

# Minnesota's Enclosed Sports Arena Rule

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Proposed Air Quality Action Levels  
for Ice Arenas

Environmental Exposure Grand Rounds  
November 2, 2011

# Background

Minnesota has had rules governing air quality in arenas since 1977...

- ★ **MN Statutes § 144.1222**
  - Public pools; enclosed sports arenas
- ★ **Administrative Rules ch. 4620**
  
- ★ 272 rinks at 232 facilities
  
- ★ Estimated 70,000+ users
  
- ★ 5 – 10 Motorsports events



# Current Rule

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- ★ 1977 rule regulates “acceptable air quality” as defined by one-hour average levels of:
  - Carbon monoxide (CO)
  - Nitrogen dioxide (NO<sub>2</sub>)
- ★ The rule is outdated and is being revised (since 2009.....)
- ★ New proposed action and evacuation levels

# Carbon Monoxide (CO) in Air (ppm)

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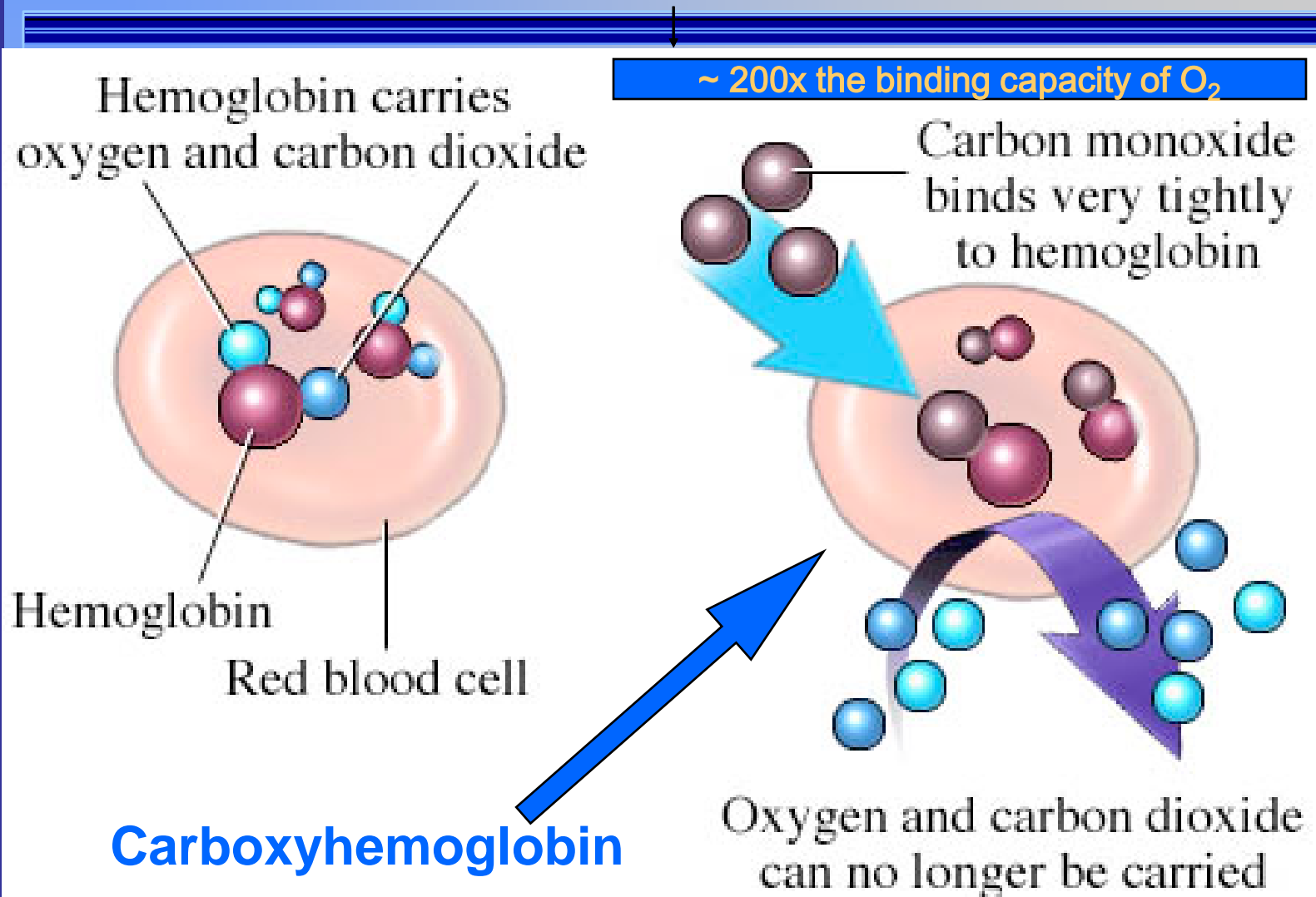
## *Standards/Criteria:*

▪ NAAQS (8-hour average)	9
▪ ACGIH (TWA)	25
▪ MN Arena Rule Corrective Action	30
▪ NAAQS (1-hour average)	35
▪ OSHA (PEL)	50
▪ MN Arena Rule Evacuation	125

## *Levels Measured in Air:*

▪ Ambient air	0.1-1
▪ Inside motor vehicles (EPA 2005)	9-25
▪ Underground garages, tunnels	up to 100

# What are the health effects of CO?



# 2009 Proposed CO Action Level

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- Basis: World Health Organization (WHO)
- Used the Coburn-Forster-Kane equation to ensure COHb level does not exceed 2.5%, even when a normal subject engages in light or moderate exercise:
  - 90 ppm for 15 minutes
  - 50 ppm for 30 minutes
  - 25 ppm for 1 hour
  - 10 ppm for 8 hours

# 2010 Proposed CO Action Level

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Adverse health endpoints for most sensitive subpopulation - individuals with coronary heart disease (after light exercise):

- 1) reduction in time until the onset of angina;
- 2) increased risk of cardiac arrhythmia; and
- 3) significant change in electrocardiogram readings.

Studies have suggested these effects could begin at ~ 2% increase in COHb

# 2010 Proposed CO Action Level

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- 20 ppm; rationale:
- Better protection against adverse health effects for most sensitive sub-population
- Increased safety factor to account for heavier exertion, longer exposure periods, individual variability
- Better protection for children who may have pre-existing conditions

# 2010 Proposed CO Evacuation Level

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Derived from the Acute Exposure Guideline Level (AEGL-2\*) for emergency response:

- 10 min. at 420 ppm
- 30 min. at 150 ppm
- 60 min. at 83 ppm (rounded to 85 ppm)
- 4 hours at 33 ppm
- 8 hours at 27 ppm

\*The AEGL 2 is the level of a chemical at which the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects, or an impaired ability to escape

# 2010 Proposed CO Evacuation Level: 85 ppm

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- Intended to prevent a 4% increase in COHb in most susceptible subpopulation
- Protective of psychomotor effects\*
  - reduced coordination, tracking, and impaired vigilance

\*occur at increase of 5-7% COHb

# Carbon monoxide (CO) Air Monitoring Values

CO	Action Level <sup>1</sup>	Evacuation Level <sup>2</sup>
Current	> 30 ppm	> 125 ppm
Proposed	> 20 ppm*	> 85 ppm**

\* based on preventing a ~2% increase in COHb

\*\*based on preventing a ~4% increase in COHb

<sup>1</sup> Immediate corrective action- levels need to be reduced within one hour using ventilation or other methods; must report to MDH

<sup>2</sup>Evacuate - Notify MDH

# Thank You!

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- ★ <http://www.health.state.mn.us/divs/eh/indoorair/arenas/index.html>
- ★ EPHT Data Portal (CO data)
  - <https://apps.health.state.mn.us/mndata/>
- ★ James Kelly, MS
  - 651-201-4910
  - James.kelly@state.mn.us