

Polycyclic aromatic hydrocarbons strongly linked to raised rheumatoid arthritis risk

These environmental toxicants seem to mediate most of smoking's effects on risk

The amount of environmental exposure to polycyclic aromatic hydrocarbons, or PAH for short, is strongly linked to a person's risk of developing rheumatoid arthritis, suggests research published in the open access journal **BMJ Open**.

These chemicals, formed from the burning of coal, oil, gas, wood, or tobacco as well as the flame grilling of meat and other foods, also seem to account for most of smoking's impact on risk of the disease, the findings indicate.

Mounting evidence links several environmental toxicants with various long term conditions. But few studies have looked at their association with inflammatory conditions, such as rheumatoid arthritis, which is thought to arise from an interplay between genes, sex, and age, and environmental factors, including smoking, nutrition, and lifestyle.

To try and shed some light on the potential role of environmental exposure on rheumatoid arthritis risk, the researchers drew on responses to the nationally representative US National Health and Nutrition Examination Survey (NHANES) between 2007 and 2016.

NHANES evaluates a wide variety of toxicants, including PAH; chemicals used in the manufacture of plastics and various consumer products (PHTHTEs); and volatile organic compounds (VOCs), derived from paints, cleaning agents, and pesticides, among other things; along with data related to health, nutrition, behaviours and the environment.

The study included 21,987 adults, 1418 of whom had rheumatoid arthritis and 20,569 of whom didn't. Blood and urine samples were taken to measure the total amount of PAH (7090 participants), PHTHTEs (7024), and VOCs (7129) in the body.

The odds of rheumatoid arthritis were highest among those in the top 25% of bodily PAH levels, irrespective of whether or not they were former or current smokers.

After accounting for potentially influential factors, including dietary fibre intake, physical activity, smoking, household income, educational attainment, age, sex, and weight (BMI), only one PAH—1-hydroxynaphthalene—was strongly associated with higher odds (80%) of the disease.

PHTHTE and VOC metabolites weren't associated with heightened risk after accounting for potentially influential factors.

Somewhat surprisingly, however, smoking wasn't associated with heightened rheumatoid arthritis risk either, after accounting for PAH levels in the body.

And further analysis to separate out the influences of PAH and smoking showed that bodily PAH level accounted for 90% of the total effect of smoking on rheumatoid arthritis risk.

This is an observational study, and as such, can't determine cause. And the researchers acknowledge various limitations to their findings, including that measurements of environmental toxicants in fat (adipose) tissue weren't available.

Nor did they measure heavy metal levels which have previously been linked to rheumatoid arthritis risk. Cigarettes are a major source of the heavy metal cadmium.

But they write: "To our knowledge, this is the first study to demonstrate that PAH not only underlie the majority of the relationship between smoking and [rheumatoid arthritis], but also independently contribute to [it]."

"This is important as PAH are ubiquitous in the environment, derived from various sources, and are mechanistically linked by the aryl hydrocarbon receptor to the underlying pathophysiology of [rheumatoid arthritis]."

They add: "While PAH levels tend to be higher in adults who smoke...other sources of PAH exposure include indoor environments, motor vehicle exhaust, natural gas, smoke from wood or coal burning fires, fumes from asphalt roads, and consuming grilled or charred foods."

"This is pertinent as households of lower socioeconomic status generally experience poorer indoor air quality and may reside in urban areas next to major roadways or in high traffic areas." These people may therefore be particularly vulnerable, they suggest.