

# JUST FACTS.

SEIZE THE DATA

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3/30/2012 12:40 PM

**From:** James D. Agresti (Just Facts)

**To:** Melody Bakken Wisconsin Department of Health and Family Services)

**Subject:** Major error in cut sheet on carbon dioxide

Dear Ms. Bakken,

I am writing to alert you to an error in this [cut sheet](#) on carbon dioxide from the Wisconsin Department of Health and Family Services. This document contains a major recurring error. The figures given for CO2 concentrations that cause various adverse effects are mistaken by more than a factor of ten.

For example, the cut sheet says that exposure to CO2 concentrations above 5,000 parts per million (ppm) “may lead to serious oxygen deprivation resulting in permanent brain damage, coma and even death.” As detailed by the [National Research Council](#) (and many other academic sources), humans can be routinely exposed to more than ten times this level of CO2 for days on end without any indications of permanent brain damage or threat of death. In fact, it takes prolonged CO2 exposures of more than [20,000 ppm](#) just to cause occasional, mild headaches.

Sincerely,

James D. Agresti | President | Just Facts

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RE: Major error in cut sheet on carbon dioxide

FROM: Werner, Mark A - DHS

TO: James D. Agresti

Monday, April 9, 2012 9:22 PM

Mr. Agresti:

Thank you for your message. We will review this information and make any necessary changes.

-Mark

Mark A. Werner, Ph.D.

Chief, Health Hazard Evaluation Section

Bureau of Environmental and Occupational Health

Wisconsin Division of Public Health

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WI DHS Carbon Dioxide Fact Sheet  
FROM: Wozniak, Ryan J - DHS  
TO: James D. Agresti  
Thursday, April 12, 2012 11:54 AM

Dear Mr. Agresti,

Thank you for your inquiry into the WI Dept. of Health Services (DHS) fact sheet on CO2. Your concern relates to our statement that levels of CO2 above 5,000 ppm “may lead to serious oxygen deprivation resulting in permanent brain damage, coma and even death.” In your inquiry, you state that “humans can be routinely exposed to more than ten times this level of CO2 for days on end without any indications of permanent brain damage or threat of death.” However, the level of CO2 widely considered to be immediately dangerous to life and health (IDLH) is 40,000 ppm, only eight times higher. In fact, OSHA and NIOSH have determined that 8 hour averages over 5,000 ppm CO2 are potentially dangerous in work settings and not to be exceeded. As a Public Health agency, we must protect the health of all citizens, including sensitive populations such as children (higher metabolic and respiratory rates), the elderly (reduced lung function) and individuals with respiratory diseases such as asthma or emphysema. Additionally, we have to consider the potential effects of chronic exposures (in years, not days), which are rarely adequately addressed (especially with regard to sensitive populations) due to the difficulty and cost of such studies. Therefore, we must err on the side of caution when developing health guidance for the entire population. Our statement is not to imply that every person exposed to 5,001 ppm will have permanent adverse health effects, but that this is the level at which serious effects may begin to occur in those most susceptible and chronically exposed.

If you have further questions, or would like additional clarification, please reply to this email or call me at the number below.

Best regards,

Ryan J. Wozniak, MPH, PhD  
Toxicologist  
Wisconsin Department of Health Services  
Bureau of Environmental and Occupational Health

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4/12/2012 2:24 PM

Dear Dr. Wozniak:

Thank you for your reply. I truly appreciate your point about erring on the side of caution, but the cut sheet still appears to be mistaken. This is further illustrated by its claims that CO2 levels of

- “1,000 – 2,000 ppm” are “associated with complaints of drowsiness and poor air.”

- “2,000 – 5,000 ppm” are “associated with headaches, sleepiness, and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.”

Are there any studies that support these dose-response relationships? Given the [National Research Council's](#) extensive review of toxicity studies on CO<sub>2</sub>, these assertions seem unsupported. To quote a few extracts:

- “20,000 ppm is an appropriate subchronic NOAEL for headaches.”
- “it takes an exposure concentration of at least 10,000 ppm to increase minute-volume after a plateau in the hyperventilatory response has been reached, usually after a few hours.”

In contrast with the Wisconsin Department of Health's CO<sub>2</sub> cut sheet, the [cut sheet](#) from the Minnesota Department of Health is more in keeping with the empirical evidence:

At high levels, the carbon dioxide itself can cause headache, dizziness, nausea and other symptoms. This could occur when exposed to levels above 5,000 ppm for many hours. At even higher levels of CO<sub>2</sub> can cause asphyxiation as it replaces oxygen in the blood-exposure to concentrations around 40,000 ppm is immediately dangerous to life and health. CO<sub>2</sub> poisoning, however, is very rare.

I understand the need to build in margins of safety as OSHA does, but a safety factor is a judgment call. To recommend avoiding such exposures may make sense in the light of the extenuating factors you mention (sensitive populations and chronic exposure), but to claim that CO<sub>2</sub> levels >5,000 ppm can cause death when the NOAEL for headaches is 20,000 ppm seems misleading. The same applies to the even lower levels in the cut sheet said to be associated with symptoms such as drowsiness and poor concentration.

Respectfully,

James D. Agresti | President | Just Facts

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As of 6/16/21, no further replies from the Wisconsin Department of Health Services