

# Diabetes, Polychlorinated Biphenyls (PCBs), and Dioxins

## Introduction

Diabetes is a serious concern in Alaska and is prevalent throughout the state. In 2004, 21,024 adults in Alaska reported a diagnosis of diabetes, a 27% increase from 2000.<sup>1</sup> The number of people in Alaska with diabetes has been increasing steadily since 1995 and public health officials predict that the trend will continue. People in Alaska with lower incomes and retired people or those unable to work are more likely to have diabetes.<sup>2</sup> Diabetes was the seventh leading cause of death in Alaska in 2003.<sup>3</sup> According to the Indian Health Service, the prevalence of diabetes among Alaska Native people increased 80% over a 20-year period.<sup>4</sup>

This paper is a review of the scientific literature that examines the role of environmental contaminants, such as PCBs<sup>5</sup> and dioxins<sup>6</sup>, as contributing factors in the incidence of diabetes. Although risk factors commonly associated with diabetes include obesity and a sedentary lifestyle, the role of environmental exposures must be considered. Diabetes prevention programs have generally focused on education concerning diet and physical activity. Evidence presented in this paper suggests that prevention measures should also address environmental exposures.

In Alaska, we are particularly concerned about contamination from industrial and military sources that adversely affect the environment and human health. The north is a hemispheric sink for persistent organic pollutants (POPs), such as PCBs, pesticides, and dioxins, that threaten the integrity of ecosystems and human health. POPs originate from thousands of miles away, traveling northward via wind and ocean currents and in the bodies of migratory animals. Local sources of contaminants include military sites and resource extraction operations. The cold northern environment and fat-based food web favor the retention and accumulation of POPs.

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<sup>1</sup> Hall, L. et.al. 2005. The Prevalence of Diabetes Among Adult Alaskans 2002-2004. State of Alaska Epidemiology Bulletin 9(3):1-7.

<sup>2</sup> Ibid.

<sup>3</sup> Hall, L.S. et.al. 2005. Diabetes Mortality in Alaska 1994-2003. State of Alaska Epidemiology Bulletin 9(4):1-7.

<sup>4</sup> Hall, L.S. 2001. Diabetes in Alaska: Results from the Behavioral Risk Factor Surveillance System. State of Alaska Division of Epidemiology Bulletin 5(4):1-7.

<sup>5</sup> Polychlorinated biphenyls (PCBs) are persistent, synthetic chemicals manufactured in the U.S. between 1929 and 1976 for use in transformers, electrical capacitors, hydraulic fluids, paints, caulking, ceiling/floor tiles and other materials. Although PCBs are banned in many countries, including the U.S., there are substantial amounts in capacitors, transformers, and waste sites. Formerly used military sites in Alaska are often contaminated with PCBs. PCBs are mixtures of chemicals containing up to 209 congeners or components. PCBs have a range of adverse health effects, especially during fetal and early life, including IQ and behavioral deficits, and alterations of thyroid and reproductive function. Exposure to PCBs increases the risk of cardiovascular disease, liver disease, and diabetes. For a complete review of PCBs, see: Carpenter, D. 2006. Polychlorinated biphenyls (PCBs): Routes of Exposure and Effects on Human Health. Reviews of Environmental Health 21(1).

<sup>6</sup> Dioxins are a group of persistent chlorinated chemicals originating primarily as by-products of industrial processes such as incineration, paper production, metallurgical operations, and pesticide manufacturing.