

## 4. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

### 4.1 PRODUCTION

3,3'-Dichlorobenzidine is commercially produced by reduction of *o*-nitrochlorobenzene through various reduction procedures to form a hydrazo compound, which is rearranged in the presence of mineral acids to form 3,3'-dichlorobenzidine (DCMA 1989; Sax 1987). Commercial supplies are usually provided in the form of the dihydrochloride salt because of its greater stability.

According to the 1997 Directory of Chemical Producers (SRI 1997), only one company, Lomac, Inc. of Muskegon, Michigan, manufactures (that is, produces) 3,3'-dichlorobenzidine. By contrast, in 1986, there were approximately 10 suppliers of the chemical listed in the United States (NTP 1994). Current production volumes of 3,3'-dichlorobenzidine for individual companies are considered confidential business information and cannot be reported. The United States International Trade Commission (USITC 1984a) reported a 1983 production volume of 3,3'-dichlorobenzidine-based dyes of over 18 million pounds in the United States. However, 3,3'-dichlorobenzidine is no longer used to manufacture dyes in the United States (CPMA 1998). Consumption of 3,3'-dichlorobenzidine in the United States amounted to 9.9 million pounds in 1987 (Hopmeier 1988).

Table 4-1 lists the facilities in each state that manufacture 3,3'-dichlorobenzidine or process the compound for further distribution, the range of maximum amounts of 3,3'-dichlorobenzidine on-site, and the activities and uses of the product. "Processing" means the further distribution of the compound either as the same physical compound, in a different form or physical state, or as part of another article or mixture (40 CFR 372.3). In 1996, there was one facility in the United States that manufactured or used 3,3'-dichlorobenzidine. The data listed in Table 4-1 are derived from the 1996 Toxics Release Inventory (TR196 1998). Only certain types of facilities were required to report. Therefore, this is not an exhaustive list.

### 4.2 IMPORT/EXPORT

Imports of 3,3'-dichlorobenzidine base and salts were 1.1 million pounds in 1983, while pigments derived from 3,3'-dichlorobenzidine were about 129,000 pounds in 1983 (USITC 1984b).

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**Table 4-1. Facilities That Manufacture or Process 3,3'-Dichlorobenzidine**

FACILITY	LOCATION <sup>a</sup>	RANGE OF MAXIMUM AMOUNTS ON SITE IN POUNDS	ACTIVITIES AND USES
LOMAC INC.	MUSKEGON , MI	1,000 - 9,999	PRODUCE , IMPURITY

Source: TRI96 1998

<sup>a</sup> Post Office state abbreviations used

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##### 4.3 USE

3,3'-Dichlorobenzidine is used primarily in the production of yellow, and some red and orange pigments for the printing ink, textile, paper, paint, rubber, plastic, and related industries (EPA 1979a). As of 1983, 7 specified pigments were commercially available. The yellow pigments derived from 3,3'-dichlorobenzidine can be used as substitutes for lead chromate pigments (HSDB 1996). Little, if any, dye is prepared from this compound. The chemical also has application as a compounding ingredient for rubber and plastics (HSDB 1996), and can be used to test for the presence of gold (Searle 1976). 3,3'-Dichlorobenzidine is used in the manufacture of the raw material tetraminobiphenyl which is used to produce polybenzimidazole (PBI). PBI fiber is used in many protective clothing applications, such as firefighter's apparel, welder's garments, high-temperature gloves, and crash rescue garments (Celanese 1985).

3,3'-Dichlorobenzidine is also used with 4,4'-methylenebis (2-chloroaniline) as a curing agent for liquidcastable polyurethane elastomers (HSDB 1996).

##### 4.4 DISPOSAL

3,3'-Dichlorobenzidine is treated in the workplace as a controlled substance under OSHA. Therefore, strict requirements have been made to minimize exposure to the chemical in the workplace air and contact with the skin and eyes. Nonetheless, some releases may occur in wastewater effluents.

One company which purchases 3,3'-dichlorobenzidine as the dihydrochloride salt in sealed fiber in drums rinses the empty drums with water, adds the rinse water to the product stream, then sprays the drums with a sodium hypochlorite bleach solution (converting the 3,3'-dichlorobenzidine to a quinone-type compound), and places them in polyethylene bags for disposal (London and Boiano 1986).

3,3'-Dichlorobenzidine is listed as a toxic substance under Section 313 of the Emergency Planning and Community Right to Know Act (EPCRA) under Title III of the Superfund Amendments and Reauthorization Act (SARA) (EPA 1995). Disposal of wastes containing 3,3'-dichlorobenzidine is controlled by a number of federal regulations (see Chapter 7). The current recommended technologies specified for treating 3,3'-dichlorobenzidine-containing wastes (waste waters and nonwastewaters) prior to land disposal include wet air oxidation, chemical or electrolytic oxidation, and carbon adsorption and incineration (EPA

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1986). Facilities which generate 3,3'-dichlorobenzidine-containing wastes, and owners and operators of hazardous waste treatment, storage, and disposal facilities must also comply with regulations promulgated under the authority of the Resource Conservation and Recovery Act (RCRA).