

# Air Pollution Is Making Your Allergies Worse

Analysis by [Dr. Joseph Mercola](#) ✓ Fact Checked

## STORY AT-A-GLANCE

- › Air pollution attaches to pollen and can damage your lungs, which may help drive protein allergens deeper into your pulmonary system to trigger a significant allergic response
- › Rising levels of carbon dioxide gas have lengthened the growing season, contributing to more pollen in the air. However, the pollen has less protein, which may be contributing to the collapsing bee population
- › The number of people with food allergies is also rising, including adults who develop food allergies
- › Your allergic response is mediated by your gut microbiome. Another physiological biomarker tied to seasonal and food allergies is vitamin D; consider testing your level twice a year to identify your vitamin D requirements

With each passing year, more people are affected by seasonal allergies. In the quest to identify the mechanism behind the growing number of people experiencing allergies, scientists have identified several factors that play an important role. One of these is air pollution.<sup>1,2</sup>

According to the Asthma and Allergy Foundation of America,<sup>3</sup> more than 50 million Americans have experienced a variety of types of allergies each year, and that number only continues to rise. The annual cost exceeds \$18 billion for allergic rhinitis and \$25 billion for food allergies.

The most common types of seasonal allergies are reactions to tree, grass and weed pollen. Allergic rhinitis, which is also called hay fever, affects 5.2 million children and 19.2 million adults. Although these numbers are staggering, scientists expect them to continue to rise as increasing levels of carbon dioxide (CO<sub>2</sub>) have affected plant growth and pollen production.

The most common symptoms of allergic rhinitis include sneezing, stuffy, runny nose, watery and itchy eyes and itching in your nose, throat or mouth. A sizable number of allergy sufferers experience **noticeable brain fog** as well. Food and seasonal allergies are your body's reactions to particles it considers foreign.

The first time your body meets a protein allergen, plasma cells release immunoglobulin E (IgE).<sup>4</sup> This attaches to the surface of mast cells, which are found in great numbers in your surface tissue such as skin and nasal mucus membranes. Mast cells release important chemical mediators, one of which is histamine.

The next time your body encounters this allergen, your mast cells become activated within minutes and release a powerful cocktail of histamines, leukotrienes and prostaglandins. This triggers the cascade of symptoms that you associate with allergies.

## **Rising Levels of CO<sub>2</sub> Feed Flowering Plants**

One of the major components of air pollution is carbon dioxide. According to the Center for Climate and Energy Solutions,<sup>5</sup> carbon dioxide makes up 76% of all greenhouse gas emissions. Trees and other plants use carbon dioxide for photosynthesis. You might think rising levels of carbon dioxide may be good for plant life, but like most things, plants need a balance.

Gilles Oliver is an engineer from the National Aerobiological Surveillance Network, which tracks pollen throughout France. He spoke with a reporter from Vice France about the interaction between CO<sub>2</sub> and plant life, saying,<sup>6</sup> “But when the proportion of this CO<sub>2</sub> in the air increases, plants grow faster and produce more pollen.”

An increase in pollen production raises your exposure to pollen, and thus produces more severe seasonal allergies. Changes in temperature and CO2 have also extended the frost-free season and thus lengthened pollen season.<sup>7</sup> However, the pollen being produced by these plants may be contributing to the collapse of the [bee population](#).

Scientists have found that increases in CO2 produce more pollen, but the pollen has lower protein levels.<sup>8</sup> When bees harvest from flowers they first drink the nectar and then collect the pollen. Nectar is high in carbohydrates, while pollen offers long-term nutrition and provides the bees' only natural source of protein.

When scientists compared flowers from Canada Goldenrod collected from 1842 to the present, they found the percentage of protein dropped by 33%.<sup>9</sup> Over the same number of years, CO2 levels have risen by 30%. This increased the carbohydrates in the pollen making it essentially junk food for bees.<sup>10</sup>

The researchers confirmed the CO2 change in the environment played a role in dropping protein levels through testing published in the Proceedings of the Royal Society B.<sup>11</sup>

More than 100 past studies have demonstrated the change in atmospheric carbon dioxide reduces the nutritional value of plants, but this study was the first to examine the effects on bees. Mathilde Renard, an agricultural engineer at the Environmental Department of the Paris City Hall, also spoke with the Vice France reporter about the rising pollen counts in Paris.<sup>12</sup>

She attributes some of the urban pollen to the city's planting efforts. One of the main strategies Paris is now using is to diversify the species to reduce the pollen concentration for each plant, in the hope of reducing citizens' allergic response.

Other gardening choices that affect pollen count include preferentially planting male trees.<sup>13</sup> Female trees shed more seeds and fruit, which need to be cleaned, but male trees tend to produce more allergic pollen. Some city planners have also chosen species based on their aesthetic value. For instance, birch trees are pretty, but birch tree pollen is one of the largest allergic triggers in the northern hemisphere.<sup>14</sup>

## Pollution and Allergens Interact in Rising Allergies

Oliver attributes the increase in allergies in France to air pollution, saying,<sup>15</sup> “It does two things. If you have allergies, it weakens your respiratory tract so you can get ill more easily. It also breaks up the pollen particles in the air, which allows them to penetrate deeper in our respiratory systems.”

The effect of **air pollution** on your body is insidious. The World Health Organization<sup>16</sup> determined 92% of the global population is breathing polluted air. Most people associate air pollution with respiratory conditions since it has a significant impact on your pulmonary health.

However, while the damage to your lungs is significant, it's important to remember air pollution affects more than your pulmonary system. For example, a study<sup>17</sup> published in Environmental Health found a link between living close to busy roads and developing non-Alzheimer's dementia and Parkinson's disease.

According to the WHO, by 2016 air pollution was already responsible for **respiratory diseases** that killed 543,000 children aged 5 years and younger every year.<sup>18</sup> Air pollution is also responsible for asthma in 14% of children around the globe. In April 2019, London launched an ultra-low emissions zone in central London in an attempt to reduce emissions by 45%.<sup>19</sup>

Researchers found that children living in these areas had a reduction in lung capacity by about 5% when pollution rose above legal levels.<sup>20</sup> Dr. Ben Barrett commented on studies evaluating the effect air pollution has on pulmonary health in children, saying:<sup>21</sup>

*“Air pollution has been found to restrict lung growth in children. Low lung function in childhood can persist into adulthood and is often associated with other health problems including chronic obstructive lung disease in later life.”*

## Air Pollution May Also Drive Pollen Deeper Into Your Lungs

As Oliver commented, air pollution increases the ability of pollen to penetrate your lungs. This can happen through several mechanisms.<sup>22</sup> These include the facilitation of pollen release, stimulating the IgE-mediated response and enhancing the expression of allergens within pollen grains.

Grains of pollen do not only carry allergens, but can also elicit allergic responses in individuals who are sensitized. Pollen grains are too large to penetrate deep into the respiratory tract, so symptoms observed with patients who are allergic to pollen are more likely due to particles that are smaller than pollen grains. According to researchers:<sup>23</sup>

*“Interestingly, air pollutants bind to these particles and exacerbate allergic disorders. Moreover, pollen grains release biologically active lipids, which activate immune cells in vitro.”*

Researchers postulate that the interaction between air pollution and pollen grains outside the body may increase the amount of allergen released into the environment. This may happen through a variety of mechanisms that researchers have been studying in the lab and with human participants.<sup>24</sup>

They found that allergic reactions to grass pollen are greater in cities than in rural areas. Several types of air pollutants act “as adjuvants through binding to allergens and stimulating IgE synthesis, resulting in exacerbation of asthma symptoms.”<sup>25</sup>

## **A Clean Society May Increase Risk of Food Allergies**

The number of people experiencing **food allergies** is also on the rise. One paper<sup>26</sup> published by Yale University<sup>27</sup> proposed the rising number may be the result of an exaggerated activation of the system that protects you against eating toxic foods. As many as 8% of children<sup>28</sup> have a potentially deadly response to the major eight food allergens, often referred to as the “Big 8.”<sup>29</sup>

These include milk, eggs, wheat, soybeans, fish, crustacean shellfish, tree nuts and peanuts. Your body uses multiple sensory mechanisms to monitor what you eat,

including chemosensory processes in the gut. The Yale University scientists argue that the body has a food quality control system in which an allergic response plays a significant role.

One prevailing theory for this rise in food allergies is living in a [too-clean environment](#). This is also called the hygiene hypothesis, which some scientists have expanded to include processed foods, dishwashing detergent and other environmental chemicals.

In a paper<sup>30</sup> written in *Clinical and Experimental Immunology*, the researchers argue these factors also play a role in disrupting your internal food quality control system.

There is a difference between a food sensitivity, intolerance and a food allergy.<sup>31</sup> A true allergy is mediated by the immune system and triggered by a reaction to proteins found in your food or drink. Food intolerances are also called food sensitivities. These are usually an unpleasant gastrointestinal reaction, but the reaction is not mediated by your immune system.

Although most food allergies develop in childhood, it's not unheard of for adults to develop a food allergy. Data<sup>32</sup> gathered from October 2015 to September 2016 suggest 10.8% of adults are allergic to food. Scientists believe this contradicts the long-held belief that most allergies develop in childhood.

In a survey of 40,443 adults, 38.3% had food allergies that sent them to the emergency room and 48% had at least one triggered after the age of 18. Your gut microbiome is vital to the functioning of your immune system, which mediates an allergic response to food. You'll find suggestions on how to optimize your gut microbiome in "[How Your Gut Health Impacts Your Disease Risk](#)."

## **Vitamin D – Links to Seasonal and Food Allergies**

One physiological biomarker tied to the risk of seasonal and food allergies is vitamin D. Researchers have found there is both experimental and clinical evidence that vitamin D is linked to allergic rhinitis.<sup>33</sup>

One double-blind placebo-controlled clinical trial<sup>34</sup> evaluated the combined effect of vitamin D supplementation with an antihistamine medication. The study found that the people who received vitamin D and the medication had a significant decrease in their symptoms as compared to those who only received the medication.

The researchers measured vitamin D levels after eight weeks, finding those who received the supplement had a mean serum level of 24 nanograms per milliliter (ng/mL) and the level in the group who did not get vitamin D supplementation was 15 ng/mL.

It is important to note that the researchers did not use the supplement as a basis for concluding the vitamin D had a positive effect, but rather the serum level of vitamin D. The rising level of food allergies also corresponds to the increasing number of people with vitamin D deficiency. Vitamin D plays a significant role in the regulation of IgE, important in the development of food allergies.

The link between vitamin D deficiency, which has almost doubled in just over 10 years in the U.S.,<sup>35</sup> and poor regulation of IgE responses, may be a significant factor. Both play a role in the development, severity and course of allergic diseases and may help explain, at least in part, why so many adults are developing food allergies.

Vitamin D deficiency has become so widespread it's been called a pandemic by a Harvard Medical School researcher.<sup>36</sup> The short list of health benefits attributed to vitamin D optimization include improving your immune system, strengthening muscles, bones and teeth and improving your cardiovascular health.

I recommend you get your vitamin D level tested twice each year — once when the level is likely to be at its lowest (midwinter) and once when it's at its highest (midsummer). Grassroots Health offers vitamin D testing through its [D\\*Action Study](#) and has an [online vitamin D calculator](#) you can use to estimate your vitamin D requirements.

To read more about the interaction between vitamin D deficiency and allergies, how to optimize your vitamin D and the synergy between vitamin D3, magnesium, calcium and vitamin K2, see "[Vitamin D Deficiency Can Lead to Increased Allergies.](#)"

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