Right to Know

Hazardous Substance Fact Sheet

Common Name: **BENZIDINE**

Synonyms: 4,4'-Bianiline; Diphenylenediamine

Chemical Name: [1,1'-Biphenyl]-4,4'-Diamine

Date: July 1998 Revision: July 2007

CAS Number: 92-87-5

RTK Substance Number: 0204

DOT Number: UN 1885

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

Description and Use

Benzidine is a white, grayish-yellow, or slightly reddish, crystalline (sand-like) powder. It is used in making dyes and chemicals, and as a reagent and microscopy stain.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	4	-
FLAMMABILITY	1	-
REACTIVITY	0	-

CARCINOGEN
MUTAGEN
MAY BURN
POISONOUS GASES ARE PRODUCED IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Benzidine** is a CARCINOGEN--HANDLE WITH EXTREME CAUTION.
- **Benzidine** can affect you when inhaled and by passing through your skin.
- Contact can irritate the skin and eyes.
- Inhaling **Benzidine** can irritate the nose and throat.
- **Benzidine** may cause a skin allergy.

Reason for Citation

- **Benzidine** is on the Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of cool water for at least 15 minutes, occasionally lifting upper and lower lids. Remove contact lenses, if worn, while rinsing. Medical attention is necessary.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: Recommends limiting exposure to the lowest feasible level.

NIOSH: Recommends that exposure to occupational carcinogens be limited to the lowest feasible concentration.

ACGIH: Recommends eliminating, to the fullest extent possible, all exposure to this carcinogen.

- **Benzidine** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- As **Benzidine** is absorbed through your skin, contact should be eliminated.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) requires private employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Benzidine**:

- **Benzidine** can irritate the skin causing a rash or burning feeling on contact.
- Exposure can irritate the eyes, nose, and throat.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Benzidine** and can last for months or years:

Cancer Hazard
- **Benzidine** is a CARCINOGEN in humans. It has been shown to cause bladder cancer.
- Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.
- **Benzidine** is a MUTAGEN. It may cause genetic changes.

Reproductive Hazard
According to the information presently available to the New Jersey Department of Health, **Benzidine** has not been tested for its ability to affect reproduction.

Other Effects
- Skin allergy may occur with itching, redness and/or eczema-like rash. If this happens, future contact can trigger symptoms.

Medical

Medical Testing
Before beginning employment and at regular times after that, for those with frequent or potentially high exposures, the following is recommended:

- Urine cytology (a test for abnormal cells in the urine)

If symptoms develop or overexposure is suspected, the following is recommended:

- Evaluation by a qualified allergist will help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Specific engineering controls are required for this chemical by OSHA. Refer to the OSHA **Benzidine** Standard (29 CFR 1910.1010).
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- When vacuuming, a high efficiency particulate air (HEPA) filter should be used, not a standard shop vacuum.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Benzidine**. Wear personal protective equipment made from material which can not be permeated and/or degraded by this substance. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
- Safety equipment manufacturers recommend *Rubber* or *Nitrile* for gloves and DuPont *Tychem*® fabrics for solutions of **Benzidine** in *Methanol*.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Eye protection is included in the recommended respiratory protection.
- Contact lenses should not be worn when working with this substance.

Respiratory Protection

***Improper use of respirators is dangerous*.** Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- At any exposure level, use a NIOSH approved supplied-air respirator with a full facepiece operated in pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Benzidine** may burn, but does not readily ignite.
- Use dry chemical, CO_2, water spray, an alcohol-resistant foam or other foaming agent.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides*.
- Use water spray to keep fire-exposed containers cool.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Benzidine** is spilled or leaked, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Collect using a vacuum with a HEPA filter or a wet method, and place in covered containers for disposal.
- Ventilate and wash area after clean-up is complete.
- It may be necessary to contain and dispose of **Benzidine** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Benzidine** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Benzidine** is handled, used, or stored.
- **Benzidine** must be stored to avoid contact with NITRIC ACID and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) since violent reactions occur.
- Store in tightly closed containers in a cool, well-ventilated area away from HEAT and DIRECT SUNLIGHT.
- Sources of ignition, such as smoking and open flames, are prohibited where **Benzidine** is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include: Right to Know Information Resources, Public Presentations, General References, Industrial Hygiene Information, Surveys and Investigations, and Medical Evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

LEL or **Lower Explosive Limit** is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

PIH is a DOT designation for chemicals which are Poison Inhalation Hazards.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **BENZIDINE**

Synonyms: 4,4'-Bianiline; Diphenylenediamine
CAS No: 92-87-5
Molecular Formula: $C_{12}H_{12}N_2$
RTK Substance No: 0204
Description: White to grayish-yellow or reddish powder, darkens on exposure to light or air.

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
4 - Health **1 - Fire** **0 - Reactivity** **DOT ID #:** UN 1885 **ERG Guide #:** 153 **Hazard Class:** 6.1 (Poisonous Material)	**Benzidine** may burn, but does not readily ignite. Use dry chemical, CO_2, water spray, an alcohol-resistant foam or other foaming agent. POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides*. Use water spray to keep fire-exposed containers cool.	**Benzidine** may react violently with NITRIC ACID and OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE). **Benzidine** is not compatible with HEAT and SUNLIGHT.

SPILL/LEAKS

Isolation Distance: 25 to 50 meters (80 to 160 feet)

Use a vacuum with a HEPA filter or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
Toxic to aquatic organisms.

PHYSICAL PROPERTIES

Odor Threshold:	No Information
Flash Point:	No Information
LEL:	N/A
UEL:	N/A
Relative Density:	1.25 (water = 1)
Relative Vapor Density:	6.36 (air = 1)
Water Solubility:	Soluble in hot water
Boiling Point:	752°F (400°C)
Melting Point:	239°F (115°C)

EXPOSURE LIMITS

OSHA:	Lowest feasible level
NIOSH:	Lowest feasible level
ACGIH:	Eliminate exposure if possible
IDLH LEVEL:	No Information

PROTECTIVE EQUIPMENT

Gloves:	Rubber, Nitrile
Coverall:	DuPont Tychem® fabrics (for **Benzidine** in 25% *Methanol*)
Boot:	Rubber
Respirator:	Supplied air

HEALTH EFFECTS

Eyes:	Irritation
Skin:	Irritation
Acute:	Nose and throat irritation
Chronic:	Cancer (bladder) in humans
	Skin allergy with itching and rash

FIRST AID AND DECONTAMINATION

Remove the person from exposure.
Flush eyes with large amounts of water for at least 15 minutes.
Remove contact lenses if worn.
Remove contaminated clothing. Wash contaminated skin with soap and water.
Transfer promptly to a medical facility.