Key advances / trends in undersea medicine since 2000

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1. Pathophysiology of DCS
Variability in VGE in the same diver after identical dives

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Within-diver variability in venous gas emboli (VGE) following repeated dives

David J Doolette,[1,2] F Gregory Murphy[1]

[1] *Navy Experimental Diving Unit, Panama City, Florida, USA*
[2] *Department of Anaesthesiology, University of Auckland, New Zealand*

Individual divers performing an identical profile multiple times may produce markedly variable VGE

Dive profiles matter, but so does something else

2. Pathophysiology of DCS:
Emergence of a role for inflammation

Evidence for harm in DCS by inflammatory activations

For example, reduced cerebral blood flow after white cell activation by vascular passage of bubbles

For example, a substantial body of evidence that microparticles contribute to inflammatory harm (Thom laboratory)

Caveat: strong evidence that bubbles are 1° vector of injury

Potential targets for prevention and treatment strategies

3. Prevention of DCS:
Personalized decompression

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Technical report

First impressions: Use of the Azoth Systems O'Dive subclavian bubble monitor on a liveaboard dive vessel

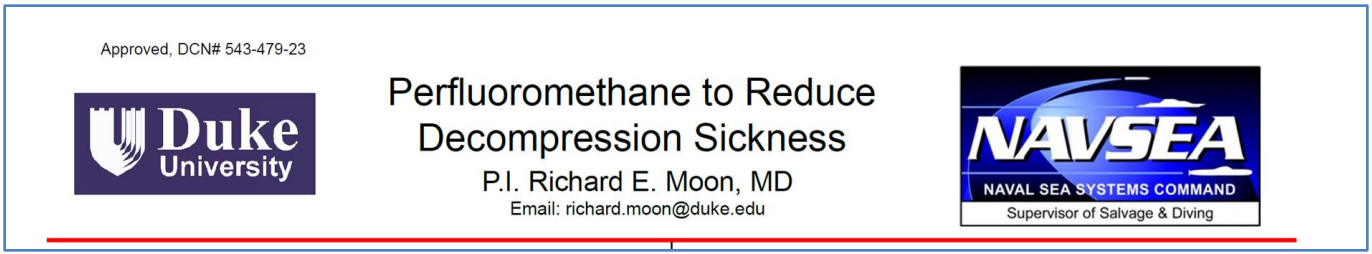
Peter Germonpré[1,2,3], Paul Van der Eecken[4], Elke Van Renterghem[2,5], Faye-Lisa Germonpré[6], Costantino Balestra[3,7]

Advice for next dive based on VGE in previous one

Laudible goal, but wrong execution

Goal: real time in-dive monitoring?

4. Prevention of DCS:
Exotic gas breathing



Non-subtle reduction in decompression risk when breathed as a decompression gas from heliox dive (swine)

Exciting line of novel research

5. Prevention of DCS:
Emergence of multiple experimental preconditioning strategies

Studies suggesting modification of decompression stress by:

Pre-dive hydration

Pre-dive exercise

Pre-dive vibration

Pre-dive bouncing on a trampoline

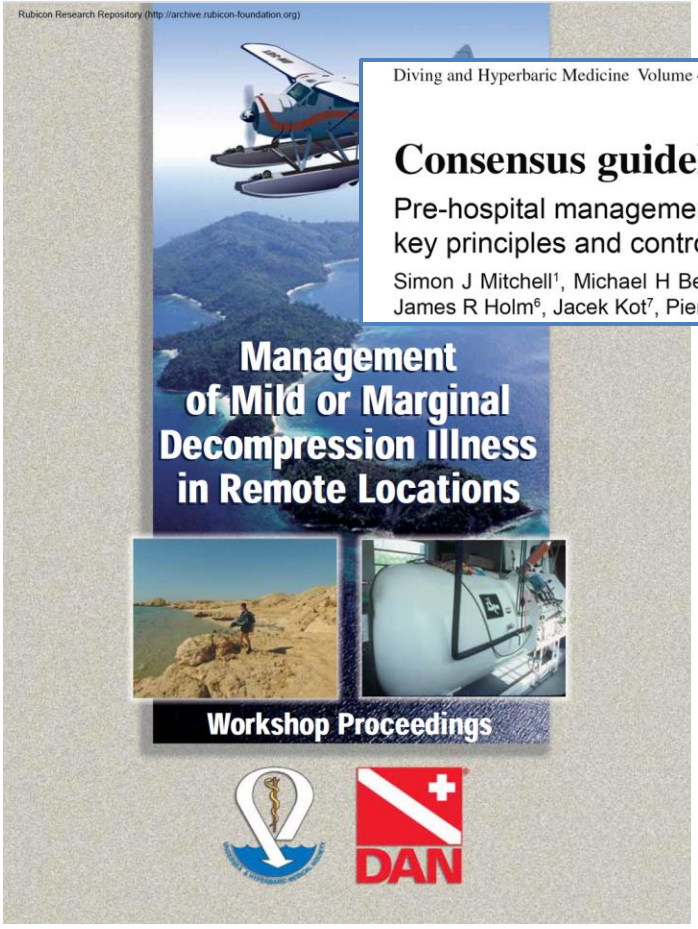
Pre-dive consumption of dark chocolate

Pre-dive sauna

Pre-dive oxygen breathing

None have become mainstreamed, all require further Ix

6. Treatment of DCS



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Consensus guideline

Pre-hospital management of decompression illness: expert review of key principles and controversies

Simon J Mitchell[1], Michael H Bennett[2], Phillip Bryson[3], Frank K Butler[4], David J Doolette[5], James R Holm[6], Jacek Kot[7], Pierre Lafère[8]

Legitimized the option not to recompress cases of DCS that meet a 'mild' definition

Widely implemented

Operational impact

7. Emergence of rebreathers:
High associated fatality rates

78 Diving and Hyperbaric Medicine Volume 43 No. 2 June 2013

Analysis of recreational closed-circuit rebreather deaths 1998–2010

Andrew W Fock

Rebreather diving has 10x fatality rate of open circuit scuba

MILITARY MEDICINE, 176, 4:446, 2011

Descriptive Epidemiology of 153 Diving Injuries With Rebreathers Among French Military Divers From 1979 to 2009

LTC Emmanuel Gempp, French Armed Forces Health Service, MC;*

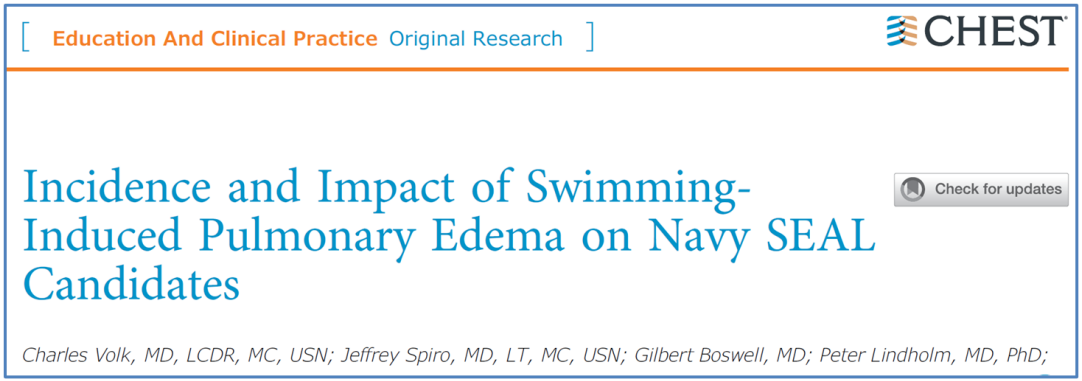
104/153 injuries: hypoxia, hyperoxia, hypercapnia

Unreliable / absent rebreather monitoring for 3H conditions

No established diver monitoring that warns of ANY of these

Potential for increasing diver 'resistance'

8. Increased recognition of immersion pulmonary edema in diving and immersed exercise



106/2117 (5%) suffered IPE
93/106 continued training. 9/93 suffered a repeat event
Lower incidence in actual diving

Steps toward understanding pathophysiology and prevention (mainly Duke group)

Thank you