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Biotransformation Pathway(s) of the ^{14}C-labeled Fluorotelomer 8-2 Telomer B Alcohol (8-2 TBA) in Acclimated Bacterial Culture

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The environmental fate of chemicals containing perfluorocarbon moieties [$F(CF_2)_n$-] is of increasing scientific and public interest. The 8-2 Telomer B Alcohol [$F(CF_2)_8CH_2CH_2OH$; CAS # 678-39-7], which contains the [$F(CF_2)_n$-] moiety, is a primary raw material and intermediate used to make various fluorotelomer-based consumer products. Using ^{14}C-labeled 8-2 Telomer B Alcohol [$F(CF_2)_7{}^{14}CF_2CH_2CH_2OH$], we have investigated the biodegradation potential of this substance to determine whether or not any metabolic pathways are available for its further biotransformation to other fluorinated metabolites. 120-mL volume glass serum bottles were used for the test. The test substance (ethanol stock solution) was dispersed into bacterial growth medium plus bacterial inoculum that had pre-grown with 8-2 TBA prior to the test. The final concentration of the test substance was about 0.5 – 1.0 mg L^{-1}. After crimp-sealing the bottles, the sealed serum bottles containing the test solution were incubated at room temperature under dark and were extracted periodically with an organic solvent such as acetontrile to recover the parent compound and potential transformation products. After extraction, the acetonitrile-extracted solution was used to separate and quantify the ^{14}C-labeled 8-2 TBA parent and ^{14}C-labeled transformation products by LC/ARC (on-line liquid chromatography/accurate radioisotope counting). The potential ^{14}C-labeled transformation products were further identified by Q-TOF-MS and/or NMR analysis. Our results indicate that the ^{14}C-labeled 8-2 TBA was readily metabolized to other fluorinated species under the experimental conditions. Among many transformation products observed, $F(CF_2)_7COOH$ contributed to a small percentage of total mass balance (<10%) and may be further degraded at a relatively slow rate. Our results also demonstrate that the $-CH_2CH_2-$ "spacer" influences the biotransformation pathway(s) of 8-2 TBA, compared with its perfluorinated acid counterpart.

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Biotransformation Potential of the Fluorotelomer 8-2 Telomer B Alcohol (8-2 TBA) in Bacterial Culture

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The 8-2 Telomer B Alcohol [$F(CF_2)_8CH_2CH_2OH$; CAS # 678-39-7] is a primary raw material and intermediate used in the synthesis of various telomer-based fluorinated surfactants and polymers which are used in a wide range of consumer products. This compound is postulated to be an environmental degradation product arising from telomer-based fluorinated surfactants and polymers. We have investigated the biodegradation of this substance to determine whether or not it is environmentally persistent and if metabolic pathways are available for its further biotransformation to other fluorinated species. The 8-2 Telomer B Alcohol is surface active, sorptive to certain surfaces, of low solubility in water, and may be volatile. As such, test systems and sampling and analysis methods have been carefully established for these studies. Biotransformation with adapted and non-adapted sludge cell cultures under modified aerobic ready and accelerated conditions have been investigated in sealed serum bottles following modified OECD 301 and OECD 302 guidelines. Transformation products have been analyzed with LC/MS/MS after extracting the samples with an MTBE-based solvent system. Under accelerated conditions, the concentration of the 8-2 TBA decreased substantially 14 days after the incubation and

several primary metabolites have been identified. It appears that the 8-2 TBA can be rapidly transformed to other forms under suitable experimental conditions.