Are Oxygen Levels Changing?

The generation and maintenance of all our life processes are supported by four basic components: carbohydrates, water, proteins and energy. Most scientists agree that oxygen is actually the over-riding key ingredient in all four of these life components:

oxygen + carbon + hydrogen + nitrogen = protein
oxygen + hydrogen + carbon = carbohydrates
oxygen + hydrogen = water
oxygen + carbohydrates = energy

80% of all our metabolic energy production is created by oxygen! The human body is largely composed of oxygen, so it is no wonder that scientists are now discovering how low levels of oxygen can disrupt the body's ability to function correctly.

The oxygen concentration in a healthy human body is approximately three times that of air. Fortunately, oxygen is the most abundant element on earth comprising nearly 50% of the earth's crust and averaging about 20% of dry air in a non-polluted environment. Scientists now also agree that oxygen plays a powerful and primary role in our overall health and well-being. A growing number of researchers agree that the best way to improve health may be related to the optimum oxygenation of every cell.

All metabolic processes in the body are regulated by oxygen. Our brains process billions of bits of information each second. Our metabolic processes work to rid our bodies of waste and toxins. Even our abilities to think, feel and act require oxygen-related energy production. Oxygen also plays a vital role in proper metabolic functions, blood circulation, and the assimilation of nutrients, digestion and the elimination of cellular and metabolic wastes. Sufficient oxygen helps the body in its ability to rebuild itself and maintain a strong and healthy immune system. You know how important water, vitamins, minerals and enzymes are to your health and vitality. Although you can actually exist without food for about 40 days, and water for about seven days, without oxygen, life ceases to exist in only minutes.

Today, cutting edge researchers believe that even relatively healthy people may have trouble extracting all of the oxygen that they need from the air. In fact, the air itself is becoming more and more polluted, making oxygen extraction more difficult. Physiologists understand that breathing polluted air, or breathing air that contains less oxygen, puts tremendous stress on the human body.

Surprisingly, ongoing research by scientists and paleontologists has analyzed the oxygen in air bubbles trapped in fossilized amber from prehistoric times. Their research now confirms that the oxygen levels were significantly higher then than they are today. In fact, many scientists now
believe that the dinosaurs and other life forms may have become extinct because of a rapid drop in oxygen in the atmosphere resulting in the inability of their respiratory systems to adapt to this drastic oxygen reduction. If the dinosaurs became extinct because they could not obtain enough oxygen, is it any wonder that our bodies can suffer as well as our oxygen supplies become more polluted?

Here's just a couple of the many journal articles supporting this more accepted theory of what is happening to our oxygen supply:

Atmospheric Oxygen Levels Falling

Environment News Service (ENS) 1999: July 19, 1999
SYDNEY, Australia, July 19, 1999 (ENS)

As levels of the greenhouse gas carbon dioxide rise, concentrations of oxygen in our air have fallen, according to scientists at the Australian government research organization, CSIRO, the Commonwealth Scientific Industrial Research Organization. "As fossil fuels burn, they generate carbon dioxide, using up oxygen in the process," explained Ray Langenfelds from CSIRO Atmospheric Research. "About half of the carbon dioxide from fossil fuels remains in the atmosphere," he says.

Scientists from CSIRO have measured the miniscule decline in oxygen that has occurred during the past 20 years, the longest period over which such an assessment has been made. The team analyzed air dating back to 1978 from CSIRO's unique archive of pristine air collected at the remote Cape Grim Baseline Air Pollution Station operated by the CSIRO and Bureau of Meteorology in northwestern Tasmania.

CSIRO's oxygen measurements have been made with technology available only recently and provide what researchers say is an important constraint on identification of the factors that are influencing growth of carbon dioxide in the atmosphere. Findings based on the decline in oxygen have just been published in the international journal, "Geophysical Research Letters." "The changes we are measuring represent just a tiny fraction of the total amount of oxygen in our air - 20.95 percent by volume. The oxygen reduction is just 0.03 percent in the past 20 years and has no impact on our breathing," Langenfelds stated. "Typical oxygen fluctuations indoors or in city air would be far greater than this."

The oxygen measurements shed new light on the extent to which the world's forests and oceans share the task of absorbing half the carbon dioxide generated by burning of fossil fuels. "While the oceans emerge as the slightly larger long-term sink, plants are clearly soaking up more carbon dioxide with time. If they weren't, levels of carbon dioxide would be far higher," says Langenfelds.

Although deforestation during the past 20 years has released vast quantities of carbon dioxide, remaining plants are taking up much of this gas. As plants photosynthesize, they produce oxygen, explaining why the oxygen decline in air has been less than expected. Researchers speculate that plants today could be growing more rapidly than in the past due to warmer conditions, higher carbon dioxide concentrations or increased nitrogen fertilization. Previously cleared land may be returning to forest, also absorbing carbon dioxide.

North Pacific oxygen levels drop markedly

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University Week, The faculty and staff publication of the University of Washington
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February 14, 2002

Oxygen in the upper waters of the North Pacific, an area that accounts for about 40 percent of the world's oceans, decreased as much as 15 percent in a little less than two decades between the early 1980s and late 1990s. The change could be the result of climate shifts occurring at decade-long intervals — which should eventually shift back — or, it could be caused by global warming, says Steven Emerson, UW professor of oceanography. Emerson reported on the findings this week at the Ocean Sciences Meeting in Honolulu. The meeting, sponsored by the American Geophysical Union and American Society of Limnology and Oceanography, continues through Friday.

It has been just in the last year that research teams — two from Japan and one led by Emerson, all working in different areas of the North Pacific — published three separate papers on findings of oxygen decreases of 10 to

15 percent from the top 100 to 600 meters (300 to 2,000 feet) of the ocean, referred to as the upper thermocline. The Emerson paper is based on measurements made during expeditions funded by the National Science Foundation and the UW in 1980 and 1981, which was then compared with data collected during expeditions in 1991 and 1997.

Slower ocean circulation, an increased growth rate — or productivity — of plants in the surface waters or a combination of the two could result in less oxygen, Emerson says. Emerson's presentation comes just days after the publication of a paper in the Feb. 7 issue of Nature presenting evidence that circulation has slowed 25 percent since the mid-1970s in the equatorial and north Pacific Ocean, a significant change in the intensity, according to lead author Michael McPhaden, a scientist with the National Oceanic and Atmospheric Administration in Seattle and UW affiliate faculty member. With slowing circulation, water would linger longer in the thermocline. Plants and organic matter would have more time to decompose, Emerson says, a process that consumes oxygen when carbon released from decaying tissue is oxidized. Some global-warming circulation models suggest that global warming would result in a decrease of oxygen in the upper thermocline, Emerson says.

Along with findings by scientists such as McPhaden that circulation is slowing, Emerson's co-presenter at the Ocean Sciences Meeting used man-made chlorofluorocarbons, or CFCs, as tracers to consider the age of water in places where oxygen depletion was measured. Water was spending more time in the thermocline in the 1990s compared to the 1980s, according to Sabine Mecking, who earned her doctorate at the UW and is now a post-doctoral fellow at Woods Hole Oceanographic Institution.

Emerson says other scientists, such as Dave Karl of the University of Hawaii, have evidence that productivity has increased. An increase in the rate or amount of plant growth near the surface means increasing amounts of degradation in the thermocline, a process taking oxygen. Documenting additional changes and finding ways of measuring changes in circulation and productivity will eventually help scientists improve models of how oceans react on a decadal scale.

"This work is going to get a lot of attention in the next 10 years," Emerson says. Emerson, Mecking and Jeffrey Abell, a UW graduate student, were the co-authors of the most recently published paper on the declines in oxygen that appeared in the journal Global Biogeochemical Cycles last fall.