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HEALTH EFFECTS DIVISION
SCIENTIFIC DATA REVIEWS
EPA SERIES 361

900883

(21)

Format
IV

"INERT INGREDIENTS OF PESTICIDE FORMULATIONS"
SURFACE ACTIVE AGENT EVALUATION FORM

A. EPA Accession Number and Name

001221 Octylphenoxypoly(ethyleneoxy)ethanol (4-70 moles of EO)

B. American Chemical Society Chemical Abstracts Service (CAS) Name and Registry Number

Poly(oxy-1,2-ethanediyl), alpha-[(1,1,3,3-tetramethylbutyl)phenyl]-omega-hydroxy-

9036-19-5

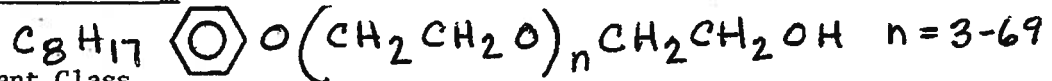
C. Other Names

(EPA S): Polyoxyethylene (4-70 moles) octylphenol
(S): Ethoxylated octylphenol; Ethylene oxide-octylphenol adduct;
Polyethylene glycol mono-(octylphenyl) ether; Polyethylene glycol octyl phenyl ether

D. Chemical Composition

CH-H22-O(C2-H4-O)_nH
n = 4-70

E. Molecular Structure



F. Surfactant Class

Cyclic ethers: ethoxylated alkylphenols

G. Physical Data

1. Trade name, equivalent chemical name, manufacturer, state, product concentration, H.L.B.
Igepal CA: series of octylphenoxypoly(ethyleneoxy)ethanols; GAF Corp.; liquid or wax; 100%; 10.0-18.0
Neutronyx 675: Onyx Chemical Co.
OP 1062: BASF Wyandotte
Triton X: series of octylphenoxypoly(ethyleneoxy)ethanols; Rohm and Haas; liquid or wax; 10.4-18.7
2. Solubility - oil-soluble at low EO content; water soluble at high EO content (2)
3. Ionic Character - nonionic
4. Other physical data - Triton X series - (SG) 25/25: 1.040-1.128
solubility: dispersible to miscible in water; dispersible to soluble in mineral acids; miscible in polar organic solvents; miscible to insoluble in aromatics (5)

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H. Usage

1. In pesticidal formulations - emulsifier (2)
surfactant; related adjuvant of surfactants (6)
2. General - used in all phases of detergent compounding, in industrial metal cleaners, acid cleaners, floor cleaners, detergent - sanitizers and waterless hand cleaners; emulsifier for vinyl acetate and acrylate polymerization; controlled foam detergent (2,6)

- I. Government Regulations - EPA 40 CFR 180.1001 - Residues exempt from the requirement of a tolerance when used in accordance with good agricultural practice as an inert ingredient in pesticide formulations applied to growing crops or raw agricultural commodities after harvest. (1)
FDA 21 CFR 121.2541 - May be safely used in articles used for food manufacturing, handling, transporting, etc. (4)
FDA 21 CFR 121.2519 - May be safely used as a defoaming agent in the manufacture of paper and paper board intended for food packaging. (2,5)
FDA 21 CFR 121.2520 - May be safely used as a component of adhesives in food packaging. (2,5)
FDA 21 CFR 121.2535 - May be safely used as a component of animal glue. (2,5)
FDA 21 CFR 121.2571 - May be used as a component of paper and paper board in contact with dry food. (2,5)

- J. Environment - Triton X-100 (10 EO units) did not effect wheat plant growth. (7)
 30% of octyl phenol ethoxylate (8 moles of EO) was degraded in a percolating filter apparatus within two weeks, 70% within three weeks and 90%-95% after ten weeks. Triton X-100 had a 24 hr LC50 of 16.2 mg/l to Bluegills; Triton X-305 (30 EO units) had an LC50 of 1080.0 mg/l. Application of 1% solutions of Triton X-45 and X-100, produced severe injury to tomato plants. (3)

The application of alkyphenol ethoxylates was found to increase the penetration of insecticides into leaves of plants.

Results of aquatic toxicity experiments suggest that levels presently reported in aquatic environments do not approach the LC50 values. Some sublethal effects can occur at levels less than 1 mg/l.

The course of ultimate biodegradation of these compounds is slow. The rate of degradation is heavily dependant on the degree of acclimation of the receiving system. With acclimated bacteria, the resistance to degradation increased with the number of EO units and with the degree of branching of the alkyl chain. Branched chain structures containing more than 10 EO units were found to be essentially non-biodegradable in a river water die-away test. The position of attachment of the alkyl chain is also important - primary attachment yields a faster decomposition than secondary. The major degradative pathway appears to be via shortening of the ethoxylate chain, although some degree of carboxylation of the alkyl chain has been demonstrated. (3,4)

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- K. Toxicology - Triton X405, which contains about 40 EO units, had no effect on survival, growth or food consumption at 1 to 4 percent dietary levels in rats. 95% of this compound was excreted in the feces and 1% in the urine. Triton X compounds of greater than 4 moles EO produced no irritating or physiological effects when applied to the skin of rabbits and humans. (5) Triton X-100 had an eye irritation threshold of 0.5%. (5)

The ethoxylated alkylphenols are only mildly toxic, the most toxic surfactants in this series have oral LD50 values of between 1,000 and 3,000 mg/kg in rats. The most toxic are those having approximately ten ethylene oxide units; the toxicity decreases as the ethylene oxide content is decreased towards one unit or increased towards 40 units.

Subacute feeding studies have shown that alkylphenol ethoxylates of 15-25 units of ethylene oxide only can produce focal myocardial necrosis in 4 days in dogs and guinea pigs but not in other animals. The feeding level was 1,000 mg/kg/day.

Chronic feeding studies with rats and dogs using various alkylphenol ethoxylates in concentrations of up to 1.4% produced no adverse effects. Rats fed 1,000 mg/kg/day of nonyl phenol with four moles of ethylene oxide for two years showed only a slight elevation in liver weight.

Absorption and metabolism studies in rats and dogs indicated that 90% of ingested ethoxylated alkylphenol was excreted in 72 hours. As the EO content is increased, urinary excretion and conversion of CO₂ are decreased and fecal excretion increases.

A variety of ethoxylated alkylphenols with 1-13 moles of EO were tested on human skin. 2 out of 50 individuals exhibited a mild positive response. (3,7)

- L. Recommendation - Class 3
Group 21. Cyclic ethers: Ethoxylated alkylphenols

The chemical characteristics of this group of surfactants (non-ionic, aliphatic and ethoxylated sidechains, phenolics) and the available toxicological data on representatives of the group suggest the following general biological properties:

- (1) inert or relatively inert against most microbiological organisms
- (2) biodegradable with difficulty
- (3) non reactive with biological membrane constituents
- (4) relatively non irritant to skin and mucous membranes
- (5) low order of single and repeated dose toxicity

As an inert ingredient in pesticide formulations, a member of this group should pose no hazard to the health of animals or man, but repeated application could lead to temporary adverse environmental effects.

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M. Bibliography

- (1) U.S. E.P.A., Code of Federal Regulations; 40, part 180.1001, Washington, D.C.: 1976.
- (2) G.A.F. Corp., Technical Literature, 1976.
- (3) Human Safety and Environmental Aspects of Major Surfactants, The Soap and Detergent Association, New York: 1977.
- (4) U.S. E.P.A., Code of Federal Regulations; 21, part 121.2541, Washington, D.C.: 1976.
- (5) Rohm and Haas Co., Technical Literature, 1977.
- (6) McCutcheon's Detergents and Emulsifiers, North American Edition, McCutcheon's Division, The Manufacturing Confectioner Publishing Co., Glen Rock, N.J.: 1976.
- (7) Elworthy, P.H. and J.F. Treon, Physiological Activity of Nonionic Surfactants, Nonionic Surfactants, Marcel Dekker Publishing Co., New York: 1967.



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