National Aeronautics and Space Administration Goddard Space Flight Center/Wallops Flight Facility Health Unit



Monthly Medical Moment: January 2025 <u>Cold-Related Injuries in Nonfreezing Conditions</u> YOU CAN GET INJURED FROM THE COLD IN TEMPERATURES ABOVE FREEZING!

(32°-60° Fahrenheit)

How are nonfreezing cold injuries different from frostbite/frostnip?1

- Frostbite (ice crystals in the tissue) and frostnip (ice crystals on the skin/early frostbite) require freezing temperatures
- Non-freezing cold injuries can occur with frostbite/frostnip

Trench Foot/Immersion Foot^{2-4,7}

- What it looks like: four stages
 - Stage 1 (during exposure): loss of sensation/painless, bright red hands/feet that become pale/white (the body constricts blood vessels to prevent heat loss in the vital organs)
 - Stage 2 (during rewarming, can last a few hours to days): skin color changes persist, weak pulses become stronger, swelling, abnormal sensation/feeling cold
- Stage 3 (lasts for days to weeks): limbs are bright red, swollen, and painful; may have blisters; pulses are strong
- Stage 4 (lasts for weeks to years): limbs are cold, especially sensitive to the cold (limbs stay colder for longer after exposure), chronic pain, excessive sweating

- How you get it
 - Having cold and wet extremities leaving on sweaty socks/rubber boots for long periods of time – can happen when you're fishing, hiking, skiing, doing combat ops/training
 - Wet feet lose heat 25-times faster than dry feet!
- What to do if you have it
 - Do not rub/massage your limbs for warmth it can cause skin damage
 - Rewarm gradually keep the limb rested, elevated, and pat dry at room temperature (do NOT immerse in warm/hot water)



Karatay M. (2007, August). A mild case of trench foot [photograph].



Najjar I. (2022, December). "Trench foot" on the banks of Lake Geneva: a severe case of nonfreezing cold injury. The patient's feet on day 2 [photograph].

National Aeronautics and Space Administration Goddard Space Flight Center/Wallops Flight Facility Health Unit



Raynaud's Phenomenon^{2,5}

- Not unique to cold happens when blood vessels spasm in response to stress like cold (but can be present in other diseases or even occur on its own)
- What it looks like: distant parts of your digits turn white (blood supply cutoff from blood vessel spasm), then blue (from lack of oxygen), then red (when blood flow returns)
- If it is because of the cold, it will resolve when you are out of the cold



Profpedia. (2018, January). Raynaud syndrome on female airman's hand [photograph].

The National Health Service UK. Raynaud's may make your fingertips appear paler if you have brown or black skin [photograph].

Chilblains/Pernio^{2,6-7}

- Not unique to cold, but cold is the most common trigger (dry or damp cold) happens when small blood vessels (the capillary beds) are damaged by cold
- Occurs within 24 hours of exposure, may last for weeks, typically self-resolves
- What it looks like: red/purple rash/nodules especially at the fingers/toes, swelling, pain, itching



Heilman J. (2011, August). Chilblains from excessively icing the feet [photograph].



The National Health Service UK. Your fingers or toes may become red, purple or swollen. The redness may be harder to see on brown and black skin [photograph]

Cold Urticaria/"Cold Hives"2,8

- Allergic-type reaction to cold (cold weather, cold drinks, etc.)
- What it looks like: hives, swelling, anaphylaxis in severe cases; occurs within seconds to 20 minutes after exposure, but can be delayed up to 72 hours; if not severe, typically resolves when away from the cold
- Caution with taking over-the-counter antihistamines for hives during work use allergy medications that are less likely to make you drowsy and sleepy, like cetirizine (Zyrtec), loratadine (Claritin), and fexofenadine (Allegra)
- Severe life-threatening reactions (anaphylaxis) may need an Epi pen!





Rylan7667. (2024, April). Cold urticaria [photograph]. da Silva S. D

da Silva S. Dermatology Atlas. Hives on darker skin [photograph].

National Aeronautics and Space Administration Goddard Space Flight Center/Wallops Flight Facility Health Unit



Ways to Prevent Nonfreezing Cold Injuries

- Avoid cold exposure
- Dress appropriately keep clothing and thermal layers dry (bring extra socks)
- Avoid being in the cold when fatigued, dehydrated, or malnourished
- Quit smoking to help keep your blood vessels open and your limbs warm
- Get seen by a healthcare provider if conditions do not go away on their own, are severe, getting worse, or are associated with other symptoms

Bonus Injury: Erythema Ab Igne/ "Toasted Skin Syndrome" 9-10

- Skin condition caused by long term exposure to non-burning heat (like keeping space heaters close to you, or keeping warmers on your skin), but may also occur with other chronic conditions
- What it looks like: mild red bumps/patches that self-resolve in minutes to hours after removing the heat source; after weeks and months of continued heat, the skin darkens, thickens, and a rash that is painful, sensitive, or itchy may develop
- Be careful when using space heaters at your desk!



Miller K. (2011, December). Erythema ab igne: reticulated, interlacing, hyperpigmented patches with a few, scattered, erythematous macules at junctions on the medial aspects of the lower legs [photograph].



Smith T. (2018, February). Erythema ab igne. To relieve chronic thoracic and lumbar back pain, the patient had been using a heating pad daily, often for several hours at a time [photograph]

References

- 1. Regli I, Oberhammer R, Zafren K, Brugger H, Strapazzon G. Frostbite treatment: a systematic review with meta-analyses. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine. 2023; 31(96).
- Zafren K. Nonfreezing cold injury (trench foot). International Journal of Environmental Research and Public Health. 2021; 18(10): 10482. doi: 10.3390/ijerph181910482
- Ungley C, Channell G, Richards R. The immersion foot syndrome. Wilderness and Environmental Medicine. 2003; 13(2). Doi: 10.1580/1080-6032(2003)014[0135:TIFS]2.0.CO;2
- Yekhalov V, Kravets O, Stanin D, Ploshchenko Y. Trench foot is an urgent problem of our time. Proceedings of the II International Scientific and Practical Conference. General regularities and models of science development. 2023; 88-93.
- Conterence. General regularities and models of science development. 2023; 88-93.
 Goundry B, Bell L, Langtree M, Moorthy A. Diagnosis and management of Raynaud's phenomenon. BMJ. 2012; 344. Doi: 10.1136/bmj.e289
- Whitman P, Crane J. Pernio. StatPearls. 2023.
- Cold-related illnesses in workers. National Institute for Occupational Safety and Health (NIOSH). Sep 2024. <u>https://www.cdc.gov/niosh/cold-stress/about/related-illness.html</u>
- 8. Maltseva N, Borzova E, Fomina D, et al. Cold urticaria what we know and what we do not know. European Journal of Allergy and Clinical Immunology. 2020. Doi: 10.1111/all.14674
- 9. Smith T, Nambudiri V. Erythema ab igne. Cleveland Journal of Medicine. 2018; 85(2): 96-97.
- 10. Harview C, Krenitsky A. Erythema ab igne: a clinical review. Cutis. 2023; 111: E33-E38.

Please contact the Health Unit with any questions or concerns. For emergencies, please call 9-1-1.

NASA Wallops Flight Facility Health Unit 34200 Fulton Street Building F-160 Wallops Island VA 23337 Phone: 757-824-1266 | Fax: 757-824-1497 Email: <u>gsfc-wffhealthunit@mail.nasa.gov</u> NASA Goddard GSFC Health Unit 800 Greenbelt Rd Building 97 Mail Stop Code 250 Greenbelt MD 20771 Phone: 301-286-6666 | Fax: 301-614-6942 Email: gsfc-gbhealthunit@mail.nasa.gov