Right to Know

Hazardous Substance Fact Sheet

Common Name: **3,3,'-DICHLOROBENZIDINE**

Synonyms: o,o'-Dichlorobenzidine; 4,4'-Diamino-3,3'-Dichlorophenol

Chemical Name: [1,1'-Biphenyl]-4,4'-Diamine, 3,3'-Dichloro-

Date: May 2001 Revision: July 2010

CAS Number: 91-94-1

RTK Substance Number: 0644

DOT Number: UN 3077

Description and Use

3,3'-Dichlorobenzidine is a gray to purple, crystalline (sand-like) powder. It was used to make dyes and pigments, and as a curing agent for plastics. It is no longer used to make dyes in the United States.

Reasons for Citation

- **3,3'-Dichlorobenzidine** is on the Right to Know 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 water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

Skin Contact

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

Inhalation

- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- 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

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	3	-
FLAMMABILITY	1	-
REACTIVITY	0	-

CARCINOGEN
POISONOUS GASES ARE PRODUCED IN FIRE

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

- **3,3'-Dichlorobenzidine** can affect you when inhaled and by passing through the skin.
- **3,3'-Dichlorobenzidine** should be handled as a CARCINOGEN and MUTAGEN--WITH EXTREME CAUTION.
- Contact can irritate and burn the skin and eyes.
- Inhaling **3,3'-Dichlorobenzidine** can irritate the nose and throat.
- Exposure to **3,3'-Dichlorobenzidine** can cause headache, dizziness, nausea and vomiting.
- **3,3'-Dichlorobenzidine** may cause a skin allergy.
- Exposure may affect the liver and kidneys.

Workplace Exposure Limits

OSHA: No exposure limits have been established by OSHA for **3,3'-Dichlorobenzidine**. Please refer to the OSHA *13 Carcinogens* Standard (29 CFR 1910.1003).

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

ACGIH: An exposure limit has not been determined for this suspected carcinogen.

- **3,3'-Dichlorobenzidine** is a PROBABLE 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 **3,3'-Dichlorobenzidine** 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 and 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) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require 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 **3,3'-Dichlorobenzidine**:

- Contact can irritate and burn the skin and eyes.
- Inhaling **3,3'-Dichlorobenzidine** can irritate the nose and throat causing coughing and wheezing.
- Exposure to **3,3'-Dichlorobenzidine** can cause headache, dizziness, nausea and vomiting.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **3,3'-Dichlorobenzidine** and can last for months or years:

Cancer Hazard
- **3,3'-Dichlorobenzidine** is a PROBABLE CARCINOGEN in humans. It has been shown to cause liver, breast, bladder, and other types of cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- **3,3'-Dichlorobenzidine** has caused CANCER in the offspring of animals exposed during pregnancy.

Other Effects
- **3,3'-Dichlorobenzidine** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Exposure may affect the liver and kidneys.

Medical

Medical Testing
Before first exposure and every 12 months thereafter, OSHA requires your employer to provide (for persons exposed to **3,3'-Dichlorobenzidine**):

- Complete work and medical history
- Thorough physical examination
- Liver and kidney function tests
- Any other tests determined necessary by the examining physician

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

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

OSHA requires your employer to provide you and your doctor with a copy of the OSHA *13 Carcinogens* Standard (29 CFR 1910.1003).

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).

Mixed Exposures
- More than light alcohol consumption can cause liver damage. Drinking alcohol may increase the liver damage caused by **3,3'-Dichlorobenzidine**.

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 actions are required for this chemical by OSHA. Refer to the OSHA *13 Carcinogens* Standard (29 CFR 1910.1003).
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.
- Where possible, transfer **3,3'-Dichlorobenzidine** from drums or other containers to process containers in an enclosed system.

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 **3,3'-Dichlorobenzidine**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective clothing material.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented 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 detectable concentration, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P100 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **3,3'-Dichlorobenzidine**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential for high exposure exists, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.

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).

- **3,3'-Dichlorobenzidine** may burn, but does not readily ignite.
- Use dry chemical, CO_2, water spray, alcohol-resistant foam or other foam as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides* and *Hydrogen Chlorides*.
- 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 **3,3'-Dichlorobenzidine** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **3,3'-Dichlorobenzidine** 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 **3,3'-Dichlorobenzidine** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **3,3'-Dichlorobenzidine** is handled, used or stored as required by the OSHA *13 Carcinogens* Standard (29 CFR 1910.1003).
- **3,3'-Dichlorobenzidine** may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce flammable and explosive *Hydrogen gas*.
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **3,3'-Dichlorobenzidine** 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 providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and 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.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne 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.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

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.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

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 on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

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.

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

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

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 *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **3,3'-DICHLOROBENZIDINE**

Synonyms: o,o'-Dichlorobenzidine; 4,4'-Diamino-3,3'-Dichlorophenol
CAS No: 91-94-1
Molecular Formula: $C_{12}H_{10}Cl_2N_2$
RTK Substance No: 0644
Description: Gray to purple, crystalline powder

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **1 - Fire** **0 - Reactivity** **DOT#:** UN 3077 **ERG Guide #:** 171 **Hazard Class:** 9 (Environmentally Hazardous Substance)	**3,3'-Dichlorobenzidine** may burn, but does not readily ignite. Use dry chemical, CO_2, water spray, alcohol-resistant foam or other foam as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides* and *Hydrogen Chlorides*. Use water spray to keep fire-exposed containers cool.	**3,3'-Dichlorobenzidine** may react with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) to produce flammable and explosive *Hydrogen gas*.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

DO NOT wash into sewer.

3,3'-Dichlorobenzidine is toxic to aquatic organisms.

PHYSICAL PROPERTIES

Auto Ignition Temp:	662°F (350°C)
Water Solubility:	Insoluble
Boiling Point:	788°F (420°C)
Melting Point:	270° to 271°F (132° to 133°C)
Molecular Weight:	253.13

EXPOSURE LIMITS

Exposure by all routes should be controlled to levels as low as possible.

The Protective Action Criteria values are:

PAC-1 = 6 mg/m^3
PAC-2 = 40 mg/m^3
PAC-3 = 2,000 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Natural Rubber
Coveralls:	Tyvek®
Respirator:	Full facepiece APR with *P100 filters* >6 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation and burns
Skin:	Irritation and burns
Inhalation:	Nose and throat irritation with coughing and wheezing
	Headache, dizziness, nausea and vomiting
Chronic:	Cancer (liver, breast, bladder) in animals

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.

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

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.