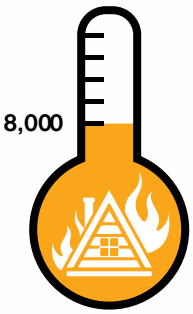
Beware the Toxic Twins: CO+HCN

Dangerous individually, significantly more harmful together

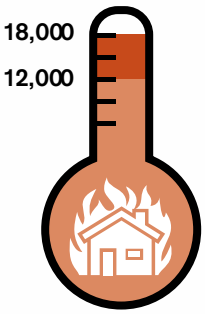
Smoke from structural fires produces many toxic gases, including carbon monoxide (CO) and hydrogen cyanide (HCN) – known as the "toxic twins." Together, they create a chemical asphyxiant that can cause heart attacks at the time of the fire and cancer decades later.

Today's fires burn **2-3 x faster**[1] **and hotter** than natural materials, **speeding the release of toxic gases** such as **HCN**



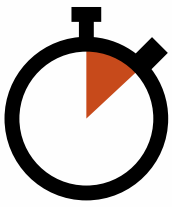
In 1950, home furnishings (natural products such as cotton, wool and wood) burned at

8,000
BTUs/lb^2.



Today, typical home furnishings (polyurethane carpeting/cushions and polystyrene in TVs, hard plastic toys, etc.) burn at

12,000-18,000
BTUs/lb^2.



10:00 minutes

HCN levels of **200 ppm** are common in normal structural fires. That is **lethal in 10** minutes.[3]

FACTS ABOUT HCN[3]

- HCN is 35 times more toxic than CO
- HCN can enter the body by absorption, inhalation, or ingestion and targets the heart and brain
- HCN can cause heart attacks and cardiac arrest, then hamper resuscitation
- HCN can cause bizarre and irrational behavior, hamper ability to perform role or to self-rescue, and can hinder or prevent rescue by others
- HCN can incapacitate a victim within a short time

SYMPTOMS OF HCN POISONING[4]

- Lethargy
- Weakness
- Shortness of breath, chest tightening, headache
- Drowsiness
- Disorientation, possibly bizarre behavior
- Cardiac issues
- Possibly bright red skin discoloration (for prolonged exposure)
- Soot or burns around the mouth and nose
- Coughing up carbonaceous sputum
- Smell of almond extract on the breath (anecdotal)

HOW CAN YOU PROTECT YOURSELF?

- **Wear PPE**
- **Always monitor the area for toxic gases**
- **Keep SCBA on until air is safe to breathe** and make SCBA available for drivers/operators
- **Shower in an hour** to reduce exposure to toxins by 90%. If you wait until you go home that night, the shower does nothing to reduce your risk of cancer
- **Decontaminate PPE** according to Fire & Emergency Training Institute (FETI) guidelines
- **Watch out for symptoms in fellow firefighters**, both at the fire scene and back at the station
- **Institute a training program** focusing on the hazards of hydrogen cyanide

1. Kerber, S. (2014). Analysis of Changing Residential Fire Dynamics and Its Implications on Firefighter Operational Timeframes. Retrieved August 2, 2017 from http://newscience.ul.com/wp-content/uploads/sites/30/2014/04/Analysis_of_Changing_Residential_Fire_Dynamics_and_Its_Implications_on_Firefighter_Operational_Timeframes.pdf
2. Flatley, C. (2005). FLASHOVER AND BACKDRAFT: A PRIMER. Retrieved August 2, 2017 from http://www.fireengineering.com/articles/2005/03/flashover-and-backdraft-a-primer.html
3. Cyanide: New Concerns for Firefighting and Medical Tactics, June 2009, Richard Rochford, PBI Performance Products e-newsletter
4. Dräger HCN Online Course by LSU: Hydrogen Cyanide and the Everyday Fire

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