

Investigation of the Effects of Rapid Heat Acquisition and Desloratadine on Hematological Profiles of Firefighters

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INTRODUCTION

- Previous research has shown increased platelet counts amongst firefighters exposed to rapid heat stress (Watkins et al., 2020) However, the extent to which thermal strain contributes to immune responses (i.e., white blood cell count) in structural firefighters (SFF) warrants further investigation.
- Whether desloratadine, an H1 antihistamine, can influence the heat-induced immune response remains to be investigated.
- **PURPOSE:** To evaluate the impact of rapid exertional heat stress (EHS) on SFF's white blood cell (WBC) and platelet (PLT) count, and whether desloratadine influences the hematological response.

MATERIALS & METHODS

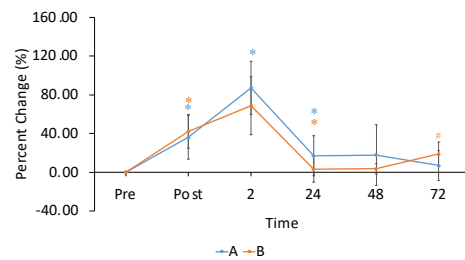
- Participants were five male SFFs (Age: 31.6 +/- 6.44 yrs; Height: 1.91 +/- 0.06 m; Weight 94.83 +/- 12.53 kg; VO2max: 49.96 +/- 6.52 ml/kg/min) from both career and volunteer fire departments across the greater Victoria area.
- SFFs walked on a treadmill in structural firefighting protective equipment at 3.0 mph with a 5% incline until reaching volitional maximum or a core temperature (Tc) of 39.5°C.
- Participants ingested 10mg drug/placebo and a Tc capsule 2 hours prior to each session, with an identical drug/placebo dose 24 hours later.
- Venous blood samples were obtained immediately before, after, and 2-, 24-, 48-, and 72-hours post-heating.

Figure 1
Residential Structure Fire



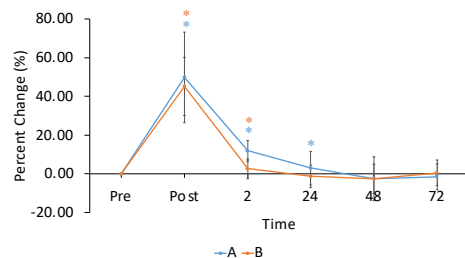
RESULTS

Figure 2
Comparison of Percentage Change of WBC Count Over Time Following EHS Between Drug and Placebo



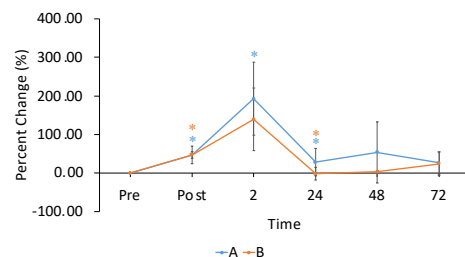
Note 1. Error bars represent 1 STDEV
Note 2. * Indicates significant difference from previous measurement (p<0.05)
Note 3. # indicates significant difference from baseline measurement (p<0.05)

Figure 3
Comparison of Percentage Change of Platelet Number Over Time Following EHS Between Drug and Placebo



Note 1. Error bars represent 1 STDEV
Note 2. * Indicates significant difference from previous measurement (p<0.05)

Figure 4
Comparison of Percentage Change of Neutrophil Number Over Time Following EHS Between Drug and Placebo



Note 1. Error bars represent 1 STDEV
Note 2. * Indicates significant difference from previous measurement (p<0.05)

Table 1
Peak Percent Change and Return to Baseline Values with Corresponding Time for Different WBCs Following EHS

A				
WBC	Peak %Δ	Time	Return to Baseline %Δ	Time
Lymphocyte #	30.98	Post	-21.49	2 hrs
Monocyte #	33.97	2 hrs	14.65	24 hrs
Neutrophil #	192.94	2 hrs	28.58	24 hrs
Eosinophil #	-39.86	2 hrs	-6.13	24 hrs
Basophil #	58.33	2 hrs	-5.00	24 hrs
B				
WBC	Peak %Δ	Time	Return to Baseline %Δ	Time
Lymphocyte #	45.68	Post	-8.02	2 hrs
Monocyte #	28.75	Post	3.42	24 hrs
Neutrophil #	139.41	2 hrs	-1.57	24 hrs
Eosinophil #	-40.74	2hrs	1.59	24 hrs
Basophil #	66.67	Post	-11.11	24 hrs

MAIN FINDINGS

- Tc increased by a mean of 1.89 +/- 0.44°C during EHS.
- No significant differences between drug and placebo were observed for WBC; PLT; and number of lymphocytes (LY), monocytes (MO), neutrophils (NE), eosinophils (EO), and basophils (BA) (p>0.05). Therefore, conditions remained A & B to continue double-blinding for further study.
- All WBC, PLT, LY, MO, NE, EO, and BA showed significant differences over time following EHS (p<0.05).
- Significant elevations in WBC, PLT, LY, & NE were found between baseline and either immediately post or 2 hours post testing (p<0.05).
- In both conditions WBC count increased post-test by 36.02-42.35% from baseline (p<0.05) and continued to increase to 68.76-87.17% 2 hours post-test (p<0.05). By contrast, PLTs post-test increased by 45.13-49.80% from baseline (p<0.05) and saw a recovery to 2.56-11.83% above baseline within 2 hours.

CONCLUSIONS

- EHS significantly impacts WBC markers and PLT counts within 72 hours post exposure.
- Desloratadine does not appear to influence these hematological responses.

Figure 5
Treadmill testing & metabolic cart



REFERENCES

- Watkins, E. R., Hayes, M., Watt, P., Renshaw, D., Richardson, A. J. (2020). Extreme occupational heat exposure is associated with elevated haematological and inflammatory markers in fire service instructors. *Experimental Physiology*, 106(1), 233-243. <https://doi.org/10.1113/EP088386>
- Times Colonist. (2017, February 25). *Nine escape fire that destroyed duplex on Pauquachin First Nation*. <https://www.timescolonist.com/local-news/nine-escape-fire-that-destroyed-duplex-on-pauquachin-first-nation-4646879>

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