The Deadly Twin Toxins
HCN & CO

by Deputy Chief Howard A Cohen (ret.)
Bennington Fire Department
Bennington, Vermont
Africa Fire Mission
Roger Audett, Pine Point Fire Training
Jason Kruson, Deputy Chief, Charleston SC FD
All the firefighters who took time to teach me how to be a smart and safe firefighter.
Howard’s Bio

Department Chaplain 2001 - present
Deputy Chief, Jan. 2018 - 2021 (ret.)
Training Officer 2018 -
Fire Instructor Level 1, June 2020 -
Level 1 & 2 Firefighter, Board Certified
Crisis Intervention Stress Management
Wilderness First Responder
Haz Mat Ops

Other Things About Me

Rabbi
Life Coach
Wilderness Guide
Canoe Builder
Toxic Twins:
The Dangers of Smoke

Or
Howard is going to scare the ______ out of you training.
Course Objectives:

1: How and why hydrogen cyanide (HCN) and carbon monoxide (CO) are dangerous;

2: What produces HCN & CO;

3: How to protect yourself from these harmful chemicals;

4: What to do if you are exposed to them.

5: This is New Info: It’s Important to Share.

6: HCN & CO are Deadly and We All Have People Who Care for Us and Who Depend on Us.
Risk A Lot to Save A Lot
Risk Little to Save Little
Risk Nothing to Save Nothing

Chief Alann Brunacini, 1985
Test Question #1

Your life depends on you knowing the correct answer to this question.

What is the most dangerous thing about fire fighting?
SMOKE!

1: All Smoke is unburned fuel
2: All Smoke contains HCN
3: All Smoke is potentially deadly if not immediately then over time.
Anatomy of Fire Smoke

- Particulates
  - Dust
  - Soot
- Irritants
  - Hydrochloric acid
  - Sulfur dioxide
  - Oxides of nitrogen
  - Ammonia
- Asphyxiants/Toxicants
  - Carbon dioxide
  - Hydrogen cyanide
  - Carbon monoxide
  - Hydrogen sulfide
Hydrogen Cyanide (HCN) is produced by incomplete combustion.
<table>
<thead>
<tr>
<th></th>
<th>Smoke</th>
<th>Matrix</th>
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</thead>
<tbody>
<tr>
<td>What you see</td>
<td>Harm you now</td>
<td>Harm you later</td>
</tr>
<tr>
<td>What you don’t see</td>
<td>CO, HCN, NOx, SO2, HCL, H2S</td>
<td>Aldehydes, Benzene etc</td>
</tr>
<tr>
<td></td>
<td>Soot, Particulates</td>
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</table>
Lethargy
Weakness
Shortness of breath
Chest tightening
Headache
Drowsiness
Disorientation or bizarre behavior
Cardiac issues
Bright red skin
Soot or burns around the mouth and nose
Coughing up carbonaceous mucus
Smell of almond extract on breath
7 Steps to Keeping Safe

1) Wear PPE
2) Monitor
3) Keep SCBA on until Safe
4) Shower within an hour or as soon as possible
5) Watch for symptoms
6) Start Training program
7) **Wash Gear**: Why it’s important to wash your gear
- Turn out gear soaks up toxins and later “off gasses” them.
- Gear and skin get coated in high levels of potentially carcinogenic compounds
- Extreme heat helps chemicals enter through the skin: With every 5 degrees that body temperature rises, skin absorption rates increase by as much 400%.
Test Question #2

Your life depends on you knowing the correct answer to this question

WHEN IS THE TIME OF GREATEST RISK OF EXPOSURE?
THE ANSWER: OVERHAUL.

When the fire is mostly out but the embers are still smoldering—is often when a fire is at its most toxic.
Where is Smoke a Threat?

- During initial operations
- Setting up command
- Pump panel
- Exterior operations
  - Ventilation
  - Secondary Egress
  - Utilities
  - etc.
• What is smoke?
• What makes it dangerous?
• What is the concentration?
• What is the exposure time?
• What am I benefiting?
• What are the long term effects and consequences?

Ask the question – Is it worth it?
Final Thought

*We don’t rise to the occasion, we fall back on our training.*

Kurt Waganbach, VT State Trooper (ret.)
BIBLIOGRAPHY

DRAGAR VIDEO:
https://www.youtube.com/watch?v=RvZU9SEyKWk

TO HELL AND BACK:
https://www.youtube.com/watch?v=D119qhfjpf24&t=1326s