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CO₂: A good thing - to a degree

Life depends upon carbon dioxide, but too much of it sets the stage for increasing human health hazards

By William H. Schlesinger

Carbon dioxide (CO₂) makes up only about 0.038% of our atmosphere, but thank goodness it's there. CO₂ is the raw material for photosynthesis - the process by which plants convert sunlight energy into carbohydrates, which they use to grow. Essentially everything you eat can be traced to photosynthesis. Without CO₂, our food supply would collapse. This is a case, however, where you can have too much of a good thing.

Carbon dioxide has been relatively stable in Earth's atmosphere for a long time - not varying much above or below 270-290 parts per million (ppm) for the past 10,000 years. Then, about 150 years ago, humans began to burn fossil fuels with enthusiasm. The carbon in coal, oil, and natural gas is converted to CO₂ during combustion.

As a result of fossil fuel combustion, atmospheric CO₂ levels have risen to about 380 ppm. It has been about 20 million years since the Earth's atmospheric CO₂ levels have been this high - a span that more than encompasses the history of human life. Increasing CO₂ levels are destined to cause a warmer future climate for all of us.

Most plants grow faster in a CO₂-rich environment. This includes crop plants as well as weeds. While crops are likely to have experienced a small bump in yield because of rising CO₂ levels, farmers have also had to contend with the emergence of more aggressive crop weeds. The impact of CO₂ on weeds is worth taking seriously - it may cause a number of serious problems for farmers and for human health.

Most people are familiar with poison ivy, a scourge of trails, yards and gardens. In collaboration with Jacqueline Mohan, then at Duke University, I was involved with field research that revealed an alarming trend. When poison ivy is grown in the global CO₂ conditions projected for 2050, plants will be larger and much more toxic.

This relationship was recently confirmed by Lew Ziska, a scientist at the U.S. Department of Agriculture. His team found that, when grown in elevated CO₂ conditions, poison ivy plants had higher levels of the skin irritant urushiol in their leaves. Nearly all plants will grow faster in the future, but you can expect an especially thick growth of poison ivy on most forest trails.

Pollen also thrives when CO₂ levels rise. Shannon La Deau, now at the Smithsonian Institution, showed the pollen loads of pine trees increased in response to elevated CO₂.

While pine pollen is not particularly harmful to humans, similar results have been seen for other plants, including ragweed. This suggests those who suffer from hay fever, asthma and emphysema may face exacerbated conditions in the future.

Climate change also a result

In addition to affecting plant growth, elevated carbon dioxide levels are also causing global climate change. Warmer conditions are likely to extend the range of existing diseases and lengthen breeding season of mosquitoes and other disease-transmitting insects. Some tropical disease experts believe malaria and other mosquito-borne maladies will become more widespread as a result of climate change, both here and in the tropics.

Scientists at the Institute of Ecosystem Studies and at universities across the globe are working to anticipate and address the hardships that will arise from a warmer, CO₂-rich world. In the meantime, it seems prudent to minimize CO₂ outputs whenever possible. Reduced fossil fuel consumption, alternative energy innovations, and informed personal choices are all part of the solution.

Many effects of global warming seem distant in time and space, but the effects of high CO₂ on human health will be with each of us every day.

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