

Chapter 12

Impact of Hydrocarbon Exposure on the Risk of Parkinson's Disease

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ABSTRACT

PAHs (polycyclic aromatic hydrocarbons) are a type of organic compounds arising from the incomplete combustion of natural materials. PAHs are harmful organic pollutants and are omnipresent in the environment. It is well known that some hydrocarbons are highly carcinogenic, and for this reason, they become of great interest recently. Anthropogenic activities are considered as the primary sources of PAHs including the combustion of refuse, exhaust of motor vehicles, contaminated food, and industrial food processing such as smoking processes and some cooking practices like grilling and roasting. Consumption or exposure of hydrocarbons will elicit neurodegenerative diseases such as Parkinson's.

DOI: 10.4018/978-1-6684-5156-4.ch012

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This chapter offers a general review of PAHs origins, properties, human health effects, and the PAHs consumption in diverse food types and the route of dietary intake. The other aim is to highlight the potential relationship between hydrocarbon exposure and the risk of Parkinson's disease through gut microbiota and oxidative stress.

INTRODUCTION

In recent years, polycyclic aromatic hydrocarbons (PAHs) have received a lot of attention because of an increase in concentration levels of PAHs in different environmental areas and the diversity of their sources (Xia, Duan, Qiu *et al.* 2010). Polycyclic aromatic hydrocarbons (PAHs) “polyaromatic hydrocarbons” or “polynuclear aromatic hydrocarbons”, arise from the incomplete combustion of natural materials (such as oil and wood) and natural polymer compounds (Asfaram, Dil, Arabkhani *et al.* 2020). So, PAHs are found in different environmental areas (water, air, and soil), as well as in various foods we consume everyday (Ghasemzadeh-Mohammadi, Mohammadi, Hashemi *et al.* 2012; Duedahl-Olesen 2013). PAHs occur via environmental sources (either natural or anthropogenic), although the main source of PAHs is anthropogenic in origin such as the combustion of refuse, exhaust of transport activities, tobacco smoke, petroleum refineries, oil/gasoline spills (Christensen and Bzdusek 2005; Moon, Kannan, Lee *et al.* 2006), industrial food processing, packaging materials, cooking practices and contaminated food (Fromberg, Højgård and Duedahl-Olesen 2007).

The nervous system (NS) is a highly complex organ that is responsible for receiving and processing sensory information and the control of highly complex behaviors that allow for survival. In addition, the magnitude of the effects and the specificity of the lesion of our NS are influenced by environmental exposures, such as age, sex, route and its dose of exposure (Cavanagh 2000). So, the term “neurotoxicology” can broadly be defined as the study of adverse effects on the NS resulting from chemical exposures, directly or indirectly, synthetic or natural (Cavanagh 2000). Therefore, consumption or exposure of a specific substance, like hydrocarbons, will elicit neurodegenerative diseases, like Parkinson's disease (PD) and Alzheimer's disease (Cannon and Greenamyre 2011).

In fact, dietary intake is the first source of exposure to PAHs especially for non-exposed and non-smokers, and PAHs can spread widely in food chain via consumption of various food products (Xia, Duan, Qiu *et al.* 2010). It is reported that, in various countries, diet was responsible for 90% of PAHs exposures of population (Alomirah, Al-Zenki, Al-Hooti *et al.* 2011). Common health concerns from PAHs include the ability of being teratogenic, carcinogenic, and mutagenic (Kim, Jahan, Kabir *et al.* 2013). PAHs are so present in the environment, for that reason most people can be exposed to them through dermal contact, ingestion, and inhalation (Armstrong, Hutchinson, Unwin *et al.* 2004; Ravindra, Sokhi and Van Grieken 2008).

This chapter offers a general review of PAHs origins, properties, human health effects, and the PAHs consumption in diverse food types and the route of dietary intake. The other aim is to highlight the potential relationship between hydrocarbon exposure and the risk of Parkinson's disease through gut microbiota and oxidative stress. Finally, we suggest in this chapter some preventive measures to minimize PAHs in food products and to limit their risks.

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