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I U C L I D

D a t a S e t

Existing Chemical Substance ID: Corn Steep Liquor

Producer Related Part
Company: Keller and Heckman LLP
Creation date: 28-NOV-2006

Substance Related Part
Company: Keller and Heckman LLP
Creation date: 28-NOV-2006

Printing date: 28-NOV-2006
Revision date:
Date of last Update: 28-NOV-2006

Number of Pages: **15**

Chapter (profile): Chapter: 1, 2, 3, 4, 5, 7
Reliability (profile): Reliability: without reliability, 1, 2, 3, 4
Flags (profile): Flags: without flag, confidential, non confidential, WGK (DE), TA-Luft (DE), Material Safety Dataset, Risk Assessment, Directive 67/548/EEC

1.0.1 OECD and Company Information

Name: The Corn Refiners Association (CRA)

Remark: The member companies are:

Archer Daniels Midland Company
Cargill, Inc.
Corn Products International, Inc.
National Starch and Chemical Company
Penford Products Company
Roquette America, Inc.
Tate & Lyle Ingredients Americas, Inc.

1.0.2 Location of Production Site

Remark: Not an HPV Challenge endpoint.

1.0.3 Identity of Recipients

Remark: Not an HPV Challenge endpoint.

1.1 General Substance Information

Substance type: organic
Physical status: liquid
Test substance: Corn Steep Liquor (CAS#66071-94-1)

1.1.1 Spectra

Remark: Not an HPV Challenge endpoint.

1.2 Synonyms

Corn steepwater
Light steepwater
Heavy steepwater
Condensed fermented corn extractives

1.3 Impurities

Remark: None identified

1.4 Additives

Remark: None identified

1.5 Quantity

Quantity >500,000 tons. The vast majority of production is for Non-TSCA regulated uses.

1.6.1 Labelling

Remark: No specific labeling required.

1.6.2 Classification

Remark: No specific classification.

1.7 Use Pattern

Remark: The primary use of corn steep liquor is as a nutrient additive in the feed for ruminant animals in which it provides a natural source of proteins, amino acids, vitamins, reducing sugars (e.g., dextrose), organic acids (e.g., lactic acid), minerals, and other elemental nutrients. Some corn steep liquor is used in the production of acetic acids, food acids, and fermentation processes. Some corn steep liquor has been used in the pharmaceutical industry in the production of intravenous solutions and drugs, most notably antibiotics (penicillin).

1.7.1 Technology Production/Use

Remark: Not an HPV Challenge endpoint.

1.8 Occupational Exposure Limit Values

Remark: No TLV has been established

1.9 Source of Exposure

Remark: See discussion in accompanying corn steep liquor assessment plan.

1.10.1 Recommendations/Precautionary Measures

Remark: See corn steep liquor assessment plan.

1.10.2 Emergency Measures

Remark: See corn steep liquor assessment plan.

1.11 Packaging

Remark: Bulk, small and large packaging

1.12 Possib. of Rendering Subst. Harmless

Remark: Not applicable

1.13 Statements Concerning Waste

Remark: See corn steep liquor assessment plan.

1.14.1 Water Pollution

Remark: Not a significant source of water pollution.

1.14.2 Major Accident Hazards

Remark: None

1.14.3 Air Pollution

Remark: Not a significant source of air pollution.

1.15 Additional Remarks

Remark: None

1.16 Last Literature Search

Date of Search: 31-OCT-2006

1.17 Reviews

Remark: None

1.18 Listings e.g. Chemical Inventories

Remark: TSCA inventory (USA)
Domestic Substances List (DSL) - Canada
EINECS (Europe)

2.1 Melting Point

Remark: Not applicable. Corn steep liquor is a liquid.

2.2 Boiling Point

(a)
Value: 100-104°C
GLP: Not reported
Remark: Range reported in Material Safety Data Sheets. All values were similar across companies.
Test substance: Corn steep liquor (66071-94-1)
Source: Material Safety Data Sheets from from all six member companies.
Reliability: (4) Not assignable. As reported in MSDS. Original study reports not available.

2.3 Density

Value: 1.2-1.4 g/cm^3
GLP: Not reported
Remark: Range reported in Material Safety Data Sheets.
Test substance: Corn steep liquor (66071-94-1)
Source: Material Safety Data Sheets from from two member companies.
Reliability: (4) Not assignable. As reported in MSDS. Original study report not available.

2.3.1 Granulometry

Remark: Not an HPV Challenge endpoint.

2.4 Vapor Pressure

Value: 17.5 mm Hg at 20°C
GLP: Not reported
Remark: Range reported in Material Safety Data Sheets.
Test substance: Corn steep liquor (66071-94-1)
Source: Material Safety Data Sheets from from three member companies.
Reliability: (4) Not assignable. As reported in MSDS. Original study report not available.

2.5 Partition Coefficient

Remark: No data available

2.6.1 Water Solubility

Value: Soluble
GLP: Not reported
Remark: Reported in Material Safety Data Sheets.
Test substance: Corn steep liquor (66071-94-1)
Source: Material Safety Data Sheets from from five member companies.
Reliability: (4) Not assignable. As reported in MSDS. Original study report not available.

2.6.2 Surface Tension

Remark: Not an HPV Challenge endpoint.

2.7 Flash Point

Remark: Not flammable.

2.8 Auto Flammability

Value:
Remark: Not flammable.

2.9 Flammability

Result:
Remark: Not flammable.

2.10 Explosive Properties

Result:
Remark: Not explosive.

2.11 Oxidizing Properties

Result:
Remark: Not an oxidizer.

2.12 Additional Remarks

Memo: None

3.1.1 Photodegradation

Remark: Photodegradation is not expected to be a significant source of degradation.

3.1.2 Stability in Water

Remark: Corn steep liquor is approximately 50% water with the rest made up of water soluble proteins, free amino acids, minerals, vitamins, reducing sugars (such as dextrose), and other natural organic acids (such as lactic acid).

3.1.3 Stability in Soil

Remark: Not an HPV Challenge endpoint.

3.2 Monitoring Data (Environment)

Remark: No data available

3.3.1 Transport between Environmental Compartments

Remark: Not an HPV Challenge endpoint.

3.3.2 Distribution

Remark: Corn steep liquor consists of natural water soluble materials, and, therefore, will be largely found in the water.

3.4 Mode of Degradation in Actual Use

Memo: Corn steep liquor is readily degraded by biological means.

3.5 Biodegradation

Remarks: Corn steep liquor is made up of natural constituents such as proteins, reducing sugars, and organic acids, and therefore, is readily degraded by biological means.

3.6 BOD5, COD or BOD5/COD Ratio

Remarks: No data avialable

3.7 Bioaccumulation

Remark: Corn steep liquor is made up of water soluble components from soaking corn in water and is, therefore, not expected to bioaccumulate.

3.8 Additional Remarks

Memo: None

AQUATIC ORGANISMS

4.1 Acute/Prolonged Toxicity to Fish

Remark: Corn steep liquor is not expected to exhibit toxicity to fish or other aquatic organisms. Corn steep liquor consists of the water soluble components of corn that has been soaked in water. These all-natural constituents are primarily crude proteins, amino acids, vitamins, reducing sugars, organic acids (e.g., lactic acid), and other trace elemental nutrients. The primary use of corn steep liquor is as a nutrient source additive in animal feeds, and has a long history of safe use. It should be noted that the available data for one component (lactic acid, which may make up 10-25% of the corn steep liquor) have been summarized for the HPV Challenge program. These data indicate very low aquatic toxicity for this component.

4.2 Acute Toxicity to Aquatic Invertebrates

Remark: As noted in the fish section above, corn steep liquor consists of all-natural, water soluble constituents of corn that has been soaked in water. No toxicity to aquatic invertebrates is expected.

4.3 Toxicity to Aquatic Plants e.g. Algae

Remarks: As above, no toxicity to aquatic plants is expected. Because corn steep liquor is a nutrient source, some enhancement of algal growth is possible if corn steep liquor reaches water bodies in concentrated form. However, this is unlikely since manufacture of corn steep liquor is controlled and its primary use as an additive in animal feed would result in only very dilute material potentially reaching water bodies.

4.4 Toxicity to Microorganisms e.g. Bacteria

Remarks: Corn steep liquor is used in the production of acetic acid, other food acids, and in fermentation processes. Therefore, the material would not inhibit microorganism growth, and in fact, would act as a nutrient source.

4.5 Chronic Toxicity to Aquatic Organisms

4.5.1 Chronic Toxicity to Fish

Remark: Corn steep liquor is a nutrient source and is not expected to have any adverse chronic effects on fish.

4.5.2 Chronic Toxicity to Aquatic Invertebrates

Remark: Corn steep liquor is a nutrient source and is not expected to have any adverse chronic effects on aquatic invertebrates.

TERRESTRIAL ORGANISMS

4.6.1 Toxicity to Soil Dwelling Organisms

Remark: As with the aquatic systems, corn steep liquor is primarily used as a nutrient source in animal feed and, therefore, would not be expected to elicit any adverse effects on terrestrial organisms.

4.6.2 Toxicity to Terrestrial Plants

Remark: Not an HPV Challenge endpoint.

4.6.3 Toxicity to other Non-Mamm. Terrestrial Species

Remark: Not an HPV Challenge endpoint.

4.7 Biological Effects Monitoring

Memo: Not an HPV Challenge endpoint.

4.8 Biotransformation and Kinetics

Remark: Not an HPV Challenge endpoint.

4.9 Additional Remarks

Memo: None

5.1 Acute Toxicity

5.1.1 Acute Oral Toxicity

Remarks: The safety of corn steep liquor to animals has been well established in numerous studies evaluating its use as a natural protein and nutrient source in animal feed. See Section 5.10 of this robust summary document for a summary of the safety of corn steep liquor.

5.1.2 Acute Inhalation Toxicity

Remark: Specific data on inhalation toxicity are not available. Since corn steep liquor is a viscous liquid used as a supplement in animal feeds and as a nutrient source in fermentation reactions, no inhalation exposure is expected.

5.1.3 Acute Dermal Toxicity

Remark: Specific data on dermal toxicity are not available. Since corn steep liquor is a viscous liquid used as a supplement in animal feeds and as a nutrient source in fermentation reactions, no dermal exposure is expected.

5.1.4 Acute Toxicity, other Routes

Remark: Not a required HPV endpoint.

5.2 Corrosiveness and Irritation

5.2.1 Skin Irritation

Remark: Specific skin irritation data are not available.

5.2.2 Eye Irritation

Remark: Specific eye irritation data are not available.

5.3 Sensitization

Remark: No specific animal studies are available.

5.4 Repeated Dose Toxicity

Remark: The majority of safety studies conducted with corn steep liquor for its use in animal feed have been repeated dose feeding studies. No adverse effects were observed. See Section 5.10 for a summary of the safety of corn steep liquor.

5.5 Genetic Toxicity 'in Vitro'

Remark: Specific in vitro genetic toxicity data are not available.

5.6 Genetic Toxicity 'in Vivo'

Remark: Not required.

5.7 Carcinogenicity

Remark: Not an HPV endpoint.

5.8 Toxicity to Reproduction

Remarks: Specific studies addressing the reproductive toxicity endpoint were not available, however, feeding studies on several animal species indicate that corn steep liquor does not present a reproductive toxicity concern.

5.9 Developmental Toxicity/Teratogenicity

Remark: Specific studies addressing the developmental toxicity endpoint were not available, however, feeding studies on several animal species indicate that corn steep liquor does not present a developmental toxicity concern.

5.10 Other Relevant Information

Remark: The safety and efficacy of corn steep liquor has been well established in numerous tests and has a long history of safe use as a nutrient in animal feed. Beginning in the 1880s, corn steep liquor has had steadily increasing production for animal feeds as ranchers have valued its safety and efficacy.

Beef cattle and sheep
Corn steep liquor is a staple item in ruminant feeding both as an ingredient in corn gluten feed and directly as a liquid feed supplement. Extensive feeding studies have demonstrated the safe use of this natural source of protein and other nutrients and vitamins.

Poultry feed
Corn steep liquor has long been used in the poultry industry for all types of birds (chicks, broilers, layers, and turkeys). A survey of the published data and reviews of unpublished chick

feeding test data showed that even low levels of corn steep liquor stimulated the growth of young chickens.

Dairy feeding
Corn gluten feed containing corn steep liquor has been used in dairy rations for over 75 years. It provides a nutritional source that naturally enhances milk production.

Swine rations
Corn gluten feed containing 20-30% corn steep liquor or more has been used for many years for growing and finishing pigs. Gluten feed is usually palletized with other ingredients and supplemented with amino acids from corn steep liquor for feeding.

Pet foods
Corn gluten feed containing corn steep liquor has been included in some pet food formulations because it provides the required nutrients without the excessive calories of other feeds (corn steep liquor has virtually no fat).

Catfish feeding
Feeding trials showed that corn gluten feed containing 20-30% corn steep liquor in the diet can be used to provide nutrients in catfish farms without reduction of growth rate or feed efficiency.

Honey Bees
Corn steep liquor (1%) has been shown to significantly increase the life span of honey bees, which acts as a source of proteins, amino acids, vitamins and minerals.

In summary, corn steep liquor has been safely used for over a hundred years as a natural source of nutrients in animal feeds. No adverse toxicity has been observed in any of these studies.

Source: Pressick, J.C. 1985. To Prepare a Review on Corn Steepwater in Animal Feeding Showing its Long, Successful Feeding History, Safety and Efficacy. Internal report to the Corn Products Unit, Report No. 11337-7118,, July-August 1985, pp. 1-26.

Reliability: (4) Not assignable. Information as summarized in Pressick 1985. Original studies not available for review.

5.11 Experience with Human Exposure

Memo: Corn steep liquor has been used as a supplement in animal feed for many years without reported human incident. Corn steep liquor consists only of all-natural water soluble constituents of corn soaked in water, along with a very small amount of sulfurous acid (<0.01%), so no adverse effects to humans would be expected.

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Staley. 1991. Material Safety Data Sheet: Corn Steep Liquor. A. E. Staley Manufacturing Co, Decatur, IL.

USDA. 2006. AES Timeline: The Rescue of Penicillin. United States Department of Agriculture. Available at http://www.ars.usda.gov/is/timeline/penicillin.htm.

Westburg, J.A. 2006. Process for Manufactoring Animal Feed Supplements. United States Patent 7,045,165 B2. May 16, 2006.

White, P. and Johnson, L.A., (eds.). 2003. Corn: Chemistry and Technology (2nd Edition), American Association of Cereal Chemists.

7.1 Risk Assessment

Memo: See the assessment plan for corn steep liquor. Based on the fact that corn steep liquor consists only of all-natural nutrients resulting from soaking corn in water, along with a very small amount of sulfurous acid (<0.01%), no adverse effects would be expected.