%					
<sup>a</sup> : tape-strips excluding numbers 1 & 2 which are considered to be non-absorbed dose.										

\*replicates B-5 and B-7 were excluded from the calculations owing to a deviating absorption profile caused by damaged membrane integrity.

**Distribution of radioactivity at 24 hours after dose application of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation (Dilution II) to rat skin samples (All cells).**

		Distribution of radioactivity (% dose applied)								N= 6 K N° = 1
Donor N°	1	1	2	2	3*	3	2*	3		
Sex	M	M	M	M	M	M	M	M		
Cell N°	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	MEAN±SD	
Skin wash 6h	91.0	84.5	73.4	86.4	85.1	78.0	88.2	35.8	74.9±20.1	
Skin wash 24h	12.5	10.1	10.0	8.1	7.8	9.0	6.6	11.7	10.24±1.67	
Tape strip 1	<0.90	0.91	<0.90	<0.90	<0.90	<0.89	2.97	1.61	<1.02±0.29	
Tape strip 2	<0.90	<0.90	<0.90	<0.90	<0.90	<0.89	<0.90	<0.91	<0.90±0.00	
Total tape strips 1 + 2	1.8	1.81	1.8	1.8		1.78		2.52	1.92±0.29	
Donor chamber	0.91	0.93	0.85	0.91	0.90	0.86	0.23	0.98	0.91±0.05	
TOTAL NON-ABSORBED	106.21	97.34	86.05	97.21		89.64		51	87.91±19.39	
Stripped skin	2.1	3.2	4.5	3.5	5.6	5.2	11.9	8.6	4.50±2.27	
Tape strip 3	<0.90	<0.90	<0.90	<0.90	<0.90	<0.89	<0.90	<0.91	<0.90±0.00	
Tape strip 4	<0.90	<0.90	<0.90	<0.90	<0.90	<0.89	<0.90	<0.91	<0.90±0.01	
Tape strip 5	<0.90	<0.90	<0.90	<0.90	<0.90	<0.89	<0.90	<0.91	<0.90±0.00	
Tape strip 6-10	3.97	2.03	4.17	3.73	2.20	1.75	2.58	2.33	3±1.08	
Tape strip 11-15	<0.90	3.11	0.95	1.87	2.52	2.28	-	2.43	1.93±0.87	
TOTAL Tape strips 3+ <sup>a</sup>	7.57	7.84	7.82	8.3		6.7		7.49	7.62±0.53	
TOTAL DOSE SITE	9.67	11.04	12.32	11.8		11.9		16.09	12.14±2.15	
Receptor fluid µg (0 - 12h)	0.007	0.058	0.291	0.171	2.504	0.116	0.736	0.040	0.114±0.105	
Receptor fluid µg (0 - 24h)	0.009	0.065	0.326	0.173	2.507	0.120	0.885	0.042	0.123±0.115	
%Ratio receptor 12h/24h	78	89	89	99	100	97	83	95	93	
Receptor fluid Total	0.36	2.58	12.82	6.85	99.26	4.68	34.73	1.69	4.83±4.54	
Receptor chamber wash	<0.009	0.016	0.019	<0.008	<0.008	0.017	0.075	0.016	0.014±0.004	
TOTAL DIRECT	0.369	2.596	12.839	6.858		4.697		1.706	4.8442±4.5370	
POTENTIAL (dose site+ receptor)	10.039	13.636	25.159	18.658		16.597		17.796	16.9808±5.0967	
POTENTIAL (skin+ receptor)	2.469	5.796	17.339	10.358		9.897		10.306	9.3608±5.0206	
TOTAL RECOVERY	116.25	110.98	111.21	115.87		106.24		68.80	104.89±18.06	
Evaluation according to EFSA Guidance										
Absorption >75% within half of study duration?					Yes (Exclude all tape strips)					
Recovery <95%?					No					
Total % Potentially Absorbable adjusted according to EFSA (2017)					9.3608±5.0206 (k=1) 14%					
<sup>a</sup> : tape-strips excluding numbers 1 & 2 which are considered to be non-absorbed dose.										

\*replicates C-5 and C-7 were excluded from the calculations owing to a deviating absorption profile caused by damaged membrane integrity.

**Conclusion:**

The dermal penetration through rat dermatomed skin of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation was investigated at three nominal concentrations corresponding to the neat product (350 g /kg) and to two representative spray dilutions of 3 g/L and 0.3 g/L.

**Concentrate**

The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable for the neat formulation applying the EFSA guidance (2017) to the study data was 2.6%.

**Intermediate Dose level (Spray dilution at 3 g/L)**



The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable for the spray dilution at 3 g/L applying the EFSA guidance (2017) to the study data was 3.6%.

#### Low Dose level (Spray dilution at 0.3 g/L)

The mean percentage of <sup>65</sup>Copper hydroxide in the WG 53.8 formulation that was considered to be potentially absorbable for the spray dilution at 0.3 g/L applying the EFSA guidance (2017) to the study data was 14%.

Therefore, the following dermal absorption values can be proposed for Copper hydroxide in the WG 53.8 formulation:

- 2.6% for the neat formulation (350 g/kg)
- 3.6% for the intermediate dose (3 g/L)
- 14% for the low dose (0.3 g/L)

Although the above values have been determined in accordance with the EFSA guidance on dermal absorption (2017), it is noted that this is overly conservative in the case of copper, as the amount retained in the stratum corneum and stripped skin is not likely to be available for systemic absorption over time and in actual fact, these compartments should be excluded from the calculations.

#### **Reference**

#### **KCP 7.3/03**

##### **Report**

*In vivo* percutaneous absorption of copper, formulated as Copper Hydroxide (DPX-GFJ52) 53.8WG (35% as metallic copper), in rats  
xxx (2016)  
Du-Pont-42648

##### **Guideline(s)**

OECD 427 (2004); OECD Assessment No 28, (2004); EFSA Panel on Plant Protection Products and their Residues (PPR): Guidance on Dermal Absorption (2017)

##### **Deviations**

No

##### **GLP**

Yes

##### **Acceptability**

Yes

##### **Duplication (if vertebrate study)**

Not relevant

#### **Materials and methods:**

##### **Test animals:**

##### **Species:**

Rat

##### **Strain:**

Wistar (HsdCpb:Wu)

##### **Number, sex**

36 males

##### **Age:**

9-10 weeks

##### **Weight at dosing:**

296-332g (group A; concentrate), 295-330g (group B; dilution I), 286-333g (group C; dilution II)

##### **Source:**

Harlan, Horst, The Netherlands

##### **Acclimation period:**

At least 5 days (including 1 day in metabolism cages)

Identification:	Tail markings and cage cards
Diet:	Commercial rodent diet (SDS, Witham, England)
Water:	Provided <i>ad libitum</i>
Housing:	Nalgene metabolic cages
Temperature:	22±2°C
Humidity:	45-65%
Photoperiod:	12 hours light/12 hours dark
Air changes	9-11 changes/hour
<b>Test Material:</b>	
Non-radiolabelled:	Copper hydroxide
Radiolabelled:	<sup>65</sup> Copper hydroxide
<b>Formulation:</b>	<p>The formulation used in this experiment was Copper hydroxide 53.8 WG containing nominal 53.8% <sup>65</sup>Copper hydroxide (equivalent to 35% metallic copper).</p> <p>It was used at three nominal concentrations of copper hydroxide: neat (317 ± 17 g/kg) with 2 spray dilutions of 3 g <sup>65</sup>Copper. L<sup>-1</sup> and 0.3 g <sup>65</sup>Copper. L<sup>-1</sup>.</p>
<b>Test system:</b>	<p>The dermal absorption of <sup>65</sup>Copper hydroxide was investigated in 3 groups of male rats, each comprising 3 subgroups of 4 animals as follows:</p> <ul style="list-style-type: none"><li>• Group A, undiluted concentrate, comprising time groups AT1 (24h), AT2 (72h) &amp; AT3 (144h)</li><li>• Group B, spray dilution I, comprising time groups BT1 (24h), BT2 (72h) &amp; BT3 (144h)</li><li>• Group C, spray dilution II, comprising time groups CT1 (24h), CT2 (72h) &amp; CT3 (144h)</li></ul> <p>The extended time periods after the test material was washed off the skin at 6 hours, provided additional information on the bioavailability of the test substance after passing the epidermis and entering the systemic circulation.</p>
<b>Treatment:</b>	<p>At least 24-hours prior to dosing, each animal had an area of 20 cm<sup>2</sup> clipped between the dorsal and shoulder region (care was taken to avoid skin damage). The area was swabbed with acetone and checked for abrasions; only rats with intact skin were used. Following shaving and skin wash the animals were moved to metabolism cages.</p> <p>In all groups, the test substance was applied <i>via</i> dermal application on a dorsal area of approximately 10 cm<sup>2</sup> limited by an 'O' ring under semi-occlusive conditions (plastic cover and permeable tape) using the following methods:</p> <ul style="list-style-type: none"><li>• Group A: the skin was moistened with physiological saline and an appropriate amount of weighed test substance was applied to the skin and evenly spread within the 'O' ring.</li><li>• Groups B &amp; C: the formulations were vortexed and checked for homogeneity. 100 µL of test substance was applied to the area with a pipette and evenly spread within the 'O' ring.</li></ul>

The exposure period was 6-hours for all animals and the rats were subsequently maintained until 24, 72 and 144 hours post-dose (18, 66 & 138 hours post exposure).

**Sampling:**

**Skin washing:** 6 hours following initiation of exposure, the 'O' ring was removed and retained, and the skin washed 9 times with mild soap solution.

**Excreta:** Urine and faeces were collected at 24-hour intervals until sacrifice. After each 24-hour collection the cages were washed, and faeces was mixed with 3 parts water and weighed and homogenised ready for analysis.

**Sacrifice:** Animals were sacrificed by exsanguination following anaesthesia. At sacrifice the following samples were collected; 'O' ring and protective device, skin wash at sacrifice, individual surface tape strips (*stratum corneum*) to a maximum of 15, post-stripping application site, non-treated skin, whole blood, plasma, GI-tract, and residual carcass.

**Controls:**

Urine, faeces, and tissues were collected from untreated control animals. In addition, blank materials and cage wash solutions were collected.

**Radioassay:**

The amount of copper was determined at mass 65 m/z and mass 63 m/z using a double focusing high resolution inductively coupled plasma spectrometry (HR-ICP-MS) in medium mode (resolution, 40000) in all collected samples.

**Pilot study:**

Due to the fact that copper is abundantly available from various sources, a pilot study was undertaken to determine the background levels of copper in various matrices and samples of untreated rats and to ascertain the feasibility of analysing copper in the various matrices.

**Results and discussion:**

Measurements of the homogeneity of the three concentrations of formulation applied indicated that it was acceptable. The actual administered doses for the concentrate were slightly higher than intended, recoveries for this group ranged from 94.6% to 96.5%.

There were no deaths or clinical signs of toxicity in the animals. Body weights at sacrifice were only slightly lower compared with the start of treatment with no dose response and were considered to be secondary to housing and devices used in the study and not a treatment related effect.

Absorption and excretion

For the undiluted concentrate, after 24-hours, <0.051% of the applied dose was absorbed and the recovery was comparable after 72 hours (<0.042%) and 144 hours (<0.047%), indicating the amount present in the stratum corneum and stripped skin was not systemically available. This is supported by the fact that the amount present in the stratum corneum or stripped skin did not decrease over time.

It was not possible to determine the levels of Cu for the 2 spray dilutions because of high amounts of endogenous copper in the urine, faeces, cage wash, blood, GI tract and carcass; therefore, absorption was only determined in the unabsorbed fractions as well as control skin, stripped skin and tape strips. Based on the very low absorption found for the concentrate formulation and considering the good recoveries for the field dilutions, it is concluded that only a negligible amount of applied copper was absorbed from either dilution.

Tape stripping

Tape stripping in all groups revealed that most of the applied <sup>65</sup>Cu was concentrated in the upper layers of the stratum corneum at 144 hours post application.

In the undiluted concentrate group, the amount of  $^{65}\text{Cu}$  in tape strips 3+ after 24 hours was 0.056% of the administered dose and decreased only very slightly to 0.022% at 144 hours following dosing, confirming that little to no absorption from the application site occurs, resulting in very low systemic uptake (below the LoD).

In the spray dilution groups, the amount in tape strips 3+ after 24 hours was 0.61% and 2.50% for dilutions I and II, respectively. Again, decreasing only slightly to 0.46% and 1.90% respectively after 144 hours. The total amount in all tape strips (1+) was constant across the time groups, indicating that little to no  $^{65}\text{Cu}$  becomes systemically available over time.

#### Stripped skin

After 24 hours the amount in the stripped skin was 0.009% of the administered concentrate, after 72 and 144 hours, 0.002% and <0.001% was found. For spray dilution I the majority of stripped skin (except one animal) was below the LoD resulting in <0.04% and <0.02% of the administered dose being recovered at 24 and 144 hours. Similarly, for dilution II all of the stripped skin except one animal was below the LoD, resulting in <0.29% and 0.17% of the administered dose being recovered at 24 and 144 hours. This indicates that little to no  $^{65}\text{Cu}$  from the stripped skin compartment becomes systemically available over time.

#### Carcass and blood

For the concentrate, 0.019%, 0.014% and <0.005% were found in the residual blood at 24, 72 and 144 hours. It was not possible to determine the levels of  $^{65}\text{Cu}$  in the blood or residual carcass because of the high background levels of endogenous copper present in these matrices.

The results are presented in the tables below:

#### **Distribution of radioactivity at 24, 72 and 144 hours after dose application of $^{65}\text{Copper}$ hydroxide in a WG 53.8 formulation (undiluted concentrate) to rats.**

	AT1 (24h)		AT2 (72h)		AT3 (144h)	
	Mean	SD	Mean	SD	Mean	SD
Urine (total)	<0.001	-	<0.001	-	<0.002	-
Faeces (total)	<0.001	-	<0.018	-	<0.035	-
Cage wash	<0.001	-	<0.003	-	<0.002	-
Blood	<0.001	-	<0.001	-	<0.001	-
Control skin	<0.001	-	<0.001	-	<0.001	-
GI tract	<0.002	-	<0.002	-	<0.002	-
Carcass	<0.025	-	<0.017	-	<0.007	-
Stripped skin	0.009	0.012	0.002	0.002	<0.001	<0.001
<b>Absorbed</b>	<b>&lt;0.051</b>	<b>0.044</b>	<b>&lt;0.042</b>	<b>0.027</b>	<b>&lt;0.047</b>	<b>0.005</b>
Total skin wash <sup>1</sup>	94.31	0.86	96.32	1.70	94.71	1.66
O-ring/cover	0.17	0.12	0.11	0.08	0.12	0.08
Tape strips (3+) <sup>2</sup>	0.06	0.04	0.03	0.04	0.02	0.01
<b>Not absorbed</b>	<b>94.54</b>	<b>0.95</b>	<b>96.46</b>	<b>1.63</b>	<b>94.85</b>	<b>1.57</b>
<b>Recovery</b>	<b>94.59</b>	<b>0.94</b>	<b>96.50</b>	<b>1.61</b>	<b>94.90</b>	<b>1.57</b>

<sup>1</sup>including tape strips 1 & 2 (values below the LoD were considered as the LoD for the calculations)

<sup>2</sup>tape strip 3 to the final tape strip taken (up to 15)

**Distribution of radioactivity at 24, 72 and 144 hours after dose application of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation (Dilution I) to rats.**

	BT1 (24h)		BT2 (72h)		BT3 (144h)	
	Mean	SD	Mean	SD	Mean	SD
Urine (total)	n.m.	-	n.m.	-	n.m.	-
Faeces (total)	n.m.	-	n.m.	-	n.m.	-
Cage wash	n.m.	-	n.m.	-	n.m.	-
Blood	n.m.	-	n.m.	-	n.m.	-
Control skin	0.01	-	0.01	-	0.01	-
GI tract	n.m.	-	n.m.	-	n.m.	-
Carcass	n.m.	-	n.m.	-	n.m.	-
Stripped skin	<0.04	-	<0.02	-	<0.02	-
Absorbed	n.a.	-	n.a.	-	n.a.	-
Total skin wash <sup>1</sup>	95.24	3.19	100.41	2.56	99.17	1.30
O-ring/cover	0.18	0.05	0.12	0.05	0.22	0.06
Tape strips (3+) <sup>2</sup>	0.61	0.22	0.45	0.39	0.46	0.21
Not absorbed	96.04	3.16	100.98	2.26	99.85	1.47
Recovery	96.08	3.15	101.00	2.26	99.88	1.47

<sup>1</sup>including tape strips 1 & 2 (values below the LoD were considered as the LoD for the calculations)

<sup>2</sup>tape strip 3 to the final tape strip taken (up to 15)

n.m. = not measured, n.a. = not applicable

**Distribution of radioactivity at 24, 72 and 144 hours after dose application of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation (Dilution II) to rats.**

	CT1 (24h)		CT2 (72h)		CT3 (144h)	
	Mean	SD	Mean	SD	Mean	SD
Urine (total)	n.m.	-	n.m.	-	n.m.	-
Faeces (total)	n.m.	-	n.m.	-	n.m.	-
Cage wash	n.m.	-	n.m.	-	n.m.	-
Blood	n.m.	-	n.m.	-	n.m.	-
Control skin	<0.10	-	<0.10	-	<0.10	-
GI tract	n.m.	-	n.m.	-	n.m.	-
Carcass	n.m.	-	n.m.	-	n.m.	-
Stripped skin	<0.29	-	<0.17	-	<0.17	-
Absorbed	n.a.	-	n.a.	-	n.a.	-
Total skin wash <sup>1</sup>	94.75	94.89	95.80	1.56	94.78	1.29
O-ring/cover	0.65	0.77	1.20	0.28	0.95	0.30
Tape strips (3+) <sup>2</sup>	2.50	1.11	1.37	0.18	1.90	0.59
Not absorbed	97.41	0.85	98.38	1.37	97.63	1.23
Recovery	97.80	0.76	98.64	1.38	97.89	1.23

<sup>1</sup>including tape strips 1 & 2 (values below the LoD were considered as the LoD for the calculations)

<sup>2</sup>tape strip 3 to the final tape strip taken (up to 15)

n.m. = not measured, n.a. = not applicable

The *in vivo* dermal penetration in rats of <sup>65</sup>Copper hydroxide in a WG 53.8 formulation was investigated at three nominal concentrations corresponding to the neat product (350 g /kg) and to two representative spray dilutions of 3 g/L and 0.3 g/L.

**Concentrate**

After 24 hours, <0.051% of the applied dose was absorbed (sum of excreta, GI tract, Stripped skin, and carcass). The absorption was comparable after 72 and 144 hours (<0.042% and <0.047%).

Mean recovery within the time groups was 94.59% to 96.50%.

#### Intermediate Dose level (Spray dilution at 3 g/L)

It was not possible to determine an increase in  $^{65}\text{Cu}$  in the spray dilutions owing to the high levels of background endogenous copper in the matrices. However, owing to the small absorption for the concentrate and good recovery for the spray dilutions it is concluded that only a negligible amount of copper would be absorbed.

Mean recovery across the time groups was 96.08% to 101.0%.

#### Low Dose level (Spray dilution at 0.3 g/L)

It was not possible to determine an increase in  $^{65}\text{Cu}$  in the spray dilutions owing to the high levels of background endogenous copper in the matrices. However, owing to the small absorption for the concentrate and good recovery for the spray dilutions it is concluded that only a negligible amount of copper would be absorbed.

Mean recovery across the time groups was 97.80% to 98.64%.

#### **Conclusion:**

The absorption of  $^{65}\text{Cu}$  from the undiluted concentrate was  $<0.05\%$  over 144 hours. For both spray dilutions, a worst-case assumption for absorption was determined from the non-absorbed fractions (owing to the high background levels of endogenous copper preventing measurement in some matrices). Based on the low absorption for the concentrate and the good recoveries for both dilutions from the non-absorbed fractions, it is concluded that very little absorption of applied copper had occurred in both field dilutions.

The amount of the applied dose of  $^{65}\text{Cu}$  in the stripped skin was very low; the largest amount being observed in dilution II at 24 hours (0.3%). The amount present in the stratum corneum showed no clear decrease over time and the majority remained in the upper layers.

**Therefore, for all 3 dose levels the amount of  $^{65}\text{Cu}$  located in the stratum corneum was not available for absorption under the conditions of the study.**

#### Triple pack calculations

All three studies are comparable with regard to test material, formulation, vehicle, exposure etc. and fulfils all of the criteria for similarity as outlined in the EFSA guidance on dermal absorption (2017).

For the *in vivo* study, it is possible to use a worst-case value of 1.9% (which represents the mean missing recovery), by assuming that all of this amount is in the absorbed fraction. Therefore, the triple pack calculations for the highest dilution (0.3%) would be based on the following values:

- In vivo rat: 1.9%
- In vitro rat: 14%
- In vitro human: 7.5%

The dermal absorption value for the highest dilution can therefore be calculated as follows:

*In vivo* human % absorption = *in vivo* rat % absorption / *in vitro* rat % absorption  $\times$  *in vitro* % human absorption

*In vivo* human % absorption =  $1.9\% / 14\% \times 7.5\% = 0.8\%$

Therefore, a dermal absorption value of 0.8% can be determined from the triple pack approach.

It is acknowledged however, that this is also a conservative approach as the values for the *in vitro* studies are likely to be an overestimation, owing to the inclusion of the tape-strips and the stripped skin in the final values, when it is unlikely that this is an absorbable dose.

*Applicant's comment:*

In accordance with Maas (2020) a dermal absorption value of 0.1 % was used for the concentrate and 1 % was used for the dilution (please refer to KCP 7.3/04).

Concerning the triple pack study summaries; we have noticed an error in the calculation for the human in vitro calculation (dilution II). In the submitted summary the value for dilution II is reported as 7.5%, this value should actually be 8.6% ( $7.41 \pm 1.48 = 7.41 + 1.2 (k=0.84) = 8.6\%$ ). The previous value was not adjusted correctly to account for the standard deviation ( $k=0.84$ ).

When fed into the triple pack calculation for dilution II, this results in a dermal absorption value of 1.2%, rather than the previously proposed 1% (see below):

*Dilution II (0.3%)*

*The values used in the triple pack calculation for dilution II are:*

- *In vivo rat: 1.9% (based on mean missing recovery as a worst case)*
- *In vitro rat: 14%*
- *In vitro human: 8.6%*

*The dermal absorption value for the highest dilution can therefore be calculated as follows:*

*In vivo human % absorption = in vivo rat % absorption / in vitro rat % absorption x in vitro % human absorption*

$$\text{In vivo human \% absorption} = 1.9\% / 14\% \times 8.6\% = 1.2\%$$

*Therefore, a dermal absorption value of 1.2% can be determined from the triple pack approach.*

For transparency we would like to make you aware of this change; however, we propose to stick to a dermal absorption value of 1% for the calculations, which is still a conservative value supporting the proposed value of 0.5% (based on the previous in vitro studies and position papers), and the value of 0.8% for dilution I in the triple pack summaries. As you are aware, the dermal absorption is not inversely proportionate to concentration for copper, and any differences are solely a result of differences in LOQ values and not a true reflection of the dilution of the formulation.

## **A 2.11 Other/Special Studies**

None.

## Appendix 3 Exposure calculations

### A 3.1 Operator exposure calculations (KCP 7.2.1.1)

**Table A 3.1- 1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on orchards (also covering use in vine)**

Operator exposure for Nordox 75 WG outdoor spray applications					
Application rate of active substance		1.25 kg a.s./ha		I_AppRate	
Assumed area treated		10 ha/day		d_AreaTreated	
Amount of active substance applied		12.5 kg a.s./day		I_AmountAS	
Dermal absorption of the product		0.10%		I_AbsorpProduct	
Dermal absorption of in-use dilution		1.00%		I_Absorinuse	
Formulation type		Wettable granules, soluble granules			
Indoor or Outdoor application		Outdoor			
Application method		Upward spraying			
Application equipment		Vehicle-mounted			
Season		early (without leaves)			
https://www.fsc.org/eng/other-topics					



**Table A 3.1- 2: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on low berries and other small fruits**

Operator exposure for Nordox 75 WG outdoor spray applications					
Application rate of active substance		1 kg a.s./ha		i_AppRate	
Assumed area treated		50 ha/day		d_AreaTreated	
Amount of active substance applied		50 kg a.s./day		i_AmountAS	
Dermal absorption of the product		0.10%		i_AbsorpProduct	
Dermal absorption of in-use dilution		1.00%		i_AbsorInuse	
Formulation type		Wettable granules, soluble granules			
Indoor or Outdoor application		Outdoor			
Application method		Downward spraying			
Application equipment		Vehicle-mounted			
Season		not relevant			
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	26638	131500	AOEM	
	Body	19317	50075	AOEM	
	Head	325	4477	AOEM	
	Protected hands (gloves)	211	1573	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	596	3111	AOEM	
	Protected head (hood and face shield)	5	253	AOEM	
	Inhalation	120	285	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Water soluble bag	No		1	
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7416	40226	AOEM	
	Body	4147	21376	AOEM	
	Head	196	591	AOEM	
	Protected hands (gloves)	355	5260	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	114	279	AOEM	
	Inhalation	7	28	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	
	1. Total				
		Without RPE/PPE		With RPE/PPE	
Longer term					
Total systemic exposure from mixing, loading and application (mg a.s./day)		0.2908390		0.1347465	
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)		0.0048473		0.0022458	
% of RVNAS		6.06%		2.81%	
Acute					
Total systemic exposure from mixing, loading and application (mg a.s./day)		1.1204628		0.3829400	
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)		0.0186744		0.0063823	
% of RVAAS		#DIV/0!		#DIV/0!	

**Table A 3.1-4: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on fruiting vegetables**

Operator exposure for Nordox 75 WG outdoor spray applications					
Application rate of active substance	1 kg a.s./ha	<i>i_AppRate</i>			
Assumed area treated	50 ha/day	<i>d_AreaTreated</i>			
Amount of active substance applied	50 kg a.s./day	<i>i_AmountAS</i>			
Dermal absorption of the product	0.10%	<i>i_AbsorpProduct</i>			
Dermal absorption of in-use dilution	1.00%	<i>i_AbsorInuse</i>			
Formulation type	Wettable granules, soluble granules				
Indoor or Outdoor application	Outdoor				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Season	not relevant				
Outdoor treatment of fruiting vegetables, soluble granules, downward spraying, vehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	26638	131500	AOEM	
	Body	19317	50075	AOEM	
	Head	325	4477	AOEM	
	Protected hands (gloves)	211	1573	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	596	3111	AOEM	
	Protected head (hood and face shield)	5	253	AOEM	
	Inhalation	120	285	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Water soluble bag	No		1	
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7416	40226	AOEM	
	Body	4147	21376	AOEM	
	Head	196	591	AOEM	
	Protected hands (gloves)	355	5260	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	114	279	AOEM	
	Inhalation	7	28	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	
	1. Total				
	Without RPE/PPE		With RPE/PPE		
Longer term					
Total systemic exposure from mixing, loading and application (mg a.s./day)	0.2908390		0.1347465		
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0.0048473		0.0022458		
% of RVNAS	6.06%		2.81%		
Acute					
Total systemic exposure from mixing, loading and application (mg a.s./day)	1.1204628		0.3829400		
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0.0186744		0.0063823		
% of RVAAS	#DIV/0!		#DIV/0!		

**Table A 3.1-4: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on ornamentals**

Operator exposure for Nordox 75 WG outdoor spray applications					
Application rate of active substance	1 kg a.s./ha	<i>i_AppRate</i>			
Assumed area treated	10 ha/day	<i>d_AreaTreated</i>			
Amount of active substance applied	10 kg a.s./day	<i>i_AmountAS</i>			
Dermal absorption of the product	0.10%	<i>i_AbsorpProduct</i>			
Dermal absorption of in-use dilution	1.00%	<i>i_AbsorInuse</i>			
Formulation type	Wettable granules, soluble granules				
Indoor or Outdoor application	Outdoor				
Application method	Upward spraying				
Application equipment	Vehicle-mounted				
Season	not relevant				
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7716	37555	AOEM	
	Body	6232	31373	AOEM	
	Head	65	895	AOEM	
	Protected hands (gloves)	74	315	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	143	622	AOEM	
	Protected head (hood and face shield)	1	51	AOEM	
	Inhalation	74	274	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Water soluble bag	No		1	
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	19442	62368	AOEM	No data available for a drift reduction scenario
	Body	88117	514162	AOEM	
	Head	11580	71072	AOEM	
	Protected hands (gloves)	352	9194	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	1150	2247	AOEM	
	Inhalation	234	827	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	
<b>1. Total</b>					
		Without RPE/PPE		With RPE/PPE	
Longer term					
Total systemic exposure from mixing, loading and application (mg a.s./day)		1.5139317		0.4396211	
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)		0.0252322		0.0073270	
% of RVNAS		31.54%		9.16%	
Acute					
Total systemic exposure from mixing, loading and application (mg a.s./day)		7.6467242		1.9278490	
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)		0.1274454		0.0321308	
% of RVAAS		#DIV/0!		#DIV/0!	

### A 3.2 Worker exposure calculations (KCP 7.2.3.1)

**Table A 3.2- 1: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on orchards (2 x 1.25 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Pome fruit			
Indoor or outdoor	Outdoor			
Application method	Upward spraying			
Application equipment	Manual-Knapsack			
Worker's task	Searching, reaching, picking			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1.25	kg a.s./ha		<i>i_AppRate</i>
Number of applications	2			<i>i_AppNo</i>
Interval between multiple applications	14	days		<i>i_AppInt</i>
Half-life of active substance	30	days		<i>d_HalfLifeAS</i>
Multiple application factor	1.7			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3.75	µg a.s./cm <sup>2</sup>		<i>d_DFR</i>
Working hours	8	hr		<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	22500	cm <sup>2</sup> /hr		<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	4500	cm <sup>2</sup> /hr		<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	2250	cm <sup>2</sup> /hr		<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA	ha/hr*10 <sup>^(-3)</sup>		<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA	ha/hr*10 <sup>^(-3)</sup>		<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA	ha/hr*10 <sup>^(-3)</sup>		<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	11.6345337	2.3269067	1.1634534	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.1939089	0.0387818	0.0193909	
% of RVNAS	242.39%	48.48%	24.24%	

**Table A 3.2- 2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on vine (2 x 1.2 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Grapes			
Indoor or outdoor	Outdoor			
Application method	Upward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Hand harvesting			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1.2	kg a.s./ha		<i>i_AppRate</i>
Number of applications	2			<i>i_AppNo</i>
Interval between multiple applications	7	days		<i>i_AppInt</i>
Half-life of active substance	30	days		<i>d_HalfLifeAS</i>
Multiple application factor	1.9			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3.6	µg a.s./cm <sup>2</sup>		<i>d_DFR</i>
Working hours	8	hr		<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	30000	cm <sup>2</sup> /hr		<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	10100	cm <sup>2</sup> /hr		<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	no TC available for this assessment			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA	ha/hr*10 <sup>^(-3)</sup>		<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA	ha/hr*10 <sup>^(-3)</sup>		<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA	ha/hr*10 <sup>^(-3)</sup>		<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	15.9897643	5.3832206	no TC available for this assessment	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.2664961	0.0897203		
% of RVNAS	333.12%	112.15%		

**Table A 3.2- 3: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on vine (3 x 1.2 kg Cu/ha; refinement DT<sub>50</sub>)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Grapes			
Indoor or outdoor	Outdoor			
Application method	Upward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Hand harvesting			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1.2	kg a.s./ha		<i>i_AppRate</i>
Number of applications	2			<i>i_AppNo</i>
Interval between multiple applications	7	days		<i>i_AppInt</i>
Half-life of active substance	7	days		<i>d_HalfLifeAS</i>
Multiple application factor	1.5			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3.6	µg a.s./cm <sup>2</sup>		<i>d_DFR</i>
Working hours	8	hr		<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	30000	cm <sup>2</sup> /hr		<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	10100	cm <sup>2</sup> /hr		<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	no TC available for this assessment			
		cm <sup>2</sup> /hr		<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA	ha/hr*10 <sup>^</sup> (-3)		<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA	ha/hr*10 <sup>^</sup> (-3)		<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA	ha/hr*10 <sup>^</sup> (-3)		<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	12.9600000	4.3632000	no TC available for this assessment	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.2160000	0.0727200		
% of RVNAS	270.00%	90.90%		

**Table A 3.2- 4: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on vine (3 x 1.2 kg Cu/ha; refinement DT<sub>50</sub> & DFR)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Grapes			
Indoor or outdoor	Outdoor			
Application method	Upward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Hand harvesting			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1.2	kg a.s./ha		<i>i_AppRate</i>
Number of applications	2			<i>i_AppNo</i>
Interval between multiple applications	7	days		<i>i_AppInt</i>
Half-life of active substance	7	days		<i>d_HalfLifeAS</i>
Multiple application factor	1.5			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	2.28	µg a.s./cm <sup>2</sup>		<i>d_DFR</i>
Working hours	8	hr		<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	30000	cm <sup>2</sup> /hr		<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	10100	cm <sup>2</sup> /hr		<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	no TC available for this assessment			
		cm <sup>2</sup> /hr		<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA	ha/hr*10 <sup>^</sup> (-3)		<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA	ha/hr*10 <sup>^</sup> (-3)		<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA	ha/hr*10 <sup>^</sup> (-3)		<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	8.2080000	2.7633600	no TC available for this assessment	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.1368000	0.0460560		
% of RVNAS	171.00%	57.57%		

**Table A 3.2- 5: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on vine (3 x 1.2 kg Cu/ha; refinement by provisional TC values)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Grapes			
Indoor or outdoor	Outdoor			
Application method	Upward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Hand harvesting			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1.2 kg a.s./ha			<i>i_AppRate</i>
Number of applications	2			<i>i_AppNo</i>
Interval between multiple applications	7 days			<i>i_AppInt</i>
Half-life of active substance	30 days			<i>d_HalfLifeAS</i>
Multiple application factor	1.9			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3.6 µg a.s./cm <sup>2</sup>			<i>d_DFR</i>
Working hours	8 hr			<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	9800 cm <sup>2</sup> /hr			<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	4600 cm <sup>2</sup> /hr			<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	1100 cm <sup>2</sup> /hr			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	5.2233230	2.4517639	0.5862914	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.0870554	0.0408627	0.0097715	
% of RVNAS	108.82%	51.08%	12.21%	

**Table A 3.2- 6: Estimation of worker exposure towards copper using the EFSA-OPEX model, use on low berries and other small fruits (3 x 1.0 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Leaf vegetables and fresh herbs			
Indoor or outdoor	Outdoor			
Application method	Downward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Reaching, picking			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1 kg a.s./ha			<i>i_AppRate</i>
Number of applications	3			<i>i_AppNo</i>
Interval between multiple applications	7 days			<i>i_AppInt</i>
Half-life of active substance	30 days			<i>d_HalfLifeAS</i>
Multiple application factor	2.6			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3 µg a.s./cm <sup>2</sup>			<i>d_DFR</i>
Working hours	8 hr			<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	5800 cm <sup>2</sup> /hr			<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	2500 cm <sup>2</sup> /hr			<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm <sup>2</sup> /hr			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	3.5834281	1.5445811	0.3583428	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.0597238	0.0257430	0.0059724	
% of RVNAS	74.65%	32.18%	7.47%	

**Table A 3.2- 7: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on fruiting vegetables (3 x 1.0 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Fruiting vegetables			
Indoor or outdoor	Outdoor			
Application method	Downward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Reaching, picking			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1 kg a.s./ha			<i>i_AppRate</i>
Number of applications	3			<i>i_AppNo</i>
Interval between multiple applications	7 days			<i>i_AppInt</i>
Half-life of active substance	30 days			<i>d_HalfLifeAS</i>
Multiple application factor	2.6			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3 µg a.s./cm <sup>2</sup>			<i>d_DFR</i>
Working hours	8 hr			<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	5800 cm <sup>2</sup> /hr			<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	2500 cm <sup>2</sup> /hr			<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm <sup>2</sup> /hr			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	3.5834281	1.5445811	0.3583428	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.0597238	0.0257430	0.0059724	
% of RVNAS	74.65%	32.18%	7.47%	

**Table A 3.2- 8: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on bulb vegetables (onion, garlic, shallots: 3 x 1.0 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Bulb vegetables			
Indoor or outdoor	Outdoor			
Application method	Downward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Reaching, picking			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1 kg a.s./ha			<i>i_AppRate</i>
Number of applications	3			<i>i_AppNo</i>
Interval between multiple applications	7 days			<i>i_AppInt</i>
Half-life of active substance	30 days			<i>d_HalfLifeAS</i>
Multiple application factor	2.6			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3 µg a.s./cm <sup>2</sup>			<i>d_DFR</i>
Working hours	8 hr			<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	5800 cm <sup>2</sup> /hr			<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	2500 cm <sup>2</sup> /hr			<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm <sup>2</sup> /hr			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	3.5834281	1.5445811	0.3583428	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.0597238	0.0257430	0.0059724	
% of RVNAS	74.65%	32.18%	7.47%	

**Table A 3.2- 9: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on lettuce, scarole (leave vegetables: 3 x 1.0 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Leaf vegetables and fresh herbs			
Indoor or outdoor	Outdoor			
Application method	Downward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Reaching, picking			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1 kg a.s./ha			<i>i_AppRate</i>
Number of applications	3			<i>i_AppNo</i>
Interval between multiple applications	7 days			<i>i_AppInt</i>
Half-life of active substance	30 days			<i>d_HalfLifeAS</i>
Multiple application factor	2.6			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3 µg a.s./cm <sup>2</sup>			<i>d_DFR</i>
Working hours	8 hr			<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	5800 cm <sup>2</sup> /hr			<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	2500 cm <sup>2</sup> /hr			<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm <sup>2</sup> /hr			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	3.5834281	1.5445811	0.3583428	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.0597238	0.0257430	0.0059724	
% of RVNAS	74.65%	32.18%	7.47%	

**Table A 3.2- 10: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on ornamentals (3 x 1.0 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG				
Crop type	Ornamentals			
Indoor or outdoor	Outdoor			
Application method	Upward spraying			
Application equipment	Vehicle-mounted			
Worker's task	Cutting, sorting, bundling, carrying			
Main body parts in contact with foliage	Hand and body			
Application rate of active substance	1 kg a.s./ha			<i>i_AppRate</i>
Number of applications	3			<i>i_AppNo</i>
Interval between multiple applications	7 days			<i>i_AppInt</i>
Half-life of active substance	30 days			<i>d_HalfLifeAS</i>
Multiple application factor	2.6			<i>d_MAF</i>
Dermal absorption of the product	0.10%			<i>i_AbsorpProduct</i>
Dermal absorption of the in-use dilution	1.00%			<i>i_Absorplnuse</i>
Dislodgeable foliar residue ( <i>i_AppRate</i> * <i>i_DFR</i> )	3 µg a.s./cm <sup>2</sup>			<i>d_DFR</i>
Working hours	8 hr			<i>d_WorkHr</i>
Dermal transfer coefficient - Total potential exposure	14000 cm <sup>2</sup> /hr			<i>d_DermTcUCV</i>
Dermal transfer coefficient - arms, body and legs covered	5000 cm <sup>2</sup> /hr			<i>d_DermTcCV1</i>
Dermal transfer coefficient - hands, arms, body and legs covered	1400 cm <sup>2</sup> /hr			<i>d_DermTcCV2</i>
Inhalation transfer coefficient for automated applications	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcAut</i>
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcCut</i>
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10 <sup>^(-3)</sup>			<i>d_InhalTcSort</i>
<b>1. Total</b>				
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves	Comments
Total systemic exposure (mg a.s./day)	8.6496540	3.0891621	0.8649654	
Total systemic exposure per kg body weight (mg/kg bw/day)	0.1441609	0.0514860	0.0144161	
% of RVNAS	180.20%	64.36%	18.02%	



### A 3.3 Resident exposure calculations (KCP 7.2.2.1)

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on orchards (3 x 1.25 kg Cu/ha)**

Resident exposure for Nordox 75 WG						
Croptype		Pome fruit				
Application method		Upward spraying				
Application equipment		Manual-Knapsack			i_AppEquip	
Formulation type		Wettable granules, soluble granules			i_FormVal	
Buffer strip		5 m			i_Buffer	
Application rate of the product		1.25 kg a.s./ha			i_AppRate	
Concentration of active substance (in-use dilution for liquid applications)		2.5 g a.s./l			d_ConcAS	
Dermal absorption of product		0.10%			i_AbsorpProduct	
Dermal absorption of in-use dilution		1.00%			i_AbsorpInuse	
Oral absorption		50.00%			i_AbsorpOrallnuse	
Dislodgeable foliar residue (i_AppRate*i_DFR)		3.75 µg a.s./cm²			d_DFR	
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa	Pa			i_Volat	
Concentration in air		0.001 mg/m³			d_AirCon	
Resident dermal spray drift exposure 75th percentile - adult		5.63 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child		1.689 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult		0.00210 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child		0.00164 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult		3.68 ml spray dilution/person				
Resident dermal spray drift exposure mean - child		1.11 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult		0.00170 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child		0.00133 ml spray dilution/person				
Exposure duration dermal		2 hours			d_ReExpDur	
Exposure duration inhalation		24 hours			d_ReExpDurInhal	
Exposure duration entry into treated crops		0.25 hours			d_ExpDurTreatCrop	
Light clothing adjustment factor		18.0%			d_ClothAF	
Breathing rate adult		0.23 m³/day/kg			d_BreathRAd	
Breathing rate child (1-3 year old)		1.07 m³/day/kg			d_BreathRCh	
Drift percentage on surface (75th percentile)		15.79%				
Drift percentage on surface (mean)		11.69%				
Turf transferable residues percentage		5.00%			d_Turf	
Transfer coeff. of surface deposits-adult		7300 cm²/hour			d_ReTCAAd	
Transfer coeff. of surface deposits-child (1-3 year old)		2600 cm²/hour			d_ReTCCh	
Saliva extraction percentage		50.00%			d_SalExt	
Surface area of hands mouthed		20 cm²			d_AreaHM	
Frequency of hand to mouth activity		9.5 events/hour			d_ReFreqHM	
Ingestion rate for mouthing of grass per day		25 cm²			d_MouthGrass	
Dislodgeable residues percentage transferability for object to mouth		20.00%			d_DRP	
Transfer coefficient for entry into treated crops (75th percentile) - ad		7500 cm²/h			d_TcEntryAd	
Transfer coefficient for entry into treated crops (75th percentile) - chi		2250 cm²/h			d_TcEntryCh	
Transfer coefficient for entry into treated crops (mean) - adult		5980 cm²/h			d_TcEntryAd	
Transfer coefficient for entry into treated crops (mean) - child		1794 cm²/h			d_TcEntryCh	
1. Total						
1.1 1-3 year old child						
Spray drift (75th percentile)			Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0387332	0.0107000	0.0335099	0.0363579	0.0905793	
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0038733	0.0010700	0.0033510	0.0036358	0.0090579	
% of RVNAS	4.84%	1.34%	4.19%	4.54%	11.32%	
1.2 Adult						
Spray drift			Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.1206650	0.0138000	0.0248348	0.1211931	0.2085075	
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0020111	0.0002300	0.0004139	0.0020199	0.0034751	
% of RVNAS	2.51%	0.29%	0.52%	2.52%	4.34%	

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on vine (3 x 1.2 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Grapes				
Application method	Upward spraying				
Application equipment	Vehicle-mounted				
Formulation type	Wettable granules, soluble granules				
Buffer strip	5 m				
Application rate of the product	1.2 kg a.s./ha				
Concentration of active substance (in-use dilution for liquid applications)	6 g a.s./l				
Dermal absorption of product	0.10%				
Dermal absorption of in-use dilution	1.00%				
Oral absorption	50.00%				
Dislodgeable foliar residue (i_AppRate*i_DFR)	3.6 µg a.s./cm <sup>2</sup>				
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10 <sup>-3</sup> Pa				
Concentration in air	0.001 mg/m <sup>3</sup>				
Resident dermal spray drift exposure 75th percentile - adult	5.63 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	1.689 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0.00210 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0.00164 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	3.68 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	1.11 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0.00170 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0.00133 ml spray dilution/person				
Exposure duration dermal	2 hours				
Exposure duration inhalation	24 hours				
Exposure duration entry into treated crops	0.25 hours				
Light clothing adjustment factor	18.0%				
Breathing rate adult	0.23 m <sup>3</sup> /day/kg				
Breathing rate child (1-3 year old)	1.07 m <sup>3</sup> /day/kg				
Drift percentage on surface (75th percentile)	3.07%				
Drift percentage on surface (mean)	2.32%				
Turf transferable residues percentage	5.00%				
Transfer coeff. of surface deposits-adult	7300 cm <sup>2</sup> /hour				
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm <sup>2</sup> /hour				
Saliva extraction percentage	50.00%				
Surface area of hands mouthed	20 cm <sup>2</sup>				
Frequency of hand to mouth activity	9.5 events/hour				
Ingestion rate for mouthing of grass per day	25 cm <sup>2</sup>				
Dislodgeable residues percentage transferability for object to mouth	20.00%				
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm <sup>2</sup> /h				
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm <sup>2</sup> /h				
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm <sup>2</sup> /h				
Transfer coefficient for entry into treated crops (mean) - child	1794 cm <sup>2</sup> /h				
<b>1. Total</b>					
<b>1.1 1-3 year old child</b>					
	Spray drift (75th percentile)	Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0929597	0.0107000	0.0067156	0.0374760	0.1082505
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0092960	0.0010700	0.0006716	0.0037476	0.0108250
% of RVNAS	11.62%	1.34%	0.84%	4.68%	13.53%
<b>1.2 Adult</b>					
	Spray drift	Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.2895960	0.0138000	0.0049770	0.1249200	0.3084201
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0048266	0.0002300	0.0000830	0.0020820	0.0051403
% of RVNAS	6.03%	0.29%	0.10%	2.60%	6.43%

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on low berries and other small fruits (strawberry, 3 x 1.0 kg Cu/ha)**

Formulation type	Wettable granules, soluble granules			i_FormVal	
Buffer strip	2-3 m			i_Buffer	
Application rate of the product	1 kg a.s./ha			i_AppRate	
Concentration of active substance (in-use dilution for liquid applications)	5 g a.s./l			d_ConcAS	
Dermal absorption of product	0.10%			i_AbsorpProduct	
Dermal absorption of in-use dilution	1.00%			i_AbsorpInuse	
Oral absorption	50.00%			i_AbsorpOrallnuse	
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²			d_DFR	
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa			i_Volat	
Concentration in air	0.001 mg/m³			d_AirCon	
Resident dermal spray drift exposure 75th percentile - adult	0.47 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	0.327 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0.00010 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0.00022 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	0.22318 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	0.18 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0.00009 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0.00017 ml spray dilution/person				
Exposure duration dermal	2 hours			d_ReExpDur	
Exposure duration inhalation	24 hours			d_ReExpDurInhal	
Exposure duration entry into treated crops	0.25 hours			d_ExpDurTreatCrop	
Light clothing adjustment factor	18.0%			d_ClothAF	
Breathing rate adult	0.23 m³/day/kg			d_BreathRAD	
Breathing rate child (1-3 year old)	1.07 m³/day/kg			d_BreathRCh	
Drift percentage on surface (75th percentile)	5.60%				
Drift percentage on surface (mean)	4.10%				
Turf transferable residues percentage	5.00%			d_Turf	
Transfer coeff. of surface deposits-adult	7300 cm²/hour			d_ReTCAd	
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour			d_ReTCCh	
Saliva extraction percentage	50.00%			d_SalExt	
Surface area of hands mouthed	20 cm²			d_AreaHM	
Frequency of hand to mouth activity	9.5 events/hour			d_ReFreqHM	
Ingestion rate for mouthings of grass per day	25 cm²			d_MouthGrass	
Dislodgeable residues percentage transferability for object to mouth	20.00%			d_DRP	
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm²/h			d_TcEntryAd	
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm²/h			d_TcEntryCh	
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h			d_TcEntryAd	
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h			d_TcEntryCh	
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0145070	0.0107000	0.0141998	0.0434413	0.0639635
Total systemic exposure per kg body weight (mg a.s./body weight)	0.0014507	0.0010700	0.0014200	0.0043441	0.0063964
% of RVNAS	1.81%	1.34%	1.77%	5.43%	8.00%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0197700	0.0138000	0.0105237	0.1448045	0.1465627
Total systemic exposure per kg body weight (mg a.s./body weight)	0.0003295	0.0002300	0.0001754	0.0024134	0.0024427
% of RVNAS	0.41%	0.29%	0.22%	3.02%	3.05%

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on fruiting vegetables (3 x 1.0 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype		Fruiting vegetables			
Application method		Downward spraying			
Application equipment		Vehicle-mounted			i_AppEquip
Formulation type		Wettable granules, soluble granules			i_FormVal
Buffer strip		2-3 m			i_Buffer
Application rate of the product		1 kg a.s./ha			i_AppRate
Concentration of active substance (in-use dilution for liquid applications)		5 g a.s./l			d_ConcAS
Dermal absorption of product		0.10%			i_AbsorpProduct
Dermal absorption of in-use dilution		1.00%			i_Absorpinuse
Oral absorption		50.00%			i_AbsorpOrallnuse
Dislodgeable foliar residue (i_AppRate*i_DFR)		3 µg a.s./cm²			d_DFR
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa	Pa			i_Volat
Concentration in air		0.001 mg/m³			d_AirCon
Resident dermal spray drift exposure 75th percentile - adult		0.47 ml spray dilution/person			
Resident dermal spray drift exposure 75th percentile - child		0.327 ml spray dilution/person			
Resident inhal. spray drift exposure 75th percentile - adult		0.00010 ml spray dilution/person			
Resident inhal. spray drift exposure 75th percentile - child		0.00022 ml spray dilution/person			
Resident dermal spray drift exposure mean - adult		0.22318 ml spray dilution/person			
Resident dermal spray drift exposure mean - child		0.18 ml spray dilution/person			
Resident inhal. spray drift exposure mean - adult		0.00009 ml spray dilution/person			
Resident inhal. spray drift exposure mean - child		0.00017 ml spray dilution/person			
Exposure duration dermal		2 hours			d_ReExpDur
Exposure duration inhalation		24 hours			d_ReExpDurinhal
Exposure duration entry into treated crops		0.25 hours			d_ExpDurTreatCrop
Light clothing adjustment factor		18.0%			d_ClothAF
Breathing rate adult		0.23 m³/day/kg			d_BreathRAAd
Breathing rate child (1-3 year old)		1.07 m³/day/kg			d_BreathRCh
Drift percentage on surface (75th percentile)		5.60%			
Drift percentage on surface (mean)		4.10%			
Turf transferable residues percentage		5.00%			d_Turf
Transfer coeff. of surface deposits-adult		7300 cm²/hour			d_ReTCAd
Transfer coeff. of surface deposits-child (1-3 year old)		2600 cm²/hour			d_ReTCCh
Saliva extraction percentage		50.00%			d_SolExt
Surface area of hands mouthed		20 cm²			d_AreaHM
Frequency of hand to mouth activity		9.5 events/hour			d_ReFreqHM
Ingestion rate for mouthing of grass per day		25 cm²			d_MouthGrass
Dislodgeable residues percentage transferability for object to mouth		20.00%			d_DRP
Transfer coefficient for entry into treated crops (75th percentile) - ad		7500 cm²/h			d_TcEntryAd
Transfer coefficient for entry into treated crops (75th percentile) - chi		2250 cm²/h			d_TcEntryCh
Transfer coefficient for entry into treated crops (mean) - adult		5980 cm²/h			d_TcEntryAd
Transfer coefficient for entry into treated crops (mean) - child		1794 cm²/h			d_TcEntryCh
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0145070	0.0107000	0.0141998	0.0434413	0.0639635
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0014507	0.0010700	0.0014200	0.0043441	0.0063964
% of RVNAS	1.81%	1.34%	1.77%	5.43%	8.00%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0197700	0.0138000	0.0105237	0.1448045	0.1465627
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0003295	0.0002300	0.0001754	0.0024134	0.0024427
% of RVNAS	0.41%	0.29%	0.22%	3.02%	3.05%

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on bulb vegetables (3 x 1.0 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Bulb vegetables				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Formulation type	Wettable granules, soluble granules				
Buffer strip	2-3 m				
Application rate of the product	1 kg a.s./ha				
Concentration of active substance (in-use dilution for liquid applications)	5 g a.s./l				
Dermal absorption of product	0.10%				
Dermal absorption of in-use dilution	1.00%				
Oral absorption	50.00%				
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²				
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa				
Concentration in air	0.001 mg/m³				
Resident dermal spray drift exposure 75th percentile - adult	0.47 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	0.327 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0.00010 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0.00022 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	0.22318 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	0.18 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0.00009 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0.00017 ml spray dilution/person				
Exposure duration dermal	2 hours				
Exposure duration inhalation	24 hours				
Exposure duration entry into treated crops	0.25 hours				
Light clothing adjustment factor	18.0%				
Breathing rate adult	0.23 m³/day/kg				
Breathing rate child (1-3 year old)	1.07 m³/day/kg				
Drift percentage on surface (75th percentile)	5.60%				
Drift percentage on surface (mean)	4.10%				
Turf transferable residues percentage	5.00%				
Transfer coeff. of surface deposits-adult	7300 cm²/hour				
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				
Saliva extraction percentage	50.00%				
Surface area of hands mouthed	20 cm²				
Frequency of hand to mouth activity	9.5 events/hour				
Ingestion rate for mouthing of grass per day	25 cm²				
Dislodgeable residues percentage transferability for object to mouth	20.00%				
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm²/h				
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm²/h				
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)		Entry into treated crops (75th percentile)	
Total systemic exposure (mg a.s./day)		0.0145070		0.0434413	
Total systemic exposure per kg body weight (mg a.s./day/kg)		0.0014507		0.0043441	
% of RVNAS		1.81%		5.43%	
1.2 Adult					
Spray drift		Vapour		Entry into treated crops	
Total systemic exposure (mg a.s./day)		0.0197700		0.1448045	
Total systemic exposure per kg body weight (mg a.s./day/kg)		0.0003295		0.0024134	
% of RVNAS		0.41%		3.02%	

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on leaf vegetables (3 x 1.0 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Leaf vegetables and fresh herbs				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Formulation type	Wettable granules, soluble granules				
Buffer strip	2-3 m				
Application rate of the product	1 kg a.s./ha				
Concentration of active substance (in-use dilution for liquid applications)	3.33333333 g a.s./l				
Dermal absorption of product	0.10%				
Dermal absorption of in-use dilution	1.00%				
Oral absorption	50.00%				
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²				
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa				
Concentration in air	0.001 mg/m³				
Resident dermal spray drift exposure 75th percentile - adult	0.47 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	0.327 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0.00010 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0.00022 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	0.22318 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	0.18 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0.00009 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0.00017 ml spray dilution/person				
Exposure duration dermal	2 hours				
Exposure duration inhalation	24 hours				
Exposure duration entry into treated crops	0.25 hours				
Light clothing adjustment factor	18.0%				
Breathing rate adult	0.23 m³/day/kg				
Breathing rate child (1-3 year old)	1.07 m³/day/kg				
Drift percentage on surface (75th percentile)	5.60%				
Drift percentage on surface (mean)	4.10%				
Turf transferable residues percentage	5.00%				
Transfer coeff. of surface deposits-adult	7300 cm²/hour				
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				
Saliva extraction percentage	50.00%				
Surface area of hands mouthed	20 cm²				
Frequency of hand to mouth activity	9.5 events/hour				
Ingestion rate for mouthing of grass per day	25 cm²				
Dislodgeable residues percentage transferability for object to mouth	20.00%				
Transfer coefficient for entry into treated crops (75th percentile) - adl	7500 cm²/h				
Transfer coefficient for entry into treated crops (75th percentile) - chi	2250 cm²/h				
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)		Entry into treated crops (75th percentile)	
Total systemic exposure (mg a.s./day)		0.0096713		0.0434413	
Total systemic exposure per kg body weight (mg a.s./day/kg)		0.0009671		0.0043441	
% of RVNAS		1.21%		5.43%	
1.2 Adult					
Spray drift		Vapour		Entry into treated crops	
Total systemic exposure (mg a.s./day)		0.0131800		0.1448045	
Total systemic exposure per kg body weight (mg a.s./day/kg)		0.0002197		0.0024134	
% of RVNAS		0.27%		3.02%	

**Table A 3.3-2: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on ornamentals (3 x 1.0 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Ornamentals				
Application method	Upward spraying				
Application equipment	Vehicle-mounted				i_AppEquip
Formulation type	Wettable granules, soluble granules				i_FormVal
Buffer strip	5 m				i_Buffer
Application rate of the product	1 kg a.s./ha				i_AppRate
Concentration of active substance (in-use dilution for liquid applications)	5 g a.s./l				d_ConcAS
Dermal absorption of product	0.10%				i_AbsorpProduct
Dermal absorption of in-use dilution	1.00%				i_Absorplnuse
Oral absorption	50.00%				i_AbsorpOrallnuse
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²				d_DFR
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa			Pa	i_Volat
Concentration in air	0.001 mg/m³				d_AirCon
Resident dermal spray drift exposure 75th percentile - adult	5.63 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	1.689 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0.00210 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0.00164 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	3.68 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	1.11 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0.00170 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0.00133 ml spray dilution/person				
Exposure duration dermal	2 hours				d_ReExpDur
Exposure duration inhalation	24 hours				d_ReExpDurInhal
Exposure duration entry into treated crops	0.25 hours				d_ExpDurTreatCrop
Light clothing adjustment factor	18.0%				d_ClothAF
Breathing rate adult	0.23 m³/day/kg				d_BreathRAd
Breathing rate child (1-3 year old)	1.07 m³/day/kg				d_BreathRCh
Drift percentage on surface (75th percentile)	2.30%				
Drift percentage on surface (mean)	1.80%				
Turf transferable residues percentage	5.00%				d_Turf
Transfer coeff. of surface deposits-adult	7300 cm²/hour				d_ReTCAd
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				d_ReTCCh
Saliva extraction percentage	50.00%				d_SalExt
Surface area of hands mouthed	20 cm²				d_AreaHM
Frequency of hand to mouth activity	9.5 events/hour				d_ReFreqHM
Ingestion rate for mouthing of grass per day	25 cm²				d_MouthGrass
Dislodgeable residues percentage transferability for object to mouth	20.00%				d_DRP
Transfer coefficient for entry into treated crops (75th percentile) - adl	7500 cm²/h				d_TcEntryAd
Transfer coefficient for entry into treated crops (75th percentile) - chi	2250 cm²/h				d_TcEntryCh
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				d_TcEntryAd
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				d_TcEntryCh
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.0774664	0.0107000	0.0058321	0.0434413	0.1020636
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0077466	0.0010700	0.0005832	0.0043441	0.0102064
% of RVNAS	9.68%	1.34%	0.73%	5.43%	12.76%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0.2413300	0.0138000	0.0043223	0.1448045	0.2920201
Total systemic exposure per kg body weight (mg a.s./day/kg)	0.0040222	0.0002300	0.0000720	0.0024134	0.0048670
% of RVNAS	5.03%	0.29%	0.09%	3.02%	6.08%

## Appendix 4 Exposure calculation done by zRMS using dermal absorption for concentrate of 1% and for dilution 9%

### Operator exposure calculations (KCP 7.2.1.1)

Table B 3.1- 3: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on orchards

#### Operator exposure for Nordox 75 WG outdoor spray applications

Operator exposure for H0405 WS Outdoor spray applications					
Application rate of active substance		1,25 kg a.s./ha		i_AppRate	
Assumed area treated		10 ha/day		d_AreaTreated	
Amount of active substance applied		12,5 kg a.s./day		i_AmountAS	
Dermal absorption of the product		1,00%		i_AbsorpProduct	
Dermal absorption of in-use dilution		9,00%		i_AbsorInuse	
Formulation type		Wettable granules, soluble granules			
Indoor or Outdoor application		Outdoor			
Application method		Upward spraying			
Application equipment		Vehicle-mounted			
Season		not relevant			
OutdoorWettable granules, soluble granulesUpward sprayingVehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	9163	44681	AOEM	
	Body	7290	33474	AOEM	
	Head	81	1119	AOEM	
	Protected hands (gloves)	86	393	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	174	778	AOEM	
	Protected head (hood and face shield)	1	63	AOEM	
	Inhalation	79	276	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Water soluble bag	No		1	
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	23697	77960	AOEM	No data available for a drift reduction scenario
	Body	110146	642703	AOEM	
	Head	14475	88840	AOEM	
	Protected hands (gloves)	440	11493	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	1437	2809	AOEM	
	Inhalation	266	1033	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

#### 1. Total

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	13,8590805	3,9133210
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,2309847	0,0652220
% of RVNAS	288,73%	81,53%



**Table B 3.1- 2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on orchards (2 x 1.25 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Pome fruit		
Indoor or outdoor	Outdoor		
Application method	Upward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Searching, reaching, picking		
Main body parts in contact with foliage	Hand and body		
Application rate of active substance	1,25 kg a.s./ha		
Number of applications	2		
Interval between multiple applications	14 days		
Half-life of active substance	30 days		
Multiple application factor	1,7		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3,75 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	22500 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	4500 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	2250 cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	104,7108031	20,9421606	10,4710803
Total systemic exposure per kg body weight (mg/kg bw/day)	1,7451801	0,3490360	0,1745180
% of RVNAS	2181,48%	436,30%	218,15%

**Table B 3.1-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on orchards (3 x 1.25 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Pome fruit				
Application method	Upward spraying				
Application equipment	Vehicle-mounted				i_AppEquip
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				i_FormVal
Buffer strip	5 m				i_Buffer
Application rate of the product	1,25 kg a.s./ha				i_AppRate
Concentration of active substance (in-use dilution for liquid applications)	2,5 g a.s./l				d_ConcAS
Dermal absorption of product	1,00%				i_AbsorpProduct
Dermal absorption of in-use dilution	9,00%				i_AbsorpInuse
Oral absorption	50,00%				i_AbsorpOralinuse
Dislodgeable foliar residue (i_AppRate*i_DFR)	3,75 µg a.s./cm²				d_DFR
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa				i_Volat
Concentration in air	0,001 mg/m³				d_AirCon
Resident dermal spray drift exposure 75th percentile - adult	5,63 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	1,689 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0,00210 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0,00164 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	3,68 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	1,11 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0,00170 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0,00133 ml spray dilution/person				
Exposure duration dermal	2 hours				d_ReExpDur
Exposure duration inhalation	24 hours				d_ReExpDurInhal
Exposure duration entry into treated crops	0,25 hours				d_ExpDurTreatCrop
Light clothing adjustment factor	18,0%				d_ClothAF
Breathing rate adult	0,23 m³/day/kg				d_BreathRAD
Breathing rate child (1-3 year old)	1,07 m³/day/kg				d_BreathRCh
Drift percentage on surface (75th percentile)	15,79%				
Drift percentage on surface (mean)	11,69%				
Turf transferable residues percentage	5,00%				d_Turf
Transfer coeff. of surface deposits-adult	7300 cm²/hour				d_ReTCAd
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				d_ReTCCh
Saliva extraction percentage	50,00%				d_SalExt
Surface area of hands mouthed	20 cm²				d_AreaHM
Frequency of hand to mouth activity	9,5 events/hour				d_ReFreqHM
Ingestion rate for mouthing of grass per day	25 cm²				d_MouthGrass
Dislodgeable residues percentage transferability for object to mouth	20,00%				d_DRP
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm²/h				d_TcEntryAd
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm²/h				d_TcEntryCh
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				d_TcEntryAd
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				d_TcEntryCh
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,3157292	0,0107000	0,1042720	0,3272213	0,5569225
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0315729	0,0010700	0,0104272	0,0327221	0,0556922
% of RVNAS	39,47%	1,34%	13,03%	40,90%	69,62%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	1,0439850	0,0138000	0,2235130	1,0907375	1,7321674
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0173998	0,0002300	0,0037252	0,0181790	0,0288695
% of RVNAS	21,75%	0,29%	4,66%	22,72%	36,09%

**Table B 3.2- 1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on vineyards**

Operator exposure for Nordox 75 WG outdoor spray applications					
Application rate of active substance	1,2 kg a.s./ha	<i>i_AppRate</i>			
Assumed area treated	10 ha/day	<i>d_AreaTreated</i>			
Amount of active substance applied	12 kg a.s./day	<i>i_AmountAS</i>			
Dermal absorption of the product	1,00%	<i>i_AbsorpProduct</i>			
Dermal absorption of in-use dilution	9,00%	<i>i_AbsorInuse</i>			
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				
Indoor or Outdoor application	Outdoor				
Application method	Upward spraying				
Application equipment	Vehicle-mounted				
Season	not relevant				
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	32896	123209	AOEM	
	Body	20461	148254	AOEM	
	Head	623	3415	AOEM	
	Protected hands (gloves)	174	2377	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	215	1755	AOEM	
	Protected head (hood and face shield)	10	193	AOEM	
	Inhalation	8	30	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Water soluble bag	No		1	
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	22854	74841	AOEM	No data available for a drift reduction scenario
	Body	105740	616994	AOEM	
	Head	13896	85287	AOEM	
	Protected hands (gloves)	422	11033	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	1380	2696	AOEM	
	Inhalation	260	992	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

**1. Total**

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	13,6315835	3,7094217
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,2271931	0,0618237
% of RVNAS	283,99%	77,28%
Acute		

**Table B 3.2- 2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on vineyards (2 x 1.20 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Grapes		
Indoor or outdoor	Outdoor		
Application method	Upward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Hand harvesting		
Main body parts in contact with foliage	Hand and body		
Application rate of active substance	1,2 kg a.s./ha		
Number of applications	2		
Interval between multiple applications	7 days		
Half-life of active substance	30 days		
Multiple application factor	1,9		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3,6 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	30000 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	10100 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	no TC available for this assessment cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	143,9078784	48,4489857	no TC available for this assessment
Total systemic exposure per kg body weight (mg/kg bw/day)	2,3984646	0,8074831	
% of RVNAS	2998,08%	1009,35%	

**Table B 3.2-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on vineyards (2 x 1.20 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Grapes				
Application method	Upward spraying				
Application equipment	Vehicle-mounted				i_AppEquip
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				i_FormVal
Buffer strip	5 m				i_Buffer
Application rate of the product	1,2 kg a.s./ha				i_AppRate
Concentration of active substance (in-use dilution for liquid applications)	6 g a.s./l				d_ConcAS
Dermal absorption of product	1,00%				i_AbsorpProduct
Dermal absorption of in-use dilution	9,00%				i_AbsorpInuse
Oral absorption	50,00%				i_AbsorpOralinuse
Dislodgeable foliar residue (i_AppRate*i_DFR)	3,6 µg a.s./cm²				d_DFR
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa Pa				i_Volat
Concentration in air	0,001 mg/m³				d_AirCon
Resident dermal spray drift exposure 75th percentile - adult	5,63 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	1,689 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0,00210 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0,00164 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	3,68 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	1,11 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0,00170 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0,00133 ml spray dilution/person				
Exposure duration dermal	2 hours				d_ReExpDur
Exposure duration inhalation	24 hours				d_ReExpDurInhal
Exposure duration entry into treated crops	0,25 hours				d_ExpDurTreatCrop
Light clothing adjustment factor	18,0%				d_ClothAF
Breathing rate adult	0,23 m³/day/kg				d_BreathRAD
Breathing rate child (1-3 year old)	1,07 m³/day/kg				d_BreathRCh
Drift percentage on surface (75th percentile)	3,07%				
Drift percentage on surface (mean)	2,32%				
Turf transferable residues percentage	5,00%				d_Turf
Transfer coeff. of surface deposits-adult	7300 cm²/hour				d_ReTCAd
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				d_ReTCCh
Saliva extraction percentage	50,00%				d_SalExt
Surface area of hands mouthed	20 cm²				d_AreaHM
Frequency of hand to mouth activity	9,5 events/hour				d_ReFreqHM
Ingestion rate for mouthing of grass per day	25 cm²				d_MouthGrass
Dislodgeable residues percentage transferability for object to mouth	20,00%				d_DRP
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm²/h				d_TcEntryAd
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm²/h				d_TcEntryCh
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				d_TcEntryAd
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				d_TcEntryCh
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,7577501	0,0107000	0,0208967	0,3372841	0,7949101
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0757750	0,0010700	0,0020897	0,0337284	0,0794910
% of RVNAS	94,72%	1,34%	2,61%	42,16%	99,36%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	2,5055640	0,0138000	0,0447933	1,1242803	2,5837805
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0417594	0,0002300	0,0007466	0,0187380	0,0430630
% of RVNAS	52,20%	0,29%	0,93%	23,42%	53,83%

**Table B 3.3- 1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on low berries and other small fruits**

**Operator exposure for Nordox 75 WG outdoor spray applications**

Operator exposure for Non-dex 75 WG outdoor spray applications					
Application rate of active substance		1 kg a.s./ha		i_AppRate	
Assumed area treated		50 ha/day		d_AreaTreated	
Amount of active substance applied		50 kg a.s./day		i_AmountAS	
Dermal absorption of the product		1,00%		i_AbsorpProduct	
Dermal absorption of in-use dilution		9,00%		i_AbsorInuse	
Formulation type		Soluble concentrates, emulsifiable concentrate, etc.			
Indoor or Outdoor application		Outdoor			
Application method		Downward spraying			
Application equipment		Vehicle-mounted			
Season		not relevant			
OutdoorSoluble concentrates, emulsifiable concentrate, etc. Downward sprayingVehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	98691	374323	AOEM	
	Body	55794	224425	AOEM	
	Head	2594	14228	AOEM	
	Protected hands (gloves)	439	9903	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	762	7313	AOEM	
	Protected head (hood and face shield)	42	806	AOEM	
	Inhalation	12	32	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
Water soluble bag	No		1		
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7416	40226	AOEM	
	Body	4147	21376	AOEM	
	Head	196	591	AOEM	
	Protected hands (gloves)	355	5260	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	114	279	AOEM	
	Inhalation	7	28	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

**1. Total**

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	2,6482927	0,7524947
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,0441382	0,0125416
% of RVNAS	55,17%	15,68%

**Table B 3.3- 2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on low berries (3 x 1.00 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Low berries and other small fruits		
Indoor or outdoor	Outdoor		
Application method	Downward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Reaching, picking		
Main body parts in contact with foliage	Hand and forearm		
Application rate of active substance	1 kg a.s./ha		
Number of applications	3		
Interval between multiple applications	7 days		
Half-life of active substance	30 days		
Multiple application factor	2,6		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	5800 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	3000 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	750 cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	32,2508527	16,6814755	4,1703689
Total systemic exposure per kg body weight (mg/kg bw/day)	0,5375142	0,2780246	0,0695061
% of RVNAS	671,89%	347,53%	86,88%

**Table B 3.3-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on copper using the EFSA-OPEX model, professional use on low berries (3 x 1.00 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Low berries and other small fruits				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				
Buffer strip	5 m				
Application rate of the product	1 kg a.s./ha				
Concentration of active substance (in-use dilution for liquid applications)	5 g a.s./l				
Dermal absorption of product	1,00%				
Dermal absorption of in-use dilution	9,00%				
Oral absorption	50,00%				
Dislodgeable foliar residue (I_AppRate*I_DFR)	3 µg a.s./cm²				
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa				
Concentration in air	0,001 mg/m³				
Resident dermal spray drift exposure 75th percentile - adult	0,23798 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	0,2175 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0,00009 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0,00017 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	0,12278 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	0,12 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0,00008 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0,00014 ml spray dilution/person				
Exposure duration dermal	2 hours				
Exposure duration inhalation	24 hours				
Exposure duration entry into treated crops	0,25 hours				
Light clothing adjustment factor	18,0%				
Breathing rate adult	0,23 m³/day/kg				
Breathing rate child (1-3 year old)	1,07 m³/day/kg				
Drift percentage on surface (75th percentile)	2,30%				
Drift percentage on surface (mean)	1,80%				
Turf transferable residues percentage	5,00%				
Transfer coeff. of surface deposits-adult	7300 cm²/hour				
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				
Saliva extraction percentage	50,00%				
Surface area of hands mouthed	20 cm²				
Frequency of hand to mouth activity	9,5 events/hour				
Ingestion rate for mouthing of grass per day	25 cm²				
Dislodgeable residues percentage transferability for object to mouth	20,00%				
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm²/h				
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm²/h				
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0811075	0,0107000	0,0181475	0,3909721	0,3816175
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0081108	0,0010700	0,0018148	0,0390972	0,0381617
% of RVNAS	10,14%	1,34%	2,27%	48,87%	47,70%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0882646	0,0138000	0,0389003	1,3032403	1,1290664
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0014711	0,0002300	0,0006483	0,0217207	0,0188178
% of RVNAS	1,84%	0,29%	0,81%	27,15%	23,52%



**Table B 3.4-1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on fruiting vegetables**

**Operator exposure for Nordox 75 WG outdoor spray applications**

Application rate of active substance	1 kg a.s./ha	<i>i_AppRate</i>			
Assumed area treated	50 ha/day	<i>d_AreaTreated</i>			
Amount of active substance applied	50 kg a.s./day	<i>i_AmountAS</i>			
Dermal absorption of the product	1,00%	<i>i_AbsorpProduct</i>			
Dermal absorption of in-use dilution	9,00%	<i>i_AbsorInuse</i>			
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				
Indoor or Outdoor application	Outdoor				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Season	not relevant				
OutdoorSoluble concentrates, emulsifiable concentrate, etc. Downward sprayingVehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	98691	374323	AOEM	
	Body	55794	224425	AOEM	
	Head	2594	14228	AOEM	
	Protected hands (gloves)	439	9903	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	762	7313	AOEM	
	Protected head (hood and face shield)	42	806	AOEM	
	Inhalation	12	32	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
Head and respiratory PPE	None		1	1	
Water soluble bag	No		1		
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7416	40226	AOEM	
	Body	4147	21376	AOEM	
	Head	196	591	AOEM	
	Protected hands (gloves)	355	5260	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	114	279	AOEM	
	Inhalation	7	28	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

**1. Total**

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	2,6482927	0,7524947
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,0441382	0,0125416
% of RVNAS	55,17%	15,68%

**Table B 3.4-2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on fruiting vegetables (3 x 1.00 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Fruiting vegetables		
Indoor or outdoor	Outdoor		
Application method	Downward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Reaching, picking		
Main body parts in contact with foliage	Hand and body		
Application rate of active substance	1 kg a.s./ha		
Number of applications	3		
Interval between multiple applications	7 days		
Half-life of active substance	30 days		
Multiple application factor	2,6		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	5800 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	2500 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	32,2508527	13,9012296	3,2250853
Total systemic exposure per kg body weight (mg/kg bw/day)	0,5375142	0,2316872	0,0537514
% of RVNAS	671,89%	289,61%	67,19%

**Table B 3.4-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on copper using the EFSA-OPEX model, professional use on fruiting vegetables (3 x 1.00 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype		Fruiting vegetables			
Application method		Downward spraying			
Application equipment		Vehicle-mounted			i_AppEquip
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				i_FormVal
Buffer strip		5 m			i_Buffer
Application rate of the product		1 kg a.s./ha			i_AppRate
Concentration of active substance (in-use dilution for liquid applications)		5 g a.s./l			d_ConcAS
Dermal absorption of product		1,00%			i_AbsorpProduct
Dermal absorption of in-use dilution		9,00%			i_AbsorpInuse
Oral absorption		50,00%			i_AbsorpOralinuse
Dislodgeable foliar residue (i_AppRate*i_DFR)		3 µg a.s./cm²			d_DFR
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa	Pa			i_Volat
Concentration in air		0,001 mg/m³			d_AirCon
Resident dermal spray drift exposure 75th percentile - adult		0,23798 ml spray dilution/person			
Resident dermal spray drift exposure 75th percentile - child		0,2175 ml spray dilution/person			
Resident inhal. spray drift exposure 75th percentile - adult		0,00009 ml spray dilution/person			
Resident inhal. spray drift exposure 75th percentile - child		0,00017 ml spray dilution/person			
Resident dermal spray drift exposure mean - adult		0,12278 ml spray dilution/person			
Resident dermal spray drift exposure mean - child		0,12 ml spray dilution/person			
Resident inhal. spray drift exposure mean - adult		0,00008 ml spray dilution/person			
Resident inhal. spray drift exposure mean - child		0,00014 ml spray dilution/person			
Exposure duration dermal		2 hours			d_ReExpDur
Exposure duration inhalation		24 hours			d_ReExpDurInhal
Exposure duration entry into treated crops		0,25 hours			d_ExpDurTreatCrap
Light clothing adjustment factor		18,0%			d_ClothAF
Breathing rate adult		0,23 m³/day/kg			d_BreathRAD
Breathing rate child (1-3 year old)		1,07 m³/day/kg			d_BreathRCh
Drift percentage on surface (75th percentile)		2,30%			
Drift percentage on surface (mean)		1,80%			
Turf transferable residues percentage		5,00%			d_Turf
Transfer coeff. of surface deposits-adult		7300 cm²/hour			d_ReTCAd
Transfer coeff. of surface deposits-child (1-3 year old)		2600 cm²/hour			d_ReTCCh
Saliva extraction percentage		50,00%			d_SalExt
Surface area of hands mouthed		20 cm²			d_AreaHM
Frequency of hand to mouth activity		9,5 events/hour			d_ReFreqHM
Ingestion rate for mouthing of grass per day		25 cm²			d_MouthGrass
Dislodgeable residues percentage transferability for object to mouth		20,00%			d_DRP
Transfer coefficient for entry into treated crops (75th percentile) - adult		7500 cm²/h			d_TcEntryAd
Transfer coefficient for entry into treated crops (75th percentile) - child		2250 cm²/h			d_TcEntryCh
Transfer coefficient for entry into treated crops (mean) - adult		5980 cm²/h			d_TcEntryAd
Transfer coefficient for entry into treated crops (mean) - child		1794 cm²/h			d_TcEntryCh
1. Total					
1.1 1-3 year old child					
	Spray drift (75th percentile)	Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0811075	0,0107000	0,0181475	0,3909721	0,3816175
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0081108	0,0010700	0,0018148	0,0390972	0,0381617
% of RVNAS	10,14%	1,34%	2,27%	48,87%	47,70%
1.2 Adult					
	Spray drift	Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0882646	0,0138000	0,0389003	1,3032403	1,1290664
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0014711	0,0002300	0,0006483	0,0217207	0,0188178
% of RVNAS	1,84%	0,29%	0,81%	27,15%	23,52%

**Table B 3.5-1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on bulb vegetables**

**Operator exposure for Nordox 75 WG outdoor spray applications**

Operator exposure for outdoor use and outdoor spray applications					
Application rate of active substance	1 kg a.s./ha		i_AppRate		
Assumed area treated	50 ha/day		d_AreaTreated		
Amount of active substance applied	50 kg a.s./day		i_AmountAS		
Dermal absorption of the product	1,00%		i_AbsorpProduct		
Dermal absorption of in-use dilution	9,00%		i_AbsorInuse		
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				
Indoor or Outdoor application	Outdoor				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Season	not relevant				
OutdoorSoluble concentrates, emulsifiable concentrate, etc. Downward sprayingVehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	98691	374323	AOEM	
	Body	55794	224425	AOEM	
	Head	2594	14228	AOEM	
	Protected hands (gloves)	439	9903	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	762	7313	AOEM	
	Protected head (hood and face shield)	42	806	AOEM	
	Inhalation	12	32	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
Water soluble bag	No		1		
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7416	40226	AOEM	
	Body	4147	21376	AOEM	
	Head	196	591	AOEM	
	Protected hands (gloves)	355	5260	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	114	279	AOEM	
	Inhalation	7	28	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

**1. Total**

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	2,6482927	0,7524947
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,0441382	0,0125416
% of RVNAS	55,17%	15,68%

**Table B 3.5-2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on bulb vegetables (3 x 1.00 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Bulb vegetables		
Indoor or outdoor	Outdoor		
Application method	Downward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Reaching, picking		
Main body parts in contact with foliage	Hand and body		
Application rate of active substance	1 kg a.s./ha		
Number of applications	3		
Interval between multiple applications	7 days		
Half-life of active substance	30 days		
Multiple application factor	2,6		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	5800 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	2500 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	32,2508527	13,9012296	3,2250853
Total systemic exposure per kg body weight (mg/kg bw/day)	0,5375142	0,2316872	0,0537514
% of RVNAS	671,89%	289,61%	67,19%

**Table B 3.5-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on copper using the EFSA-OPEX model, professional use on bulb vegetables (3 x 1.00 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype			Bulb vegetables		
Application method			Downward spraying		
Application equipment			Vehicle-mounted	i_AppEquip	
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.			i_FormVal	
Buffer strip			5 m	i_Buffer	
Application rate of the product			1 kg a.s./ha	i_AppRate	
Concentration of active substance (in-use dilution for liquid applications)			5 g a.s./l	d_ConcAS	
Dermal absorption of product			1,00%	i_AbsorpProduct	
Dermal absorption of in-use dilution			9,00%	i_Absorplnuse	
Oral absorption			50,00%	i_AbsorpOrallnuse	
Dislodgeable foliar residue (i_AppRate*i_DFR)			3 µg a.s./cm²	d_DFR	
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa		Pa	i_Volat	
Concentration in air			0,001 mg/m³	d_AirCon	
Resident dermal spray drift exposure 75th percentile - adult			0,23798 ml spray dilution/person		
Resident dermal spray drift exposure 75th percentile - child			0,2175 ml spray dilution/person		
Resident inhal. spray drift exposure 75th percentile - adult			0,00009 ml spray dilution/person		
Resident inhal. spray drift exposure 75th percentile - child			0,00017 ml spray dilution/person		
Resident dermal spray drift exposure mean - adult			0,12278 ml spray dilution/person		
Resident dermal spray drift exposure mean - child			0,12 ml spray dilution/person		
Resident inhal. spray drift exposure mean - adult			0,00008 ml spray dilution/person		
Resident inhal. spray drift exposure mean - child			0,00014 ml spray dilution/person		
Exposure duration dermal			2 hours	d_ReExpDur	
Exposure duration inhalation			24 hours	d_ReExpDurInhal	
Exposure duration entry into treated crops			0,25 hours	d_ExpDurTreatCrap	
Light clothing adjustment factor			18,0%	d_ClothAF	
Breathing rate adult			0,23 m³/day/kg	d_BreathRAD	
Breathing rate child (1-3 year old)			1,07 m³/day/kg	d_BreathRCh	
Drift percentage on surface (75th percentile)			2,30%		
Drift percentage on surface (mean)			1,80%		
Turf transferable residues percentage			5,00%	d_Turf	
Transfer coeff. of surface deposits-adult			7300 cm²/hour	d_ReTCAd	
Transfer coeff. of surface deposits-child (1-3 year old)			2600 cm²/hour	d_ReTCCh	
Saliva extraction percentage			50,00%	d_SalExt	
Surface area of hands mouthed			20 cm²	d_AreaHM	
Frequency of hand to mouth activity			9,5 events/hour	d_ReFreqHM	
Ingestion rate for mouthing of grass per day			25 cm²	d_MouthGrass	
Dislodgeable residues percentage transferability for object to mouth			20,00%	d_DRP	
Transfer coefficient for entry into treated crops (75th percentile) - adult			7500 cm²/h	d_TcEntryAd	
Transfer coefficient for entry into treated crops (75th percentile) - child			2250 cm²/h	d_TcEntryCh	
Transfer coefficient for entry into treated crops (mean) - adult			5980 cm²/h	d_TcEntryAd	
Transfer coefficient for entry into treated crops (mean) - child			1794 cm²/h	d_TcEntryCh	
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)		Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0811075	0,0107000	0,0181475	0,3909721	0,3816175
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0081108	0,0010700	0,0018148	0,0390972	0,0381617
% of RVNAS	10,14%	1,34%	2,27%	48,87%	47,70%
1.2 Adult					
Spray drift		Vapour		Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0882646	0,0138000	0,0389003	1,3032403	1,1290664
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0014711	0,0002300	0,0006483	0,0217207	0,0188178
% of RVNAS	1,84%	0,29%	0,81%	27,15%	23,52%

**Table A 3.6-1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on leaf vegetables**

**Operator exposure for Nordox 75 WG outdoor spray applications**

Operator exposure for herbicide 75 WG outdoor spray applications					
Application rate of active substance	1 kg a.s./ha		i_AppRate		
Assumed area treated	50 ha/day		d_AreaTreated		
Amount of active substance applied	50 kg a.s./day		i_AmountAS		
Dermal absorption of the product	1,00%		i_AbsorpProduct		
Dermal absorption of in-use dilution	9,00%		i_AbsorInuse		
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				
Indoor or Outdoor application	Outdoor				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Season	not relevant				
OutdoorSoluble concentrates, emulsifiable concentrate, etc. Downward sprayingVehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	98691	374323	AOEM	
	Body	55794	224425	AOEM	
	Head	2594	14228	AOEM	
	Protected hands (gloves)	439	9903	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	762	7313	AOEM	
	Protected head (hood and face shield)	42	806	AOEM	
	Inhalation	12	32	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
Head and respiratory PPE	None		1	1	
Water soluble bag	No		1		
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	7416	40226	AOEM	
	Body	4147	21376	AOEM	
	Head	196	591	AOEM	
	Protected hands (gloves)	355	5260	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	114	279	AOEM	
	Inhalation	7	28	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

**1. Total**

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	2,6482927	0,7524947
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,0441382	0,0125416
% of RVNAS	55,17%	15,68%

**Table B 3.6-2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on leaf vegetables (3 x 1.00 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Leaf vegetables and fresh herbs		
Indoor or outdoor	Outdoor		
Application method	Downward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Reaching, picking		
Main body parts in contact with foliage	Hand and body		
Application rate of active substance	1 kg a.s./ha		
Number of applications	3		
Interval between multiple applications	7 days		
Half-life of active substance	30 days		
Multiple application factor	2,6		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	5800 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	2500 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	580 cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	32,2508527	13,9012296	3,2250853
Total systemic exposure per kg body weight (mg/kg bw/day)	0,5375142	0,2316872	0,0537514
% of RVNAS	671,89%	289,61%	67,19%



**Table B 3.6-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on copper using the EFSA-OPEX model, professional use on leaf vegetables (3 x 1.00 kg Cu/ha)**

Resident exposure for Nordox 75 WG					
Croptype	Leaf vegetables and fresh herbs				
Application method	Downward spraying				
Application equipment	Vehicle-mounted				
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				
Buffer strip	5 m				
Application rate of the product	1 kg a.s./ha				
Concentration of active substance (in-use dilution for liquid applications)	3,333333333 g a.s./l				
Dermal absorption of product	1,00%				
Dermal absorption of in-use dilution	9,00%				
Oral absorption	50,00%				
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²				
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa				
Concentration in air	0,001 mg/m³				
Resident dermal spray drift exposure 75th percentile - adult	0,23798 ml spray dilution/person				
Resident dermal spray drift exposure 75th percentile - child	0,2175 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - adult	0,00009 ml spray dilution/person				
Resident inhal. spray drift exposure 75th percentile - child	0,00017 ml spray dilution/person				
Resident dermal spray drift exposure mean - adult	0,12278 ml spray dilution/person				
Resident dermal spray drift exposure mean - child	0,12 ml spray dilution/person				
Resident inhal. spray drift exposure mean - adult	0,00008 ml spray dilution/person				
Resident inhal. spray drift exposure mean - child	0,00014 ml spray dilution/person				
Exposure duration dermal	2 hours				
Exposure duration inhalation	24 hours				
Exposure duration entry into treated crops	0,25 hours				
Light clothing adjustment factor	18,0%				
Breathing rate adult	0,23 m³/day/kg				
Breathing rate child (1-3 year old)	1,07 m³/day/kg				
Drift percentage on surface (75th percentile)	2,30%				
Drift percentage on surface (mean)	1,80%				
Turf transferable residues percentage	5,00%				
Transfer coeff. of surface deposits-adult	7300 cm²/hour				
Transfer coeff. of surface deposits-child (1-3 year old)	2600 cm²/hour				
Saliva extraction percentage	50,00%				
Surface area of hands mouthed	20 cm²				
Frequency of hand to mouth activity	9,5 events/hour				
Ingestion rate for mouthing of grass per day	25 cm²				
Dislodgeable residues percentage transferability for object to mouth	20,00%				
Transfer coefficient for entry into treated crops (75th percentile) - adult	7500 cm²/h				
Transfer coefficient for entry into treated crops (75th percentile) - child	2250 cm²/h				
Transfer coefficient for entry into treated crops (mean) - adult	5980 cm²/h				
Transfer coefficient for entry into treated crops (mean) - child	1794 cm²/h				
1. Total					
1.1 1-3 year old child					
Spray drift (75th percentile)		Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0540717	0,0107000	0,0181475	0,3909721	0,3666242
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0054072	0,0010700	0,0018148	0,0390972	0,0366624
% of RVNAS	6,76%	1,34%	2,27%	48,87%	45,83%
1.2 Adult					
Spray drift		Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,0588431	0,0138000	0,0389003	1,3032403	1,1138312
Total systemic exposure per kg body weight (mg/kg bw/day)	0,0009807	0,0002300	0,0006483	0,0217207	0,0185639
% of RVNAS	1,23%	0,29%	0,81%	27,15%	23,20%

**Table A 3.7-1: Estimation of operator exposure towards copper using the EFSA-OPEX model, use on ornamentals**

**Operator exposure for Nordox 75 WG outdoor spray applications**

Operator exposure for Nordox 75 WG outdoor spray applications					
Application rate of active substance		1 kg a.s./ha		i_AppRate	
Assumed area treated		10 ha/day		d_AreaTreated	
Amount of active substance applied		10 kg a.s./day		i_AmountAS	
Dermal absorption of the product		1,00%		i_AbsorpProduct	
Dermal absorption of in-use dilution		9,00%		i_AbsorInuse	
Formulation type		Soluble concentrates, emulsifiable concentrate, etc.			
Indoor or Outdoor application		Outdoor			
Application method		Upward spraying			
Application equipment		Vehicle-mounted			
Season		not relevant			
OutdoorSoluble concentrates, emulsifiable concentrate, etc. Upward sprayingVehicle-mounted					
Mixing and loading	Exposure values	µg exposure/day mixed and loaded		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	28588	106902	AOEM	
	Body	17999	140606	AOEM	
	Head	519	2846	AOEM	
	Protected hands (gloves)	154	1981	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	183	1463	AOEM	
	Protected head (hood and face shield)	8	161	AOEM	
	Inhalation	7	30	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	Yes		Incl. in AOEM model	
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
Water soluble bag	No		1		
Application	Exposure values	µg exposure/day applied		Reference	Comment
		75 <sup>th</sup> centile	95 <sup>th</sup> centile		
	Hands	19442	62368	AOEM	No data available for a drift reduction scenario
	Body	88117	514162	AOEM	
	Head	11580	71072	AOEM	
	Protected hands (gloves)	352	9194	AOEM	
	Protected body (workwear or protective garment and sturdy footwear)	1150	2247	AOEM	
	Inhalation	234	827	AOEM	
	Protective Equipment	Select for inclusion		Penetration factor	Inhalation Protection factor
	Gloves	No			
	Clothing	Work wear - arms, body and legs covered		Incl. in AOEM model	
	Head and respiratory PPE	None		1	1
	Closed cab	No		vehicle mounted upward spraying only	

**1. Total**

	Without RPE/PPE	With RPE/PPE
Longer term		
Total systemic exposure from mixing, loading and application (mg a.s./day)	11,4353961	3,1458220
Total systemic exposure from mixing, loading and application per kg body weight (mg/kg bw/day)	0,1905899	0,0524304
% of RVNAS	238,24%	65,54%

**Table B 3.7-2: Estimation of worker exposure towards copper using the EFSA-OPEX model, professional use on ornamentals (3 x 1.00 kg Cu/ha)**

Worker exposure from residues on foliage for Nordox 75 WG			
Crop type	Ornamentals		
Indoor or outdoor	Outdoor		
Application method	Upward spraying		
Application equipment	Vehicle-mounted		
Worker's task	Cutting, sorting, bundling, carrying		
Main body parts in contact with foliage	Hand and body		
Application rate of active substance	1 kg a.s./ha		
Number of applications	3		
Interval between multiple applications	7 days		
Half-life of active substance	30 days		
Multiple application factor	2,6		
Dermal absorption of the product	1,00%		
Dermal absorption of the in-use dilution	9,00%		
Dislodgeable foliar residue (i_AppRate*i_DFR)	3 µg a.s./cm²		
Working hours	8 hr		
Dermal transfer coefficient - Total potential exposure	14000 cm²/hr		
Dermal transfer coefficient - arms, body and legs covered	5000 cm²/hr		
Dermal transfer coefficient - hands, arms, body and legs covered	1400 cm²/hr		
Inhalation transfer coefficient for automated applications	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for cutting ornamentals	NA ha/hr*10^(-3)		
Inhalation transfer coefficient for sorting / bundling ornamentals	NA ha/hr*10^(-3)		
1. Total			
	Potential exposure	Work wear - arms, body and legs covered	Working wear and gloves
Total systemic exposure (mg a.s./day)	77,8468858	27,8024592	7,7846886
Total systemic exposure per kg body weight (mg/kg bw/day)	1,2974481	0,4633743	0,1297448
% of RVNAS	1621,81%	579,22%	162,18%

**Table B 3.7-3: Estimation of resident exposure towards copper with the EFSA-OPEX model, use on copper using the EFSA-OPEX model, professional use on ornamentals (3 x 1.00 kg Cu/ha)**

Resident exposure for Nordox 75 WG						
Croptype			Ornamentals			
Application method			Upward spraying			
Application equipment			Vehicle-mounted		i_AppEquip	
Formulation type	Soluble concentrates, emulsifiable concentrate, etc.				i_FormVal	
Buffer strip			5 m		i_Buffer	
Application rate of the product			1 kg a.s./ha		i_AppRate	
Concentration of active substance (in-use dilution for liquid applications)			5 g a.s./l		d_ConcAS	
Dermal absorption of product			1,00%		i_AbsorpProduct	
Dermal absorption of in-use dilution			9,00%		i_AbsorpInuse	
Oral absorption			50,00%		i_AbsorpOrallnuse	
Dislodgeable foliar residue (i_AppRate*i_DFR)			3 µg a.s./cm²		d_DFR	
Vapour pressure of in-use dilution	low volatile substances having a vapour pressure of <5*10-3Pa		Pa		i_Volat	
Concentration in air			0,001 mg/m³		d_AirCon	
Resident dermal spray drift exposure 75th percentile - adult			5,63 ml spray dilution/person			
Resident dermal spray drift exposure 75th percentile - child			1,689 ml spray dilution/person			
Resident inhal. spray drift exposure 75th percentile - adult			0,00210 ml spray dilution/person			
Resident inhal. spray drift exposure 75th percentile - child			0,00164 ml spray dilution/person			
Resident dermal spray drift exposure mean - adult			3,68 ml spray dilution/person			
Resident dermal spray drift exposure mean - child			1,11 ml spray dilution/person			
Resident inhal. spray drift exposure mean - adult			0,00170 ml spray dilution/person			
Resident inhal. spray drift exposure mean - child			0,00133 ml spray dilution/person			
Exposure duration dermal			2 hours		d_ReExpDur	
Exposure duration inhalation			24 hours		d_ReExpDurInhal	
Exposure duration entry into treated crops			0,25 hours		d_ExpDurTreatCrap	
Light clothing adjustment factor			18,0%		d_ClothAF	
Breathing rate adult			0,23 m³/day/kg		d_BreathRAD	
Breathing rate child (1-3 year old)			1,07 m³/day/kg		d_BreathRCh	
Drift percentage on surface (75th percentile)			2,30%			
Drift percentage on surface (mean)			1,80%			
Turf transferable residues percentage			5,00%		d_Turf	
Transfer coeff. of surface deposits-adult			7300 cm²/hour		d_ReTCAd	
Transfer coeff. of surface deposits-child (1-3 year old)			2600 cm²/hour		d_ReTCCh	
Saliva extraction percentage			50,00%		d_SalExt	
Surface area of hands mouthed			20 cm²		d_AreaHM	
Frequency of hand to mouth activity			9,5 events/hour		d_ReFreqHM	
Ingestion rate for mouthing of grass per day			25 cm²		d_MouthGrass	
Dislodgeable residues percentage transferability for object to mouth			20,00%		d_DRP	
Transfer coefficient for entry into treated crops (75th percentile) - adult			7500 cm²/h		d_TcEntryAd	
Transfer coefficient for entry into treated crops (75th percentile) - child			2250 cm²/h		d_TcEntryCh	
Transfer coefficient for entry into treated crops (mean) - adult			5980 cm²/h		d_TcEntryAd	
Transfer coefficient for entry into treated crops (mean) - child			1794 cm²/h		d_TcEntryCh	
1. Total						
1.1 1-3 year old child						
Spray drift (75th percentile)			Vapour (75th percentile)	Surface deposits (75th percentile)	Entry into treated crops (75th percentile)	All pathways (mean)
Total systemic exposure (mg a.s./day)	0,6314584		0,0107000	0,0181475	0,3909721	0,7528797
Total systemic exposure per kg body weight (mg/kg a.s./day)	0,0631458		0,0010700	0,0018148	0,0390972	0,0752880
% of RVNAS	78,93%		1,34%	2,27%	48,87%	94,11%
1.2 Adult						
Spray drift			Vapour	Surface deposits	Entry into treated crops	All pathways (mean)
Total systemic exposure (mg a.s./day)	2,0879700		0,0138000	0,0389003	1,3032403	2,4497806
Total systemic exposure per kg body weight (mg/kg a.s./day)	0,0347995		0,0002300	0,0006483	0,0217207	0,0408297
% of RVNAS	43,50%		0,29%	0,81%	27,15%	51,04%

## **Appendix 5 Detailed evaluation of exposure and/or DFR studies relied upon (KCP 7.2, KCP 7.2.1.1, KCP 7.2.2.1, KCP 7.2.3.1)**

A study was conducted to compare two methods of spraying a 20 % solution of Copper sulphate onto vines (tractor mounted tunnel sprayer or pneumatic nebulizer) at 500 g/ha (xxx, 2013), see RAR Vol 3 (PPP) B.6.4.1/01. The average leaf deposits were between 3.1 and 9.6 µg/cm<sup>2</sup> equating to a DFR of between 0.6 and 1.9 µg/cm<sup>2</sup>/kg a.s. applied.

### **ZRMS:**

Since this study was not available for evaluation by zRMS these values were not used in exposure calculations.