RHABDOMYOLYSIS IN WILDLAND FIRE FIGHTERS: A PATIENT POPULATION AT RISK

Wildland fire fighting involves exposure to heat and prolonged, intense exertion. These factors increase the risk for rhabdomyolysis. Healthcare providers can prevent debilitating consequences. Be alert to wildland fire fighters reporting rhabdomyolysis signs and symptoms. Have a low threshold to check serial serum creatine phosphokinase (CK) in wildland fire fighters.

Elements of wildland fire response and training associated with an increased risk for rhabdomyolysis are:

+ Carrying heavy loads, such as chainsaws and gear packs weighing up to 110 pounds
+ High levels of exertion, such carrying heavy loads over rugged, steep terrain
+ Exposure to heat from the fire, the environment, and generated by physical effort
+ Rigorous training and physical fitness tests

Death and permanent disability of fire fighters have been associated with heat stress and rhabdomyolysis in fire fighters [NIOSH 2009, 2012, 2014].

Rhabdomyolysis may be misdiagnosed as heat stress or dehydration as the presenting signs and symptoms can be similar [NWCG 2011]. Rhabdomyolysis can have debilitating or deadly consequences if not quickly diagnosed and treatment started.

Photo by BLM-California

Fire fighter Trainee Suffers Fatal Exertional Heat Stroke During Physical Fitness Training—Texas

A case report of a NIOSH fire fighter fatality investigation highlighting the close relationship between fire fighting, heat and rhabdo

2009-17 Date Released: June 2010

The initial diagnoses were hyperthermia, severe dehydration, and heatstroke, with heatstroke complications including:

+ Rhabdomyolysis
+ Acute renal failure
+ Disseminated intravascular coagulation

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Tips for Identifying Rhabdomyolysis and Possible Complications

Suspect rhabdomyolysis in wildland fire fighters with heat-related illnesses and dehydration, muscle pain, and/or exercise intolerance. Consider doing the following:

+ Ask about date of last fire response and last physical exertion. Fire fighters may not become symptomatic or seek care until several days after a fire response, training exercises, job-required physical fitness tests, or recreational exercise.
+ Check *serial* CK levels. This will let you know whether levels are rising or falling. Fire fighters with rising CK levels should be monitored for complications of rhabdomyolysis (arrhythmia, seizure, acute renal failure, compartment syndrome, etc.) and fluid treatment started. A single CK level may be misleading.

Fire fighter having blood drawn.

+ Do not rule out rhabdomyolysis solely on urine tests that check for myoglobin indirectly (urine dipstick positive for blood and a urinalysis with no red blood cells). Myoglobin is quickly cleared from the body so it may not be detected in the urine at the time of presentation while CK elevations in the blood may persist for days. Additionally, up to 81% of rhabdomyolysis patients may not exhibit myoglobinuria at all.
+ Check compartment pressures when severe muscle pain is localized to a specific compartment, diabetic neuropathy may make physical exam of that compartment unreliable, etc. Documentation of elevated compartment pressures may help facilitate rapid fasciotomy for compartment syndrome. Delayed diagnosis and treatment of compartment syndrome can result in permanent disability.

Right leg after fasciotomy for compartment syndrome. Note residual swelling in right leg, ankle, and foot.

Bottom Line

Help keep fire fighters safe by having a high suspicion for rhabdomyolysis. For information on other heat-related disorders, see http://www.cdc.gov/niosh/topics/heatstress/.

References

NIOSH [2014]. Captain dies from hyperthermia and exertional heatstroke while performing advanced survival training—Texas. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, FF Report No. F2012-27, http://www.cdc.gov/niosh/fire/reports/face201227.html.

NIOSH [2012]. Report of a NIOSH health hazard evaluation, HHE 2011–0035. By Eisenberg J and McFadden J. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. Unpublished.

NIOSH [2009]. Fire fighter trainee suffers fatal exertional heat stroke during physical fitness training—Texas. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, FF Report No. F2009-17, http://www.cdc.gov/niosh/fire/reports/face200917.html.

NWCG [2011]. Safety advisory: rhabdomyolysis epidemiological study results and recommendations. Risk Management Committee, National Wildfire Coordinating Group, http://www.wildlandfire.com/docs/2011/safe/rhabdo.pdf.

Counselman FL, Lo BM. Rhabdomyolysis [2017]. In: Tintinalli JE, Stapczynski J, Ma O, Yealy DM, Meckler GD, Cline DM. eds. Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 8e New York, NY: McGraw-Hill; 2016. http://accessemergencymedicine.mhmedical.com/content.aspx?bookid=1658&sectionid=109433424.

Additional Resources

NIOSH [2016]. NIOSH criteria for a recommended standard; occupational exposure to heat and hot environments. By Jacklitsch B, Williams WJ, Musolin K, Coca A, Kim J-H, Turner N. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication 2016–106.

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