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### A Thousand Plus Breaths

Estimates indicate that the average human being takes 22,000 breaths each day [1]. The term 'breath' denotes both inhaled air and expelled air, and it is crucial to distinguish them as their composition differs. Inhaled air comprises of 78% nitrogen, 21% oxygen, and small amounts of other gases like carbon dioxide, argon, neon, helium, and hydrogen [2]. This composition is far from surprising as the dry air of our atmosphere has a similar make-up [3]. In contrast, exhaled air contains 78% nitrogen, 17% oxygen, 4% carbon dioxide, and 1% other gases [4].

The information above is a good recapitulation of some of the content from your grade 8 biology course, but this is not the goal of this article. Instead, we want to explore the myriad elements present in our air and how they might affect the human body.





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## The Mysterious Elements Present in Our Air

The air we inhale is not a pure composition of the ubiquitous gases mentioned in the introduction of this article. With each inhalation, humans also intake water as vapour, smoke, dust, allergens, mold, acid droplets, volatile organic compounds (VOCs), and dirt [5, 6]. Bacteria, viruses, and certain types of fungi are also commonly present and in higher concentrations in indoor environments [7].

Some of these elements are composed of multiple distinct particles, each having varying consequential or null effects on the human body. For example, allergens include pollen, mold, and house dust. Dust also has its own list of constituents like dead skin, dust mites, insect debris, and more. Then, dirt, occasionally confused with dust, contains mineral matter like fine clay and sand particles.

All these elements have one thing in common: they are aerosols, i.e., particles that can suspend in the air and often invisible to the naked eye [8]. Most particles that have the capacity to become airborne hold the potential to become aerosols; therefore, they turn into a suitable candidate for entry into our respiratory system.

<b>OUR AIR...</b>	
→ <b>common dry air gases</b>	nitrogen, oxygen, carbon dioxide, argon, neon, helium, hydrogen, etc.
→ <b>allergens</b>	pollen, dust, mold, dust mites, animal dander, etc.
→ <b>indoor dust</b>	dead skin, clothing fibers, insect debris, soil particles, etc.
→ <b>pathogens</b>	bacteria, viruses, and fungi
→ <b>fine and ultrafine particulate matter</b>	wildfire debris, exhaust fumes, combustion particles, etc.
→ <b>volatile organic compounds</b>	benzene, toluene, vinyl chloride, methane, ethanol, acetone, etc.
→ <b>other components</b>	water vapour, acid droplets, etc.



## Help! I'm Having Trouble Breathing.

Many conditions can afflict your respiratory system, so, for simplicity, we will solely focus on those related to aerosols, referred to as “irritants” in this context [9]. Irritants most commonly lead to inflammation in the respiratory system, which can cause symptoms like itchiness, coughing, wheezing, labored breathing, sneezing, runny nose, and more---tell-tale symptoms of one of the most heard-of and common respiratory conditions: allergies.

Inflammation also occurs in people with asthma, a long-term breathing disorder whose symptoms amplify with exposure to fine air particles, especially those resulting from human-induced air pollution [10].

Bronchitis, an inflammation of the bronchi, is another well-known result of inhaling certain viruses and particles of tobacco smoke, harmful vapours, dust, and air pollutants [11]. The condition can be acute, lasting only a short period, or chronic, persisting for a long time. Bacteria, viruses, and fungi can also lead to pneumonia, which occurs when one of these pathogens successfully nests in your alveoli (air sacs), propagates, and resists bodily defenses [12].



Many other respiratory conditions exist. In extreme cases, disease and organ damage may occur, sometimes manageable and reversible with treatment, other times, irreversible and life-threatening. Certain groups of people are more at-risk than others [13]:

- children and teens because they spend more time outdoors and are still developing,
- outdoor workers because they spend considerable time outside,
- older adults as their lungs and immune systems reduce in efficiency due to aging,
- pregnant women and their fetuses because they are more susceptible to grave consequences from air pollution,
- people with pre-existing respiratory conditions because their respiratory systems are already under stress,
- people in lower income classes as they are often located near sources of pollution and have fewer financial resources to relocate to areas with better air quality, and
- people in certain occupations that are more likely to be exposed to harmful aerosols.



## Multiple Chemical Sensitivities (MCS)

People with Multiple Chemical Sensitivities (MCS) are also an at-risk group for adverse reactions to aerosols [14]. An often-neglected group, people with MCS frequently find themselves with a lower quality of life due to persistent symptoms and a lack of available treatments. Currently, a poor understanding of MCS plagues the medical field, but new research promises a reversal of this.

Other respiratory conditions may also decrease quality of life. In fact, many do just that, but it is necessary to highlight and include health conditions such as MCS that receive little attention yet affects an appalling 1 million **plus** Canadians.

### Worth Reflecting On...

It is also true that some particles are more harmful than others, and concentrations, length of exposure, and biological elimination all matter when considering health effects. This being said, we can nonetheless benefit from recognizing the constituents of our air and how they possibly affect us if of significance.

In the next part of this article, we will look at ways aerosols impact the rest of the body and some solutions to counter undesirable effects.

We invite you to visit the following resources in the meantime:

- Household Maintenance Tips on [ecolivingguide.ca](http://ecolivingguide.ca)
- [Learn about Multiple Chemical Sensitivities \(MCS\)](#)
- [Is Mold the Source of Your Problems?](#)
- Find more informative newsletters [here](#).

## Works Cited

1. Anonymous. "How Your Lungs Work." *Canadian Lung Association*, <https://www.lung.ca/lung-health/lung-info/breathing>. Accessed on September 4, 2023.



2. Berner, R A. "Atmospheric oxygen over Phanerozoic time." *Proceedings of the National Academy of Sciences of the United States of America* vol. 96,20 (1999): 10955-7. doi:10.1073/pnas.96.20.10955
3. Buis, Alan. "The Atmosphere: Getting a Handle on Carbon Dioxide." NASA's Jet Propulsion Laboratory, *NASA Global Climate Change*, October 9, 2019, <https://climate.nasa.gov/news/2915/the-atmosphere-getting-a-handle-on-carbon-dioxide/>.
4. Dhami, P.S., Chopra, G., and Shrivastava, H.N. "A Textbook of Biology." *Pradeep Publications*, 2015, pp. V/101.
5. Anonymous. "The Air We Breathe." *Smithsonian Environmental Research Center*, [https://forces.si.edu/atmosphere/02\\_01\\_02.html](https://forces.si.edu/atmosphere/02_01_02.html). Accessed on September 4, 2023.
6. Anonymous. "Fine Particulate Matter." *Government of Canada*, April 14, 2021, <https://www.canada.ca/en/health-canada/services/air-quality/indoor-air-contaminants/fine-particulate-matter.html>.
7. Prussin, Aaron J 2nd et al. "Total Virus and Bacteria Concentrations in Indoor and Outdoor Air." *Environmental science & technology letters* vol. 2,4 (2015): 84-88. doi:10.1021/acs.estlett.5b00050
8. Voiland, Adam. "Aerosols: Tiny Particles, Big Impact." *NASA Earth Observatory*, November 2, 2010, <https://earthobservatory.nasa.gov/features/Aerosols>.
9. D Amato, M et al. "News on Climate Change, Air Pollution, and Allergic Triggers of Asthma." *Journal of investigational allergology & clinical immunology* vol. 28,2 (2018): 91-97. doi:10.18176/jiaci.0228
10. Anonymous. "Air Pollution." *Asthma and Allergy Foundation of America*, 2015, <https://aafa.org/asthma/asthma-triggers-causes/air-pollution-smog-asthma/>.
11. Anonymous. "Bronchitis." *Canadian Lung Association*, <https://www.lung.ca/lung-health/bronchitis>. Accessed on September 4, 2023.
12. Anonymous. "Pneumonia." *Canadian Lung Association*, <https://www.lung.ca/lung-health/pneumonia>. Accessed on September 4, 2023.
13. Anonymous. "Who Is at Risk from Air Pollution?" *American Lung Association*, 2023, <https://www.lung.org/clean-air/outdoors/who-is-at-risk>.



14. Anonymous. "Canadian Community Health Survey (CCHS)." *Statistics Canada*, 2015-2016, Share File.