The Practical Guide to Heat Stress and Emergency Incident Rehab

*What it is, what it isn’t and how to get it done.*

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**Disclaimer**

*There are many ways to skin a cat ... they are all bad for the cat*

We do not endorse any particular product. Involve your medical director and the person who writes the checks to determine what works in your situation.

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**Does heat stress really happen?**

- “Heat injuries hit 7 FFs at Ft Bragg Fire”
- “Mo. Firefighters Overcome by Heat”
- “A 26-year-old Houston firefighter trainee who collapsed and later died of heat stroke after a 4.4-mile run in April 2009 probably would have survived if department trainers had provided water during the run or an ice water immersion facility to lower his body temperature, a federal safety investigation concluded.”
- Three HazMat technicians treated for exertional heat illness at a tanker roll over.

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**What is rehab?**

- An opportunity to correct the unwanted effects of work in the heat.
- Incidents AND training
- Structured vs. unstructured
- Incident vs. post incident

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**What are the effects of heavy exertion in the heat?**

- “Uncompensable heat stress”
- Rising heart rate
- Rising core and skin temperature
- Platelet activation

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**Heart Rate During Fire Suppression**

? Now what?
Firefighters come in shapes

No convection
No conduction
No Evaporation

Uncompensable heat stress

Remove turnout gear any time it is safe

Heat Gain During Fire Suppression

When does heat stress in turnout gear happen?

Every time work is performed in turnout gear

- On cold days, overcooling must be avoided
- On moderate days, cooling is easy
- In hot humid conditions, cooling is difficult

U.S. States - www.tinytate.com

April

U.S. States - www.tinytate.com

July
Do the environmental conditions alter your operations?

Elements of Rehab
- Rest
- Rehydrate
- Recover

Rest
- Helps heart rate recovery
- Allows time for core temperature recovery

When & How Much?
- NFPA 1584
  - Two 30-minute cylinders
  - One 60-minute cylinder
  - 45 minutes continuous work
• Scene dictates conditions
• You cannot work beyond your body’s limits
• On scene with hard exertion
• 20-30 minutes (incomplete recovery)
• Post incident / Multiple incidents

How many training exposures is too many?

Kory Stringer died after his second EMS exposure...
ERHPL lab studies: a second bout of work after 20 minute rehab is almost always limited by heart rate
Live fire studies: 20 minutes of fire suppression results in significant exertional heat stress that cannot be corrected in 30 minutes

“The notion that *esprits de corps* can somehow defeat the principles of physiology is not only wrong but it is dangerously wrong.”
- Sir Roger Bannister 1989

Rehydration

*Prehydration is important*
Fire suppression: Firefighters responsibility
HazMat: Drink while screening and dressing
In the absence of certain medicines or vitamins, urine color is a reasonable estimate of hydration status

Which fluid to use?

*Which fluid to use?*

- On *average*, a firefighter will lose 700 - 1000 mL of fluid during 20 minutes of fire attack.
- For *full replacement*, 105% of loss must be consumed.
- Water is equivalent to sport drink in terms of performance.
- Full strength sport drink is acceptable.
- Taste matters.
- Counter for hypoglycemia?
- It may not be possible to keep up with loses at each break.
Cooling

- Mother nature built a good machine
  - Passive cooling is as good as active cooling if conditions are favorable
  - Cool temperatures
  - Low humidity
  - Turnout gear removed
- Active cooling required for hot humid conditions
  - Convection (moving air or water)
  - Conduction (still water)

Nutrition

- Consider nutrition on every incident
- Provide nutrition on multi hour incidents
- Not Good
  - High fat foods
  - Fast food
  - Pure carbohydrate
- Good
  - Sport bars or cereal bars
  - Mixture of carbohydrate and protein

What rehab is not

- Chief Larry Johnson:
  - Hungry firefighters are mean firefighters

How is rehab done?

Levels of rehab

- Awareness
- Operations
- Technician
- Specialist
Rehab is scaleable

Awareness	Operations	Technician

Few personnel	Major incident
Bottled water	Coolers
Continuous water supply
Vehicle/Shade shelter	Tents/Buses
Structures
Buddy monitoring	Designated EMS crew
Multiple EMS crews

Conditions and resources dictate cooling strategies

Cold	Moderate	Hot

Shelter/Remove Gear	Shade/Remove Gear

1) Air Conditioning
2) Cooling Devices

Awareness

• “Company Level rehab”
• 2-6 firefighters
• Every call where work was performed
• Intensity varies with conditions
• Rescue company after extrication on hot day
• Be aware of number of responses
• Consider “crew rest” as needed

Awareness level cooling

1. Remove turnout gear
2. Air conditioning
3. Booster line
4. Tarp for shade
5. Ventilation fan

Operations

• Longer and multi-company incidents
• Residential structure fire
• Major rescue incident (eg trench collapse)
• May be handled by EMS or rehab company
• Should employ an accountability system
• Should keep records of activity
Operations

- May be a regional or department resource
- Preplan response
- Can you handle two companies at once?
- What is the surge plan?

Operations level cooling

- Manufactured

A word about medical monitoring in the rehab sector

- Firefighters and HazMat technicians in rehab are not patients
- Presumably healthy
- Just completed some quantity of heavy physical exertion

A word about medical monitoring in the rehab sector

- Everyone...
- Looks bad when entering rehab
- Is hot
- Is tired
- Has a high heart rate
Use good clinical judgement

- High heart rate and temperature when removing turnout gear or HazMat ensemble is normal.
- Heart rates of 90-100 after 30 minutes is probably normal but not necessarily recovered.
- High heart rates and temperature beyond 40-45 minutes is probably not normal.
- Have you provided adequate cooling?
- Have you provided adequate rehydration?
- Is there an underlying medical condition?

Conclusions

- We must agree that fireground rehab is important.
- Reasons
  - Protects the public interest
  - Protects the responder
  - Protects the fire department

Conclusions

- Responders cannot simply work through heat stress with a good outcome.

Conclusions

- There are multiple deliveries for emergency incident rehab.
- Rehab is not difficult but it must be planned.
- Perform a needs analysis.
  - What conditions do most incidents occur in?
  - What are the worst conditions I respond in?
  - What resources can I bring to every incident?
  - How can I ramp up resources for larger incidents?
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For more information about fireground rehab and emergency responder health and safety visit www.firefighterresearch.org or www.erhpl.org