crabs, which use these beaches for development and which the public frequents on Long Island, NY.

Methods.—Metals were assessed in egg (prespawning), embryo (early postspawning), and larvae (late postspawning) stages. At all sites, eggs were extracted from adult females to obtain a baseline contamination level (ie, metals are transferred during egg formation). Embryos and larvae were collected from the sediment of each beach. Sediment and water were collected from all sites, and metal levels were compared to organism samples. Metal concentrations in all samples were determined using inductively coupled plasma mass spectrometry (ICP-MS). Descriptive statistics are reported and differences in life stages were analyzed using a Kruskal-Wallis test.

Results.—All trace metals accumulated, but to varying degrees based on life stage and beach. Essential metals that are required for physiological function showed significant accumulation from egg to larval stages for most sites ($P < .001$). Nonessential metals, which can have toxic effects, showed significant accumulation from egg to larval stages for most sites ($P < .001$).

Conclusions.—For a given metal, early stages related to sediment and water concentrations at some sites. Thus, local abiotic conditions may affect the uptake rate of each metal. We showed that metal bioaccumulation occurred at concentrations naturally found in habitats and suggested factors other than local levels of a contaminant should be considered when addressing the danger to organisms, including humans, that heavily use these areas.

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The Benefits of Wilderness Programs for Cancer Patients and Survivors: A Literature Review

S. Terez Malka¹; Tyler Warmack²

¹Harvard School of Medicine, Boston, MA, USA, ²University of North Carolina School of Medicine, Chapel Hill, NC, USA

Introduction.—Many organizations promote wilderness experiences for cancer patients and survivors. Data suggest that moderate-to-vigorous exercise may reduce fatigue and depression in adults undergoing cancer treatment. The psychology literature suggests additional benefits of nature-based programming, including increased self-esteem and decreased anxiety. However, rigorous studies of the impact of wilderness-based programs are lacking.

Objective.—To evaluate the impact of wilderness programs on cancer patients and survivors.

Methods.—We searched PubMed, MEDLINE, CINAHL, and the Cochrane Central Register of Controlled Trials through March 2016. Search terms included adventure or wilderness or nature; therapy, rehabilitation, or treatment; and cancer. We reviewed the bibliographies of relevant articles for additional citations. Two authors independently analyzed the results for relevance and study design. Systematic reviews and controlled trials were selected for inclusion.

Results.—Forty-nine articles were identified: 38 were not relevant and 7 were case reports. Four studies were identified that met inclusion criteria, including 1 systematic review and 3 controlled trials. Outcomes of the controlled trials were heterogeneous, precluding meta-analysis. Two studies analyzed the impact of wilderness therapy programming on the physical activity levels of participants. The other 2 studies explored self-reported psychological benefits. Analysis of the 4 articles suggests benefits to program participants, including an increase in regular physical activity and improved perception of self-esteem, body image, quality of life, and mood. No studies assessed physical health outcomes or impact on disease progression.

Conclusions.—There are few rigorous studies evaluating the impact of adventure and wilderness programming on cancer patients and survivors, and no studies exploring medical effects. Preliminary data suggest positive, though potentially transient, benefits, including an increase in exercise frequency and improved self-esteem and mood. Given the popularity of these programs and potential benefits, further research is indicated to quantify the medical and psychological impact of wilderness programming on cancer patients and survivors.

Phase 3 Efficacy and Safety Results of Sufentanil Sublingual 30 mcg Tablet for Management of Acute Traumatic Pain in Emergency Medicine

James Miner¹; Harold Minkowitz²; Zubaid Rafique³; Karen DiDonato⁴; Pamela Palmer⁴

¹Hennepin County Medical Center, Minneapolis, MN, USA, ²Memorial Hermann Memorial City Medical Center, Houston, TX, USA, ³Ben Taub General Hospital, Houston, TX, USA, ⁴AcelRx Pharmaceuticals, Redwood City, CA, USA

Introduction.—Opioids often are considered standard-of-care treatment for acute pain associated with field trauma; however, limitations of these therapies have been well documented. Morphine is associated with erratic onset of analgesia when delivered intramuscularly (IM) and delayed side effects resulting from active metabolites, and fentanyl's rapid distribution demands frequent redosing. There remains a clinical need for rapid-acting, potent analgesics that do not require an invasive route of delivery. In collaboration with the Department of Defense, a sufentanil sublingual 30 mcg tablet (SST) is in development for treatment of acute pain in battlefield and emergency trauma settings.

Objective.—To evaluate SST's safety and efficacy in managing moderate-to-severe pain in the emergency department (ED).

Methods.—This is a multicenter, open-label, phase 3 study in up to 120 adult patients presenting to the ED with acute traumatic pain. SST was administered as needed but not more frequently than hourly. Efficacy was assessed by patient reports of pain intensity on an 11-point numerical rating scale (0 = no pain and 10 = worst possible pain). The primary efficacy variable was the summed pain intensity difference from baseline over the first hour (SPID1). Safety was assessed via vital signs and adverse event reporting (AEs).

Results.—Forty of the 120 patients have been enrolled to date and an interim analysis performed. Statistically significant and clinically meaningful reductions in pain intensity have been observed following a single dose of SST. A low number of adverse events has been reported, with nausea and somnolence the most frequent (5% each). All available safety and efficacy results will be included at the time of presentation.

Conclusions.—Sufentanil 30 mcg tablets are in development for treatment of moderate-to-severe acute pain in an EM population. Early efficacy and tolerability results suggest that SST may offer a viable alternative to IM or IV dosing.

Funding: The late-stage development of this drug is being sponsored in part by the US Department of Defense.

An Assessment of Diarrhea Among Long-Distance Backpackers in the Sierra Nevada

Derek Meyer¹; Amber Costantino²; Susanne Spano¹

¹UCSF - Fresno, Fresno, CA, USA, ²California State University - Fresno, Fresno, CA, USA

Introduction.—The John Muir Trail (JMT) is a 210-plus mile, long-distance backpacking trail in the Sierra Nevada mountain range of California. Previous studies from the Appalachian Trail and Long Trail have found significant correlation between backpacker demographics and on-trail hiking behaviors and diarrhea incidence, ranging from 10.7% to 63%. Incidence of diarrhea also has been shown to depend on age, sex, and regularity of standard backcountry hygiene practices. However, no studies to date have examined these variables among backpackers on the JMT.

Objectives.—To determine the significance of particular JMT backpacker demographics and hygiene compliance regularity with diarrhea incidence and severity.

Methods.—Survey data from long-distance backpackers who attempted a JMT trek in 2014 were assessed via statistical software for the significance of variables that might contribute to the incidence and severity of on-trail diarrhea. These variables included age, sex, pre hike body weight, pre hike physical activity (hours/week), pre hike self-assessed physical condition, previous hiking or backpacking experience (days in previous 10 years), solo or group backpacking itinerary, on-trail average pack-weight, on-trail hygiene compliance regularity (water filtration, hand hygiene, dish washing), and posthike difficulty assessment. Backpackers also reported their on-trail incidence and severity of diarrhea.

Results.—Of 737 valid responders, 16.4% reported experiencing diarrhea (82% with minimal or mild severity; 18% with significant severity). No statistical significance was found between diarrhea incidence as related to hiker demographics or compliance with standard hygiene recommendations. Regular hand sanitizer use was significantly correlated with having more severe diarrhea, but

had no effect on incidence. Most JMT backpackers follow standard backcountry hygiene recommendations.

Conclusions.—JMT backpackers have comparatively lower risk of experiencing diarrhea than other major long-distance backpacking routes in the United States. Diarrhea incidence is unaffected by backpacker demographics or hygiene compliance regularity on the JMT.

Iloprost With and Without rt-PA: Treatment of 131 Cases of Severe Frostbite

Emmanuel Cauchy¹; Eric Chetaille¹; Emmanuel Pham¹;

Hugo Nespoulet¹; Pascal Zellner¹; François Becker¹; Peter Hackett²

¹IFREMMONT (Institut de Formation et de Recherche en Médecine de Montagne), Hôpital de Chamonix, Chamonix, France, ²Institute for Altitude Medicine, Telluride, CO, USA

Introduction.—Both rt-PA and iloprost (prostacyclin) are effective treatments for severe frostbite, but it is unclear if using them in combination is more effective.

Objective.—To evaluate combined treatment with rt-PA and iloprost in severe frostbite, compared with other therapies.

Methods.—Retrospective case review of 131 patients with severe frostbite. Patients without contraindication or severe trauma were managed with rapid rewarming (38°C bath water immersion + aspirin IV [250mg] + buflomedil IV [400 mg, alphalytic vasodilator] during 1 hour. Then 41 patients received daily treatment of aspirin and buflomedil (TT-A); 58 received aspirin and IV iloprost 2 ng/6 h (prostacyclin) (TT-B); and 20 received aspirin, IV tPA (100 mg, first day only) and iloprost (TT-C). Twelve patients did not receive any treatment (TT-D). The final level of amputation was measured 3 to 8 days later on bone scanning.

Results.—For grade 3 frostbite, 100% of the patients required amputation in TT-D (4 of 4 patients), as did 62.5% with TT-A (10 of 16 patients), 4.9% with TT-B (2 of 41 patients) ($P < .01$), and 27.3% with TT-C (3 of 11 patients) ($P < .03$). For grade 4, 100% needed amputation in TT-D (3 of 3 patients), 100% in TT-A (4 of 4 patients), 66.7% TT-B (4 of 6 patients) ($P < .001$) and 44.4% with TT-C (4 of 9 patients) ($P < .03$). Of 407 digits, 183 frozen fingers lead to 22 amputations (TT-A 49%, TT-B 0%, TT-C 2%, TT-D 49%), and 224 frozen toes lead to 25 amputations (TT-A 34%, TT-B 0%; TT-C 4%, TT-D 62%). Analysis showed that tPA was effective up to 12 hours and iloprost up to 48 hours.

Conclusion.—The efficacy of iloprost was significantly higher than buflomedil or no treatment. The addition of rt-PA to prostacycline seems to improve the prognosis only of stage 4 frostbite and only when the delay between rewarming and treatment was less than 12 hours.

Search and Rescue (SAR) and Fatalities in Mount Rainier National Park (MORA) 2010-2015: Location and Altitude Data May Enhance SAR Training and Preventative Search and Rescue (PSAR)

Brian Scheele

Mount Sinai Medical Center, Miami Beach, FL, USA

Introduction.—Visits to our national parks number in the millions each year. Despite efforts by search and rescue (SAR) personnel to aid visitors, fatalities do occur. Mount Rainier National Park (MORA) encompasses 236,381 acres (956.60 km² [369.35 miles²]) and is centered around the stratovolcano Mount Rainier (4,392 m [14,411 feet]).

Objectives.—To provide an initial source of reference in the medical literature describing publicly available data on SAR and fatalities in MORA and to quantify location and altitude data regarding fatalities that required SAR activation in MORA to enhance SAR preparedness and PSAR activity.

Methods.—A retrospective review of a National Park Service publicly available database.

Results.—Between January 2010 and September 2015, 239 SARs and 41 fatalities occurred in MORA. Fatalities occurred in 22 defined locations, with 3 fatality locations unknown. Not all fatalities involved SAR. Thirty-two fatalities (78%) were related to activity of 24 SARs (10%), and 9 fatalities (12%) were unrelated to SAR activity. Location of the 32 SAR-related fatalities was concentrated in 18 defined locations with 2 fatality locations unknown. Seven

locations had more than one SAR-related fatality, yet only 2 individual SARs were related to more than one fatality. Thirteen SAR-related fatalities occurred at very high altitude (>3500 m [>11482 feet]), 12 at high altitude (1500–3500 m [4921–11,482 feet]), and 7 at low altitude (<1500 m [<4921 feet]). SAR-related fatalities occurred at a mean elevation of 2645 m (8679 feet), SD 1225 m (4022 feet), and interquartiles 1584 m, 2853 m, and 3825 m (Q1 5200 feet, Q2 9362 feet, Q3 12,550 feet).

Conclusions.—Between 2010 and 2015, 10% of SAR operations within MORA involved fatalities, and 78% of these SARs were located at high or very high altitude. These SAR operations and fatalities were located in distinct areas within MORA. SAR training and PSAR operations may benefit from quantified location and altitude-specific data.

Epidemiology of Mountain Climbing Injuries Presenting to Emergency Departments in the United States from 2012 to 2014

Benjamin Nicholson; Jacob Kallenberg; Jolion McGreevy
Boston Medical Center, Boston, MA, USA

Introduction.—There is currently a paucity of literature describing the burden and severity of mountain climbing-related injuries presenting to the emergency department.

Objective.—To determine the epidemiology of mountain climbing injuries presenting to US emergency departments.

Methods.—The Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) is a weighted database that provides a national probability sample of participating hospitals and allows estimation of product-related injuries treated in emergency departments in the United States. The NEISS database was queried for the period January 1, 2012 through December 31, 2014 for product code 1258: "Mountain climbing (activity, apparel or equipment)." The results were analyzed for diagnosis, sex, race, anatomic location of the injury, size of the hospital, and disposition.

Results.—The NEISS database provided 367 representative unique cases, resulting in an estimated 14,147 visits nationally during the 3-year period. The patients were predominantly male (65.0%) and white (72.5%), with an average age of 27.6 years. The largest percentage, 34.8% (4922), was seen in small hospitals. Disposition from the ED was discharge in 88.3%, admission in 7.7%, and transfer to another facility in 3.2%. The most common diagnoses were fracture (4008, 28.3%), strain or sprain (3574, 25.3%), and contusions/abrasions (1658, 11.7%). Internal organ injury (611, 4.3%) was less common. The lower extremities were commonly injured, including the ankle (2909, 20.6%), foot (1553, 11.0%), and lower leg (1361, 9.6%). The head (1496, 10.6%) was also a frequently injured body site.

Conclusions.—Musculoskeletal injuries commonly were observed in association with products coded as mountain-climbing related. The majority was discharged from the emergency department. Injuries predominately involved the lower extremities; however, 10.6% of patients had an injury to the head. Preventive strategies should focus on lower extremity protection and encourage the use of helmets.

Epidemiology of Scuba Diving-Related Injuries Presenting to the Emergency Department Between 2012 and 2014

Benjamin Nicholson; Jolion McGreevy
Boston Medical Center, Boston, Massachusetts, USA

Introduction.—Scuba diving injuries not reported to the Diver Alert Network are poorly described in the literature and the current burden of injury is unknown.

Objective.—To describe injury patterns observed nationally and influence future efforts aimed at developing countermeasures and training to better address the current burden of injury among scuba divers.

Methods.—The Consumer Product Safety Commission's National Electronic Injury Surveillance System (NEISS) is a weighted database that provides a national probability sample of participating hospitals that allows for estimation of product-related injuries treated in emergency departments in the United States.