

Parkinson's Disease and pollution: Environmental Health

This fact sheet is part of a series on the link between health challenges and toxic chemicals in our environment. Oregon health and community organizations provided input on the health issues of greatest concern in our state.

What is Parkinson's Disease?

Parkinson's Disease (PD) is a chronic disease of the nervous system. Over time, the brain loses the ability to form and transmit dopamine, a chemical critical for movement. Among the first symptoms are tremors, muscle stiffness and poor balance.

What causes Parkinson's Disease?

The exact cause of Parkinson's is unknown. Risk factors include genetics, diet, early-life exposure to viral or bacterial infections, allergies and toxic chemical exposure (Liu et al., 2003; Bower et al., 2006; Brown et al., 2006; Dick, 2006; Costello et al., 2009; Wang et al., 2011).

Agrochemicals: No single pesticide, herbicide, fungicide, or insecticide, by itself is suspected to cause PD. But for people with certain genetics, exposure to certain pesticides have been shown to increase risk (Ritz et al., 2009). Exposure to two or more pesticides can increase risk even more. (Liu et al., 2003; Brown et al., 2006; Dick, 2006; Costello et al., 2009; Wang et al., 2011).

Examples of agrochemicals linked to increase risk of PD include:

Rotenone: a "botanical" or "organic" pesticide used to kill invasive fish. Though not registered, it is also sold as a pesticide for home and garden use (Tanner et al., 2011).

Paraquat: used by certified applicators on corn, soybean, cotton and select fruit crops (Liu et al., 2003).

Organochlorines: Pesticides like DDT used for mosquito control and dieldrin for termites, used before 1960 and largely banned in the 1970s and 1980s (Richardson et al., 2006)

Lindane: used to treat lice (Sharma et al., 2010; Heusinkveld and Westerink, 2012; FDA, 2013).

Maneb: a fungicide used on crops, most widely used on almonds, lettuce, peppers and walnuts (EPA, 2005; Domico et al., 2006).

Industrial chemicals: Polychlorinated biphenyls (PCBs), a class of over 200 chemicals used widely in industry before 1977, interfere with dopamine in laboratory studies and are found in high levels post-mortem in people with PD (Seegal et al., 1990 and 2002; Caudle et al., 2006; Hatcher-Martin, 2012). Though they were banned in 1977, PCBs persist in the environment, and bio-accumulate in many fish that we eat (Liu et al., 2003). A recent sample of Columbia River fish found levels of PCBs far exceeding safe consumption standards (Columbia Riverkeeper).

Solvents: While studies conflict, evidence suggests that repeated exposure to solvents used for cleaning, degreasing and in certain products may be related to PD. Solvents include methanol, ethanol, n-hexane, trichloroethylene and other chlorinated solvents may be related to PD (Cannon and Greenamyre, 2011; Lock et al, 2013).

Heavy Metals: Exposures to industrial releases of heavy metals, including manganese, iron, copper and lead have been associated with symptoms of PD (Liu et al., 2003; Mastroberardino et al., 2009; Willis et al., 2010; Khalid et al., 2011; Park et al., 2013).

In 2012, industrial facilities in the US released 15 million pounds of manganese, 13 million pounds of copper and 10 million pounds of lead. (Oregon facilities released 213,00 pounds of manganese, 80,000 pounds of copper and 13,000 pounds of lead (US EPA, 2012)

Occupational Exposure: A recent study suggests that pesticide applicators (specifically Paraquat and Rotenone) may have double the risk of developing PD (Tanner et al., 2011). In another study, those exposed to solvents in the workplace showed earlier onset and more severe symptoms (Pezzoli et al., 2000).

Who has Parkinson's Disease?

The average age of onset for PD is age 60 and PD risk increases with age. Less than 10 percent of cases begin before age 40 (Parkinson's Disease Foundation, 2013).

Men are 1.5 times more likely to be diagnosed with Parkinson's than women (Parkinson's Disease Foundation, 2013), and are twice as likely to die from the disease (DHHS, 2013).

Roughly 1.5 million people in the US have PD (OHSU, 2013) and approximately 60,000 new cases of PD are diagnosed annually (Parkinson's Disease Foundation, 2013); many more cases may go undetected. Prevalence of Parkinson's is expected to double by 2030 (Dorsey et al., 2007).

The economic toll of Parkinson's in the US is nearly \$15 billion annually (Kowal, 2013).

After Alzheimer's disease, Parkinson's Disease is the largest cause of death from neurological disorders (DHHS, 2013).

In Oregon: Roughly 22,500 Oregonians are currently living with PD (OHSU, 2013). PD mortality rates in Oregon are on an upward trend. In 2011, more than 350 Oregonians died from Parkinson's Disease (DHHS, 2013). Oregon has the 6th highest rate in the nation for deaths from PD (OHA, 2012).

What you can do

- Support funding for Parkinson's research with Parkinson's Action Network
<http://www.parkinsonsaction.org>
- Learn about industrial releases of heavy metals near you :
http://iaspub.epa.gov/triexplorer/tri_release.chemical

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