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

E-NEWS

EDITOR'S NOTE – February 2025

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.

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NEWS/ANNOUNCEMENTS

CUHMA Bylaws Update

A virtual special business meeting was held on January 25 to consider the draft bylaws revision previously shared with the membership for comment. The 2024-12-25 draft form developed by the board of directors was unanimously accepted in the membership vote. The new CUHMA by-laws are now in place, effective 2025-01-25. The document is available on the CUHMA website.

UPCOMING EVENTS

Boston Sea Rovers 2025

The 71st international ocean symposium and film festival with be held March 14-16 at the DoubleTree by Hilton-Boston North Shore in Danvers, MA. For more information: https://bostonsearovers.com.

AAUS Diving for Science Symposium 2025

The American Academy of Underwater Science Diving for Science symposium will be held March 24-29 in Seattle, WA. The event will be hosted by the University of Washington, the National Oceanic and Atmospheric Administration, and the Seattle Aquarium. Visit: https://aaus.org/annualsymposium.

Canadian Underwater Conference 2025

The Diver Certification Board of Canada (DCBC) will hold the 13th Canadian Underwater Conference & Exhibition March 30-April 01 at the Executive Hotel Vancouver Airport in Richmond, BC. For more information, visit: https://www.underwaterconference.ca.

UMC Introductory Diving Medicine Course

Undersea Medicine Canada is offering a Level 1 'Introductory Course in Diving Medicine - Fitness to Dive' May 12-16 at the Atlantic Commercial Diving Centre in Summerside, PEI. An optional half-day pre-course will be held on May 11 for those wanting additional preparation for the program. Visit: https://underseamedicine.ca or contact Dr. Debbie Pestell at drdeb1@ns.sympatico.ca or 902-225-8214 for more information.

DAN-UHMS Diving and Hyperbaric Medicine Special Topics Course

Divers Alert Network and the Undersea and Hyperbaric Medical Society will offer a deeper dive into select dive medicine and clinical hyperbaric medicine topics. The program is intended to add knowledge to an existing foundation of diving medicine. It will be held May 24-31 at Anse Chastanet on St. Lucia. Faculty include Jim Holm, Chris Logue, Simon Mitchell, and Neal Pollock. For more information: DAN@caradonna.com or 800-421-9999.

AsMA-UHMS Joint Scientific Meeting 2025

The joint scientific meeting of the Aerospace Medical Association and the Undersea and Hyperbaric Medical Society will be held June 01-06 at the Hyatt Regency Hotel in Atlanta, GA. For more information, visit: https://www.asma.org/scientific-meetings/asma-annual-scientific-meeting/2025-asma-uhms-annual-scientific-meeting.

EUBS Annual Scientific Meeting 2025

The annual scientific meeting of the European Underwater and Baromedical Society will be held September 02-06 in Helsinki, Finland. Information will be posted on the dedicated conference website: www.eubs2025.com.

RECENT PUBLICATIONS

Apolo-Arenas MD, Guerrero-Nogales L, Díaz-Muñoz CL, Caro-Puértolas B, Parraca JA, Caña-Pino A. Use of the hyperbaric chamber versus conventional treatment for the prevention of amputation in chronic diabetic foot and the influence on fitting and rehabilitation: a systematic review. Int J Vasc Med. 2024 Dec 30:2024:8450783. doi: 10.1155/ijvm/8450783. eCollection 2024.

Diabetes mellitus (DM) is one of the most common chronic endocrine diseases, characterized by hyperglycemia, due to abnormal nitric oxide synthesis. The trend of an increase in the number of patients with DM continues. The medical and economic burden of DM is not only associated with hyperglycemia management but also with the management of DM-related complications. Most chronic DM-associated complications are vascular in nature. Thus, hyperbaric oxygen therapy (HBOT) can be used for primary and/or secondary prevention of vascular complications. This systematic review is aimed at providing an up-to-date analysis of the effects of HBOT in patients with diabetic foot ulcers (DFUs) on the prevention of amputation, fitting, and rehabilitation of amputees. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines were followed to conduct this systematic review. PubMed and Web of Science (WOS) database were employed in the search, which ended in November 2023. A risk of bias analysis was performed using the Evidence Project tool. After analyzing the records obtained, 10 studies were identified. However, seven fulfilled the inclusion criteria and were included in this systematic review. All included patients were over 18 years of age and had DM. The degree of DFU was assessed with the Wagner scale, being between 2 and 4, and the age of previous treatment of these DFU was taken into account. The results of the current systematic review showed that significant improvements can be achieved with HBOT when comparing its effects to those of the control group that followed usual care. Most studies included in the review showed positive results for DFU, amputation prevention, fitting, and rehabilitation of amputees. Therefore, the use of a hyperbaric chamber and standard care, as opposed to standard care alone, is favorable in patients with chronic DFUs. Promising and positive results were achieved for wound healing in DFU and the prevention of amputations.

Beatty P, Evans W, Gravelyn S, Tumperi M, Daubon D, Veith A. Physiological monitoring to prevent diving disorders. Front Physiol. 2024 Dec 18:15:1517361. doi: 10.3389/fphys.2024.1517361. eCollection 2024.

Insight into human physiology is key to maintaining diver safety in underwater operational environments. Numerous hazardous physiological phenomena can occur during the descent, the time at depth, the ascent, and the hours after a dive that can have enduring consequences. While safety measures and strict adherence to dive protocols make these events uncommon, diving disorders still occur, often with insufficient understanding of the factors that triggered the event. This review first examines the most common diving disorders and their incidence rates across recreational and US military dive activities. The review then identifies physiological biomarkers (eg, heart rate, heart rate variability, blood pressure, respiration rate, temperature, oxygen saturation) that may provide a holistic view of the diver's current physiological state and potentially detect the most concerning diving disorders (eg, decompression illnesses, gas mixture-related disorders, barotraumas, and environment exposure). Although considerable research is still needed to verify the use of these biometrics in the diving environment, the research described in this review presents a promising path to developing a system that can detect pending diving disorders and provide divers and other necessary parties with an early warning before mishaps occur.

DeAsís-Fernández F, Reina-Varona Á, Papotsidakis E, Lafuente J, Fierro-Marrero J. Effects of hook maneuver on oxygen saturation recovery after -40 m apnea dive - a randomized crossover trial. Sports (Basel). 2025 Jan 15;13(1):24. doi: 10.3390/sports13010024.

To reduce the risk of syncope, trained breath-hold divers (BHDs) use a specialized breathing technique after surfacing called "hook breathing" (HB). It consists of a full inspiration followed by a Valsalva-like maneuver and with subsequent exhalation performed against resistance to generate continuous positive airway pressure during exhalation. This study analyzed the influence of HB on oxygen saturation recovery after a -40 m depth apnea dive in trained BHDs. Thirteen BHDs performed two dives to -40 m at different days, one followed by HB after a dive and the other using usual breathing (UB). To detect signs of lung edema, ultrasound B-line measurements were conducted before, 10 min after the dive, and within 1 h after the dive. To detect oxygen saturation recovery, pulse oximetry was recorded before and immediately after surfacing. Both groups exhibited significant increases in S_pO_2 over time (UB: $F(2.25, 24.7) = 22.1$, $p<0.001$, $\eta g2 = 0.612$; HB: $F(2.11, 23.2) = 29.0$, $p<0.001$, $\eta g2 = 0.688$). Significant differences in S_pO_2 were observed between the HB and UB groups at 30-45 s post-apnea, with higher S_pO_2 values in the HB group; between 1.64 and 5.08% of S_pO_2 in favor of the HB intervention. Four participants showed ultrasound B-lines within 10 min post-dive. After a 40 m apnea dive, the results revealed significant S_pO_2 recovery from 30 s to 45 s, with the HB recovering more rapidly. No differences were found at earlier (10-25 s) or later time points (50-60 s).

Jackson JB 3rd, Bakaes Y, Jacques B, Gauthier C, Mills WL Jr, Nguyen K, Gonzalez T, Cone DL. Adjunctive

hyperbaric oxygen therapy for patients with chronic refractory osteomyelitis: a report of treatment outcomes and risk factors for treatment failure. Adv Skin Wound Care. 2025 Jan-Feb; 38(1):40-45. doi: 10.1097/ ASW.0000000000000256.

Objective: To evaluate the effect of hyperbaric oxygen (HBO) therapy on the outcomes of patients with chronic refractory osteomyelitis (CRO) when combined with modern antibiotics with modern delivery methods and/or surgical treatments. Methods: The authors conducted a retrospective review on 58 patients with CRO from a single institution who underwent HBO therapy along with standard treatment between January 2009 and December 2019. To investigate associations with binary outcomes of interest, they estimated logistic regression models. All models were adjusted for sex, smoking status, and pertinent comorbidities. Exponentiated logistic regression model coefficients were interpreted as odds ratios for each outcome of interest. Multivariable logistic regression was used to control for potential confounding variables. Results: When controlling for multiple confounding factors, patients who completed HBO treatment had 7.76 times the odds of having improvement of their CRO compared with patients who started HBO treatment but did not complete it (P=0.015). Further, patients who completed HBO treatment had 7.7 times the odds of experiencing CRO improvement when controlling for CRO stage (P=0.006). However, completion of HBO did not statistically significantly impact the resolution of CRO or the odds of further surgery or amputation. Patients with diabetes, peripheral vascular disease, and congestive heart failure had increased odds of having an amputation (Ps = 0.026, 0.037, and 0.024, respectively). Conclusions: Patients who completed HBO treatment had increased odds of experiencing improvement of their CRO compared with patients who started HBO treatment but did not complete it. Patients with CRO who had diabetes and congestive heart failure had increased odds of undergoing an amputation.

Kjellberg A, Gustafsson R, Antonsson P, Hedelin H. A novel treatment strategy with hyperbaric oxygen of chronic osteomyelitis and pseudoarthrosis in a child with congenital hereditary sensory and autonomic neuropathy type 4 congenital insensitivity to pain with anhidrosis syndrome: a case report. J Med Case Rep. 2025 Jan 9;19(1):10. doi: 10.1186/s13256-024-05022-z.

Background: Congenital insensitivity to pain with anhidrosis is a rare but devastating hereditary disease. Congenital insensitivity to pain with anhidrosis is caused by a mutation in the neurotrophic receptor tyrosine kinase 1 gene (NRTK1). The condition is characterized by multiple injuries, recurrent infections, and mental retardation. Case presentation: A 7-year-old Kurdish female patient, with a known case of congenital insensitivity to pain with anhidrosis, presented with a left tibial fracture, complicated by incorrect healing, osteomyelitis, and pseudoarthrosis spanning over a number of years. The osteomyelitis and pseudoarthrosis eventually healed after treatment with a combination of a long course of antibiotics, CERAMENT with gentamicin, and 40 sessions of hyperbaric oxygen treatment at 2.4 bar, 113 minutes with two air breaks. This is the first reported case of using hyperbaric oxygen treatment in children with congenital insensitivity to pain with anhidrosis. We discuss potential mechanistic explanations of the association between healing and hyperbaric oxygen treatment. Conclusion: Hyperbaric oxygen treatment may be considered in other cases of complicated infections or treatment-resistant pseudoarthrosis in patients with this rare disease.

Krstulović J, Augustin G, Romić I, Tavra A, Batinović F, Hrgović Z. Hyperbaric oxygen therapy in the treatment of Crohn's disease. Healthcare (Basel). 2025 Jan 11;13(2):128. doi: 10.3390/healthcare13020128.

Background/Objectives: Our study describes hyperbaric oxygen therapy (HBOT) as an additional therapy in the conservative treatment of Crohn's disease (CD) and its benefit in the early postoperative period to prevent surgical complications and improve gastrointestinal motility. Methods: This retrospective study evaluated HBOT in patients hospitalized at the Clinical Hospital Center Split for complications of CD between 2015 and 2020. Patients (n=61) aged 19 to 67 with perianal fistulas, abscesses, fistulas, obstruction, stenosis, or bleeding were included, excluding those with ulcerative colitis or requiring intensive care. Patients were retrospectively divided into conservatively and surgically treated groups, and HBOT was administered over 15-25 days, with treatment lasting 60 min at 2.2 absolute atmospheres (ATA). We analyzed treatment outcomes between the HBOT-treated surgical and conservative groups and compared patients treated with HBOT to a cohort from the preceding five years who did not receive HBOT. Results: We treated 61 CD patients with HBOT, including 34 conservatively and 27 surgically treated patients. HBOT significantly reduced disease activity indices (311.7±59.1 vs. 114±29.8; 203.6±24.1 vs. 83.8±15, for conservatively treated patients, and 352.8±45.7 vs. 109±22.8; 270.4±19.7 vs. 140.3±10.6 for surgically treated patients) and accelerated bowel peristalsis recovery, with 94.1% of conservatively treated patients achieving remission. Comparison with a historical cohort showed faster recovery and improved outcomes in the HBOT group. Conclusions: HBOT is useful in postponing or avoiding surgical treatment, and in operated patients, it improves postoperative recovery and reduces the rate of postoperative complications.

Kot J, Sobczak O, Młynarczyk B, Sharma R, Lenkiewicz E, Sićko Z. Decompression sickness of medical personnel of a hyperbaric centre: A report of cases during 25 years

of activity. Int Marit Health. 2024;75(4):228-235. doi: 10.5603/imh.101076.

Medical hyperbaric sessions for hyperbaric oxygen therapy, conducted at 2.4-2.5 ATA for 80 to 120 minutes, expose staff to increased risk of DCS due to the inhalation of compressed air, which increases gas solubility in body fluids as per Henry's Law. This study evaluates the incidence and risk factors of decompression sickness (DCS) among medical personnel in a hyperbaric centre over a 25-year period. DCS, characterized by gas bubble formation in tissues during planned decompression, was documented in 6 cases among 41,507 sessions. Symptoms varied from mild cutaneous to severe neurological manifestations, dependent on bubble size and location. Risk factors identified include age, physical condition, dehydration, and BMI. Preventative measures included adherence to decompression protocols, hydration, oxygen pre-breathing, and physical fitness maintenance. Despite these precautions, the occurrence of DCS underscores the inherent occupational risk faced by hyperbaric medical staff. The study advocates for stringent safety protocols and continuous monitoring to mitigate this risk.

Laspro M, Wei LW, Brydges HT, Gorenstein SA, Huang ET, Chiu ES. Hyperbaric oxygen therapy regimens, treated conditions, and adverse effect profile: an Undersea and Hyperbaric Medical Society survey study. Undersea Hyperb Med. 2024 Fourth Quarter;51(4):369-376.

Introduction: When administering HBO_2, pressures can range from 1.4 atmospheres absolute (ATA) to 3 ATA. While different treatment profiles have been proposed, there is a paucity of literature comparing the effectiveness and risk profile associated with different pressures treating the same condition. Considering the therapeutic divergence, this study aims to survey Undersea and Hyperbaric Medical Society (UHMS) members on pressure modalities and their use in different clinical conditions. Methods: The study was a voluntary cross-sectional survey administered online and open to healthcare providers who were Undersea and Hyperbaric Medical Society members. UHMS itself distributed the survey link. The survey period lasted from November 2022 until January 2023. Data were collected utilizing the Qualtrics platform and analyzed through Microsoft Excel. Results: A total of 265 responses were recorded. The majority responded with utilizing 2.4 ATA (35.2%) as the pressure of choice, followed by 2.0 ATA only (27.1%), and those who utilized differing therapeutic pressures (26.4%). The overwhelming choice for treatment of osteoradionecrosis (ORN) of the jaw, radiation proctitis/cystitis, diabetic foot ulcer, and chronic osteomyelitis was 2.0 ATA (68.0-74.9%). Among listed adverse effects, myopia was the most commonly reported complication at 24.4%, followed by barotrauma (14.9%) and confinement anxiety (11.5%). Conclusions: There is currently little consensus regarding the best treatment modalities for conditions treated with HBO_2. As adverse effects appear non-negligible, future prospective studies must be conducted weighing the risks and benefits of higher-pressure therapies compared to safer lower-pressure options.

Leder Macek AJ, Wang RS, Cottrell J, Kay-Rivest E, McMenomey SO, Roland JT Jr, Ross FL. Hyperbaric oxygen therapy for sudden sensorineural hearing loss - a comorbidity lens. Undersea Hyperb Med. 2024 Fourth Quarter;51(4):393-402.

Objective: To determine the outcomes of patients receiving hyperbaric oxygen therapy for sudden sensorineural hearing loss and the impact of patient comorbidities on outcomes. Study design: Retrospective chart review. Setting: Tertiary referral center. Methods: All patients over 18 diagnosed with sudden sensorineural hearing loss between 2018 and 2021 who were treated with hyperbaric oxygen therapy were included. Demographic information, treatment regimens and duration, and audiometric and speech perception outcomes were recorded and analyzed. Results: 19 patients were included. The median age was 45 years. 53% were female and 21% had pre- existing rheumatologic disorders. The mean duration between hearing loss onset and physician visits was 9.6 days. All patients received an oral steroid course, while 95% also received a median of 3 intratympanic steroid injections. Patients began hyperbaric oxygen therapy an average of 34.2 days after the hearing loss onset for an average of 13 sessions. No significant relationships were found between patient comorbidities and outcomes. Of those who reported clinical improvement, 57% demonstrated complete recovery per Siegel's criteria. There was significant improvement after hyperbaric oxygen therapy for pure tone averages (50.3 dB vs. 36.0 dB, $p<0.01$) and word discrimination scores (73 vs 79%, $p<0.05$) for all patients regardless of reported clinical improvement. Conclusion: Hyperbaric oxygen therapy, as an adjunct to steroids, significantly improves recovery from sudden sensorineural hearing loss. The Charlson comorbidity index was not significantly associated with patient outcome, but patients with rheumatologic disorders were less likely to respond. Differentiating the natural history of the disease from hyperbaric oxygen therapy-associated improvements remains a challenge.

Myrthong AL, Gurav S, Mahankudo S, Ansari KF, Sawant M, Lahoti K. Hyperbaric oxygen therapy combined with standard wound care versus standard wound care alone in patients with diabetic foot ulcers: a prospective comparative study. Cureus. 2024 Dec 2;16(12):e74964. doi: 10.7759/cureus.74964. eCollection 2024 Dec.

Background: Non-healing diabetic foot ulcers (DFUs) are significant risk factors for amputations. Though the available literature suggests that adjuvant hyperbaric

oxygen therapy (HBOT) fastens the healing process and reduces the risk of amputations, its overall evidence in the reduction of amputation remains controversial. Thus, the present study aimed to compare the efficacy and safety of adjuvant HBOT and standard wound care (SWC) with SWC alone in patients with DFUs. Methods: This prospective, randomized, controlled study involved 60 adult patients with DFU. Based on the simple random number table, the patients were equally randomized into two group: adjuvant HBOT and SWC (n=30) with SWC alone (n=30). The patients received 24 sessions (six sessions per week) of HBOT (3.0 absolute atmospheric pressure) for 45 minutes daily over a period of four consecutive weeks. The outcome measures included wound size reduction, wound bed condition, complications, and proportion of patients undergoing amputation. The patients were assessed at four-week follow-up. Results: At four weeks, both the groups had a significant reduction in pain score, wound size, and inflammation of the surrounding skin compared to baseline (all $p<0.001$). At the end of the study, the adjuvant HBOT and SWC group had significantly reduced pain score and wound size as well as a greater proportion of healthy granulation tissue in the wound bed relative to the SWC group (all $p=0.001$). Moreover, adjuvant HBOT and SWC led to a significantly reduced incidence of minor amputation ($p=0.001$), while complications were comparable between the groups ($p=0.198$). Conclusion: Adjuvant HBOT and SWC are more effective than SWC in healing the DFUs and reduction of minor amputations.

Pernett F, Mulder E, Johansson F, Sieber A, Bermudez R, Lossner M, Schagatay E. Toward a hyperventilation detection system in freediving: a proof of concept using force sensor technology. Front Physiol. 2025 Jan 6:15:1498399. doi: 10.3389/fphys.2024.1498399. eCollection 2024.

Background and aim: Hyperventilation before breath-hold diving (freediving) is widely accepted as a risk factor for hypoxic syncope or blackout (BO), but there is no practical way to address it before dives. This study explores the feasibility of using a force sensor to predict end-tidal carbon dioxide ($P_{ET}CO_2$) to assess hyperventilation in freedivers. Methods and results: Twenty-one freedivers volunteered to participate during two national competitions. The divers were instructed to breathe normally and perform three dry apneas of 1, 2, and 3-min duration at 2-min intervals in a sitting position. Before and after the apneas, $P_{ET}CO_2$ was recorded. The signal from the force sensor, attached to a chest belt, was used to record the frequency and amplitude of the chest movements, and the product of these values in the 60 s before the apnea was used to predict $P_{ET}CO_2$. The mean $P_{ET}CO_2$ was below 35 mmHg before all apneas. The mean amplitude of the signal from the force sensor increased from apnea 1 to apnea 3 ($p<0.001$), while the respiratory rate was similar (NS). The product of the respiratory rate and amplitude from the force sensor explained 34% of the variability of the $P_{ET}CO_2$ in the third apnea. Conclusion: This study shows that a force sensor can estimate hyperventilation before static apnea, providing a basis for further research. More studies are needed to confirm its effectiveness in preventing issues. Freedivers may hyperventilate without noticing it, and such a system could improve awareness of this condition. Additional underwater tests are essential to determine whether this system can enhance safety in freediving.

Piotrowicz G, Kot J, Babicki A, Banaszkiewicz P, Piotrowicz A, Rzeszutek M, Rudnik A, Zientara P, Adamska-Mieruszewska J, Rydzewska G. The effects of hyperbaric treatment on perianal fistula activity in patients with Crohn's disease. Prz Gastroenterol. 2024;19(3):321-332. doi: 10.5114/pg.2024.143439. Epub 2024 Sep 23.

Introduction: Crohn's disease is a chronic, complex inflammatory disorder of the gastrointestinal tract. Among its most challenging complications are perianal fistulas. Aim: This study aims to explore the efficacy of hyperbaric oxygen therapy (HBOT) in reducing the activity of perianal fistulas in Crohn's disease patients. Material and methods: This study enrolled patients diagnosed with Crohn's disease-associated perianal fistulas, with a disease duration of at least 3 years. Participants underwent HBOT in conjunction with standard medical therapy. The therapeutic effects were assessed at predetermined intervals using the Crohn's disease activity index (CDAI), and laboratory parameters including faecal calprotectin levels, C-reactive protein (CRP) activity, serum iron concentration, and peripheral blood haemoglobin levels. Additionally, the simple endoscopic score for Crohn's disease (SESCD) and the perianal disease activity index (PDAI) were employed for evaluation. Results: The adjunctive use of HBOT with conventional therapy yielded significant clinical improvements in patients with Crohn's disease complicated by perianal fistulas. This was shown by an 81.8% improvement in CDAI scores and a 54.5% clinical remission rate, as determined by SESCD and PDAI. Notably, the beneficial effects of HBOT on SESCD, PDAI, and faecal calprotectin levels were statistically significant and persisted for 6 weeks post-HBOT, with sustained improvements observed in a follow-up assessment approximately 9 months after treatment. Conclusions: The findings of this study suggest that HBOT may be a viable therapeutic adjunct in the management of complex cases of Crohn's disease, particularly those with recurrent symptoms and limited responsiveness to conventional treatments. HBOT demonstrated potential in improving clinical outcomes and achieving remission rates exceeding 50%, indicating its promise as a treatment modality in this patient population.

Risberg J, van Ooij P-J, Mátity L. Recovery from pulmonary oxygen toxicity: a new (ESOT) model. Undersea Hyperb Med. 2024 Fourth Quarter;51(4):407-423. PMID: 39821770.

Arieli has previously demonstrated that the exposure metric K could be used to predict pulmonary oxygen toxicity (POT) based on changes in vital capacity (VC). Our previous findings indicate that the equivalent surface oxygen time (ESOT) allows the estimation of POT without loss of accuracy compared to K. In this work, we have further investigated POT recovery. The K metric assumes that the recovery of POT is to be controlled by exposure to PO_2. This results in a counterintuitively slow estimated recovery after exposure to low PO_2. Similarly, K overestimates POT during intermittent hyperoxic exposures. We used results from previous studies to train the parameters of a new ESOT recovery model. The predicted recovery of ESOT ($ESOT_{rec}$) after initial hyperoxic exposure ($ESOT_I$) of duration t_{exp} (h) and recovery time t (h) can be calculated as $ESOT_{rec}=ESOT_I \cdot e^{-f}$ with $f=0.439 \cdot t \cdot 0.906^{t_{exp}}$. For intermittent exposures, the function $ESOT(n)=(n \cdot a \cdot \ln(b \cdot n+1)+c) \cdot t_{exp} \cdot PO_2^{2.285}$ will approximate POT (ESOT(n)) after n sessions of PO_2 (atm) for time t_{exp} (min) in each cycle. Parameters a, b, and c are specific for each cycling pattern. These ESOT functions will better predict the development of POT during intermittent hyperoxic exposures as well as recovery after a broader range of continuous hyperoxic exposures than K. We recommend limiting hyperoxic exposures in surface-oriented diving to ESOT=660, 500, and 450 for a maximum of one, five, and seven consecutive days, respectively. A minimum of 48 hours of recovery should follow. These limits can probably be relaxed for intermittent exposures.

Vinkel J, Buil A, Hyldegaard O. Blood from septic patients with necrotising soft tissue infection treated with hyperbaric oxygen reveal different gene expression patterns compared to standard treatment. BMC Med Genomics. 2025 Jan 14;18(1):12. doi: 10.1186/s12920-024-02075-3.

Background: Sepsis and shock are common complications of necrotising soft tissue infections (NSTI). Sepsis encompasses different endotypes that are associated with specific immune responses. Hyperbaric oxygen (HBO_2) treatment activates the cells oxygen sensing mechanisms that are interlinked with inflammatory pathways. We aimed to identify gene expression patterns associated with effects of HBO_2 treatment in patients with sepsis caused by NSTI, and to explore sepsis-NSTI profiles that are more receptive to HBO_2 treatment. Methods: An observational cohort study examining 83 NSTI patients treated with HBO_2 in the acute phase of NSTI, fourteen of whom had received two sessions of HBO_2 (HBOx2 group), and another 10 patients (non-HBO group) who had not been exposed to HBO_2. Whole blood RNA sequencing and clinical data were collected at baseline and after the intervention, and at equivalent time points in the non-HBO group. Gene expression profiles were analysed using machine learning techniques to identify sepsis endotypes, treatment response endotypes and clinically relevant transcriptomic signatures of response to treatment. Results: We identified differences in gene expression profiles at follow-up between HBO_2-treated patients and patients not treated with HBO_2. Moreover, we identified two patient endotypes before and after treatment that represented an immuno-suppressive and an immune-adaptive endotype respectively, and we characterized the genetic profile of the patients that transition from the immuno-suppressive to the immune-adaptive endotype after treatment. We discovered one gene MTCO2P12 that distinguished individuals who altered their endotype in response to treatment from non-responders. Conclusion: The global gene expression pattern in blood changed in response to HBO_2 treatment in a direction associated with clinical biochemistry improvement, and the study provides potential novel biomarkers and pathways for monitoring HBO_2 treatment effects and predicting an HBO_2 responsive NSTI-sepsis profile. Trial registration: Biological material was collected during the INFECT study, registered at ClinicalTrials.gov (NCT01790698) 04/02/2013.

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.

Canadian Undersea and Hyperbaric Medical Association

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