

Exposure to an environmental toxin, quality of life and psychological distress[☆]

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Abstract

This study examined the effects of polychlorinated biphenyls (PCBs), a toxic substance considered carcinogenic in nature, on the socio-psychological well-being of a Native American community located in upstate New York. A sample of 353 men and women completed a demographics questionnaire and measures assessing quality of life, psychological distress and depression. Blood samples were obtained for chemical analyses of PCBs and thyroid hormone levels. Urine samples were obtained to conduct the analysis of homovanillic acid (HVA), a proxy for dopamine function. The results of the study revealed that PCB exposure, as measured by body burden levels, was not significantly related to distress and depression. Likewise, PCB exposure was not significantly related to job, family and personal aspects of quality of life. However, the study revealed that lower quality of life in each of these domains was significantly related to higher levels of psychological distress in this sample.

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1. Introduction

Many communities in the United States have been adversely affected by exposure to a variety of hazardous substances such as lead, mercury, solvents, insecticides, and pesticides. Health problems such as chronic bronchitis and asthma, neurological deficits in young children, as well as psychiatric symptoms such as depression and psychological distress have been linked to exposure to different types of contaminants in the environment (e.g., *Artic Monitoring and Assessment Programme (AMAP), 1997; Brown, 2002; Jacobson & Jacobson, 1997, 2003; Morrow, Kamis, & Hodgson, 1993; Rahill & Lundberg, 1998; Weiss, 1998*). This is particularly troublesome because an estimated 6000

people for each of 32,000 hazardous waste sites located in the United States alone have been exposed to variety of toxic substances (Amler & Lybarger, 1993 as cited in *Brown, 2002*). Moreover, it has been argued that communities in which there is a high concentration of specific ethnic groups (e.g., African Americans, Latinos, Native Americans) are especially vulnerable because they are disproportionately exposed to hazardous materials by virtue of living near areas where dumping of toxic waste materials occurred over many years (*Bullard, 1994; Harding & Greer, 1993*).

One such community is the Mohawk Nation at Akwesasne located in upstate New York that has been negatively affected by continuous exposure to a variety of contaminants such as cyanide, phenyls, metals, and fluorides. Polychlorinated biphenyls (PCBs) were among the substances released into this environment during the 1950s through the 1970s by a number of industrial plants located on the St. Lawrence River and upstream from the

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Mohawk reservation. Specifically, PCB contaminated sludge was disposed of by these industrial plants causing air, water, soil and sediment contamination (Akwasne Task Force on the Environment Research Advisory Committee, 1997). Before learning about the contamination the Mohawks, not only ate the fish from the river, but also sold the fish to local markets. The river was used for recreational purposes as well. While the most common route of exposure is through fish consumption (Chiu, Beaubier, Chiu, Chan, & Gerstenberger, 2004) contamination is thought to be widespread on the reservation, not just the areas near the river (Chiarenzelli et al., 2000). As such, exposure pathways vary and include industrial, dietary, and possibly inhalation from local dredging.

According to Brown (2002) PCB neurotoxicity gained attention in the late 1970s and early 1980s when studies showed that exposure was related to physiological effects such as “gastrointestinal problems”, “skin rashes”, “frequent infections”, “fatigue” and “weakness” (p. 253). Although the literature is scant he also noted that there are a variety of psychiatric symptoms purported to be related to PCB exposure such as “irritability”, “nervousness”, “depression”, “somatic complaints”, “fatigue” and “poor concentration” (p. 254). Because PCBs are considered carcinogenic in nature (Agency for Toxic Substances and Disease Registry, 2000) the residents can no longer sell their fish and produce to local markets, thus negatively affecting their economy.

Just as important as the economic impact is the effect on their cultural traditions. One of the most important beliefs held by the Mohawks, like many other indigenous tribes, is that their land and all living things are to be respected and protected (Locust, 1988). The fact that their environment has been contaminated is a source of great concern among many of the residents on the reservation who report that it has negatively affected their spiritual connection with the land (Akwasne Task Force on the Environment Research Advisory Committee, 1997). Others also describe the impact of environmental contamination as a loss of community (Brown, 2002) and a “deterioration in the relationship between humans and their ecological surround” (Edelstein, 2002, p. 561). Consequently, psychological distress and quality of life are thought to be related to PCB exposure.

The rationale for selecting these particular areas of inquiry was based on recent studies showing that Native American communities are often located near environmental hazardous wastes sites, and therefore may be at greater risk of adverse health effects (e.g., Carpenter, 1995; Lundberg & Santiago-Rivera, 1998; Santiago-Rivera, Morse, Hunt, & Lickers, 1998). Similar risks have been reported in other Native American communities; Palinkas, Pettersen, Russell, and Down (1993) found that Native Alaskans who experienced the devastating effects of the Exxon Valdez oil spill showed elevated levels of depression, anxiety, and post traumatic stress disorder.

One mechanism by which exposure to PCBs is thought to be related to symptoms of depression is its association with impaired endocrine functioning. Specifically, as PCBs accumulate in the body, they may disrupt thyroid hormone functioning (McKinney & Pedersen, 1987) and alter dopamine levels (e.g., Schatzberg & Rothschild, 1992), both of which have been shown to be related to symptoms of depression. In addition, the proposed relationship between PCB exposure and psychological distress is also based on the argument that environmental contamination may contribute to a loss of tribal identity, the destruction of spiritual values, and a reduced quality of life that may be related to mental health problems (Curtis, 1992). As such, this study is the first of its kind to examine the effects of PCB exposure on the social–psychological well-being of a Native American population.

2. Method

2.1. Participants

The participants consisted of 353 randomly selected adult men and women from a community of approximately 12,000 residents of the Akwasne Mohawk reservation located in upstate New York. The sample of 353 adults consisted of 113 men (32%) and 240 women (68%) and were representative of the community. The participants ranged in age from 18 to 79 (mean age = 38, SD = 13.3). Approximately, 48% of the participants were married, 26% were single, 12% were separated or divorced, and 4% were widowed. With respect to employment, about 55% of the participants were employed either full or part-time, and the unemployment rate of 23% among this group was considerably higher than the national or state average, but similar to other Native American populations. The distribution of educational level revealed that approximately 10% of the sample had college or advanced degrees, an additional 58% were high school graduates, and 26% had completed grade school. An additional 6% chose not to respond to this question. Religious affiliations were predominantly Catholic, Protestant, and Traditional Longhouse religions, with 50%, 6%, and 28% membership, respectively. About 16% did not wish to respond to this question or did not have any religious affiliation.

2.2. Procedures

As outlined in Schell et al. (2003), a randomization process was used consisting of identifying and enumerating households using detailed maps of the reservation including a drive through the neighborhoods. A list was created in which 50 homes were randomly selected at a time. After selecting the first 50 households, the field staff visited these dwellings to identify the number, age and gender of people in the household. Subsequently, a member of our field staff sent a letter of invitation to participate in the study followed by a home visit. During the home visit the field

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