Selected Abstracts from the Wilderness Medical Society's 2014 Summer Scientific Meeting

The Impact of Freeze-Thaw Cycles on Epinephrine Polar Predators

Introduction.—Epinephrine is the first-line medical treatment for anaphylaxis, a life-threatening allergic syndrome that may be triggered by an insect sting, substances, medications, and certain foods. Administering epinephrine can rapidly reverse bronchospasm and other life-threatening changes from anaphylaxis. Backcountry recreationalists and guides carry epinephrine in the form of an autoinjector. Epinephrine may be exposed to cold temperatures during these expeditions. No studies have examined the stability of epinephrine after being exposed to freezing temperatures.

Objectives.—The purpose of this study was to determine whether freeze-thaw cycles alter the concentration of epinephrine and to compare these results with standards of therapeutic activity. The United States Pharmacopeia (USP) designates an epinephrine solution must contain between 90% and 115% of the labeled epinephrine amount to meet USP standards.

Methods.—Epinephrine from 6 autoinjectors (Epi-Pen, Mylan Specialty, Basking Ridge, NJ) was extracted and divided into experimental and control samples. The experimental samples underwent 7 12-hour freeze cycles at an average temperature of -25.4°C followed by 7 12-hour thaw cycles at an average temperature 22.7°C . The control samples remained at an average temperature of 23.1°C for the duration of the study. Immediately after the seventh thaw cycle, epinephrine concentrations were measured using a high-performance liquid chromatography assay with mass spectrometry detection.

Results.—The mean concentration of the freeze-thaw samples increased compared to the control samples: 1.07 mg/mL (SD 8.78, 95% CI: 1.04–1.11) vs 0.96 mg/mL (SD 6.8, 95% CI: 0.94–0.99), respectively ($P < .01$).

Conclusions.—Epinephrine concentrations remain within the therapeutically active range (90% to 115%) after repetitive freeze-thaw cycles. This knowledge benefits those who must emergently administer epinephrine after the medication has accidentally frozen and then thawed.

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Introduction.—Human presence in the polar regions of Antarctica and the Arctic continues to increase. These areas have 3 known potential human predators: polar bears (*Ursus maritimus*), killer whales (*Orcinus orca*), and leopard seals (*Hydrurga leptonyx*).

Objective.—The purpose of this study is to examine the existing evidence of documented attacks on humans by potential polar predators. These data are then utilized in an attempt to assess the level of risk to people living in or traveling to these areas.

Methods.—This is a retrospective case series providing a descriptive review of the medical and nonmedical literature of any documented human attacks by polar bears, killer whales, or leopard seals. This study was not limited by any specified period.

Results.—Reports of 11 fatalities and more than 100 serious attacks on humans by polar bears were found documented. Wild killer whales have been linked to 1 direct human attack, which was not in a polar region, 5 additional cases of perceived potential human attacks, and no documented human fatalities. Although there are many accounts of leopard seals attacking inflatable boats, only 3 direct human attacks, resulting in 1 fatality, have been documented.

Conclusions.—Human attacks, and even more so fatalities, by potential polar predators are exceedingly rare in comparison with number of interactions. Polar bears pose the highest risk to humans for injury or death. Although there have always been relatively limited interactions and avoidance behaviors have been practiced, this review takes into consideration the ever-increasing number of polar predator and human encounters. As with all wildlife, a healthy respect should be held for the animals themselves, and their potential for human harm should be appreciated.

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Healthcare Utilization Following Acute and Over-use Injuries Among Outdoor Rock Climbers

Introduction.—An estimated 4.6 million Americans participated in rock climbing in 2013. Although injuries are common among rock climbers, the conditions for which they seek medical attention are largely unknown.