Addendum to Product Assessment Report

Product names:

Mosquito Milk Roll On 30% DEET	NL-0006683-0000
Mosquito Milk Roll On 50% DEET	NL-0006277-0000
Mosquito Milk Spray 50% DEET	NL-0006274-0000

February 2019

Addendum to biocidal product assessment report related to product authorisation under Regulation (EU) 528/2012

Contents

Background

An application for a major change was received concerning the addition of a claim against ticks for Mosquito Milk Roll On 30% DEET (R4BP case no. BC-XF027069-32), Mosquito Milk Roll On 50% DEET (R4BP case no. BC-ME027066-51) and Mosquito Milk Spray 50% DEET (R4BP case no. BC-UQ027072-26). The major change was also applied for in Belgium and Luxembourg (see table below).

Please notice that the original assessment of the products has been conducted by the eCA under the Biocidal Products Directive (BPD) in 2012. At that time, a single product assessment report (PAR) was provided in which the assessment of a range of products was reported. Furthermore, the original assessment is based on guidance that was applicable at that time. Since then, new guidances and EU harmonised agreements have become available for PT19 products.
In accordance with change regulation (EU) 354/2013, the eCA has not amended the original assessment but only performed an assessment of the additional use applied for.

Product name	**Trade name**	**Asset number(s)***	**Member state**
Mosquito Milk Roll On 30% DEET	Insect Repellent KLM Travel Clinic	NL-0006683-0000	Netherlands*
	Moustimug Tropical Roller	BE-0010075-0000	Belgium
	Moustimug tropical Roller	LU-0009967-0000	Luxembourg
Mosquito Milk Roll On 50% DEET	Mosquito Milk Roll On 50% DEET/Jungle Formula Anti Muggenroller Maximum	NL-0006277-0000	Netherlands*
	Moustimug Tropical Maxx Roller	BE-0009025-0000	Belgium
	Moustimug Tropical Maxx Roller	LU-0009831-0000	Luxembourg
Mosquito Milk Spray 50% DEET	Mosquito Milk Roll On 50% DEET/Jungle Formula Anti Muggenroller Maximum	NL-0006274-0000	Netherlands*
	Moustimug tropical maxx spray	BE-0009977-0000	Belgium
	Moustimug Tropical Maxx spray	LU-0009643-0000	Luxembourg

* Reference member state

1.5.2 Information on the intended use(s)

Overall use pattern (manner and area of use):	Topical application on exposed body parts. Area of use: indoors in well ventilated areas and outdoors.
Target organisms:	*Ticks (Ixodes ricinus)*
Category of users:	Non-professional
Directions for use including minimum and maximum application rates, application rates per time unit (e.g. number of treatments per day), typical size of application area:	Apply sparingly on the uncovered parts of the body. Spread equally. Do not apply near eyes, lips and damaged skin. Use ca. 1 ml per 600 cm^2 of skin (corresponds with 1 ml per adult male arm) For use on face, apply to palm of hand before applying. Frequency: 1 time a day.
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no)	No
Proposed Label:	See SPC for each product.
Use Restrictions:	**All Mosquito Milk DEET products:** • Use only outdoors or in a well-ventilated area **Mosquito Milk Roll On 30% DEET:** • Do not use on children < 13 years old **Mosquito Milk Roll On 50% DEET and Mosquito Milk Spray 50% DEET:** • Do not use on children < 18 years old

2.1.4 Authorised use(s)

Mosquito milk roll on 30% DEET :

Overall use pattern (manner and area of use):	Topical application on exposed body parts. Area of use: indoors in well ventilated areas and outdoors.
Target organisms:	*Ixodidae* – ticks – nymphs and adults
Category of users:	General public (non-professional)
Directions for use including minimum and maximum application rates, application rates per time unit (e.g. number of treatments per day), typical size of application area:	This product can be used to repel ticks to protect people from bites. This product is intended for non-professional use only. This product gives 6 hours of protection against ticks. Factors such as temperature, humidity and transpiration may affect the efficacy of the

	product. Apply sparingly and evenly on the skin that needs to be protected. Do not apply on the face. Avoid contact with eyes, mucous membranes and damaged skin. Avoid contact with food, plastics and lacquered surfaces. Use only outdoors or in a well-ventilated area and do not inhale the product. Do not use more than once a day. Not for use on children under 13 years. Wash hands after use
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no)	No
Proposed Label:	See SPC for each product.
Use Restrictions:	• Use only outdoors or in a well-ventilated area • Do not use more than once a day • Do not use on children < 13 years old • Wash hands after use • Apply sparingly, do not apply to the whole body but only to exposed skin areas.

Mosquito milk Roll on 50% DEET:

Overall use pattern (manner and area of use):	Topical application on exposed body parts. Area of use: indoors in well ventilated areas and outdoors.
Target organisms:	*Ixodidae* – ticks – nymphs and adults
Category of users:	General public (non-professional)
Directions for use including minimum and maximum application rates, application rates per time unit (e.g. number of treatments per day), typical size of application area:	This product can be used to repel ticks to protect people from bites. This product is intended for non-professional use only. This product gives 8.5 hours of protection against Ticks. Factors like temperature, humidity and transpiration may affect the efficacy of the product. Roll sparingly and evenly over the skin that needs to be protected. Do not apply on the face. Avoid contact with eyes, mucous membranes and damaged skin.

	Avoid contact with food, plastics and lacquered surfaces. Use only outdoors or in a well-ventilated area. Do not use more than once a day. Do not use on children < 18 years old. Wash hands after use
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no)	No
Proposed Label:	See SPC for each product.
Use Restrictions:	• Use only outdoors or in a well-ventilated area • Do not use more than once a day • Do not use on children < 18 years old • Wash hands after use • Apply sparingly, do not apply to the whole body but only to exposed skin areas.

Mosquito milk Spray 50% DEET :

Overall use pattern (manner and area of use):	Topical application on exposed body parts. Area of use: indoors in well ventilated areas and outdoors.
Target organisms:	*Ixodidae* – ticks – nymphs and adults
Category of users:	General public (non-professional)
Directions for use including minimum and maximum application rates, application rates per time unit (e.g. number of treatments per day), typical size of application area:	This product can only be used to repel mosquitoes and ticks to protect people from bites. This product is intended for non-professional use only. The product provides 8.5 hours protection against Ticks. Factors like temperature, humidity and transpiration may affect the efficacy of the product. Apply sparingly and evenly on the skin that needs to be protected. For use on the face apply the product first on the hand and then use the hand to apply it to the face. Avoid contact with eyes, mucous membranes and damaged skin. Avoid contact with food, plastics and lacquered surfaces. Use only outdoors or in a well-ventilated area and do not inhale the product.

	Do not use more than once a day. Not for use on children < 18 years old. Wash hands after use
Potential for release into the environment (yes/no):	Yes
Potential for contamination of food/feedingstuff (yes/no)	No
Proposed Label:	See SPC for each product.
Use Restrictions:	• Do not breathe spray • Use only outdoors or in a well-ventilated area • Do not use more than once a day • Do not use on children < 18 years old • Wash hands after use • Apply sparingly, do not apply to the whole body but only to exposed skin areas.

2.5 Effectiveness against target organisms

2.5.1 Function

Mosquito Milk DEET products are tick repellents (PT19) formulated as 30% DEET roll on, 50% DEET roll on and 50% DEET spray.

2.5.2 Organisms to be controlled and products, organisms or objects to be Protected

The following Mosquito Milk DEET products:

- Mosquito Milk Spray 50% DEET
- Mosquito Milk Roll On 30% DEET
- Mosquito Milk Roll On 50% DEET

are used to repel ticks (*Ixodidae*) and should be applied to the skin of exposed body parts with the purpose of protecting humans from tick bites.

2.5.3 Effects on target organisms

DEET (*N*,*N*-Diethyl-*m*-toluamide) repels ticks (*Ixodidae*) without time delay. The mechanism of action of the active ingredient is not revealed yet; however, its effectiveness is determined experimentally.

Data requirements

The TNsG on PT18 and PT19* states that for the evaluation of biocides against ticks different types of laboratory and simulated-use tests can be used.

The tests were performed according to the „Technical Notes of Guidance on Product Evaluation“ of the European Commission (2012)*. Briefly, the forearm of a person was treated with repellent, leaving the lowest 5 cm of the arm untreated. The arm was held vertically and a tick was placed on the untreated area below the treated area. Ticks entering the treated skin and walking > 3 cm in direction to the elbow within a defined timeframe were considered “not repelled”. Each test lasted for a specific time period post application with 6-

10 ticks tested per hour and volunteer. The efficacy of the test product was defined as the time in hours post application providing a mean repellency of at least 90 %.

References:

* BPD 98/8/EC: Technical Notes for Guidance: TNsG on Product Evaluation, Insecticides, acaricides and products to control other arthropods (PT 18) and Repellents and attractants (only concerning arthropods) (PT 19). *European Commission, Directorate-General Environment,* CA-Dec12-Doc.6.2.a.-Final

Complete Protection Time (CPT) calculation
Complete Protection Time (CPT) is defined as the period between the application of the product and the time when two ticks within a 30 min test period of a volunteer are not repelled (confirmed crossing).

A mean CPT-value is calculated and this value is given on the label as an average protection time (PT) in whole hours. Values are generally rounded up from 30 minutes upwards and taking the test results into account.

Tabel 2.5.3.0 Summary of the CPT results of the efficacy studies

Experimental data on the efficacy of the biocidal product against target organism(s)							
Function	**Field of use envisaged**	**Test substance**	**Test organism(s)**	**Test method**	**Test system / concentrations applied / exposure time**	**Test results: effects**	**Reference**
Insect repellent	Prevention of tick bites on humans	30 % DEET (roll-on)	*Ixodes ricinus*	U. S. Environmental Protection Agency (EPA) Product Performance Guidelines (OPPTS 810.3700 Insect Repellents for Human Skin and Outdoor Premises) + EPA Scientific Advisory Panel on Product Performance (SAP Minutes No. 2013-02)	Dose: 1.67 mg / cm^2 of skin Volunteers: 10 (5 male / 5 female) Test space: 55.5 m^3 room, height 3.1 m, 23.2ºC, RH 47% Test duration: 6 hours Control: Shortly before test runs the ticks were tested on the control arm of the volunteer. The only ticks further used for the efficacy test were ticks that walked up and crossed the boundary line marking 3 cm in the treated area within 3 minutes.	Time (h) / Repellency (%) 1 / 100 2 / 100 3 / 100 4 / 100 5 / 100 6 / 100	[redacted] Evaluation of the efficacy of Roll On 30 % DEET against the European Sheep Tick Ixodes ricinus on human volunteers. Report no.: JR_IR_0415a_01
Insect repellent	Prevention of tick bites on humans	Mosquito Milk Spray 50 % DEET (Jungle Formula Maximum Original)	*Ixodes ricinus*	U. S. Environmental Protection Agency (EPA) Product Performance Guidelines (OPPTS 810.3700 Insect Repellents for Human Skin and Outdoor Premises) + Technical	Dose: 1.67 µl / cm^2 of skin Volunteers: 10 (5 male / 5 female) Test space: 55.5 m^3 room, height 3.1 m, 23.1ºC, RH 40% Test duration: 8.5 hours Control: Shortly before test runs the ticks were tested on the control arm of the	Time (h) / Repellency (%) 1 / 100 2 / 100 3 / 100 4 / 100 5 / 100 6 / 100 7 / 100 8 / 97 8.5 / 100	[redacted] Evaluation of the efficacy of Mosquito Milk Spray 5O % DEET (Jungle Formula Maximum Original) against the European Sheep Tick *Ixodes ricinus* on human

				Notes of Guidance on Product Evaluation (TNsG) for Product Type 18 and 19 (2012) of the European Commission	volunteer. The only ticks further used for the efficacy test were ticks that walked up and crossed the boundary line marking 3 cm in the treated area within 5 minutes.		volunteers. Report no.: JR_IR_031 6a_8h_02

Studies on *Ixodes ricinus*
Two studies were conducted with DEET against *Ixodes ricinus*.

The efficacy of a 30 % DEET roll-on was evaluated in human trials with 10 volunteers. The tests were performed according to the guidelines of the US Environmental Protection Agency and „Technical Notes of Guidance on Product Evaluation“ of the European Commission (2012). Briefly, the forearm of a person was treated with repellent, leaving the lowest 5 cm of the arm untreated. The arm was held vertically and a tick was placed on the untreated area below the treated area. Ticks entering the treated skin and walking > 3 cm in direction to the elbow within 3 min were considered “not repelled”. Shortly before test runs the ticks were tested on the control arm of the volunteer. The only ticks further used for the efficacy test were ticks that walked up and crossed the boundary line marking 3 cm in the treated area within 3 minutes. Each test lasted for a maximum of 6 hours post application with 10 ticks tested per hour and volunteer. The efficacy of the test product was defined as the time in hours post application providing a mean repellency of at least 90 %. The 30 % DEET showed an efficacy time of 6 h and a repellency of constantly 100% for this period.

The efficacy of Mosquito Milk Spray 50 % DEET (Jungle Formula Maximum Original) was evaluated in human subject trials with 10 volunteers. The tests were performed according to the „Technical Notes of Guidance on Product Evaluation“ of the European Commission (2012). Briefly, the forearm of a person was treated with repellent, leaving the lowest 5 cm of the arm untreated. The arm was held vertically and a tick was placed on the untreated area 3 cm below the treated area. Ticks entering the treated skin and walking > 3 cm in direction to the elbow within 5 min were considered as “not repelled”. Shortly before test runs the ticks were tested on the control arm of the volunteer. The only ticks further used for the efficacy test were ticks that walked up and crossed the boundary line marking 3 cm in the treated area within 5 minutes. The test lasted for a maximum of 8.5 hours post application with 6 ticks tested per hour and volunteer. The efficacy time of the test product was defined according to the TNsG as the time in hours post application providing a mean repellency of at least 90 %. Mosquito Milk Spray 50 % DEET (Jungle Formula Maximum Original) showed an efficacy time of 8.5 h and a repellency between 96.7 % and 100 % throughout this period.

As mentioned above, an efficacy study was conducted to demonstrate the repellency of a DEET 50% spray (Mosquito Milk Spray 50 % DEET) on ticks (*Ixodes ricinus*), demonstrating an efficacy time of at least 8.5 h (see Tabel 2.5.3.0).
As can be seen from the full composition in point 4.1 Confidential Annex to Addendum to PAR, when comparing the composition of the DEET 50% spray (Mosquito Milk Spray 50% DEET) and the DEET 50% roll-on (Mosquito Milk roll on 50 % DEET), the concentration of active ingredient is identical (50% DEET), and in both cases the main solvent is denaturated alcohol, which is added in the two formulations at almost identical concentrations. Also, the perfume is largely identical between both formulations. Overall, the two formulations are 90% identical.

The ingredients which differ between the two formulations are added for their skin conditioning, opacifying and emulsifying properties. They are present in low concentrations, have been safely used in biocides and other topical products over many years, and have no repellent effect.
Based on the similarities between the two formulations, and the comparable mode of application, it can be concluded that the repellent efficacy of 8.5 hours against ticks observed with DEET 50% spray also applies to the DEET 50% roll-on.

For the purpose of clarity, it should be mentioned that the products used in the efficacy studies, Roll On 30 % DEET and Mosquito Milk Spray 50 % DEET (Jungle Formula Maximum Original) correspond in totality with regards to formulation, raw materials, method of manufacture, etc, to Mosquito Milk roll-on 30% DEET and to Mosquito Milk spray 50% DEET, which are the generic names used in the application.

The summarized data on protection times from these tests are included into Table 2.5.3.0.

2.5.3.1 Dose

The dosing for use against ticks is identical as for the already authorised use against mosquitoes. Therefore, the dosing instructions on the product will not change.
The product is to be used as topical application on exposed body parts, applied maximum 1 time a day.
Apply sparingly on the uncovered parts of the body. Spread equally.

2.5.3.2 Mode of action

DEET repels biting and sucking insects without time delay. The mechanism of action of the active ingredients in insect repellents is not revealed yet; however, their effectiveness has been demonstrated experimentally.

2.5.3.3 Limitations

Factors such as ambient temperature, humidity and sweating and may influence efficacy of the product.

2.5.3.4 Resistance

There is no known instance of target insects developing resistance to DEET. It is unlikely that resistance will occur for DEET, since there is only low selection pressure due to the fact that the repelled insects do not die. Therefore, it is considered unnecessary to take actions to prevent development of resistance by target organisms.

2.5.4 Evaluation of the label claim

<u>Mosquito Milk roll-on 30% DEET:</u>

Proposed label claims: This product provides 6 hours of protection against ticks (*Ixodidae*). The 6 h efficacy claim was demonstrated by an efficacy test with this product on *Ixodes ricinus* according to OPPTS 810.3700.

<u>Mosquito Milk roll-on 50% DEET:</u>

Proposed label claims: This product provides 8.5 hours of protection against ticks (*Ixodidae*). To demonstrate the 8.5 h efficacy claim read-across is done to the study with Mosquito Milk spray 50% DEET, a product that has the same amount of active substance and a 90% similar composition. For that product the 8.5 h efficacy claim was demonstrated in an efficacy

test. For a justification on the read-across to the study with Mosquito Milk spray 50% DEET, please refer to section 2.5.3.2.

Mosquito Milk spray 50% DEET:

Proposed label claims: This product provides 8.5 hours of protection against ticks (*Ixodidae*). The 8.5 h efficacy claim was demonstrated by an efficacy test with this product on *Ixodes ricinus* according to OPPTS 810.3700.

2.5.5 General conclusions on efficacy

Considering that:

- simulated-use studies on *Ixodes ricinus* were done according to US Environmental Protection Agency guidelines and „Technical Notes of Guidance on Product Evaluation" of the European Commission (2012) and showed efficacy for the products tested (Mosquito Milk Roll On 30% DEET and Mosquito Milk Spray 50% DEET).
- Mosquito Milk roll on 50% DEET and Mosquito Milk spray 50% DEET are 90% identical in formulation and have comparable mode of application.

It is concluded that the following Mosquito Milk Deet products:

- Mosquito Milk Spray 50% DEET
- Mosquito Milk Roll On 30% DEET
- Mosquito Milk Roll On 50% DEET

are effective in repelling ticks (*Ixodidae*) from human skin for 6 (Mosquito Milk Roll On 30% DEET) and 8.5 (Mosquito Milk Spray 50% DEET and Mosquito Milk roll on 50% DEET) hours respectively, when used according to the instructions on the label, providing the protection times as given in Table 2.5.3.0.

2.6 Human health and environmental risk assessment (background)

Mosquito Milk Spray 50% DEET, Mosquito Milk Roll On 30% DEET, and Mosquito Milk Roll On 50% DEET are authorized for the use to repel mosquitos. For the major change for these products, the addition of a claim against ticks is applied for. As the users would use the product in the same way for its use against ticks and mosquitos, the evaluation for ticks could be considered covered by the human health assessment for mosquitos. However, during authorisation procedures for products to be used for repelling mosquitos and the now applied for major change, many discussions have taken place at the Coordination Group, CA and at Working Groups on how an assessment should be performed, as there was a contradiction in the CAR of DEET which was subsequently included in the PARs for DEET containing products.
As the major change application only concerns the addition for ticks, the assessment for mosquitos will not be changed. However, for ticks a new assessment is included, taking into account the outcome of discussions (Commission Implementing Decision (EU) 2018/1477, CA-80 meeting 27-28 September 2018): the assessment needs to consider the amounts that are supported by the efficacy studies.

2.7 Human health

2.7.1 Assessment

Below in the table a dermal exposure assessment is included, taking into account the efficacious amount supported by the efficacy studies, and includes a value of 55% of uncovered body surface area by wearing typical outdoor clothing, i.e. shorts and T-shirt with short sleeves in line with HEAdhoc recommendation no. 11.

Furthermore, HEAdhoc Recommendation 11 indicates that oral exposure due to hand-to-mouth contact is a realistic route of exposure especially for children and infants. In addition, hand-to-mouth exposure could also happen in adults, as the products are applied to the skin with bare hands. Taking into account the default human factor values agreed in the HEAdhoc Recommendation 14, the surface of the hands is approximately 8 % of the total particular treated body surface (head, hands, arms, legs and feet) for infants, toddler, children and adults. As it is expected that adults will ingest the amount on their fingers only, the factor of 4 % of the treated body surface (head, hands, arms, legs and feet) can be used as a rough estimation (50% surface of the hands). Furthermore, 100% oral absorption is considered.

The calculations are included in the Appendix.

Summary table: systemic exposure from non-professional uses					
Exposure scenario	**Dermal exposure[1] (mg/kg b/d)**	**Oral exposure[2] (mg/kg b/d)**	**Total exposure (mg/kg b/d)**	**AEL (mg/kg bw/d)**	**%AEL**
Mosquito Milk Spray 50% DEET and Mosquito Milk Roll On 50% DEET[3], 1x application/day– no PPE					
Adult	22.14	4.43	26.57	8.2	324
Child (6 to < 11 years)	30.80	12.32	43.13	8.2	526
Child (2 to < 6 years)	34.88	13.95	48.84	8.2	596
Toddler (1 to < 2 years)	38.41	15.36	53.78	8.2	656
Infant (6 to < 12 months)	41.01	16.41	57.42	8.2	700
Mosquito Milk Roll On 30% DEET[3], 1x application/day– no PPE					
Adult	14.15	2.83	16.98	8.2	207
Child (6 to < 11 years)	19.69	7.88	27.57	8.2	336
Child (2 to < 6 years)	22.30	8.92	31.21	8.2	381

Toddler (1 to < 2 years)	24.55	9.82	34.37	8.2	419
Infant (6 to < 12 months)	26.21	10.49	36.70	8.2	448

[1] Dermal exposure is based on the efficacious amount or 1.67 µl/cm2 skin and considering the densitiy of the product, furthermore assuming 55% uncovered body surface area (HEAdhoc recomm 11).
[2] For oral exposure 8 % (children) or 4% (adult) of the total applied product amount with a transfer coefficient of 100 % is used (HEAdhoc recomm 11).
[3] Concentration active substance taken into account for the calculations are the pure active ingredient:

- 48.5% DEET for Mosquito Milk Spray 50% DEET and Mosquito Milk Roll On 50% DEET
- 31% DEET for Mosquito Milk Roll On 30% DEET

Conclusion
No safe use is identified as all exposure calculations based on a single application per day exceed 100% AEL.

2.8 Environment

2.8.1 Exposure assessment

General information

Assessed PT	PT19
Assessed scenarios	Scenario 1: Indoor use of insect repellent on human skin (indirect exposure due to bathing/showering) Scenario 2: Outdoor use of insect repellent on human skin or hair (direct exposure due to swimming)
ESD(s) used	ESD for PT 19: Emission scenarios for repellents and attractants (ECHA, 2015)
Approach	Scenario 1: Average consumption Scenario 2: Average consumption
Distribution in the environment	Calculated based on Guidance on BPR Vol IV Part B+C (2017)
Groundwater simulation	Scenario 1: simulation for leaching to groundwater was performed with PEARL 4.4.4.
Confidential Annexes	No
Life cycle steps assessed	Scenarios 1 and 2: Production: No Formulation No Application: No Service life: No **Removal: yes**
Remarks	The modelling of exposure and risk assessment and the risk characterisation during manufacturing of active substances and biocidal products, including DEET are already addressed in other pieces of legislation as agreed at TM I 06. There is no

	need for particular attention to the emission of DEET containing products into the environment due to recovery and disposal. There is no recovery intended for this type of product and only the packaging material together with remnants of the product and outdated products will be disposed off as municipal waste. Therefore it is considered that the general risk management measures, based on EU waste legislation, should be sufficient.

Emission estimation

Major emissions from the application of insect repellents result from indoor showering, bathing or laundry with emission via the STP to surface water and sediment (waste phase). Direct emission to surface water and sediment can result from outdoor showering or bathing after application of the product on the skin (waste phase).
Emission to fresh water is expected to cover the marine water risk assessment.
For the proposed applications emissions during the application phase and the service life of the products are considered less relevant and these routes are therefore not assessed.

The spray rate for Mosquito Milk Spray 50% DEET, Mosquito Milk Roll On 30% DEET, and Mosquito Milk Roll On 50% DEET is 1 mL product/600 cm^2 skin.

Scenario 1 - Indoor use of insect repellent on human skin (indirect environmental exposure due to bathing/showering)

Input parameters for calculating the local emission			
Input	**Value**	**Unit**	**Remarks**
Scenario: Indoor use of insect repellent on human skin (indirect exposure due to bathing/showering)			
Number of inhabitants feeding one sewage treatment plant (Nlocal)	10 000	[cap]	ESD PT19
Concentration of active substance in the product ($Cform_{weight}$)	300 or 500	[g/kg]	Technical concentration instead of pure active ingredient concentration (worst-case) for Mosquito Milk Roll On 30% DEET, Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET
Consumption of product per application ($Qform_{appl}$)	1.67	[µL/cm^2]	1 mL product/600 cm^2 skin
Number of applications per day (N_{appl})	1	[d^{-1}]	-

Treated area of human skin $AREA_{skin}$	9130	[cm^2]	The treated area considered for the calculations is in accordance with the human health assessment (uncovered body surface area according to HEAdhoc recomm. 11).
Fraction released to air (F_{air})	0	[-]	ESD PT19
Fraction dermally absorbed (F_{skin})	0	[-]	Worst-case approach, assuming none of the product applied is absorbed by the skin
Fraction released to wastewater (F_{water})	1	[-]	Fraction released to wastewater = 1 - (F_{air} + F_{skin}) = 1
Fraction of inhabitants using a repellent product (F_{inh})	0.2	[-]	ESD PT19 Human skin application
Market share of repellent (F_{penetr})	0.5	[-]	Default ESD PT19
Specific density of the product (RHO_{form})	900	[kg/m^3]	-

Calculations for Scenario 1 - Indoor use (indirect exposure due to bathing/showering)

Resulting local emission to relevant environmental compartments		
Compartment	**Local emission ($Elocal_{compartment}$) [kg/d]**	**Remarks**
Wastewater ($Elocal_{water}$)	4.13	Mosquito Milk Roll On 30% DEET
	6.88	Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET

Scenario 2 - Outdoor use of insect repellent on human skin (direct exposure due to swimming)

Input parameters for calculating the local emission (Emission scenario for calculating the release of repellents used on human skin due to swimming activities in surface water bodies)			
Input	**Value**	**Unit**	**Remarks**
Scenario: Outdoor use of insect repellent on human skin (direct exposure due to swimming)			
Daily number of swimmers ($N_{swimmer}$)	1500	[-]	ESD PT19
Fraction of swimmers using the repellent product (F_{swim})	0.1	[-]	Worst-case approach
Number of applications per day (N_{appl})	1	[d^{-1}]	ESD PT19
Fraction released to surface water body ($F_{waterbody}$)	1	[-]	ESD PT19
Active substance in the product ($Cform_{weight}$)	300 or 500	[g/kg]	Technical concentration instead of pure active ingredient concentration (worst-case) for Mosquito Milk Roll On 30% DEET, Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET
Consumption of product per application ($Qform_{appl}$)	1.67	[µL/cm²]	-
Treated area of human skin ($AREA_{skin}$)	9130	[cm²]	The treated area considered for the calculations is in accordance with the human health assessment (uncovered body surface area according to HEAdhoc recomm. 11).
Specific density of the product (RHO_{form})	900	[kg/m³]	-

Calculations for Scenario 2 - Outdoor use of insect repellent on human skin (direct exposure due to swimming)

Resulting local emission to relevant environmental compartments		
Compartment	**Local emission ($Elocal_{compartment}$) [kg/d]**	**Remarks**
Surface water ($Elocal_{water}$)	0.62	Mosquito Milk Roll On 30% DEET
	1.03	Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET

Input parameters for calculation of surface water concentrations following swimming of humans having used an insect repellent on their skin			
Input	**Value**	**Unit**	**Remarks**
Scenario: Outdoor use of insect repellent on human skin or hair (direct exposure due to swimming)			
Local emission rate to surface water body ($Elocal_{water}$)	0.09	[$kg.d^{-1}$]	-
Volume of water body ($V_{waterbody}$)	435,000	[-]	ESD PT19
Number of emission days ($T_{emission, 1d}$)	1	[d]	ESD PT19
Number of emission days ($T_{emission, 91d}$)	91	[d]	ESD PT19
Number of emission events ($N_{emission, 91d}$)	91	[-]	ESD PT19
First order rate constant for biodegradation in surface water ($Kdeg_{water}$)	0.047	[d^{-1}]	-

Calculation

Mosquito Milk Roll On 30% DEET

Local concentration in water body after one day ($Clocal_{water, 1d}$) = 0.0012 [mg/L]

Local concentration in water body over 91 days ($Clocal_{water, 91d}$) = 0.132 [mg/L]

Refined local concentration in water body over 91 days (including degradation) ($Clocal_{water, 91d\text{-}ref}$) = 0.3 [mg/L]

Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET

Local concentration in water body after one day ($Clocal_{water, 1d}$) = 0.002 [mg/L]

Local concentration in water body over 91 days ($Clocal_{water, 91d}$) = 0.22 [mg/L]

Refined local concentration in water body over 91 days (including degradation) ($Clocal_{water, 91d\text{-}ref}$) = 0.05 [mg/L]

Fate and distribution in exposed environmental compartments

No additional data are available. The data and considerations included in the CAR for the active substance apply to the products in the Omega Pharma DEET Family.

Identification of relevant receiving compartments based on the exposure pathway									
	Fresh-water	Freshwater sediment	Sea-water	Seawater sediment	STP	Air	Soil	Ground-water	Other
Scenario 1	Yes*	Yes*	Yes	Yes	Yes	Yes$	Yes#	Yes#	No
Scenario 2	Yes	Yes	Yes	Yes	No	Yes$	Not relevant	Not relevant	No

* indirect emission via STP
# indirect emission via sludge. Not relevant for all MS.
$ evaluated qualitatively

Scenario 1 (showering/bathing) includes emission via the STP to the aquatic and soil compartment. Scenario 2 (swimming) includes direct emission to the aquatic compartment. For scenario 2 direct emission to the soil and groundwater is not considered relevant.
No risk assessment was made for marine water. Although emission to seawater results in PECs that are a factor of ten times lower (default dilution factor according to the guidance), the PNEC is ten times lower as well as no data is available for marine organisms. Consequently, the risk ratios for fresh water and marine water are identical. The marine compartment is therefore sufficiently covered by the risk assessment for fresh water.

Values for DEET are given in the table below.

Input parameters (only set values) for calculating the fate and distribution in the environment			
Input	Value	Unit	Remarks
Molecular weight	191.27	g/mol	-
Melting point	<-20	°C	-
Boiling point	284.2	°C	-
Vapour pressure (at XC)	0.11	Pa	At 20°C
Water solubility (at X°C)	11.2	g/L	At 25°C
Log Octanol/water partition coefficient	2.4	Log 10	At pH 6 and 22°C
Organic carbon/water partition coefficient (Koc)	43.3	L/kg	-
Henry's Law Constant (at X C)	3.93×10^{-3}	$Pa/m^3/mol$	Temperature not indicated
Biodegradability			
Readily biodegradable	yes	-	-
DT_{50} for hydrolysis in surface water	≥ 1	year	pH 4, 7 and 9
DT_{50} for degradation in soil	30	d (at 12ºC)	Default for readily biodegradable substances

DT_{50} for degradation in air	0.63	d	For OH radical reaction, 24hrs day derived by the Atkinson method of calculation.
Simpletreat version	4.0	-	Adjusted effluent suspended solids concentration of 30 mg dwt / L in line with TAB 2.0 ENV

Calculated fate and distribution in the STP			
Compartment	Percentage [%]		Remarks
	Scenario 1	Scenario 2	
Air	Not relevant	Not relevant	-
Water	12.6	Not relevant	-
Sludge	0.4	Not relevant	-
Degraded in STP	87.0	Not relevant	-

Calculated PEC values

Scenario 1 - Indoor use of insect repellent on human skin (indirect exposure due to bathing/showering)

The calculated PECs are summarized in the table below.

	STP	**fresh water**	**sediment**	**Soil**	**Porewater**
Product	**PEC (mg/L)**	**PEC (mg/L)**	**PEC (mg/kg wwt)**	**PEC (mg/kg wwt)**	**PEC (µg/L)**
Mosquito Milk Roll On 30% DEET	1.65E-01	1.65E-02	2.84E-02	3.00E-02	**24.01**
Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET	2.74E-01	2.74E-02	4.73E-02	4.99E-02	**40.00**

The calculated PECs for porewater were addressed further in the risk characterisation chapter, as the limit for groundwater of 0.1 µg/L is exceeded.

Scenario 2 - Outdoor use of insect repellent on human skin (direct exposure due to swimming)

The worst case PEC value for the risk assessment for the aquatic compartment corresponds to the $C_{localwater, 91d}$ value (no degradation). The calculated PECs are summarized in the table below.

	fresh water	sediment
Product	**PEC (mg/L)**	**PEC (mg/kg wwt)**
Mosquito Milk Roll On 30% DEET	0.13	0.23
Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET	0.22	0.38

Primary and secondary poisoning

As the log K_{ow} is < 3 (2.4), a risk for bioconcentration and biomagnification is not expected (conform the biomagnification trigger value proposed for K_{ow} in the Guidance vol IV part B+C (2017). As DEET is not bioaccumulative and the concentrations in surface water are low, the risk for the primary and secondary poisoning is considered acceptable.

Risk characterisation

Atmosphere

The active substance DEET is moderately volatile. The vapour pressure is 0.11 Pa at 20°C. A Henry's law constant of $3.93x10^{-3}$ Pa m^3 mol^{-1} is reported, confirming its relatively low volatility.

AOPWIN model calculation estimates that DEET in the atmosphere reacts with photochemically produced hydroxyl radicals in air, with a half-life of 0.634 days (24 hr day; $0.5x10^6$ OH/cm^3). This calculated half life is below the trigger of < 2 days that is used as cut-off value to identify chemicals that could be of potential concern for with the potential for long-range transport through the atmosphere. As the substance unlikely shows significant long-range transport, it is considered of no concern for ozone depletion.

Criteria for the examination of environmental risks to air are not specified in the form of a numerical standard. Therefore, effects on air quality only are taken into account when adverse effects are foreseen. The assessment of potential impacts on air quality, yet, is aimed to minimize the risk for stratospheric ozone depletion. There are no indications that this substance contributes to depletion of the ozone layer and the compounds are furthermore not listed as 'controlled substance' listed in Annex I of Regulation (EC) No 1005/2009 of the European Parliament, the environmental risk to air is considered acceptable.

Aquatic compartment

The PNEC values for the water compartment and STP microorganisms were calculated from toxicity data by using recommended assessment factors. The PNEC for STP microorganisms is 10 mg/L which is based on and EC_{50} > 1000 mg/L and an assessment factor of 100. Because only three acute aquatic tests were performed, all on freshwater species, the assessment factor for the freshwater compartment was 1000. For the sediment compartment, there are no toxicity data available. The low Koc value indicates that sorption to sediment is not likely. Nevertheless, a PNEC value of 0.0741 mg/kg ww for sediment has been calculated based on the equilibrium partitioning theory and PNECwater of 0.043 mg/L. As both the PEC and PNEC for sediment are based on equilibrium partioning with the PEC

and PNEC for surface water, the risk assessment for the aquatic environment covers the surface water and sediment compartments.

Scenario 1 - Indoor use of insect repellent on human skin (indirect exposure due to bathing/showering)

	STP		Aquatic compartment	
Product	**PEC (mg/L)**	**PEC/PNEC**	**PEC (mg/L)**	**PEC/PNEC**
Mosquito Milk Roll On 30% DEET	1.65E-01	0.016	1.65E-02	0.383
Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET	2.74E-01	0.027	2.74E-01	0.638

Conclusion: The risk quotients calculated for the aquatic compartment below 1 for the considered indoor scenario (indirect emission) and considered to be acceptable.

Scenario 2 - Outdoor use of insect repellent on human skin (direct exposure due to swimming)

	Aquatic compartment	
Product	**PEC (mg/L)**	**PEC/PNEC**
Mosquito Milk Roll On 30% DEET	0.13	**3.02**
Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET	0.22	**5.12**

Conclusion: The risk quotient calculated for the aquatic compartment is above 1 for the considered outdoor scenario (direct emission). Unacceptable risks for the aquatic compartment are expected.

Terrestrial compartment

For the soil compartment there are no toxicity data available. The low Koc indicates that sorption to soil is not likely. Nevertheless, a PNEC value of 0.0379 mg/kg ww for soil has been calculated based on the equilibrium partitioning theory and PNECwater of 0.043 mg/L.

	Soil		Porewater
Product	**PEC (mg/kg wwt)**	**PEC/PNEC**	**PEC (µg/L)**
Mosquito Milk Roll On 30% DEET	3.00E-02	0.79	**24.01**
Mosquito Milk Roll On 50% DEET, Mosquito Milk Spray 50% DEET	4.99E-02	**1.32**	**40.00**

For the 30% Mosquito Milk Roll On, no soil risks are expected. The PEC/PNEC exceeds 1 for the 50% DEET products.
The porewater PEC in agricultural soil is higher than 1 µg/L. This result was further addressed by calculating PECgw at 1 m soil depth for nine FOCUS groundwater scenarios in FOCUS PEARL v. 4.4.4 model, assuming that sludge from STP is applied to agricultural soil. PECgw for the nine FOCUS groundwater scenarios, as developed for plant protection products, were calculated. The model used, input data and assumptions are shown the table

below. The overall assumption being that the only exposure route to groundwater is via the application of sludge from STPs.

Summary of data used and assumptions made to calculate PECgroundwater for DEET in FOCUS scenarios.

Parameter	Value
Model used:	FOCUS PEARL ver. 4.4.4.
Years of simulation:	26 (including 6 yrs "warming-up" period)
Crop	maize
Application rate:	0.102 and 0.170 kg/ha[a]
Application method:	To the soil surface[e]
Date of application:	1 October annually for 20 years[b]
Molar mass:	191.3 g/mol
Molar activation energy	54 kJ/mol
Vapour pressure:	0.23 Pa (25°C)
Water solubility:	11200 mg/L (25°C)
Kom:	25.1 L/kg[c]
Freundlich exponent 1/n:	1
DT_{50} soil	30 days (12°C)[d]
Coefficient for uptake in plants:	0 (worst-case assumption)

a Calculated from SimpleTreat output concentration of DEET in dry sewage sludge of 20.4-34.0 mg/kg, and application of 5000 kg dry sludge/ha/year to agricultural land (at a single event as suggested in Guidance vol IV part B+C (2017).
b Autumn application assumed to represent a worst-case situation with regards to rainfall.
c Calculated from Koc as 43.3/1.724.
d In accordance with the Guidance vol IV part B+C (2017), for ready biodegradable substances.
e EU discussion documents suggest to use incorporation at 20 cm. Since the conclusions from a scenario with soil surface application already result in risks, the worst-case incorporation scenario is not used by eCA.

The resulting PECgw (as FOCUS standard output; 80th percentile annual average PECgw at 1 m depth) show that the predicted groundwater concentrations of DEET following the intended use of this substance are > 0.1 µg/L for all FOCUS scenarios for the Mosquito Milk DEET products containing 300 and 500 g/kg (technical concentration) DEET, except for the FOCUS scenario Chateadun for the Mosquito Milk DEET products containing 300 g/kg (technical concentration) DEET.

80th precentile annual average PEC of DEET in groundwater (at 1 m depth) calculated for nine FOCUS scenarios, assuming application of sewage sludge from STP to land.

	PECgw, µg/L	PECgw, µg/L
Scenario	**300 g/kg a.s. in product**	**500 g/kg a.s. in product**
Chateaudun	0.097	**0.16**
Hamburg	**0.53**	**0.88**
Jokioinen	**0.22**	**0.37**
Kremsmuenster	**0.24**	**0.40**
Okehampton	**0.63**	**1.05**
Piacenza	**0.81**	**1.35**
Porto	**0.60**	**1.01**
Sevilla	**0.15**	**0.24**
Thiva	**0.11**	**0.18**

The predicted groundwater concentrations of DEET following the intended use of this substance are > 0.1 µg/L for all FOCUS scenarios for the Mosquito Milk DEET products

containing 300 and 500 g/kg (technical concentration) DEET, except for the FOCUS scenario Chateadun for the Mosquito Milk DEET products containing 300 g/kg (technical concentration) DEET.

As agreed at the Technical Meeting I in 2009, the Netherlands submitted available groundwater monitoring data on DEET to the RMS. In addition to a report[1] (in Dutch) presenting the results from screening the presence of 149 pesticides and some biocides in groundwater at 189 locations in the Netherlands in 2007, the results on DEET were also presented in an Excel file. Hence, details with regard to DEET from this monitoring program appear not to be available in the open literature. The monitoring data were collected by two provinces and two drinking water companies from the Southern part of the Netherlands. The majority of the samples were taken during July-December. DEET was the substance that was found above the detection limit (0.01 µg/L) at the highest number of occasions (30%). In 189 samples from 189 groundwater monitoring points 57 samples had a concentration >0.01 ug/L, and out of these three samples (1.6%) were above the drinking water limit, i.e. > 0.1 ug/L (range was 0.36-1.48 µg/L). The report also referred to monitoring data from 2003 during which DEET was found above the detection limit in 5% of the samples, and in no sample concentrations >0.1 µg/L were measured.

In the Netherlands, surplus sludge of public STPs is not applied for fertilization and soil improvement of agricultural soil. Therefore, leaching to groundwater is not expected and thus monitoring data for groundwater are not required for the Dutch authorisation of the Mosquito Milk DEET products.

Conclusion: Unacceptable risks for the terrestrial compartment, including groundwater, are expected.

For other member states, the conclusion of the potential soil and groundwater risk depends on whether public STP sludge is used for agricultural soils.

Primary and secondary poisoning
Primary poisoning of birds and mammals due to intake of the product is not expected to be relevant. Considering the low acute toxicity of DEET to birds (LD50 1375 mg/kg bw) and the type of use intake by birds and mammals of the active substance via water and soil is considered as negligible.
Although PEC/PNEC ratios could not be calculated, it can be concluded that no risk for secondary poisoning has been identified based on the low BCF value.

Mixture toxicity
Not relevant, since the product does not contain other components other than the active substance that could give a risk to the environment.

Aggregated exposure (combined for relevant emmission sources)
Based on the decision scheme included in section 4.7 in Guidance on the BPR: Volume IV Environment, Assessment & Evaluation Parts B+C (2017) an aggredated exposure assessment is not deemed necessary.

Overall conclusion on the risk assessment for the environment of the product
No safe use is identified as unacceptable risks for the aquatic and terrestrial compartment were found. These risks cannot be reduced to acceptable levels by risk mitigations.

[1] [redacted] (2008) Brede screening Bestrijdingsmiddelen Maasstroomgebied 2007. Royal Haskoning, pp 71.

3. Decision

Mosquito Milk roll on 30% DEET, Mosquito Milk roll on 50% DEET and Mosquito Milk spray 50% DEET have been evaluated as insect repellents with the purpose of protecting humans from tick bites.
Sufficient information has been provided to demonstrate efficacy of Mosquito Milk Spray 50% DEET, Mosquito Milk Roll On 30% DEET, Mosquito Milk Roll On 50% DEET according to the "Technical Notes of Guidance on Product Evaluation" of the European Commission (2012).

Considering the intended uses on human skin of these products, the human health risk and environmental risk are unacceptable with one application per day.

Given the necessity to repel ticks in the Netherlands to prevent Lyme disease, NL CA considers that the authorisation of all three products can be extended for application on humans, based on article 19(5), with appropriate risk mitigation measures that limit human exposure. The additional RMMs considered applicable in the Netherlands are listed below and in the SPCs.

- Wash hands after use
- Apply sparingly, do not apply to the whole body but only to exposed skin areas.

In addition, the following post-authorisation condition must apply:
Within two years of the publication by the European Chemicals Agency of Union guidance on how to generate efficacy data for insect repellents at the recommended application rates, the authorisation holder shall submit data to confirm the minimum effective application rate. Those data shall be submitted in the form of an application for a change of the authorisation in accordance with Commission Implementing Regulation (EU) No 354/2013.

Appendix

Mosquito Milk Spray 50% DEET and Mosquito Milk Roll On 50% DEET

general product information							
amount of product based on efficacy study	ml/cm2	0,00167	WHO guidline efficacy testing of mosquito repellants for human skin, 1 ml product on 600 cm2 skin				
density of product	mg/ml	[redacted]	T0 storage stability test				
concentration active substance in product	%						
Systemic AEL			mg/kg bw/d				
		Adult	Children (6 to < 11 years)	Children (2 to < 6 years)	Toddler (1 to < 2 years)	Infant (6 to < 12 months)	
dermal exposure							
total body surface	cm2	16600	9200	6800	4800	4100	HEAdhoc recom 14
55% of total body surface	%	9130	5060	3740	2640	2255	
amount of product on body	ml	15,22	8,43	6,23	4,40	3,76	
density of the product	mg/ml	900	900	900	900	900	
amount of product on body	mg	13695	7590	5610	3960	3382,5	
amount of active substance	mg	6642,08	3681,15	2720,85	1920,60	1640,51	
dermal absorption	%	[redacted]	20	20	20	20	
body weight	kg	60	23,9	15,6	10	8	HEAdhoc recom 14
systemic dermal exposure	mg/kg bw/d	22,14	30,80	34,88	38,41	41,01	
% AEL		270	376	425	468	500	
amount of biocidal product per application	mg	547,8	607,2	448,8	316,8	270,6	8 % (children) or 4% (adult) of the total applied product amount with a transfer coefficient of 100 %
amount of active substance per application	mg	265,7	294,5	217,7	153,6	131,2	
oral absorption	%	100,0	100,0	100,0	100,0	100,0	
systemic oral exposure	mg/kg bw/d	4,43	12,32	13,95	15,36	16,41	
%AEL		54	150	170	187	200	
systemic dermal and oral exposure	mg/kg bw/d	26,57	43,13	48,84	53,78	57,42	
%AEL		324	526	596	656	700	

Mosquito Milk Roll On 30% DEET

general product information							
amount of product based on efficacy study	ml/cm2	0,00167	WHO guidline efficacy testing of mosquito repellants for human skin, 1 ml product on 600 cm2 skin				
density of product	mg/ml	[redacted]	T0 storage stability test				
concentration active substance in product	%						
Systemic AEL			mg/kg bw/d				
		Adult	Children (6 to < 11 years)	Children (2 to < 6 years)	Toddler (1 to < 2 years)	Infant (6 to < 12 months)	
dermal exposure							
total body surface	cm2	16600	9200	6800	4800	4100	HEAdhoc recom 14
55% of total body surface	%	9130	5060	3740	2640	2255	
amount of product on body	ml	15,22	8,43	6,23	4,40	3,76	
density of the product	mg/ml	900	900	900	900	900	
amount of product on body	mg	13695	7590	5610	3960	3382,5	
amount of active substance	mg	4245,45	2352,90	1739,10	1227,60	1048,58	
dermal absorption	%	[redacted]	20	20	20	20	
body weight	kg	60	23,9	15,6	10	8	HEAdhoc recom 14
systemic dermal exposure	mg/kg bw/d	14,15	19,69	22,30	24,55	26,21	
% AEL		173	240	272	299	320	
amount of biocidal product per application	mg	547,8	607,2	448,8	316,8	270,6	8 % (children) or 4% (adult) of the total applied product amount with a transfer coefficient of 100 %
amount of active substance per application	mg	169,8	188,2	139,1	98,2	83,9	
oral absorption	%	100,0	100,0	100,0	100,0	100,0	
systemic oral exposure	mg/kg bw/d	2,83	7,88	8,92	9,82	10,49	
%AEL		35	96	109	120	128	
systemic dermal and oral exposure	mg/kg bw/d	16,98	27,57	31,21	34,37	36,70	
%AEL		207	336	381	419	448	