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January 23, 2006
File: 162704239

Michael Rochon
Cogent Environmental Solutions Ltd
18 Massari Street
Caledon ON L0N 1C0

Via e-mail: cogentenvironmental@rogers.com

Dear Mike:

Reference: A Comparison of the Acute Aquatic Ecotoxicity of Surfactants used in Cleaning Products with Natural Ingredients

In 1998 in Europe, the use of surfactants in household detergents totalled 1,448,000 tons/year, plus an additional 248,000 tonnes of surfactants were used in industrial and institutional products (Danish Environmental Protection Agency, 2001). The commonly used surfactants are generally toxic to aquatic life. A reduction in the discharge of surfactants to aquatic systems would have a beneficial impact on aquatic systems.

The acute aquatic ecotoxicity of selected anionic, non-ionic and cationic surfactants commonly used in cleaning products has been compared to the acute toxicity of a few naturally occurring compounds. This comparison was undertaken to verify that if naturally occurring compounds (e.g., lactic acid, sodium chloride, carbonates, etc.) were used in new surfactants, these would have a reduced environmental impact.

Based on the EC50s and LC50s from short-term fish, crustaceans, and/or algae toxicity tests presented in Table 1 and the acute ecotoxicity classification categories provided in Table 2, the naturally occurring compounds are much less toxic to aquatic organisms than the commonly used surfactants. A comparison of the average Acute Toxicity Factors (Table 1) for the surfactants (0.0017) with the average of the Acute Toxicity Factors[1] for natural ingredients

[1] Acute Toxicity Factor = The calculated median value within each trophic level (e.g., fish, crustaceans, or algae) using validated test results for acute toxicity. If several test results are available for one species within a trophic level, a median for the species is calculated first and these median values are used when calculating the median value for the trophic level. The Acute Toxicity Factor is the lowest median of the trophic levels.

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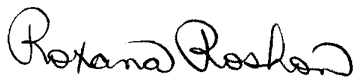
(0.55) indicates that the natural ingredients are ~325 times less toxic. Based on an assessment of their relative toxicity, substitution of naturally occurring compounds for commonly used surfactants will most likely result a more "environmentally friendly" option. The use of cleaning products without surfactants is likely to ensure a substantial reduction in aquatic toxicity.

Please call, if you have any questions about this comparison.

Sincerely,



Roxana Roshon, Ph.D.
Study Director, Ecotoxicologist
Tel: 519-763-4412, ext. 309
Fax: 519-763-4419

rroshon@stantec.com

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Table 1: A Comparison of Acute Aquatic Ecotoxicity of Selected Surfactants and Naturally Occurring Compounds used in Cleaning Products

Class of Compound	Ingredient Name	LC50[a] or EC50[b] (mg/L)	Toxicity Classification	Acute Toxicity Factor[e]	Acute Toxicity Factor Average
Anionic Surfactants	Linear Alkyl Benzene Sulphonates (11,5 – 11,8)	4.1	Moderately Toxic[c] Toxic to Aquatic Life[d]	0.0041	0.0017
	Linear Alkyl Benzene Sulphonates (C10 – C13 alkyl) Triethanolamine Salt	4.2	Moderately Toxic[c] Toxic to Aquatic Life[d]	0.0042	
Non-ionic Surfactants	C 12 – C15 (mean value C<14) A, > 6 – 9 EO	0.63	Highly Toxic[c] Very Toxic to Aquatic Life[d]	0.00063	
	C 12 – C15 (mean value C>14) A, > 6 – 9 EO	0.4	Highly Toxic[c] Very Toxic to Aquatic Life[d]	0.0004	
	C10 – C 16 A 0 - 3 PO 6 - 7 EO	3.2	Moderately Toxic[c] Toxic to Aquatic Life[d]	0.00064	
Cationic Surfactants	Alkyl Trimethyl Ammonium Salts	0.1	Highly Toxic[c] Very Toxic to Aquatic Life[d]	0.0001	
Other Ingredients	Citrate and Citric Acid	825	Practically Nontoxic[c]	0.825	0.55
	Carbonates	250	Practically Nontoxic[c]	0.25	
	Calcium and Sodium Chloride	1000	Practically Nontoxic[c]	1	
	Lactic Acid	130	Practically Nontoxic[c]	0.13	

[a] LC50 = Lethal concentration at the 50% level. Values obtained from Norwegian Foundation for Environmental Product Labelling (2004a, 2004b, 2004c).
[b] EC50 = Effect concentration at the 50% level. Values obtained from Norwegian Foundation for Environmental Product Labelling (2004a, 2004b, 2004c).
[c] US Fish and Wildlife Services (1984) (See Table 2)
[d] OECD (2001); Pratt (2002) (See Table 2)
[e] Acute Toxicity Factor = The calculated median value within each trophic level (e.g., fish, crustaceans, or algae) using validated test results for acute toxicity. If several test results are available for one species within a trophic level, a median for the species is calculated first and these median values are used when calculating the median value for the trophic level. The Acute Toxicity Factor is the lowest median of the trophic levels. Values obtained from Norwegian Foundation for Environmental Product Labelling (2004a, 2004b, 2004c).

Table 2. Ecotoxicity Hazard Classification Categories

LC50 or EC50 Concentration Range (mg/L)	Hazard Categories (US Fish and Wildlife Services, 1984)	Hazard Classes (OECD, 2001; Pratt, 2002)
< 0.01	Super Toxic	Acute Toxicity I (very toxic to aquatic life)
0.01 to 0.1	Extremely Toxic	
0.1 to 1	Highly Toxic	
1 to 10	Moderately Toxic	Acute Toxicity II (toxic to aquatic life)
10 to 100	Slightly Toxic	Acute Toxicity III (harmful to aquatic life)
100 to 1000	Practically Nontoxic	–
> 1000	Relatively Harmless	–

References

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