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Bhavini Patel

The Effects of Environmental Pollution on our Immune System

Human activity has had devastating effects on the environment since the start of the industrialization era. As global temperatures continue to climb, we will begin seeing mounting changes in our climate that will lead to intense storms, floods, wildfires, and extreme heatwaves (Huber and Gulledge, 2011). As a matter of fact, we are already witnessing the brunt of many of these weather conditions, but unfortunately for us, this is not the full extent of the damage yet. As the environment declines, so will our health, and more specifically, our immune system.





The Immune System in a Nutshell

Briefly put, the immune system protects us from illness and disease ranging from mild to severe. It is made up of different organs which are equipped with cells capable of fighting bacteria, viruses, fungi, and toxins. Without this system, we would be unable to defend ourselves from the pathogens present in our environment and would end up with symptoms like indigestion or irritable bowel syndrome (IBS), frequent infections and colds, chronic fatigue, slow-healing wounds, and elevated stress levels (Hasan, 2022).

How Does The Environment Affect Immunity?

There are three primary ways through which environmental changes can impact human immunity: rising temperatures, pollutants (i.e., harmful chemicals), and the introduction of non-native species into our neighborhoods (Martin et al., 2010).

Rising temperatures. Multiple animal studies confirm that high temperatures such as those experienced during heat waves reduce the strength of animal immune responses. In an experiment conducted at the University of Tokyo, it was found that heat stress affected the ability to fight the flu in laboratory mice (2019). In a different study that used cattle as its animal model, it was observed that high temperatures increased the amount of heat shock proteins in the animals' bodies, a phenomenon that correlated strongly with high levels of cellular damage (Bagath et al., 2019). This type of evidence has also been identified in a variety of animals including reptiles, birds, insects, and mammals (Li et al., 2021; Martin et al., 2010; Adamo and Lovett, 2011).

Although we do not yet know with certainty how the human immune response is directly modulated by heat, we do know that increasing temperatures bring bad news for our disease-fighting system. For one, it will have to fight harder and more frequently as heat brings with itself humidity which creates the perfect condition for the growth of all kinds of parasites and pathogens (Bezirtzoglou et al., 2011). Heat and humidity not only shorten pathogen incubation periods, but they also increase the abundance of pathogens in multiple biomes, including marine ones. This is bad news

for consumers of seafood who may run the risk of contracting seafood intoxication and cholera as the climate warms.

Pollutants. One of the best studied examples of pollutants affecting animal and human health comes from research on pesticides. Pesticides are chemicals that are often used in agriculture to eliminate unwanted species of weed, fungi, and insects. Besides agriculture, pesticides are also used to eradicate mosquitos and other parasites in regions of the world that face malaria epidemics, and as such may be referred to as insecticides instead.

Unfortunately, the use of these chemicals has adverse effects on the cells produced by the immune system like leukocytes and macrophages (Lee and Choi, 2020). Research reviews that study human health data also confirm a strong link between pesticide use and respiratory diseases, organ diseases, nervous system disorders, and cancer – all of which are related to dysfunctions in the immune system. A more recent study in 2021 found that exposure to pesticides in utero disturbs the developing immune cells of the fetus, and that the effects of these changes may affect the baby long after birth (Prahl et al., 2021). In fact, the same study revealed that the response to post-birth vaccinations is frequently dampened in these babies.





Invading species. As discussed previously, global warming facilitates the growth of pests and pathogens that may be detrimental to our health. Besides this, there is an additional concern for non-native species invading ecosystems that are completely new to them. This is a common consequence of human activities that involve the destruction of natural animal habitats (e.g., deforestation). Non-native species can include small mammals such as rodents, but also insects, bacteria, fungi, birds, and more.

The main worry for humans is the contamination of our livestock by non-native species (French, 2017). When livestock falls victim to these invaders, they are often administered antibiotics, and this too, persistently as the immune system of feedlot animals are often weaker than that of their wild counterparts (Dutta et al., 2019). The problem with the use of antibiotics is that they create “super bugs” that have evolved to resist the effects of such drugs (Adegoke et al., 2016). Although a clear effect on human health has yet to be studied, many scientists are speculating that antibiotic-administered livestock likely impacts humans by disturbing our gut microbiome and making us more likely to fall ill through food poisoning.

Final Thoughts

Our immune system is our first line of defense against all sorts of pathogens. In this article, we described two ways the immune system is influenced by the deteriorating environment: (1) directly, as is the case with pesticides, and (2) indirectly, as is the case with changes in our food (especially meats and seafoods) and local epidemics driven by non-native species. Once down, the immune system can have a domino effect of negative consequences on the rest of our organ systems.

It is important to remember that such a biological catastrophe can be prevented through concrete actions taken to fight against environmentally unfriendly activities. Educate yourself, spread awareness, and work on reducing your personal negative impact on the planet and your health. Visit <https://aseq-ehaq.ca/en/resources/visit-our-websites/> to find the right resources and get started.



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