Coeur The Precious Metals Co.
Coeur d' Alene, Idaho - USA

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THE PRECIOUS METALS COMPANY

Coeur Silver Valley Galena Mine

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Mine Rescue Coordinator
Wallace, Idaho

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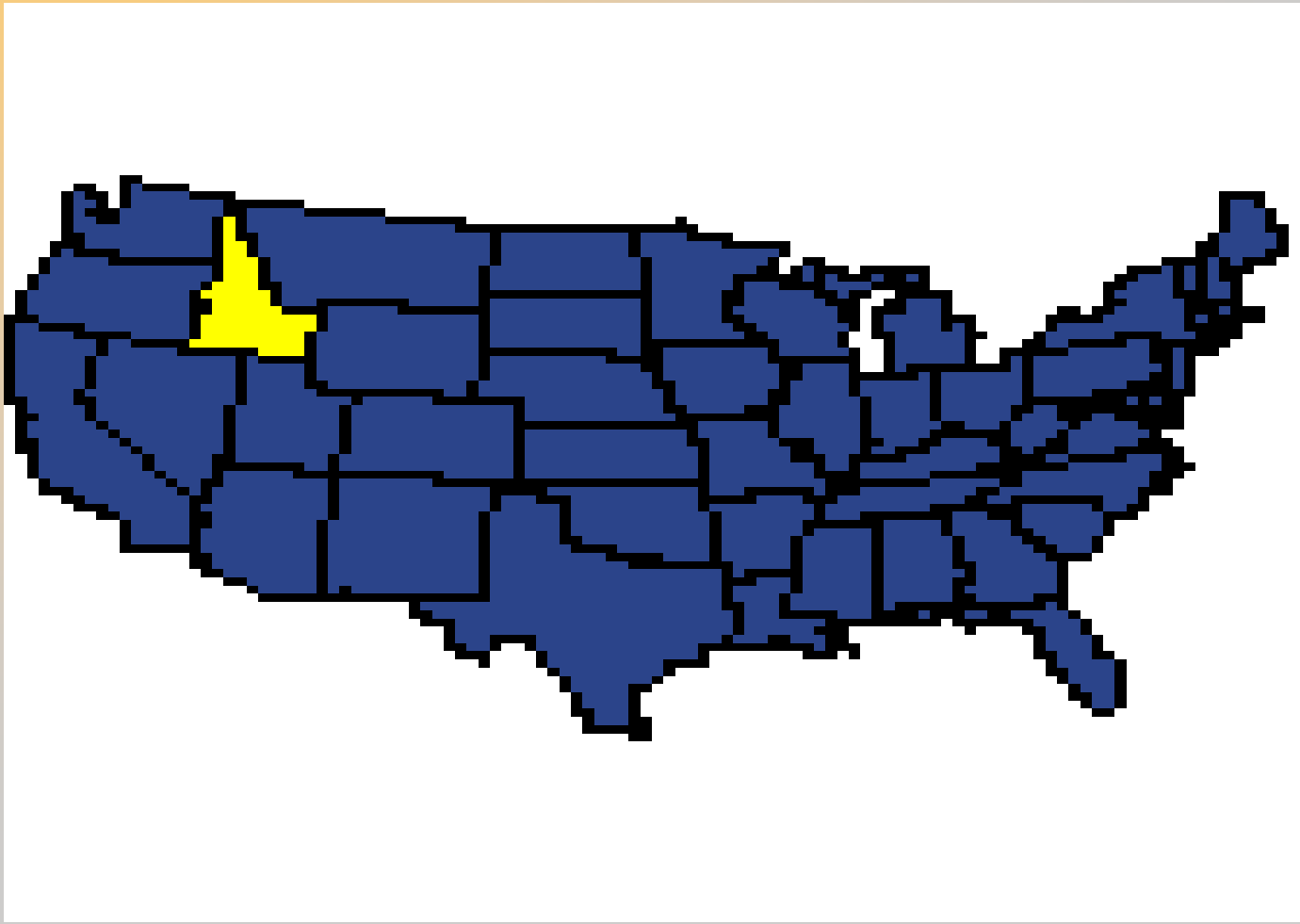
Cerro Bayo Mine
Chile
Martha Mine
Argentina


Silver Valley
Idaho

Idaho & United States of America

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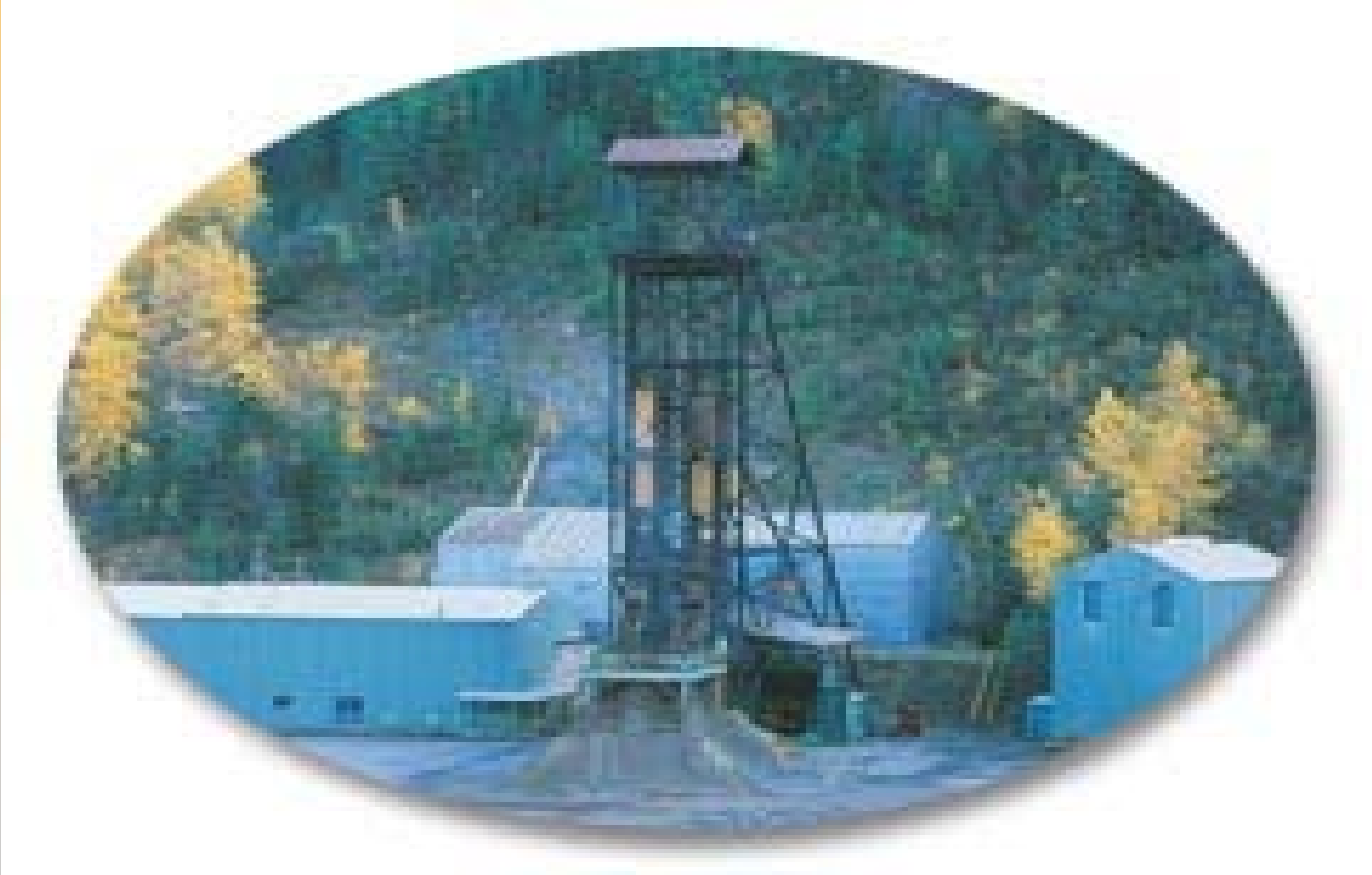
Coeur Mine –CSV
Home of Central Mine Rescue



A Study of Heat Stress Exposures and Interventions for Mine Rescue Workers

Floyd Varley

Mining Engineer

NIOSH

Spokane Research Lab

Spokane, Washington

USA

Acknowledgements

- Central Mine Rescue Association
- Hecla Mining, Lucky Friday Mine
- Coeur Silver Valley Resources, Galena Mine
- Barrick Goldstrike Mines, Meikle/Rodeo Mines

Fellow Researcher
Patrick Hintz, CIH,
NIOSH- SRL

Measuring Heat Strain

CorTemp swallowable heat sensor pills

Recorder, Alarm and Heart Rate Chest Strap

Measuring Heat Stress

- Measuring the Mine Environment
  - WBGT heat stress monitors
  - Infrared readings of Surfaces
  - Air Velocity

Mine Rescue Workers -A Study of Exposures in the Mine Environment

30 mine rescue team members were monitored during <u>underground</u> exercises to bridge the gap between lab based studies and the miners.

Mine Rescue Exercise & Training

Teams Working – Drilling with a Jack Leg

Next Team – Getting Ready To Go!

What are the Effects of Elevated Core Temperature

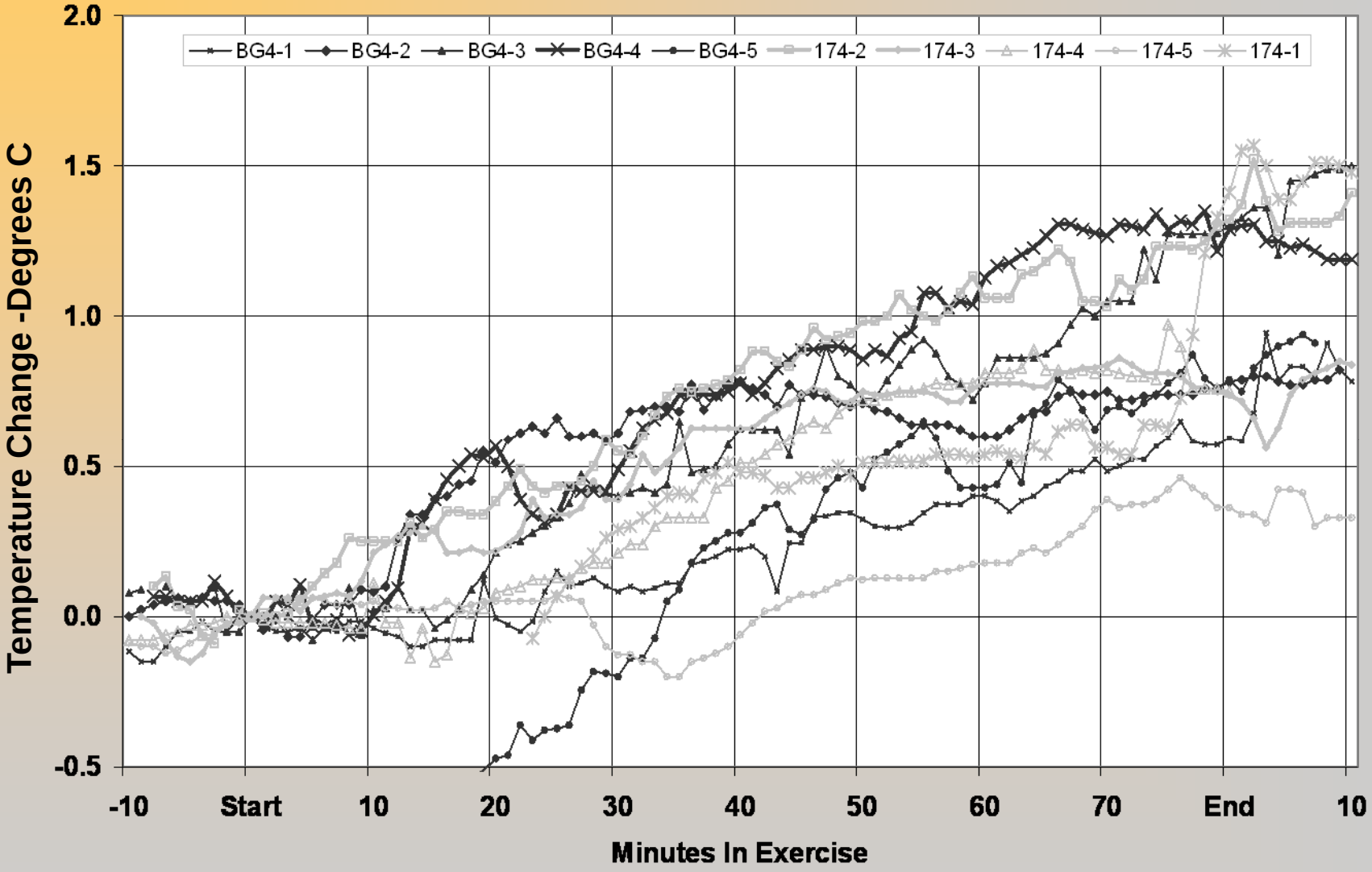
- **Over 38 C (100.4 F) Performance in terms of Judgment and Reaction Times Begins to Diminish**

- **At 38.5 ° C (101.5 F) - Physical Strain Has Begun …. The Person Is Moving Toward Heat Stroke**

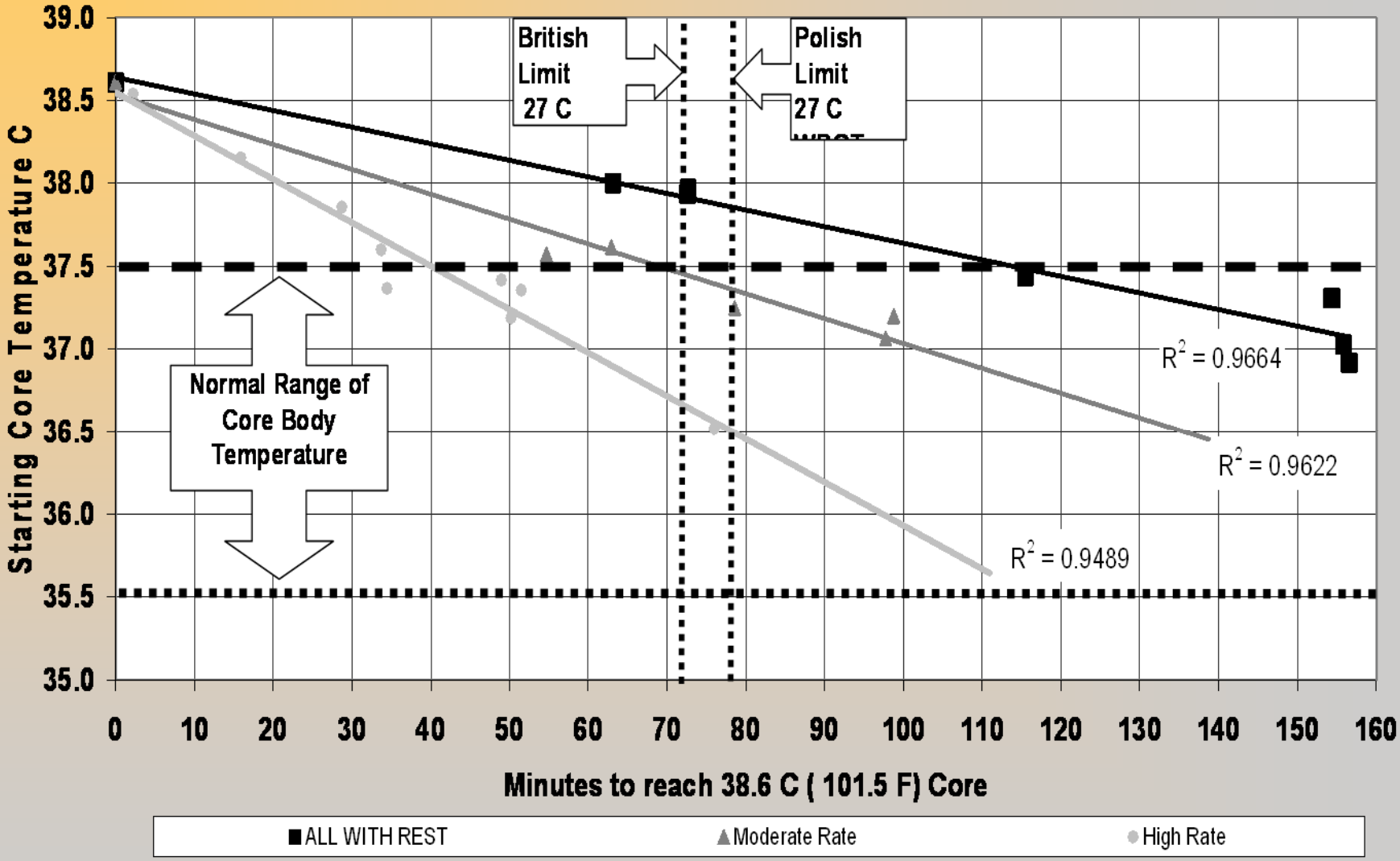
Five Man Team – Packing a Loaded Stretcher

Team Member with Water Bag

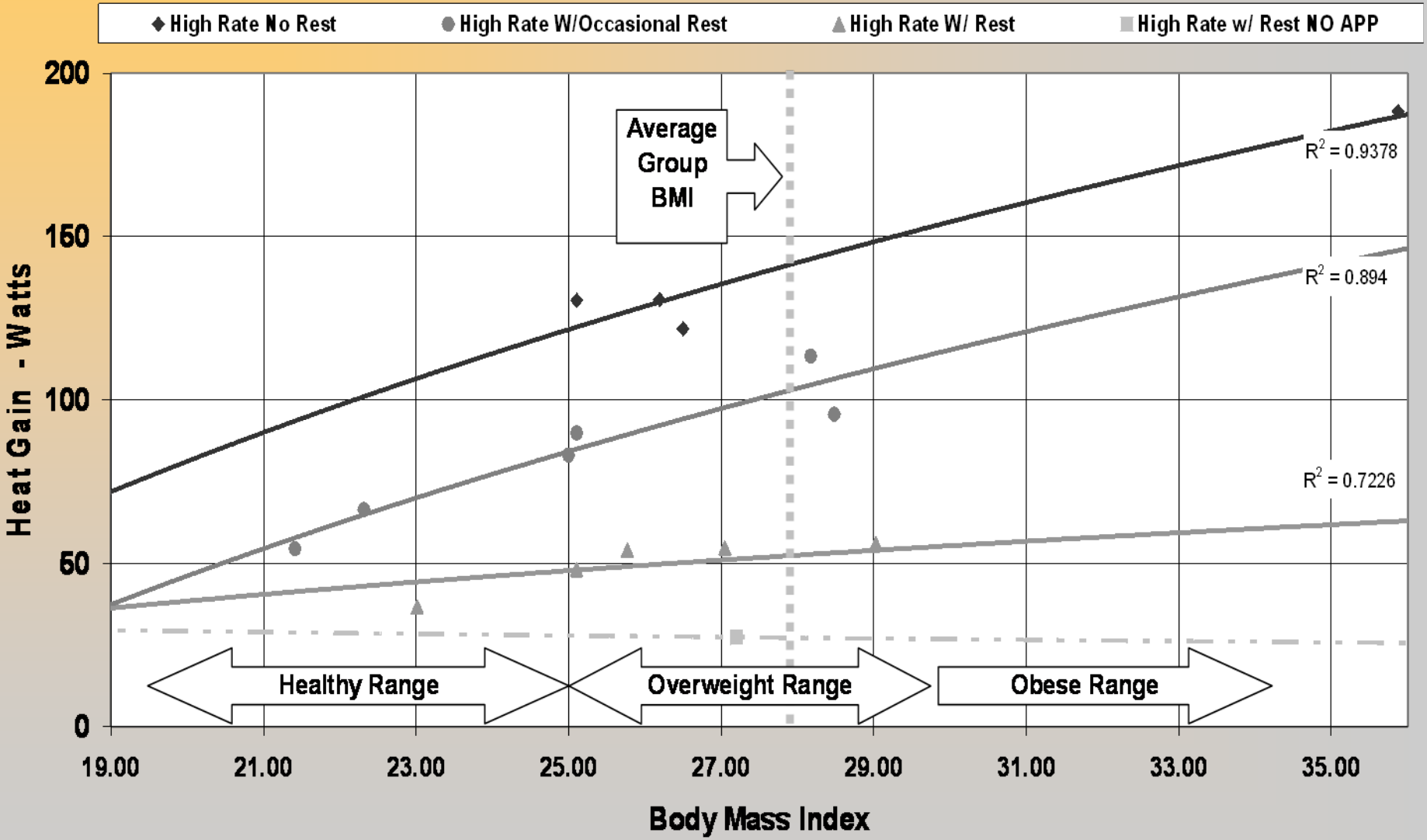
Mine Rescue Individual Results – 27C WBGT



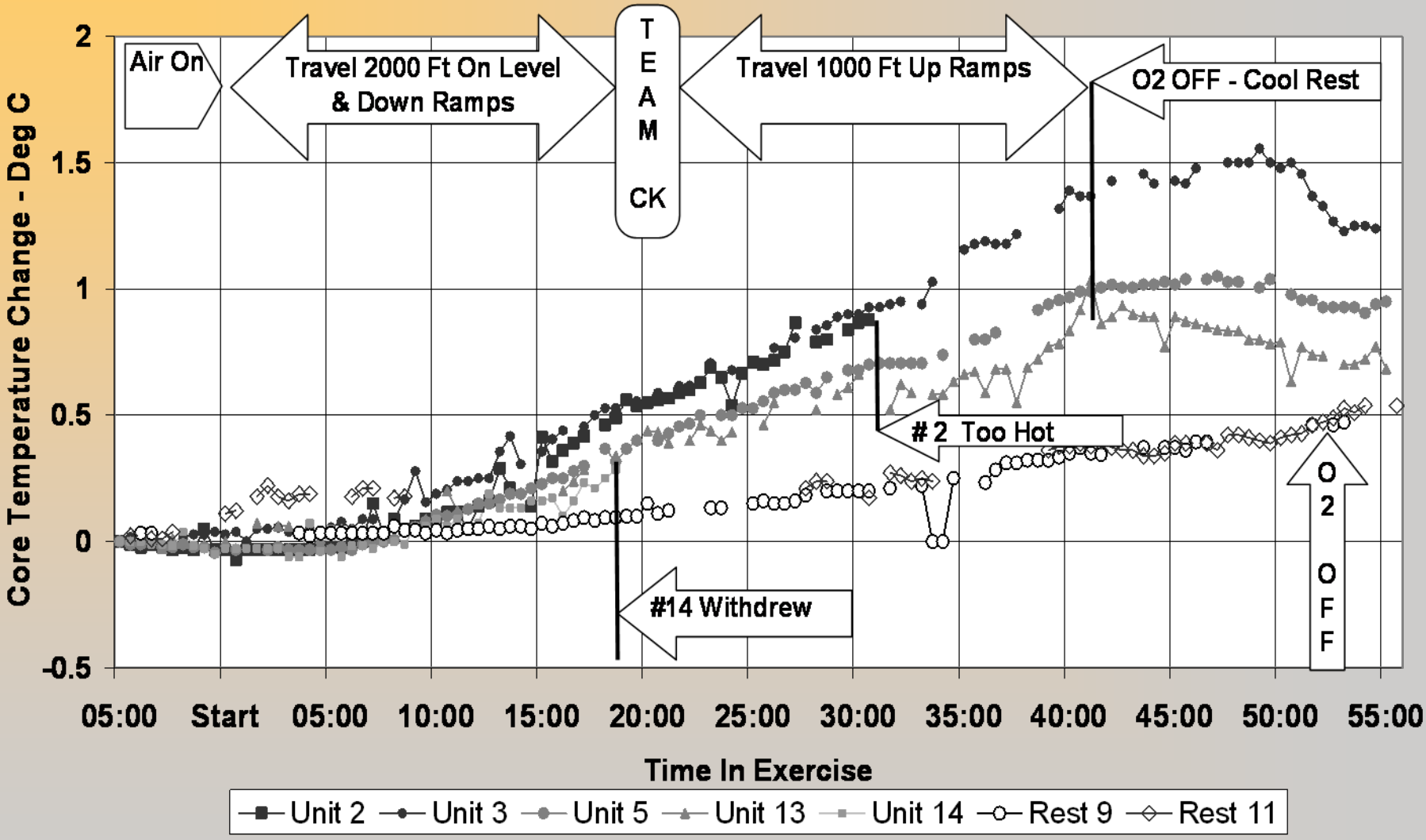
Importance of Starting Temperature



The Impact of Fitness and Rest on Heat Retention Rates

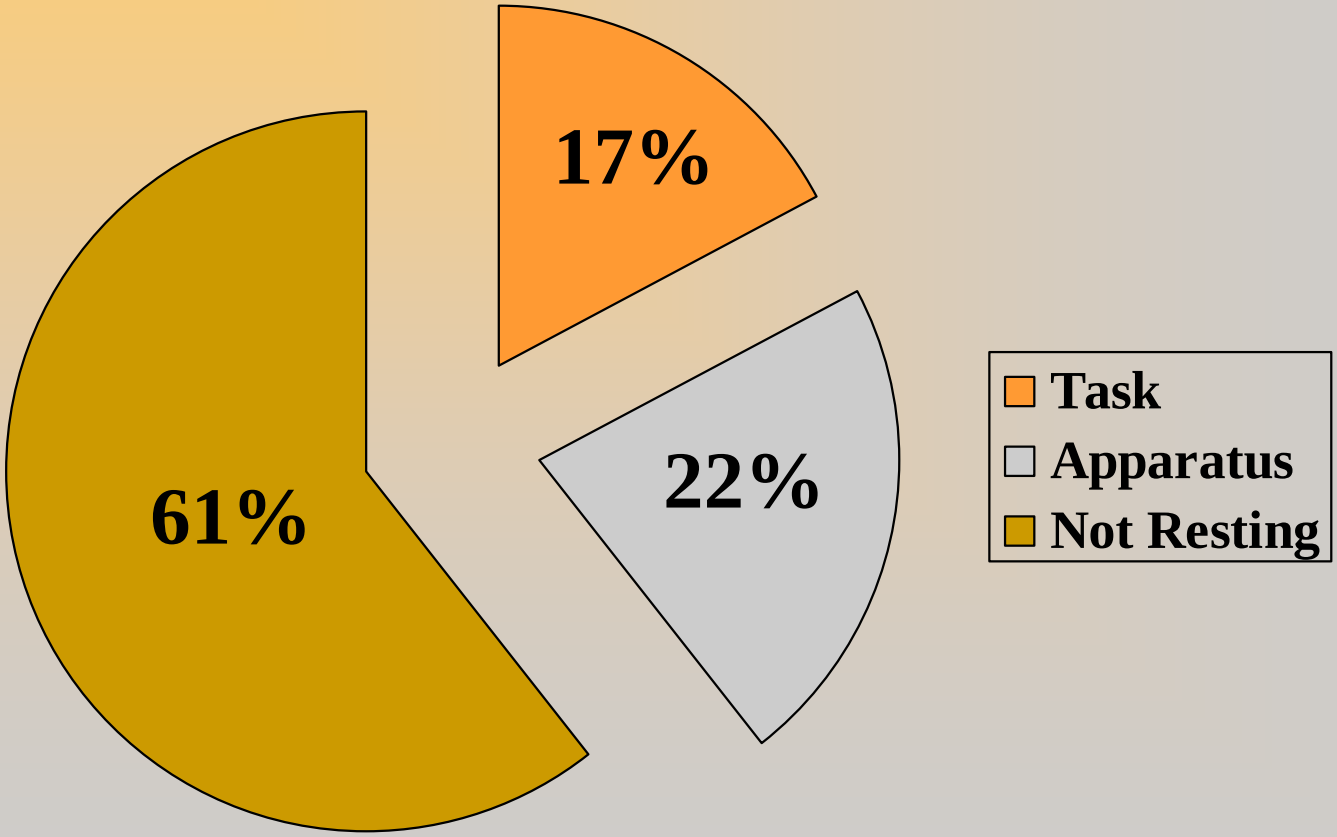


Impact of Limiting Work Rate by Forced Rest

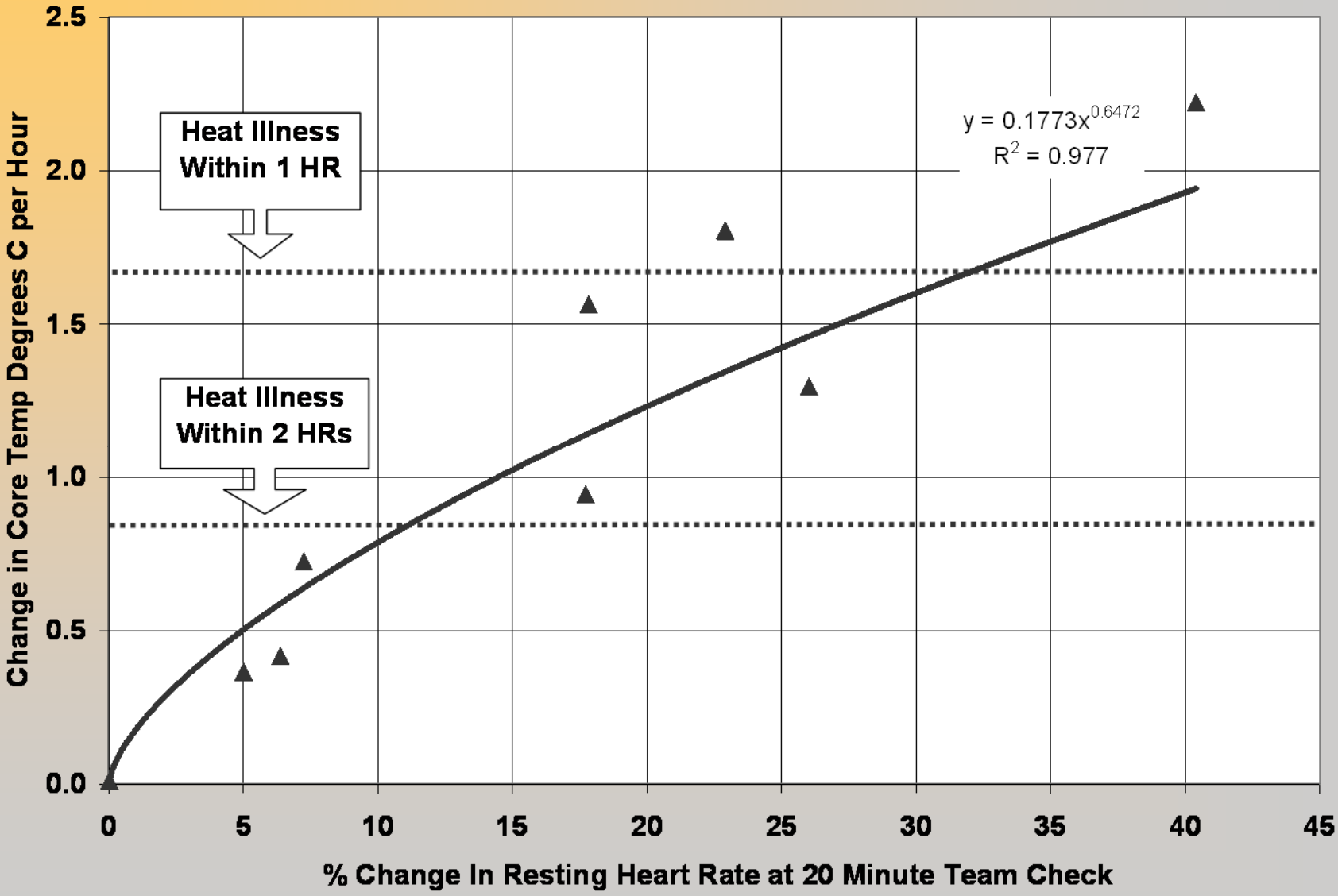


Exercise in 27ºC WBGT – Rest in 15ºC WBGT

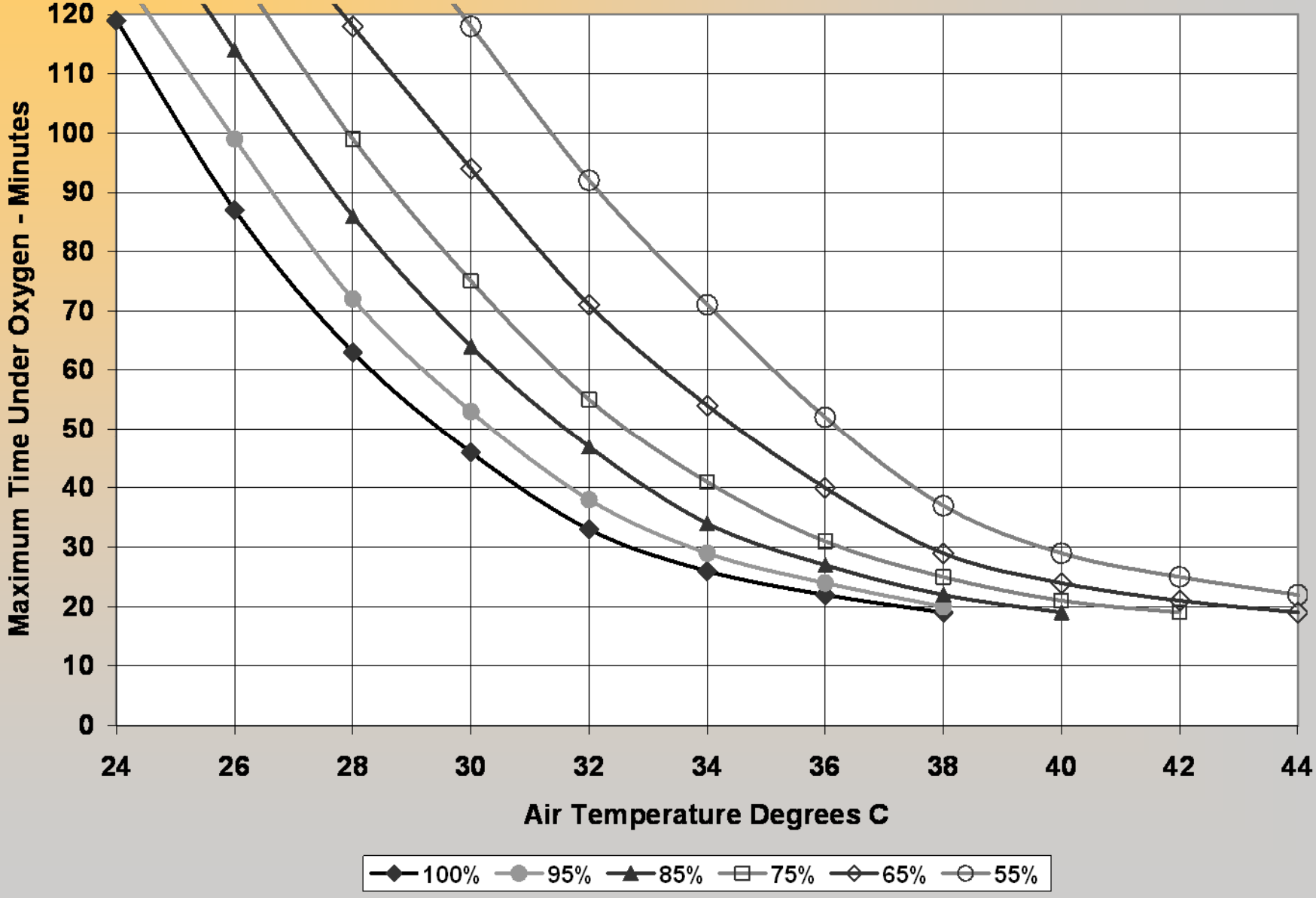
What Contributed to The Core Temperature Rise?



Controlling Work Rate by Heart Rate



Planning Realistic Durations of Operations



Other Interventions & Results

- **Apparatus Type (with & without inhalation air cooling) -** No Reduction in Core Temperature among approved apparatus.

Other Interventions & Results

- **Phase Change Cooling Vests** - No Reduction in Core Temperatures for vests with up to 3 kg of coolent - Short term (30 minute) Reductions for vests with 6 kg if coolant.

Other Interventions & Results

- **Hydration Supplied Masks** - Significant Reductions in Core Temperature as measured with the swallow able sensor – should be confirmed with other metrics in lab.

Other Interventions & Results

- Hydration Supplied Masks - Testing only

Other Interventions & Results

- **Hydration Supplies**
  Masks – Testing only

Other Interventions & Results

- **In Mask Temporal Artery Temperature Monitoring – In Progress**
  - Appears to lead core temperature rise by 10 to 15 minutes
  - Potential for real time monitoring
  - Requires 10 to 15 minutes to equalize at start up

Recommendations:

1. Estimate potential heat exposures and plan training and emergency response activities based on the time guidelines developed in Europe and not on the apparatus duration alone.
2. Monitor team members for resting heart rate and starting temperature to exclude high risk team members.
3. Control the pace of activity by monitoring recovery heart rate during team checks. Add additional rest periods based on peak heart rates. Rest until all members are within 10% of their initial resting heart rate.

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Main Entrance – Galena Mine
Coeur d' Alene Mining District

Coeur Silver Valley
Galena Mine

Thank You

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