

# Perceiving Parkinson's

## Environmental Factors In Parkinson's (Day 24)

We've discovered two critical aspects of the neuron-killing process in Parkinson's - the gut microbiota is disturbed, and the body's mitochondria are dysfunctional. Yet what disturbs the gut microbiota, and what produces mitochondria dysfunction?

There are literally hundreds of studies on the various **environmental factors** that confer a higher or lower risk of developing Parkinson's later in life. Thankfully, in 2016 the Greek epidemiologist Vanesa Bellou and colleagues performed a succinct yet utterly comprehensive **umbrella review**, a massive type of analysis that pools the data from the best and largest studies to date, on these environmental factors.

In Bellou's umbrella study, the two environmental factors associated with the **highest risk** of developing Parkinson's later in life compared to any other were:

(1) **Pesticides/Herbicides** - People with a history of pesticide/herbicide exposure were **over 60%** more likely to develop Parkinson's compared to people with no prior exposure to these agents. No single agent has been found to be more responsible than any other - rotenone, paraquat, dieldrin, maneb and several others all show an association with Parkinson's. Interestingly, these pesticides/herbicides are all widely recognized mitochondrial poisons in humans; each of them induces **mitochondria dysfunction**, often followed by cell death.

(2) **Head trauma** - People with a history of head trauma resulting in concussion were **over 50%** more likely to develop Parkinson's compared to people without such an injury. Concussive head injuries initiate a "neurometabolic cascade" throughout the brain, resulting in a transient or permanent **mitochondria dysfunction** that makes a concussed person even more susceptible to head trauma in the future.



Pesticides/Herbicides - the number one environmental risk factor for Parkinson's.

In Bellou's umbrella study, the three environmental factors associated with the **lowest risk** of developing Parkinson's later in life compared to any other were:

(1) **Smoking** - Smokers were **30%** less likely to develop Parkinson's compared to people who had never smoked. It is known that smoking cessation markedly alters the gut microbiota, so it is likely that smoking itself also **alters the gut microbiota**, perhaps in a way that lessens intestinal inflammation and therefore reduces damage to the enteric nervous system in the gut.

(2) **Coffee** - Coffee drinkers were **30%** less likely to develop Parkinson's compared to people who did not drink coffee. Importantly, decaffeinated coffee shows no protective effect. It is known that coffee consumption **alters the gut microbiota** by significantly increasing the number of anti-inflammatory *Bifidobacteria*, thus reducing inflammation and damage to the enteric nervous system.

(3) **Exercise** - People who regularly exercised were **30%** less likely to develop Parkinson's compared to people who rarely exercised. It is well known that exercise in many forms **increases mitochondria biogenesis**, thus alleviating energy failure within cells - including neurons.



Smokers are less likely to develop Parkinson's.

It is rather striking that each of the environmental factors associated with a higher risk of Parkinson's (pesticides/herbicides and head trauma) or a lower risk of Parkinson's (smoking, coffee, and exercise) is suspected or known to **affect the gut microbiota or the body's mitochondria**. These are serious clues, clues that suggest that perhaps we ought to be seeking additional environmental factors known to significantly alter **both** the gut microbiota **and** the body's mitochondria - namely, **diet**.

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#### References

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- (4) Barkhoudarian et al. 2011. The Molecular Pathophysiology of Concussive Brain Injury. *Clinical Sports Medicine* 30, 33-48.
- (5) Derkinderen et al. 2014. Gut feelings about smoking and coffee in Parkinson's disease. *Movement Disorders* 29(8), 976-979.