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Our ref.
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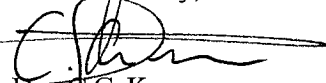
Subject
Environmental report on Bioversal HC

Your letter

Dear Mr. Beenen,

Upon your request of 22 November 1999, we herewith send you our environmental evaluation of your product Bioversal HC, focusing on the aspects that are relevant for the Harmonised Offshore Chemical Notification Format (HOCNF), being part of PARCOM Decision 96/3.

Yours sincerely,



Drs. C.C. Karman
Research Manager Ecological Risk Studies

Environmental evaluation of Bioversal HC

Introduction

Bioversal HC is a preparation that is used in case of accidental oil spills. Its' main function is cleaning and elimination of oil as it reacts as a surfactant and degradation agent. The product is anticipated to be applied at sites where oil is spilled; at sea, rivers, shores and beaches.

According to the product information supplied, the product is an aqueous combination of anionic and non-ionic detergents, polyvalent compounds and organic heterocyclic substances. It is completely miscible in water. The preparation is free of phosphate, nitrate, CHC's, FCHC's, APEO, NTA, EDTA and DTPA and based on highly degradable vegetable compounds. The pH-value of the product is ca. 7.5.

The exact composition of the product is confidential and will therefore not be provided in this environmental report. In case the exact product composition is required for regulatory purposes, the competent authorities should request this composition at Bioversal directly, referring to their confidential treatment of commercial information.

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Environmental fate

After discharge of the product into the environment the preparation will interact with the oil present. It will split up and capsule the oil layer into minuscule, isolated fragments. This isolation is expected to provide better conditions for biological degradation by increasing the surface-area available for decomposition. The micells have a good floating capacity, so the preparation is not expected to enter the water column or deposit on the sediment if applied in the advised dosage (see HOCNF §1.3 Use). In case of an overdosage of the product, it is likely that it will dissolve in the water phase where it will easily be biodegraded (see HOCNF §2.2).

The preparation stimulates biodegradation by use of a so-called bio-activator, and contains no nutrients so that nitrification as a consequence of the use of this product does not occur. The product will be degraded for over 99% within a period of 7 days to H₂O and CO₂ (OECD/DIN 38 409 section 23-1). The degradation process has a low oxygen demand (COD 133 g O₂/l = 100%, BOD₅ 88 g O₂/l = 66%). Although this is a freshwater biodegradation test, its results will be accepted in the HOCNF since no marine biodegradation tests have been formally been adopted by OSPAR.

Experimental data for accumulation processes such as sediment adsorption and bioconcentration are not available. Although usually these parameters can be estimated using the octanol-water partitioning coefficient (P_{ow}) of the product, this is not possible for Bioversal HC since it has surface active properties. However, due to its high biodegradation potential, it is not likely that the product will accumulate in either the sediment or biota.

Bioconcentration

As mentioned above, the rapid biodegradation of the product indicate that it is not likely that Bioversal HC will be available in the water column long enough for accumulation in biota. The process of bioconcentration of surfactants itself is thoroughly studied. These studies indicate that for surfactants, in addition to hydrophobicity, environmental factors (ionic strength, water hardness, dissolved organic carbon) influence the bioconcentration behaviour (Tolls & Sijm, 1995). In a critical review of Tolls *et al.* (1994) concerning the bioconcentration of surfactants, the authors concluded that it was demonstrated that biotransformation of non-ionic and anionic surfactants (which also form the basis of Bioversal HC) leads to rapid elimination from the organisms tissue. This was confirmed in a recent study on the bioconcentration of surfactants, which highlighted the importance of biotransformation as a process contributing to the reduction of the bioconcentration potential of these compounds (Tolls & Sijm, 1999).

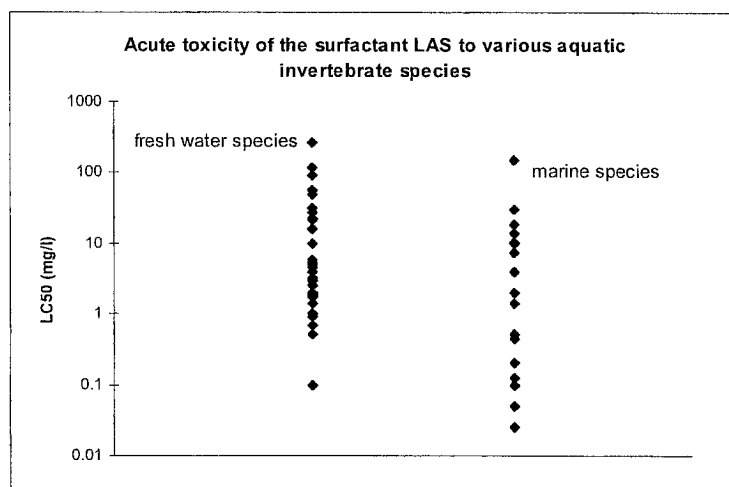
Rapid biodegradation and demonstrated biotransformation and elimination lead to the conclusion that it is not likely that bioconcentration or bioaccumulation of Bioversal HC will occur.

Toxicity of surfactants for marine and freshwater organisms

The toxicity of Bioversal is extensively tested on fresh water species (bacteria, algae, crustaceans and fish). Although marine toxicity data should be provided for the HOCNF, freshwater data are accepted as well. OSPAR states that safety factors may need to be applied or even additional marine toxicity data need to be provided if evidence supports doubt on the relevance of existing test data.

Although there are not many toxicity data of surfactants available for marine species, there are no indications of specific sensitivity of marine species to these substances. An example of fresh water versus marine toxicity is shown in the figure below, which shows the acute toxicity of LAS (Linear Alkylbenzene Sulfonate) to various aquatic invertebrate species (Kimerle, 1989).





For algae, the main factors suggesting to influence the sensitivity to surfactants are thickness and composition of the cell wall. No significant difference in toxicity has been noted between fresh water species and marine species (Kimerle, 1989, Talmage, 1994). Some of the lowest values reported (0.025-0.125 mg/l) were for the marine algae *Gymnodinium*. Other marine algae were effected at higher concentrations up to > 10 mg/l.

In general, the sensitivity of marine invertebrates to surfactants seem to be in the same range as of fresh water invertebrates (Talmage, 1994). The marine oyster embryo-larvae shows greater sensitivity to LAS, although the variability in the results is considerable (Kimerle, 1989).

Exposure of fish to high concentrations of surfactants will inhibit the respiration ability of the fish from which it could die (suffocation). The toxicity of surfactants to fish has been studied for a large number of fresh water species and a few marine species. The marine species tested indicates no greater sensitivity of marine fishes to surfactants than of fresh water fishes (Talmage, 1994).

Literature

Kimerle, R.A. (1989): Aquatic and terrestrial ecotoxicology of LAS. *Tenside Surfactants Detergents* 26, 2:169-175.

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