UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

12/7/09

MEMORANDUM

SUBJECT: **Lauryl Sulfate Salts.** Human Health Effects Scoping Document for the Registration Review Decision. DP Barcode: D371997. Reg. Review Case No. 4061. PC Codes 079011 (active) and 790152 (inert). CAS No. 151-21-3.

FROM: William J. Hazel, Ph.D., Chemist
Risk Assessment and Science Support Branch (RASSB)
Antimicrobials Division (7510P)

TO: Monisha Harris, Chemical Review Manager
Regulatory Management Branch II (RMB II)
Antimicrobials Division (7510P)

THRU: Norman Cook, Chief
Risk Assessment and Science Support Branch (RASSB)
Antimicrobials Division (7510P)

Introduction

The Antimicrobials Division (AD) of EPA's Office of Pesticide Programs (OPP) has evaluated the status of the human health assessments for the Lauryl sulfate salts Registration Review Case 4061. Sodium lauryl sulfate (sodium dodecyl sulfate) is the only member of this case serving as an active ingredient and that is only in a single antimicrobial product. It functions as an antiviral compound in Kleenex® Brand Antiviral Tissues. The hazard and exposure databases and the available assessments for sodium lauryl sulfate were examined to determine whether they reflect the current state of the science, changing use patterns, and current policies/regulations/legislation. This Registration Review will determine whether the available sodium lauryl sulfate data and existing risk assessments remain adequately protective of all known human health exposure scenarios, routes, and durations. If not, the necessary data and risk assessments will be identified and required by the Agency.

Executive Summary

Sodium lauryl sulfate was first registered as an active ingredient in 1948. A Reregistration Eligibility Decision (RED) was issued in September, 1993. The antiviral tissues contain 2.02% sodium lauryl sulfate and are registered by Kimberly-Clark Global Sales, LLC (EPA Reg. No. 9402-10). The tissues also contain citric acid as an active ingredient at 7.51%. A manufacturing-use product containing sodium lauryl sulfate has not been registered.

Sodium lauryl sulfate has been classified by the Food and Drug Administration (FDA) as both a direct and indirect food additive. It is Generally Recognized as Safe (GRAS) when directly-added to eggs, marshmallows, beverages, and oils (21 CFR 172.822) at up to 125 ppm as an emulsifier, whipping agent, surfactant, or wetting agent. Other FDA-regulated uses include: a citrus coating (21 CFR 172.210); a component of food contact paper and paperboard [21 CFR 176.170(a)(5)]; a defoaming agent component of food contact paper and paperboard [21 CFR 176.210(d)(3)]; and an emulsifier or other surface active agent during manufacture of articles intended for food contact [21 CFR 178.3400(c)].

Sodium lauryl sulfate serves as an intentionally-added inert ingredient in over 370 pesticide products although few of these are antimicrobial products. Sodium lauryl sulfate is exempt from the requirement of a tolerance when used as an inert ingredient in food contact sanitizer products provided that the final treatment solution used: in public eating places contains ≤3 ppm; on dairy processing equipment contains ≤350 ppm; and on food processing equipment and utensils has no limit [40 CFR 180.940(a), -(b), and -(c), respectively]. Residues of alkyl (C_8-C_{18}) sulfates, including sodium lauryl sulfate, are exempt from the requirement of a tolerance when used as inert ingredients (surfactants) in pesticide formulations applied to growing crops or to raw agricultural commodities (RACs) after harvest (40 CFR 180.910) or to animals (40 CFR 180.930).

ETI H2O has submitted a petition (PP#7F7179) to amend 40 CFR 180.940(a) to increase the final use concentration of sodium lauryl sulfate as an intentionally-added inert ingredient associated with the tolerance exemption in food contact surface sanitizers used in public eating places from ≤3 ppm to ≤350 ppm. The Final Rule establishing the exemption was published in the Federal Register 8/12/09 (Vol. 27, No. 154, pp. 40503-40509). The public comment period ended 10/13/09. No registered products containing sodium lauryl sulfate as an inert ingredient are known to have yet been EPA-approved for use as food contact sanitizers in public eating places at a concentration in the final sanitizer solution of >3 ppm but <350 ppm.

The toxicology database for sodium lauryl sulfate is adequate to support its use as an active or inert ingredient in pesticide formulations and to support the tolerance exemption for use as a component of food contact surface sanitizers. Sodium lauryl sulfate has low acute oral and dermal toxicity but is irritating to the

skin and eyes at high doses. Sodium lauryl sulfate is not a skin sensitizer. Sodium lauryl sulfate was negative in tests for genotoxicity. The repeated dose toxicity data on alkyl sulfates including sodium lauryl sulfate demonstrate effects consistent with surfactant-mediated irritant effects. The common target organs of toxicity following repeated-dose oral exposure were the forestomach in gavage studies, and the liver and kidneys in dietary studies.

A no-observed adverse effect level (NOAEL) of 100 mg/kg/day was selected from a 28-day oral (gavage) study in rats in which decreased food consumption and decreased body-weight gain were observed at the low observed adverse effect level (LOAEL) of 200 mg/kg/day. Other subchronic studies showed similar results. No evidence of neurotoxicity was observed in any of the studies. Chronic toxicity data on sodium lauryl sulfate are limited but in two 2-yr rat feeding studies, no treatment-related effects were observed at doses up to approximately 100 mg/kg/day. There is no evidence from two carcinogenicity studies (summaries only available) testing closely-related alkyl (C_{12}-C_{15}) sulfonates that sodium lauryl sulfate would exhibit carcinogenic potential when dosed at up to 1.5% of the diet.

No evidence of increased susceptibility was observed in the offspring of rats, rabbits, and mice following prenatal or postnatal exposure to sodium lauryl sulfate. In a developmental toxicity study with sodium lauryl sulfate in rats, rabbits, and mice, maternal toxicity and developmental toxicity were seen only at the highest dose tested of 600 mg/kg/day. The NOAEL for maternal and developmental effects in that study was 300 mg/kg/day. There was no evidence of neurotoxicity in the adult animals. A 2-generation reproductive toxicity study conducted with a related chemical, α-alkyl (C_{12}) olefin sulfonate, showed no treatment-related adverse reproductive effects and no systemic adverse effects on organs at dose levels up to 285 mg/kg/day (HDT).

Studies of rat metabolism and environmental degradation of sodium lauryl sulfate demonstrate that the residues of concern would be the parent compound only. Sodium lauryl sulfate degrades in the environment to compounds (sulfate and acetate ions) that are even less toxic than the parent compound.

As the only use of sodium lauryl sulfate as an active ingredient is in Kleenex® Brand Antiviral Tissues, human dietary (food) exposure is not expected to occur. Dietary exposure via drinking water is not likely to occur because, even if treated tissues or their leachate reach the outdoor environment, the intact parent compound would not survive to the point it could be consumed in drinking water due to the rapid metabolism of sodium lauryl sulfate by aquatic and soil microbes. Metabolites of sodium lauryl sulfate will not be of toxicological concern (sulfate and acetate anions).

Dietary (food) exposure may result from the FDA-purview food additive uses as well as the EPA-purview uses of sanitizers (containing sodium lauryl sulfate as an inert) on dairy equipment, on food processing equipment and utensils, and in eating establishments. Also, the use of sodium lauryl sulfate as an inert in

certain of the over 370 pesticide products could result in residues in raw agricultural commodities, livestock commodities, and some processed foods. FDA classifies sodium lauryl sulfate as being GRAS when used as a direct food additive (for nonpesticidal purposes) at concentrations as high as 125 ppm when ready to consume, e.g., as an emulsifier in frozen or liquid egg whites. Further, EPA has established exemptions from the requirements of a tolerance for residues of sodium lauryl sulfate in foods [40 CFR 180.940(a), -(b), and -(c)] due to the low toxicity. A human health risk assessment to support the proposed exemption amendment to 40 CFR 180.940(a) (concomitant with increased use level up to 350 ppm) was conducted by the Registration Division (K. Leifer, 8/5/09). RD determined, using very conservative, high-end assumptions, that chronic human dietary risks were not of Agency concern. Acute risks were not estimated because sodium lauryl sulfate does not induce adverse effects attributable to a single dose.

Residential and institutional exposure is expected to result from use of the Kleenex® Brand Antiviral Tissues; this will likely be largely dermal although some inhalation exposure could result. Also, it has been assumed that many of the 370 products containing sodium lauryl sulfate as an inert ingredient could result in residential exposures whether the products are used in agricultural or ornamental sites or on food contact surfaces. These exposures could be to handlers or could be postapplication. The 8/5/09 K. Leifer memo conservatively assessed risks to children and adults from various exposure scenarios and found that there were no short-term (ST) risks to handlers of concern and no ST or intermediate-term (IT) postapplication risks of concern to the Agency.

Trace amounts of exposure to sodium lauryl sulfate in agricultural crops and processed food could result from use as an inert ingredient in agricultural and sanitizer products. Residential exposure could occur as a result of the single active-ingredient use of sodium lauryl sulfate in Kleenex® Brand Antiviral Tissues. Residential exposure could also result from postapplication/bystander sources due to use of sodium lauryl sulfate as an inert ingredient in products registered for indoor residential and public buildings. Very conservative aggregate risks estimated in the 8/5/09 K. Leifer assessment included average food and water exposure and residential exposure (oral, dermal, and inhalation) all reflecting use of sodium lauryl sulfate as an inert ingredient. Aggregate risks to children and adults were not of Agency concern. Note that a 2001 OECD SIDS document aggregated exposure to residues in food, drinking water, with a number of cosmetics and health care products; OECD estimated an exposure about 25% of that found in the AD assessment of 8/5/09. Exposure to sodium lauryl sulfate from treated tissues was not included in either assessment.

Occupational exposure to handlers is likely from most of the registered uses on agricultural and ornamental sites, livestock, and food contact surfaces. However, a quantitative risk assessment is not required because, again, adverse systemic effects on humans attributable to the dermal and inhalation routes of exposure to sodium lauryl sulfate are not expected. Label instructions and the requirement that handlers wear certain personal protective equipment (PPE) are sufficient to

protect workers from the localized, irritation effects of exposure to sodium lauryl sulfate.

The primary source of information for this assessment was the 8/5/09 risk assessment by K. Leifer (Registration Division) of the ETI H2O petition (PP#7F7179) to amend 40 CFR 180.940(a) to increase the final use concentration of sodium lauryl sulfate as an inert ingredient in food contact surface sanitizers used in public eating places from ≤3 ppm to ≤350 ppm. The Final Rule establishing the exemption was published in the Federal Register 8/12/09 (Vol. 27, No. 154, pp. 40503-40509). No new toxicity data for sodium lauryl sulfate have been submitted to the Agency since this Final Rule was issued. The purpose of this scoping document is to determine whether sufficient data are available to support registration review, whether new human health assessments are needed to support registration review, and to report why the Agency feels it may be appropriate to conduct new risk assessments under the registration review process.

Chemical Identity

Table 1.1 Chemical Identity	
Common Name	Sodium lauryl sulfate
Chemical Name	sodium dodecyl sulfate
Empirical Formula	$C_{12}H_{25}NaO_4S$
Molecular Weight	288.38
PC Code	079011
CAS Registry Number	151-21-3
Registration Review Case No.	4061
Chemical Structure:	

Sodium lauryl sulfate is a white or slightly yellow solid at room temperature (25 C) which melts at 205.5 C. It is very soluble in water (10 g/L). The vapor pressure of sodium lauryl sulfate is 1.8 x 10^{-12} mmHg at 25 C. The octanol/water coefficient (Log P) is 1.6.

Human Incident Reports

One human incident associated with human exposure to sodium lauryl sulfate has been reported in OPP's incident databases. The symptoms are considered moderate including blisters on the face and nose that remained for 3.5 weeks

after exposure. Note that there are also 76 incidents involving domestic animals most commonly manifested in hair loss, difficulty breathing, and rashes.

Cumulative Risk

EPA does not have, at this time, available data to determine whether sodium lauryl sulfate has a common mechanism of toxicity with other substances or how to include this pesticide in a cumulative risk assessment. For the purposes of this Registration Review, EPA has assumed that sodium lauryl sulfate does not have a common mechanism of toxicity with other substances because it elicits no adverse systemic effects when used as an antimicrobial as registered.

Endocrine Disruption

EPA is required under the FFDCA, as amended by FQPA, to develop a screening program to determine whether certain substances (including all pesticide active and other ingredients) "may have an effect in humans that is similar to an effect produced by a naturally-occurring estrogen, or other such endocrine effects as the Administrator may designate." Following the recommendations of its Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC), EPA determined that there was scientific basis for including, as part of the program, the androgen and thyroid hormone systems, in addition to the estrogen hormone system. EPA also adopted EDSTAC's recommendation that the Program include evaluations of potential effects in wildlife. For pesticide chemicals, EPA will use FIFRA and, to the extent that effects in wildlife may help determine whether a substance may have an effect in humans, FFDCA authority to require the wildlife evaluations. As the science develops and resources allow, screening of additional hormone systems may be added to the Endocrine Disruptor Screening Program [EDSP].

For the purposes of this Registration Review, EPA has assumed that sodium lauryl sulfate does not disrupt endocrine systems because it elicits no adverse systemic effects when used as an antimicrobial as registered

Overall Conclusions

Sodium lauryl sulfate is a very widely used compound useful for its surface active properties notably as a surfactant, emulsifier, whipping agent, or wetting agent. It is widely used as an intentionally-added inert ingredient in pesticide products and as the active ingredient in one product (Kleenex® Brand Antiviral Tissues). However, it is by far much more widely-used for industrial purposes to take advantages of its surface-active properties. Being no more than the sulfated form of a straight-chain 12-carbon alcohol (dodecanol), it is readily dealt with metabolically by both microbes and higher organisms, including humans. As a result, it will not remain in the body or in the environment for very long. Any

adverse effects from exposure to sodium lauryl sulfate are associated with its irritating effects whether they are acute effects on the eyes and skin or whether they are gastric irritation due to repeated oral exposure. As discussed in this document, there are many FDA-approved uses of sodium lauryl sulfate as a direct food additive. The industrial, culinary, pharmaceutical, cosmetic, and personal care uses of sodium lauryl sulfate are likely to result in much larger levels of human exposure compared to the single active ingredient use and the 370 pesticide inert ingredient uses because the nonpesticidal uses often reflect higher concentrations and less metabolism than the pesticide inert and active uses.

The Agency has screened the hazard and exposure databases for sodium lauryl sulfate and does not anticipate that additional toxicity or exposure data will be needed for registration review. The Agency also does not expect that any human health risk assessments will be necessary due to the low hazard and low exposure associated with the use of sodium lauryl sulfate as a pesticide - particularly when compared to the much higher levels of exposure from industrial, culinary, pharmaceutical, cosmetic, and personal care uses of this compound.

Sign-off Date : 12/07/09
DP Barcode No. : D371997