

**FYI-0794-000939**



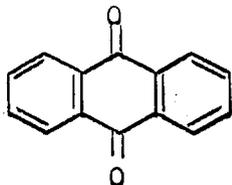
LIMITED DISTRIBUTION

This review reflects the available toxicity literature, both published and unpublished. Studies have not been evaluated for scientific merit.

**HASKELL LABORATORY**

Common Name: Anthraquinone (8CI) (AQ)  
Chemical Name: 9,10-Anthracenedione (9CI)  
Synonyms: Anthradione  
          9,10-Dihydro-9,10-dioxoanthracene  
          Hoelite  
          Morkit

CAS Registry No: 84-65-1  
Chemical Structure:



84940000039



FYI-94-000939  
INIT 07/26/94

Chemical and Physical Properties (1):

Description: Colorless to light yellow needles  
Molecular Weight: 208.20  
Melting Point: 286°C  
Boiling Point: 377°C  
Density: 1.42-1.44  
Flashpoint: 365°F (closed cup)  
Solubility: Soluble in alcohol, ether, acetone;  
          insoluble in water

Threshold Limit Value:

None

DOT Classification:

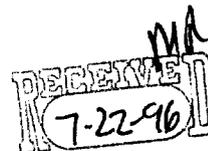
None

FDA Status (15):

ICI Americas petition March 30, 1979, would amend §176.170 (COMPONENTS OF PAPER AND PAPERBOARD IN CONTACT WITH AQUEOUS AND FATTY FOODS) to clear as a catalyst in the alkaline pulping process of lignocellulosic materials.

**BEST COPY AVAILABLE**  
**ENTIRE DOCUMENT**

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## TOXICITY

### A. Acute

#### 1. Oral

No information

#### 2. Eye

- Anthraquinone, when applied to the lower conjunctival sac of a rabbit's eye, produces inflammation and irritation which may be attributed to a mechanical action of the powder probably due to its insolubility in water (2).

#### 3. Skin

No information

#### 4. Injection

- LD50 (rat, intraperitoneal) = 3500 mg/kg (3).
- A group of 12 rats was injected intraperitoneally with a 50 mg AQ dust/kg suspension at a concentration of 10 mg/ml. At the 1 month and 3 month autopsy AQ produced no lesions i.e. did not show fibrogenic activity (14).

### B. Extended Studies

#### 1. Oral

- After feeding AQ to rats for 3 to 9 months there were adenomatous change of the thyroid gland, degenerative change of cells, venous congestion in the liver and epithelial hypertrophy and hyperplasia of the forestomach (7).
- Two hybrid stocks produced from the mating of strain C57 BL/6 female mice with C3H/Anf or AKR males were administered 464 mg AQ/kg in 5% gelatin on the 7th day after birth through the 28th day followed by 1206 ppm in the diet ad libitum for 17 months. No significant increase in the incidence of any tumor type in any sex-strain subgroup was noted when compared with untreated control groups (9).
- AQ, administered as a 50 mg/kg dose to normal rats, inhibited the absorptive and excretory functions of the liver (12).

## 2. Skin

- Groups of 20 mice painted daily or every other day on the back with AQ and other quinones in benzene gave the following results:

<u>Compound</u>	<u>No. of Mice surviving over 200 days</u>	<u>No. of Papilloma</u>	<u>No. of Lung Tumors</u>
0.25% AQ in benzene	35	2	2
Benzene (control)	46	1	2

No statistically significant tumor incidence between AQ-treated and benzene-treated groups was observed; however no untreated control group was used and the number of groups of mice tested was unspecified (10,11).

## 3. Inhalation

- "Anthraquinone is classified as a chemical dust of low toxicity. An average concentration of 12.2 mg/m<sup>3</sup> caused threshold level effects in rats, rabbits and mice. Disturbances in processes, decreased levels of hemoglobin and erythrocytes and vitamin C deficit in the blood were noted. A maximum permissible dose of 10 mg/m<sup>3</sup> is recommended for industrial working areas." (13)

## 4. Injection

- After administering injections of AQ to rats for 3 to 9 months, the animals exhibited adenomatous change of the thyroid gland, degenerative change of cells, venous congestion of the liver and epithelial hypertrophy and hyperplasia of the forestomach (7).

## C. Carcinogenic Potential

- In a mouse skin painting study lasting at least 200 days AQ (0.25%)-treated groups did not show a statistically significant incidence of tumors over benzene-treated control groups; however no untreated control group was used (10,11).
- Two hybrid stocks of mice fed 464 mg AQ/kg in 5% gelatin on the 7th-28th days after birth followed by 1206 ppm in the diet for 17 months showed no significant increase in tumors when compared with controls (9).

## D. Mutagenic Potential

- AQ was not mutagenic when tested in Samonella typhimurium strains TA 1535, TA 1537, TA 1538, TA 98 and TA 100 in the absence or presence of mammalian microsomal activation (6).

## Mutagenic Potential (Cont'd)

- A sample of anthraquinone (104-520 µg/plate), subjected to <sup>60</sup>Co gamma radiation in air and subsequently tested for mutagenicity with Salmonella typhimurium strains TA 1535, TA 1538, and TA 90, was negative (4).

## E. Teratogenic Potential

No information.

## F. Metabolism Studies

- AQ was metabolized by rats to: 2-hydroxy-9,10-anthraquinone, anthrone, conjugates of 9-hydroxy-, 9,10-dihydroxy-, and 2,9,10-trihydroxyanthracene and the sulfuric ester of 2-hydroxy-9,10-anthraquinone (5). Hydroxyanthraquinone has been isolated from the urine of rats administered AQ (8).

## G. Miscellaneous

- Suspension cultures of rat peritoneal and pulmonary macrophages were treated with a suspension of AQ dust. Samples were taken at 0, 1 and 2 hours. AQ killed less than 2% of the cells (14).

## REFERENCES

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b. Hawley, G. G., The Condensed Chemical Dictionary 9th ed. (1977).
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5. Sims, P., Biochem J. 92(3): 621-31 (1964) (CA61: 8774e).
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7. Sik, K. T., J. Korean Med. Assn. 1(1):51 (1948) (CA44: 2654g).
8. Sata, T. et al., J. Biochem. 43:21-4 (1956) (CA50: 10256g).
9. Innes, J. R. M. et al., J. Nat. Canc. Inst. 42: 1101-14 (1969).
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12. Pidemskii, E. L. and V. P. Masenko, Tr. Perm. Gos. Med. Inst. 99:325-8 (1970) (CA78: 79665N).
13. Volodchenko, V. A., et al., Gig. Tr. Prof. Zabol. 15(2):58-59 (1971) (HEEP/72/07555, TOXBACK).
14. Styles, J. A. and J. Wilson, Ann Occup. Hyg. 16:241-50 (1973).
15. \_\_\_\_\_, Food Chem. News Guide p.36 (1979).

## RELATED REFERENCES

CA 90: 43353t Hygienic evaluation of working conditions in the catalytic production of anthraquinone. Labunskii, V. V.; Artemenko, G. E.; Gudz, Z. A.; Dobzhinskii, V. G. (Khar'k. Nauchno-Issled. Inst. Gig. Tr. Profzabol., Kharkov, USSR). Tr. Khar'k. Med. Inst. 1976 (Pub. 1976). 124, 63-6 (Russ). A hygienic evaluation is given for the working conditions in a plant manufg. anthraquinone by catalytic oxidn. of anthracene for the prodn. of anthraquinone dyes. The most hazardous substances are anthracene [120-12-7] aerosol and anthraquinone [84-65-1] dust. Dysfunction of the central nervous system, a slight increase in the blood pressure (6-13 mm) and pulse frequency (3-10 beats/min) were obsd. among female workers. Recommendations are given to improve the working conditions.  
M. Kowalski

CA 89: 209875w Regularities in the relation of chemical structures to toxic effect in mono-, bi-, and trinuclear quinone series. Labunskii, V. V.; Volodchenko, V. A. (Khar'k. Med. Inst., Kharkov, USSR). Tr. Khar'k. Med. Inst. 1975 (Pub. 1976). 124, 5-9 (Russ). On the basis of the obsd. degree of lethality, hematal. changes, irritant activity, and organ damage induced by the 4 quinones tested in rats, it appeared that toxic activity increased on going from a mono- (1,4-benzoquinone [106-51-4]) to a binuclear (1,1-naphthoquinone [130-15-1]) quinone and decreased on going from the binuclear quinone to 9,10-anthraquinone [84-65-1] and 9,10-phenanthraquinone [84-11-7].

CA 88: 45911f Pathomorphological changes in animals affected by substances of the anthraquinone group. Soboleva, N. V. (USSR). Gigien. Aspekty Okhrany Zdorov'ya Naseleniya 1977, 48 (Russ). From Ref. Zh., Khim. 1977, Abstr. No. 191561. Title only translated.

CA 88: 109859e Results of and future prospects for studying the toxicological characteristics of anthraquinone derivatives. Volodchenko, V. A. (Inst. Gig. Tr. Profzabol., Kharkov, USSR). Gig. Tr. Prof. Zabol. 1977, (12), 27-30 (Russ). Tests of anthraquinone (I) [84-65-1] and 24 derivs. in rats and rabbits showed them to have a low toxicity, lower than that of C<sub>6</sub>H<sub>6</sub> and C<sub>10</sub>H<sub>8</sub> derivs. The degree of toxicity depends on the nature and location of substituents. OH and amine derivs. are more toxic than I. The concn. of I derivs. in the air of dye plants should be limited to 1 mg/m<sup>3</sup> for amine, diamine, and amino alc. derivs., and to 5 mg/m<sup>3</sup> for benzamido and acetamido derivs.

## RELATED REFERENCES (Cont'd)

- CA 88 69619c **Frameshift mutagenicity of certain naturally occurring phenolic compounds in the Salmonella/microsome test. Activation of anthraquinone and flavonol glycosides by gut bacterial enzymes.** Brown, Joseph P.; Dietrich, Paul S.; Brown, Ronald J. (Dynapol, Palo Alto, Calif.). *Biochem Soc Trans.* 1977, 5(5), 1489-92 (Eng). A high percentage of 32 anthraquinones were mutagenic for *Salmonella typhimurium* strains TA1537 (*hisC3076*), TA1538, and TA98 (both *hisD3052*); only a few of these compds. were activated by rat liver microsomes and only one required such treatment. The nonmutagenic *chrysin monoglucoside* [53797-18-5], *quinizarin monoglucoside* [39115-11-2], and *emodin 6-O-rhamnoside* [521-62-0] were rendered mutagenic to strain TA1537 by treatment with crude liver microsomes, and the nonmutagenic *alizarin 2-O-β-D-glucoside* [31297-82-2], *emodin 1(8) monoglucoside* [38840-23-2], and the alizarin, chrysin, and quinizarin glucoside tetraacetates, were rendered mutagenic to this strain by enzyme exts. of rat cecal bacteria (apparently by aglycone formation). Frameshift mutagenicity amongst the flavonoid compds. tested was largely confined to the flavonols, the most mutagenic being *quercetin* [117-39-5]. The mutagenic activity of flavonol glycosides was increased 10 to 20 fold by incorporating gut bacterial enzyme exts. and microsomal enzymes in the assay procedure.
- CA 87: 188694c **Hygienic characteristics of working conditions in the production of contact anthraquinone.** Labunskii, V. V.; Artemenko, G. E.; Gudz, Z. A.; Dobzhinskii, V. G. (USSR). *Sb Nauch Tr Kharkov Med. In t* 1975, (124), 63-5 (Russ). From *Ref Zh. Khim* 1977, Abstr. No. 151693. Title only translated.
- CA 87: 28209v **Substantiation of the maximum permissible concentration of dust of anthraquinone derivatives in the air of manufacturing plants.** Shakhov, P. P. (USSR). *Uch. Zap. Mosk. Nauchno Issled. Inst. Gig.* 1975, 22, 36-8 (Russ). Compilation of toxicity characteristics for 20 anthraquinone based dyes and semiproducts was used in establishing tentative max. admissible concn. (MAC). Anthraquinone derivs. cause trophic disorders in the organism, dystrophic changes in internal organs (liver). Mono- and diamino derivs. cause trophic impairments and hemolytic anemia whereby diamino derivs. are more toxic than monosaminoanthraquinones. Introduction of NO<sub>2</sub> enhances to a considerable extent the toxic effect. Simultaneous presence of Me, OMe, di OH, Et and NH<sub>2</sub> groups causes impaired protein and glycogen synthetic liver function, favors inhibition of redox processes while the presence of either Me or OH groups affects general trophic processes only. The cumulative properties of anthraquinones are close to those of heavy metal aerosols. Formula was given for calc. tentative MAC = 0.0008 L.D<sub>50</sub>, well compatible for that of 1-aminanthraquinone [82-45-1], 14.9 vs 5.0 mg m<sup>-3</sup>. A rule is suggested for calc. tentative MAC: 0.5 mg m<sup>-3</sup> for compds. with L.D<sub>50</sub> ≤ 1000 mg/kg and 5 mg m<sup>-3</sup> for those with L.D<sub>50</sub> ≥ 5000 mg/kg. E. Strossberg
- CA 86: 37357y **Clinical and toxicological aspects of anthraquinone laxatives.** Nelemans, F. A. (Pharm. Inst., State Univ. Utrecht, Utrecht, Neth.). *Pharmacology* 1976, 14, Suppl. 1(Anthraquinone Laxatives, Proc. Symp., 1975), 73-7 (Eng). A review with several internal refs.
- CA 85: 129808d **Substantiation of maximum permissible concentrations of dust of anthraquinone derivatives in the air of industrial buildings.** Shakhov, P. P. (USSR). *Sb. Nauch. Tr. Mosk. NII Gigieny* 1975, (22), 36-8 (Russ). From *Ref. Zh., Khim.* 1976, Abstr. No. 111764. Title only translated.
- CA 85: 14332g **Characteristics of hygienic standardization in relation to the nature of the toxic effect of chemical substances.** Vasilenko, N. M. (Kharkov, USSR). *Gig. Tr.* 1973, 9, 71-4 (Russ). Max. acceptable concn. (MAC) were detd. for 14 arom. amines, quinones, naphthalene derivs. and heterocyclic sulfoorgs. used as raw, intermediate, and final products in dye industry. Tentative MAC values for irritating and toxic substances are substantiated by  $L_{mac} = L_{ma}$ , where  $L_{ma}$  = threshold acute toxicity and  $L_{ma}$  = threshold of irritation.  $L_{mac}$  is replaced by  $L_{mca}$ , threshold limiting chronic action, for substantiating MAC in case of lack of or weak toxicity. E. Strossberg

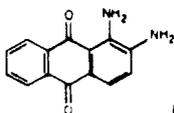
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CA83:

126946v Liver regeneration as influenced by the structure of aromatic and heterocyclic compounds. Gershbein, Leon L. (Northwest Inst. Med. Res., Chicago, Ill.). *Res. Commun. Chem. Pathol. Pharmacol.* 1975, 11(3), 445-66 (Eng). The effects of a large no. of aromatic and heterocyclic compds., including monalkylbenzenes, carcinogenic and noncarcinogenic hydrocarbons, phenylmethanes, and heterocyclic S compds., on liver regeneration were investigated in partially hepatectomized rats. The structure-activity relations between the compds. and their effects on liver regeneration were discussed. The substances were administered in the diet and (or) s.c.

CA78:

53643d Comparative biological features of diaminoanthraquinone and anthraquinone isomers. Volodchenko, V. A.; Ladunskii, V. V. (Inst. Gig. Tr. Profzabol., Kharkov, USSR). *Gig. Tr. Prof. Zabol.* 1972, (11), 44-5 (Russ). Exptl. animals



chronically intoxicated by oral doses of 1,2-diaminoanthraquinone (I) [1758-68-5] showed anemia and poor blood coagulation, hepatitis, and impaired N excretion by the kidneys. 1,5-Diaminoanthraquinone [129-44-2] and anthraquinone [84-65-1] were less toxic in these respects.

CA74:

45541w Phototoxicity testing of cosmetic materials. Gloxhuber, Christian (Toxikol. Lab., Henkel und Cie. G.m.b.H., Duesseldorf, Ger.). *J. Soc. Cosmet. Chem.* 1970, 21(12), 825-33 (Ger). Hairless mice were found suitable for testing the phototoxicity of cosmetic compds. The phototoxic properties of individual compds. are also present in formulations; it is suggested that only the former needs to be examd. in order to evaluate the phototoxicity of the latter. C. Estrup

CA68:

58050m Screening for carcinogenesis of polycyclic quinones. Keizo Tada, Narikazu Odashima, and Motoi Ishidate (Kyoritsu Pharm. Coll., Tokyo). *Kyoritsu Yakus Daijiss Kenkyu Nempo* 5, 63-8(1966)(Japan). Together with 1,4-naphthoquinone, 9,10-anthraquinone, 9,10-phenanthrenequinone, 20-methylcholanthrene (MC), and dibenz(a,h)anthracene (DBA), para and ortho quinones of benz(a)anthracene and DBA were screened for their carcinogenic activity in mice by s.c. injection and drop application on the skin. In addn. to these expts., 7-bromo- and 7-nitrobenz(a)anthra-5,6-quinone, DBA, and MC were investigated by intracutaneous injection. The carcinogenic activity of DBA in intracutaneous injection was greater than that in s.c. injection and skin application. The relation of these quinones and DBA was discussed. Nagataka Yaro

Bergström, G. and R. Holst, Lakartidningen 69(3):28-9 (1972)  
"Perianal skin changes caused by AQ in laxatives" (TOXBIB/73/066158).

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Volodchenko, V. A. et al., Gig. Tr. Prof. Zabol 14(2):58-9 (1971).  
"Establishment of max. permissible concentration of AQ in air  
of working zone" (TOXBIB/71/231952).

PAMELA J. GORT/nng  
June 19, 1979

*Pamela J. Gort*

Chemical: 2,3-xylylidine, CAS #87-59-2

Manufacture:

Deleted

Confidential  
Business  
Information

Prime Application: Isomer in mixed xylylidines sold as dye intermediate.

Environmental Release: 17 lbs./yr. to atmosphere  
37 lbs./yr. to plant waste water treatment facility

Worker Exposure: Total number of workers exposed = 46  
(Operations 33, Maintenance 13)  
Exposure Level -  $< 0.003 \text{ mg/m}^3$ , 8-hr. Time Weighted Average  
Exposure Duration, Operators = 175 days/year  
Maintenance personnel = 42 days/yr.

Exposure Control:

- Exposure limit = 0.5 ppm, 8-hr. Time Weighted Average for all xylylidine isomers.
- Nomex outerwear and neoprene gloves required routinely. Butyl rubber gloves, boots and apron or full suit, face shield and respiratory protection (cartridge respirator or airline mask) required for operations having high exposure potential.
- Medical Surveillance Program: Workers with exposure potential to 2,3-xylylidine are periodically biologically monitored (through urinalysis for free amines and nitro compounds) as protection against cyanosis.

Toxicity

- Oral  $LD_{50}$  (male rats) = 930 mg/kg  
Ref. Vernet C.H. et al. Toxicol. & Appl. Pharmacol. 42(2), 417-423 (1977).

Attachments:

- Material Safety Data Sheet (mixed xylylidines).
- Product Technical Bulletin (mixed xylylidines).

## MATERIAL SAFETY DATA SHEET

### IDENTIFICATION

**Name**

Xylidines Mixed, o-,m-,p-

**Grade**

Technical

**Synonyms**

Xylidine, Aminodimethylbenzene

**CAS Name**

Benzenamine, ar, ar-dimethyl

**I.D. Nos./Codes** NIOSH Registry No: ZE8575000

Wiswesser Code: ZR X X

**Manufacturer/Distributor**

E. I. du Pont de Nemours &amp; Co. (Inc.)

**Address**

Wilmington, DE 19898

**Chemical Family**

Aromatic Amine

**Formula** $(\text{CH}_3)_2\text{C}_6\text{H}_3\text{NH}_2$ **CAS Registry No.**

1300-73-8

**Du Pont Code:**

994-700

**Product Information and Emergency Phone**

(302) 774-2421

**Transportation Emergency Phone**

(800) 424-9300

### PHYSICAL DATA

**Boiling Point, 760 mm Hg** 213 to 226°C  
(415 to 439°F)**Specific Gravity**  
0.98 at 26°C/15°C**Vapor Density**

4.2 (Air = 1)

**% Volatiles by Vol.**

100%

**Form**

Liquid

**Appearance**

Clear, oily

**pH Information**

8.6 (water extract)

**Melting Point**

-36°C (-33°F)

**Vapor Pressure**

1 mm Hg at 44°C (111°F)

5 mm Hg at 72°C (163°F)

**Solubility in H<sub>2</sub>O**

Very slightly soluble

**Evaporation Rate (Butyl Acetate = 1)**

&lt;1

**Color** Light Yellow to **Odor**

Reddish Brown

Aromatic amine

**Octanol/Water Partition Coefficient**

### HAZARDOUS COMPONENTS

**Material(s)**Primary Aromatic Amines  
(as Xylidines)

2,6-Xylidine

**Approximate %**

99

20 (max.)

### HAZARDOUS REACTIVITY

**Instability**

Stable at normal temperatures and conditions of storage.

**Incompatibility**

Strong oxidizers; forms explosive chloroamines with hypochlorites.

**Decomposition**

With extreme heat, will release hazardous oxides of nitrogen gas.

**Polymerization**

Will not occur.

E- 61180

Date: 8/83

## FIRE AND EXPLOSION DATA

Flash Point 97-100°C (206-212°F)\* Method SFCC Autoignition Temperature

\*Depending on isomer ratio in mixture.

Flammable Limits in Air, % by Vol.

Lower 1.5

Upper

### Fire and Explosion Hazards

OSHA Class III B Combustible Liquid

**Extinguishing Media** Small fires: Dry chemical, carbon dioxide (CO<sub>2</sub>)  
Large fires: Water spray, fog, or foam.

**Special Fire Fighting Instructions** Isolate hazard and evacuate confined areas. Stay upwind; avoid smoke and fumes. Use water spray to cool tanks and reduce vapors. If smoke and fumes cannot be avoided, wear chemical-proof suit with hood and breathing air supply. Fight fire from maximum distance. Contact between water and hot Xylidines may cause spattering. Run-off from fire control may cause pollution.

## HEALTH HAZARD INFORMATION

### Exposure Limits

OSHA 8-hour Time Weighted Average (TWA) = 5 ppm or 25 mg/m<sup>3</sup>. The ACGIH TLV® is 2 ppm or 10 mg/m<sup>3</sup>. Based on a tumorigenic effect observed for 2,6-Xylidine in tests on laboratory animals, Du Pont observes an airborne exposure limit for the Xylidines of 0.5 ppm, 8-hour TWA. All limits call for avoidance of skin contact.

### Significant Routes and Effects of Exposure

Causes eye burns. Harmful if inhaled or absorbed through the skin; may cause cyanosis. Symptoms may be delayed. May cause cancer, based on tests with laboratory animals.

### Safety Precautions

Do not get in eyes, on skin, on clothing.  
Do not breathe vapor.  
Wash thoroughly after handling.

### First Aid

In case of contact: Immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse and destroy contaminated shoes.

If inhaled: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

If swallowed: Induce vomiting immediately by giving two glasses of water and sticking finger down throat. Never give anything by mouth to an unconscious person. Call a physician.

Note to Physician: Absorption of this product into the body leads to the formation of methemoglobin which, in sufficient concentration, causes cyanosis. In case of skin absorption, symptoms may be delayed 2-4 hours or longer. Since reversion of methemoglobin to hemoglobin occurs spontaneously after termination of exposure, moderate degrees of cyanosis need be treated only by supportive measures such as bed rest and oxygen inhalation. Thorough cleansing of the entire contaminated area of the body including scalp and nails is of utmost importance. If cyanosis is severe, intravenous injection of methylene blue, 1 mg/kg of body weight, may be of value. Cyanocobalamin (Vitamin B-12), 1 mg intramuscularly, will speed recovery. Intravenous fluids and blood transfusions may be indicated in very severe exposures.

## PROTECTION INFORMATION

### Ventilation

Good general ventilation should be provided to maintain vapor concentrations below exposure limits.

### Personal Protective Equipment

The following personal protective equipment should be available and worn as appropriate for exposure conditions: hard hat with brim, safety spectacles (side shields preferred), chemical splash goggles, full length face shield, butyl rubber gauntlet gloves, butyl rubber apron, and butyl rubber safety shoes (or butyl rubber boots over leather shoes). If contact with liquid or vapor cannot be avoided, wear chemical-proof suit with hood and breathing air supply.

### Other

## DISPOSAL INFORMATION

### Aquatic Toxicity

**Spill, Leak or Release** Evacuate area and keep personnel upwind and far removed from spill. Contain spill with sand or earth dam. Soak up spill with sand, "Oil Dry", or other noncombustible absorbant and transfer to a covered metal container for disposal. Flush area with detergent and water; water spray may be used to control and disperse vapors. Comply with Federal, State and local regulations on reporting releases.

### Waste Disposal

Comply with Federal, State, and local regulations. If approved, may be incinerated, sent to an approved hazardous material disposal area, or transferred to a disposal contractor. Very dilute solutions are biodegradeable by specially acclimated bacteria.

## SHIPPING INFORMATION

### Transportation

**DOT Hazard Class.\*:** Not regulated as a hazardous material by DOT

**IMCO Class.:** 6.1

**DOT Shipping Name\*:** None

**UN No.:** 1711(IMO)

**NA No.:**

**RQ Quantity\*:** Not regulated

\*49 CFR 172.101

**Shipping Containers** Railroad tank cars, tank trucks, drums

### Storage Conditions

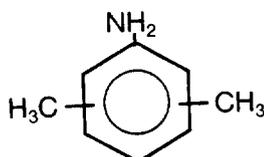
Keep in a cool, well ventilated area away from heat, sparks, and flame. Do not store with oxidizers or flammable materials.

## ADDITIONAL INFORMATION AND REFERENCES

For further information, see Du Pont Data Sheet "Xylidines Mixed, o-,m-,p-,  
Technical.

### XYLIDINES MIXED o-,m-,p- TECHNICAL (Xylidine isomers) (CH<sub>3</sub>)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>NH<sub>2</sub>

CAS Reg. No. 1300-73-8



Xylidines Mixed o-,m-,p- Technical is a clear, light yellow to red-brown oily liquid. It is soluble in organic solvents and in dilute, aqueous mineral acids, but insoluble in water and alkalies. It is used as an intermediate for rubber chemicals and dyes.

#### SPECIFICATIONS (3-X-6)

Primary aromatic amines as xylidine, % min	99.0
2,4-xylidine, % min	30
%, max	50
2,5-xylidine, % max	25
2,6-xylidine, % max	20
Other isomeric xylidines, (3,5-, 2,3-, 3,4-) % max	35
Isomeric ar-ethylanilines, % max	15
Nitro compounds as nitroxylene, %, max	0.15
Xylenediamines, % max	1.75

#### PERSONAL SAFETY AND FIRST AID

##### Health Hazards

Xylidines Mixed o-,m-,p- is harmful if inhaled or absorbed through the skin. It may cause cyanosis. Splashes in the eyes cause corneal damage. Absorption through the skin, mucous membranes or eyes can contribute to the overall exposure.

The U.S. Department of Labor (OSHA) has ruled that an employee's exposure to xylidine vapor in any

#### TYPICAL PHYSICAL PROPERTIES\*

Molecular weight	121.2
Boiling range (760 mm Hg), C	213-226
F	415-439
Freezing point, C	< -36
F	< -33
Specific gravity (26 C/15 C)	0.98
Vapor pressure, mm Hg @ 44 C (111F)	1.0
@ 72 C (163 F)	5.0
Solubility in water (25)	very slightly soluble
Flash point, closed cup (Setaflash® tester), C	97-100**
F	206-212
Vapor density (air = 1)	4.2

\*These properties are drawn from various Du Pont and other literature sources. Du Pont does not make any express or implied warranty that future production will demonstrate or continue to possess these typical properties.

\*\*Depending upon isomer ratio in mixture.

8-hour shift of a 40-hour week shall not exceed a time-weighted average of 5 ppm of vapor in air. They also caution that, since both the liquid and vapor of xylidine are capable of penetrating the skin and mucous membranes, control of vapor inhalation alone may not be sufficient to prevent absorption of an excessive dose (29 CFR 1910.1000, Air Contaminants). The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a TLV® of 2 ppm or 10 mg/m<sup>3</sup>.

**NOTICE: CAUSES EYE BURNS. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN; MAY CAUSE CYANOSIS. SYMPTOMS MAY BE DELAYED. MAY CAUSE CANCER—BASED ON TESTS WITH LABORATORY ANIMALS.**

**See Personal Safety and First Aid.**

In a test sponsored by the National Institute of Environmental Health Sciences under the National Toxicology Program, groups of rats were fed diets containing 300, 1,000 or 3,000 ppm of 2,6-xylidine for up to 102 weeks. The highest concentration was found to be significantly tumorigenic. The intermediate dose showed reduced effects and the low dose (300 ppm) showed no effect under the conditions of this bioassay.

Since Du Pont's Xylidines Mixed o-,m-,p- Technical contains 20% (Maximum) 2,6-xylidine and in light of the above and other toxicological information on the xylidines, Du Pont recommends an airborne exposure limit of 0.5 ppm, 8-hour time-weighted average and the avoidance of skin contact.

### Safety Precautions

Do not get Xylidines Mixed o-,m-,p- in eyes, on skin, or on clothing. Do not breathe vapor. Use in a closed system with adequate ventilation. Wash thoroughly after handling.

See section on STORAGE AND HANDLING for procedures and PERSONAL PROTECTIVE EQUIPMENT for handling Xylidines Mixed o-,m-,p-.

### Personal Protective Equipment

The following protective equipment should be available and worn as needed to prevent human contact: Hard hat with brim, safety spectacles (side shields preferred), chemical splash goggles, full length face shield, butyl rubber gauntlet gloves, butyl rubber apron, and butyl rubber safety shoes or butyl rubber boots over leather shoes. Wear appropriate respiratory protection<sup>(1)</sup>.

In emergencies or in any operation involving direct contact with Xylidines, Mixed o-,m-,p-, such as cleanup of spills or maintenance of equipment, personnel must wear full protective equipment such as butyl rubber chemical-proof suit, with breathing air supplied. Protective equipment must be decontaminated before removing and personnel must shower with soap and water. Butyl rubber chemical-proof suits must be laundered and tested for leaks before reuse.

### Special Safety Facilities

The following safety facilities should be readily accessible in all areas where Xylidines Mixed o-,m-,p- is handled or stored:

**Safety Showers**—or water hoses connected to spigots with quick opening valves which stay open.

**Eye Wash Fountains**—or other means for washing the eyes with a gentle flow of tap water.

### First Aid

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while

removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse and destroy contaminated shoes.

If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

### Note to Physician

Absorption of this product into the body leads to the formation of methemoglobin which, in sufficient concentration, causes cyanosis. In cases of skin absorption symptoms may be delayed 2-4 hours or longer. Since reversion of methemoglobin to hemoglobin occurs spontaneously after termination of exposure, moderate degrees of cyanosis need be treated only by supportive measures such as bed rest and oxygen inhalation. Thorough cleansing of the entire contaminated area of the body including scalp and nails is of utmost importance. If cyanosis is severe, intravenous injection of methylene blue, 1 mg/kg of body weight, may be of value. Cyanocobalamin (Vitamin B-12), 1 mg intramuscularly, will speed recovery. Intravenous fluids and blood transfusions may be indicated in very severe exposures.

### STORAGE AND HANDLING

Plans for storage and handling of Xylidines Mixed o-,m-,p- should be based on the primary consideration that it may cause cancer based on tests with laboratory animals, and therefore, human exposure must be prevented. See PERSONAL SAFETY AND FIRST AID.

Xylidines Mixed o-,m-,p- is non-corrosive to steel and is handled as a liquid at ambient temperatures. It has a freezing point below -36 C (-33 F).

It is thermally stable below 425 C (797 F). It has an autoignition temperature of 440 C (824 F). Xylidines Mixed o-,m-,p- should be handled by trained personnel in totally enclosed processing equipment where possible, or in systems designed to avoid human contact. Where contact cannot be avoided, suitable personal protective equipment must be worn.

Xylidines Mixed o-,m-,p- should be handled in a "Limited Access Area". At the end of each shift, work clothes should be laundered, and each operator should shower.

When Xylidines Mixed o-,m-,p- is transferred from within the closed system, such as when sampling, or emptying drums, positive ventilation must be provided to prevent contact with vapor or mist.

Adequacy of ventilation should be verified by air sampling. When engaged in such operation, personnel should wear appropriate respiratory protection<sup>(1)</sup> and suitable body protection.

<sup>(1)</sup>See "A Guide to Industrial Respiratory Protection", HEW Pub. No. (NIOSH) 76-189

Exhaust air from ventilation and storage tank vents containing Xylidines Mixed o-,m-,p- must be decontaminated by filtration or scrubbing prior to discharge.

### Leaks and Spills

Leaks and spills should be cleaned up promptly. The contaminated area should be roped off and posted with signs to keep all unprotected personnel far removed and upwind. The leak or spill may be contained with an earth or sand dam.

Liquid Xylidines Mixed o-,m-,p may be absorbed with sand, "Oil-Dri" or any other nonflammable absorbent, and shoveled into steel drums for disposal. After clean-up, wash down the area thoroughly with water and detergent. Wear protective equipment, such as butyl rubber chemical-proof suit with breathing air supply to avoid direct contact with Xylidines Mixed o-,m-,p.

### Storage

Steel storage tanks are satisfactory for bulk storage. A nitrogen blanket on the storage tank is used when it is necessary to minimize discoloration of the product by air oxidation. Pumps and piping may be of carbon steel. TEFLON\* TFE or FEP fluorocarbon resins are the preferred materials for packing and gaskets.

### Fire Hazard

The flash point of Xylidines Mixed o-,m-,p- ranges from 97 C (206 F) to 100 C (212 F) depending on isomer ratios. The flash point is above the temperatures at which it is normally stored and handled. However, Xylidines Mixed o-,m-,p- should be used and stored in areas of minimum fire hazard and protected from flames, sparks and excessive heat (see section on Stability). Storage tanks and equipment should be grounded.

In the event of fire, fire-fighting personnel should wear respiratory protection with breathing air supplied. Use water spray, foam, dry chemical or carbon dioxide to extinguish fires. Fight fires from upwind. Use water to cool containers or vessels exposed to fire. Apply water carefully to avoid spattering hot Xylidines Mixed o-,m-,p-.

Use caution in approaching an advanced or massive fire where confined Xylidines Mixed o-,m-,p- is exposed to high heat or flame. In those circumstances it may decompose rapidly and exothermically, thus rupturing its container.

Smoke and fumes from burning Xylidines Mixed o-,m-,p- may be harmful upon inhalation or on skin contact and therefore must be avoided. When contact with smoke cannot be avoided, wear full protective equipment, such as butyl rubber chemical-proof suit, with breathing air supplied.

### Stability

Xylidines Mixed o-,m-,p- is thermally stable at normal temperatures and conditions of storage. For the Technical Grade product, temperatures above 425 C (797 F) are required to initiate rapid, exothermic decomposition. However, contamination by some foreign materials may lower the exothermic decomposition temperature substantially.

### Drums

Drums should be stored in a cool, dry, well-ventilated area away from flammable and oxidizing materials. Consideration should be given to providing fire protection in the storage area by an automatic or remotely controlled sprinkler or water spray system.

Drums of liquid Xylidines Mixed o-,m-,p- should be emptied in a location provided with positive, forced ventilation so that contact with the vapor by personnel emptying the drums is avoided. Never use pressure to empty drums. Adequacy of ventilation should be checked by air sampling. Used drums should be decontaminated by washing with water and detergent before disposal.

Personnel emptying drums should wear long sleeve shirts and long pants, hard hat, chemical splash goggles, butyl rubber covered canvas gloves, butyl rubber apron, butyl rubber overshoes and appropriate respiratory protection<sup>(1)</sup>. Care must be taken during drum handling to avoid contact with Xylidines Mixed o-,m-,p-. Spills should be cleaned up promptly wearing full protective equipment (see "Personal Protective Equipment"). At the end of each shift, work clothes should be laundered and each operator should shower.

Waste water containing small amounts of Xylidines Mixed o-,m-,p- from drum washing or clean-up operations should be disposed of according to local codes and regulations.

### Packages

Du Pont ships Xylidines Mixed o-,m-,p- Technical in tank cars, tank trucks and 55-gal, 400 lb net non-returnable steel drums.

DOT Hazard Classification: Not regulated by DOT.

Freight Classification: Xylidine.

Due to changing governmental regulations, such as those of the Department of Transportation, Department of Labor, U.S. Environmental Protection Agency and the Food and Drug Administration, references herein to governmental requirements may be superseded. You should consult and follow the current governmental regulations such as Hazard Classification, Labeling, Food Use Clearances, Worker Exposure Limitations and Waste Disposal Procedures for the up-to-date requirements for Xylidines Mixed o-,m-,p-.

\*Reg U.S. Pat. & Tm. Off., Du Pont Co.

<sup>1</sup>See "A Guide to Industrial Respiratory Protection", HEW Pub. No. NIOSH) 76-189

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