CUHMA ACMHS
Canadian Undersea and Hyperbaric Medical Association
Association Canadienne de Médecine Hyperbare et Subaquatique

E-NEWS

EDITOR'S NOTE – March 2024

The E-News is the monthly newsletter of CUHMA, the primary outlet to share news/announcements, upcoming events, abstracts of recent publications, job postings, professional perspectives, and images of relevant professional scenes. Submission of applicable content is welcome. New issues are released on the last business day of each month. Past issues are available at https://cuhma.ca. Direct correspondence to info@cuhma.ca.

Neal W. Pollock, PhD
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PRESIDENT'S NOTE

Dear Colleagues,
Thanks to all who attended our annual business meeting on February 29th, 2024. We are finalizing the syllabus for our virtual annual scientific meeting on Saturday April 27th, 2024. Work is currently underway on obtaining accreditation and it is hoped that we will have further details by the next issue of the E-News. We hope to see you at the annual meeting in April.

Wishing you all the best.
Geoff Zbitnew MD

UPCOMING EVENTS

Boston Sea Rovers International Ocean Symposium

The 70th international ocean symposium and film festival with be held March 15-17 in Danvers, MA. For more information: https://bostonsearovers.com/clinic-home.

Canadian Underwater Conference 2024

The Diver Certification Board of Canada (DCBC) will hold the Canadian Underwater Conference & Exhibition March 24-26 at the Toronto Airport Marriot hotel. Visit: https://www.underwaterconference.ca.

AAUS Diving for Science Symposium 2024

The 2024 AAUS Diving for Science symposium will be hosted by the Smithsonian Marine Station at Fort Pierce with major contributions by Harbor Branch Oceanographic Institute, April 14-24 in Fort Pierce, FL. Visit: https://aaus.org/annualsymposium.

Ponza Rebreather Conference

The eighth iteration of the Ponza Rebreather Conference will be held May 8-12, 2024 on the island of Ponza, Italy (south of Rome and west of Naples in the Tyrrhenian Sea). Each day will include lectures and boat dives organized by the Ponza Diving Center. Visit: www.ponzadiving.com or info@ponzadiving.com.

UMC Level 2 Advanced Diving Medicine Course

Undersea Medicine Canada is offering a CSA Z275 Level 2 'Advanced Course in Diving Medicine: Diagnosis and Treatment.' This 6-day course will be held May 20-25, 2024 at the Atlantic Commercial Diving Centre in Summerside, PEI. Augmenting classroom instruction and case-based learning, site visits will allow observation of commercial diver training, diving, and hyperbaric chamber operations. A CSA Z275.2-15 Level 1 course or equivalent training is a prerequisite for this 45-h program. Find more information at https://underseamedicine.ca or contact Dr. Debbie Pestell at drdeb1@ns.sympatico.ca or 902-225-8214.

UHMS Annual Scientific Meeting 2024

The annual scientific meeting of the Undersea and Hyperbaric Medical Association will be held June 12-15, 2024 in French Quarter of New Orleans. the abstract submission deadline in March 03. Visit: https://www.uhms.org/education/annual-scientific-meeting/asm-registration.html#read-bio.

EUBS Annual Scientific Meeting 2024

The 48th annual scientific meeting of the European Underwater and Baromedical Society will be held September 16-20 in the port city of Brest, France. The abstract submission deadline is April 16th. Visit: https://eubs2024.sciencesconf.org

RECENT PUBLICATIONS

Ashworth ET, Ogawa R, Nguyen J, Afif C, Sá RC, Butts Pauly K, Vera DR, Lindholm P. A novel method for tracking hyperbaric nitrogen kinetics in vivo using radioactive nitrogen-13 gas and positron emission tomography. J Appl Physiol (1985). 2024 Feb 29. doi: 10.1152/japplphysiol.00859.2023. Online ahead of print.

Decompression sickness (DCS) is caused by gaseous nitrogen dissolved in tissues forming bubbles during decompression. To date no method exists to identify nitrogen within tissues, but with advances in PET technology it may be possible to track gaseous radionuclides into tissues. We aimed to develop a method to track nitrogen movement in vivo that could then be used to further our understanding of DCS using nitrogen-13 (13N2). A single anesthetized female Sprague Dawley rat, was exposed to 625 kPa, composed of air, isoflurane and 13N2 for 10 min. The PET scanner recorded 13N2 with energy windows of 250-750 keV. The PET showed an increase in 13N2 concentration in the lung, heart and abdominal regions, which all reached a plateau after ~4 min. This showed that it is possible to gain non-invasive in vivo measurements of nitrogen kinetics through the body while at hyperbaric pressures. Tissue samples showed radioactivity above background levels in the blood, brain, liver, femur and thigh muscle when assessed using a gamma counter.The method can be used to evaluate an array of challenges to our understanding of decompression physiology by providing a quantitative assessment method. Further development of the method will improve the specificity of the measured outcomes, and enable it to be used with larger mammals, including humans.

Bresser MF, Wingelaar TT, Van Weering JAF, Bresser P, Van Hulst RA. An observational study ascertaining the prevalence of bullae and blebs in young, healthy adults and its possible implications for scuba diving. Front Physiol. 2024 Feb 14:15:1349229. doi: 10.3389/fphys.2024.1349229. eCollection 2024.

Introduction: Intrapulmonary air-filled cavities, e.g., bullae, blebs, and cysts, are believed to contribute topulmonary barotrauma (PBT) and arterial gas embolism (AGE) in divers. However, literature is unclear about the prevalence of bullae in healthy adults, ranging from 2.3-33.8%. While this could in part be explained due to increasing quality of radiologic imaging, such as computed tomography (CT) scans, other methodological factors may also affect these findings. This study aims to ascertain the prevalence of bullae in young and healthy adults. Methods: This single-center cross-sectional observational study re-assessed the CT scans of adults (aged 18-40) performed for a clinical suspicion for pulmonary embolism, from 1 January 2016 to 1 March 2020. Presence of bullae was recorded in an electronic database. Chi-square and Fisher exact tests were used for statistical analyses. Additionally, a multivariate logistic regression analysis was performed to study the independent predictive value of identified risk factors. Results: A total of 1,014 cases were identified, of which 836 could be included. Distribution amongst age groups (18-25, 26-30, 31-35, and 36-40) was almost equally, however, 75% of the population was female. Of the male proportion, 41% smoked, compared to 27% in females. In 7.2% (95% CI 5.6-9.1) bullae were identified. The prevalence increased with increasing age ($p<0.001$), with odd ratios up to 5.347 (95% CI 2.164-13.213, $p<0.001$) in the oldest age group. Males and smokers had higher odds ratios for bullae of 2.460 (95% CI 1.144-4.208; $p=0.001$) and 3.406 (95% CI 1.878-6.157, $p<0.001$), respectively. Similar results were seen in the multivariate logistic regression analysis, where age, male sex and smoking were all statistically significant independent risk factors for bullae. Discussion: Bullae were seen in 7.2% of a healthy population up to 40 years old. Increasing age, smoking, and being male were identified as statistically significant risk factors, both in independent and in multivariate logistic regression analyses. Our observations may warrant a re-evaluation of the contribution of bullae to PBT and AGE, as the latter two occur very rarely and bullae appear to be more frequently present than earlier assumed.

Elia A, Gennser M, Eiken O, Keramidas ME. Effects of hyperventilation on repeated breath-holding while in a fasting state: do risks outweigh the benefits? Am J Physiol Regul Integr Comp Physiol. 2024 Feb 5. doi: 10.1152/ajpregu.00260.2023. Online ahead of print.

Introduction: Breath-holding preceded by either an overnight fast or hyperventilation have been shown to potentiate the risk of a hypoxic blackout. However, no study has explored the combined effects of fasting and hyperventilation on apneic performance and associated physiological responses. Methods: Nine, non-divers (8 males) attended the laboratory on two separate occasions (≥48-h apart), both after a 12-h overnight fast. During each visit a hyperoxic rebreathing trial was performed followed by three repeated maximal static apneas preceded by either normal breathing (NORM) or a 30 s hyperventilation (HYPER). Splenic volume, hematology, cardiovascular and respiratory variables were monitored. Results: There were no inter-protocol differences at rest or during the hyperoxic rebreathing for any variable ($p\geq0.09$). On 9 occasions (8 in HYPER), the subjects reached our safety threshold (oxygen saturation 65%) and were asked to abort their apneas, with the preponderance of these incidents (6) occurring during the third repetition. Across the sequential attempts, longer apneas were recorded in HYPER [median (range), 220 (123-324) s vs. 185 (78-296) s, $p\leq0.001$], with involuntary breathing movements occurring later [134 (65-234) s vs. 97 (42-200) s, $p\leq0.001$] and end-apneic partial end-tidal pressures of oxygen ($P_{ET}O_2$) being lower ($p\leq0.02$). During the final repetition, partial end-tidal

pressure of carbon dioxide [($P_{ET}CO_2$), 6.53±0.46 kPa vs. 6.01±0.45 kPa, p=0.005] was lower in HYPER. Over the serial attempts, pre-apneic tidal volume was gradually elevated [from apnea 1 to 3, by 0.26±0.24 L (HYPER) and 0.28±0.30 L (NORM), p≤0.025], with a correlation noted with pre-apneic $P_{ET}CO_2$ (r=-0.57, p<0.001) and $P_{ET}O_2$ (r=0.76, p<0.001), respectively. Conclusion: In a fasted state, pre-apnea hyperventilation compared to normal breathing leads to longer apneas, but may increase the susceptibility to a hypoxic blackout.

Hughey SB, Kotler JA, Ozaki Y, Itani Y, Fukuzawa F, Yanagimoto T, Takamatsu K, Koito S, Suzuki H, Nishihira Y, Hughey AC, Nagata T. Marine envenomation in Okinawa: overview and treatment concept. Wilderness Environ Med. 2024 Feb 6:10806032231220401. doi: 10.1177/10806032231220401. Online ahead of print.

Okinawa prefecture is a popular tourist destination due to its beaches and reefs. The reefs host a large variety of animals, including a number of venomous species. Because of the popularity of the reefs and marine activities, people are frequently in close contact with dangerous venomous species and, thus, are exposed to potential envenomation. Commonly encountered venomous animals throughout Okinawa include the invertebrate cone snail, sea urchin, crown-of-thorns starfish, blue-ringed octopus, box jellyfish, and fire coral. The vertebrates include the stonefish, lionfish, sea snake, and moray eel. Treatment for marine envenomation can involve first aid, hot water immersion, antivenom, supportive care, regional anesthesia, and pharmaceutical administration. Information on venomous animals, their toxins, and treatment should be well understood by prehospital care providers and physicians practicing in the prefecture.

Kwee E, Borgdorff M, Schepers T, Halm JA, Winters HAH, Weenink RP, Ridderikhof ML, Giannakópoulos GF. Adjunctive hyperbaric oxygen therapy in the management of severe lower limb soft tissue injuries: a systematic review. Eur J Trauma Emerg Surg. 2024 Feb 22. doi: 10.1007/s00068-023-02426-2. Online ahead of print.

Purpose: Traumatic crush injuries of the lower limb often accompany severe complications. The incorporation of hyperbaric oxygen therapy to standard trauma care may have the potential to diminish injury-related complications and improve outcome in such cases. This systematic review aims to evaluate the effectiveness of hyperbaric oxygen therapy in the management of severe lower limb soft tissue injuries. Methods: The electronic databases Medline, Embase and Cochrane Library were searched to identify studies involving patients with crush-associated sever lower limb soft tissue injuries who received hyperbaric oxygen therapy in conjunction with standard trauma care. Relevant data on type of injury, hyperbaric oxygen therapy protocol and outcome related to wound healing were extracted. Results: In total seven studies met the inclusion criteria, involving 229 patients. The studies included two randomized clinical trials, one retrospective cohort study, three case series and one case report. The randomized placebo-controlled clinical trial showed a significant increase in wound healing and decrease in the need for additional surgical interventions in the patient group receiving hyperbaric oxygen therapy when compared to those undergoing sham therapy. The randomized non-placebo-controlled clinical trial revealed that early hyperbaric oxygen therapy reduces tissue necrosis and the likelihood of long-term complications. The retrospective cohort study indicated that hyperbaric oxygen therapy effectively reduces infection rates and the need for additional surgical interventions. The case series and case report presented beneficial results with regard to wound healing when hyperbaric oxygen therapy was added to the treatment regimen. Conclusion: Hyperbaric oxygen therapy is generally considered a safe therapeutic intervention and seems to have a beneficial effect on wound healing in severe lower limb soft tissue injuries when implemented as an addition to standard trauma care.

CUHMA-ACMHS is the Canadian voice for the advancement of hyperbaric and diving medicine throughout our country and beyond. Our activities include continuous medical education for physicians, nurses, respiratory therapists and anyone involved in the fields of hyperbaric and diving medicine. We are also promoting dissemination of clinical research, publishing position statements, liaising with related professional associations and government agencies. Our main goal is advocating on behalf of our patients. Our vision is to be the reference for the development and delivery of hyperbaric and diving medicine in Canada and beyond. Our mission is to promote excellence in hyperbaric and diving medicine through leadership in education, promotion of best practices and advocacy for our patients. Our values are excellence, leadership, collaboration, communication, and integrity.

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