PROGRAMME

Capita Selecta Duikgeneeskunde

Prevention of decompression illness

A refresher course for physicians, other care professionals and instructors.

Date: 23 November, 2013 Location: AMC Amsterdam

Aim
This course aims to give insight in the prevention of medical disorders, in particular decompression illness (DCI) due to or related to professional and recreational diving.
In case of a medical diving incident it also aims to reduce the damage by adequate preclinical treatment at the dive location.
Management of environmental risk is one of the key-stones of prevention of medical disorders like decompression illness. The problem of individual sensitivity for bubble stress and decompression sickness (DCS) is elucidated by discussing predisposing demographic factors and in addition incidental human stress factors are highlighted.
For adequate on-the-site preclinical treatment insight is given in the spectrum of medical dive incidents, with DCI in particular. VGE, AGE, Type I and II DCS will be discussed with differential diagnosis and will be illustrated by cases.
After having attended the course, the participant masters diagnosing DCI and has the knowhow to treat dive casualties at the dive location. He should also be able to be in charge for great sport diving events and professional diving projects.
The course can be seen as an advanced refresher course. Having attended an elementary course on diving medicine (in the Netherlands e.g. SHF or VSG) is obligate for *medical* attendants

Subjects
Prevention of DCS by medical risk assessment (choice of conditions of recreational and commercial diving, decompression management, safety of dive profile, adequate gas regime); coping with environmental risks, implication of predisposing demographic factors and human stress-factors; VGE and AGE; DCS type I and II, differential diagnostics of DCI (with cases) and its treatment by first aid (cases).

Teachers
Jean Claude Le Péchon, MSc, MEng, Dr. Nico Schellart, Assoc. Prof. and Marga Schweigmann, MD, MA.

Recommendation
The course is recommended by the Expertgroep Duikgeneeskunde of the Vereniging voor Sportgeneeskunde.

Accreditation
The course is an advanced refresher course; basic knowledge of dive physics, physiology and medicine is supposed. The program comprises 5h 50 min oral contact hours and is assumed to give 6 accreditation points for the Dutch NVD, NVAB and VSG. The course members obtain a certificate after completion of the whole course.
Course members from outside the Netherlands should apply personally with their own accreditation office. We will support them administratively. The course content fulfils the standards of EDTC and ECHM for Medical Examiner, 2010.

General: mission of the "AMC Capita Selecta Duikgeneeskunde".

The Capita Selecta Duikgeneeskunde (CSD), refresher courses dive medicine, are given by the Academic Medical Centre (AMC), a one-board-cooperation of the medical faculty of the University of Amsterdam (UvA) and the academic hospital with the UvA. This hospital has a special position within the Dutch academic hospitals; it is the cradle, also in Europe of a related discipline, hyperbaric medicine, performed in the "Boerema Tank". This new type of refresher courses, offered to dive physicians, has a typical 'Alma Mater' character.
In the first place, the AMC Capita Selecta present extensively and discipline-wise education in dive and caisson medicine. In addition, they also give education in new developments as they occur in the academic hospitals and medical faculties. This implies that, within the lessons, the characteristics of disorders are discussed, including their diagnostics and treatment, form the point of view of the present academic state of the art.
In short, the Capita Selecta are marked by a mix of education in the dive medicine of the respective discipline and up-to-date education in the discipline itself, for instance in cardiology, ophthalmology, otology etc. Also, the Capita will pay attention to the requirements of the medical examination.
The Capita are aimed for non-specialized physicians, first line physicians, sport and occupational physicians, professional dive physicians, clinical doctors and paramedical academics and technicians.
In general, the teachers have their affiliation with academic hospitals and medical faculties, and have an international reputation in patient care, academic education and/or medical research as becomes clear from their curriculum vitae.
To have lower thresholds for the courses given in the Netherlands, the venue is easy to reach and centrally located, and moreover the course is low-budget.

Programme committee
Nico Schellart (chair, diving physiologist), Marga Schweigmann (hyperbaric & diving physician), Erik van der Sande (family and sport physician), Jean Claude Le Péchon, MSc, MEng (mondial expert in dive & caisson/tunnelling safety, ad hoc member).

Executive committee
Nico Schellart (course director), Eduard van Riet Paap (administrative manager) and Hans van Dam

Responsibility
The Capita Selecta Duikgeneeskunde are given under the responsibility of the Academic Medical Centre, Univ. of Amsterdam (course leader Nico Schellart). The organization is by the Stichting Duik Research (SDR)[1)] and Biomed. Eng & Physics, AMC (Prof. Dr. A.G.J.M. van Leeuwen, chair).

Announcements
Ongoing announcements about future courses can be found at www.duikresearch.org, www.diveresearch.org or are communicated by E-mail.

[1)] SDR is a non-profit organisation aimed to promote dive safety. Work for SDR is done voluntarily.

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Programme

Prevention of decompression illness

9h00-9h05 Introduction, Nico Schellart, coarse leader

1 9h05-10h05 **Jean Claude Le Pechon, MSc, MEng** Decompression practical management and risk assessment of recreational and professional diving activities

2 10h05-11h00 ***Marga Schweigmann MD, MA,*** *hyperbaric & diving physician.* What is DCI?

Break

3 11h20-12h05 **Dr. Nico Schellart**, Diving physiologist Coping with predisposing demographic factors

4 12h05-12.50 **Jean Claude Le Pechon**. Prevention of environmental hazards

Lunch

5 13h45-15h30 **Nico Schellart**, Incidental predisposing and human stress factors

6 14h30-15h15 Marga ***Schweigmann*** Preclinical treatment

7 15h15-15h50 Marga ***Schweigmann*** Cases

Break

16h10 16h35 Examination

16h35 16h50 Evaluation

Drinks

Disclaimer: Capita Selecta Duikgeneeskunde (i.e. AMC and SDR) is bound to execute the educational program, but small program changes are under reserve.


Jean-Claude Le Péchon


Nico Schellart


Marga Schweigmann

The lecturers

Jean-Claude Le Péchon graduated as biochemical engineer from INSA in Lyon in 1963 and as marine biologist from Nice University. He has been employed at the Muse Océanographique of Monaco as a scientific diver as well as in the Conshelf III Experiment (the undersea habitat sponsored by Jacques-Yves Cousteau). Later he joined CEMA in Marseilles (J.Y. Cousteau) to do research on breathing gases and to develop procedures for very deep dives (1000 m with animals; 500 m with humans) and was a test diver in the Saturation II simulated dive at 400 msw. From 1973 to 1986, he served with CG DORIS, an offshore and civil engineering diving company. In 1986 he founded JCLP Hyperbarie, a global consultancy agency/ bureau specialized in questions related to life support and safety under pressure (commercial diving, tunneling, space and hyperbaric medicine). He has been involved in more than 75 tunneling projects with compressed gas mixtures, up to 6.9 bar and as well as in saturation diving technology. Although retired, he is still teaching physiology and the technology of diving- and hyperbaric medicine at several universities in France and all over the world. He is a National Instructor for SCUBA diving (Air, Nitrox and Trimix) and holds a deep sea commercial diver certification since 1974. He has published many papers in magazines, books and international congresses etc., and often speaks at international congresses on different topics concerning diving, hyperbaric medicine and compressed gas work.

Nico Schellart, graduated as biologist, specialized in physiological biomedical physics. He investigated visual information processing of the retina, resulting in a PhD in 1973 (UvA). He is an associate professor with the dept. of Biomedical Engineering and Physics of the AMC and associate editor of “Medical and Biological Engineering and Computation”. He has investigated multi-sensory information processing in the brain, both animal and human. Since 1998 he performed clinical EEG and MEG research of the visual and auditory system. He has studied the brain and the visual system under hypoxic and hyperoxic conditions both in the lab and in the field and introduced HBO treatment for patients with cerebral radiation damage. He published these dysbaric and HBOT studies in e.g. Cancer, J Appl Fysiol and UHM, in addition to his neuroscience papers and has contributed to a number of textbooks and conference proceedings (like EUBS and UHM). He teaches diving physiology. He is member of UHMS and EUBS, and has tested the technical and physiological performance of dozens of dive computers (www.duikresearch.org), and is a recreational scuba- and formerly a free diver.

Marga Schweigmann was trained originally as experimental clinical psychologist. She is a diving instructor since 1993. As such she founded, in 1994, divecenter “De Tuimelaar”, in the city of Groningen, the Netherlands. For many year she taught scuba diving professionally and has an inside knowledge of the diving industry. As such she has participated in the development of new equipment and procedures, also in the field of tech diving.
She is a PADI Course Director, training and certifying new instructors, and a DAN Instructor Trainer. Since 1999 she is an enthusiastic cave-diver and she took up Trimix diving in 2009. To enable her to do this she took courses in different subjects with a variety of technical diving associations (IANTD, NACD, NSS, DSAT, GUE).
From 2002 until 2006 she studied medicine and since has focused on the interface of diving and medicine. She qualifies both as a diving and a hyperbaric physician in accordance with the rules set forth by GTÜM (Gesellschaft für Tauch- und Überdruckmedizin), running multiple internships at the Hyperbaric Medical Center in Sharm-el-Sheikh, Egypt.
She has worked as hyperbaric physician at the”Instituut voor Hyperbare Geneeskunde” of Hoogeveen, the Netherlands for 2.5 years

Description of lessons

Jean Claude Le Péchon, Decompression practical management and risk assessment of recreational and professional diving
To manage properly a decompression one needs to consider, the decompression profile (P = f(t)) to cope with the elimination of inert gases (ascent rate, stops, breathing gases such as air and Nitrox, …).
Conditions of exposure to pressure (pre-dive physical condition, water temperature, exercise, in the dry, stress factors, type and duration of pressure profile, cave diving, type of breathing gear), must be taken into account to decide the best adapted decompression profile (tables, computers, saturation procedures…).
The environmental conditions of application of the decompression profile (Breathing gas –nitrox, oxygen, constant PO_2-, in the dry, underwater, weather situation, surface decompression, exercise…) are major factors in the quality of the actual decompression. Post dive events are also important in the DCI prevention (second dive, altitude/flying, exercise, deep breath hold dives…).
To select an appropriate decompression procedure, the availability of emergency services for DCI must also the considered.

Marga Schweigmann, What is decompression illness (DCI)?
After a short introduction of the pathophysiology of DCS, arterial gas embolism (AGE) and cerebral AGE (CAGE) - together called DCI - venous gas embolism (VGE), the concept of decompression stress and its relation with DCS will be explained. Symptoms of DCI, the classical distinction between type 1 and type 2 DCS as well as the more modern classification in mild and severe symptoms will be covered. Differential diagnosis of DCI encompasses a long list of injuries and/or diseases, which makes it sometimes hard to diagnose DCI. This is complicated further by the steadily increasing mean age of the sport diving population: more and more divers will bring their (often not diving related) medical history of injuries and (age-related) diseases into diving. Attention is paid also to the psychological impact of DCS and how to handle denial as one of its symptoms.

Nico Schellart, Coping with predisposing demographic factors
VGE bubble grades (BGs) of divers, when exposed to the same dive profile, show considerable variation. Increasing age and reduced VO2max enhances VGE and DCS-risk. For both the quantitative effect is known. Other predisposing demographic factors are patent foramen oval (and septum defect) and impaired lung unction, but they are less established and a quantification is lacking. Other candidates are dehydration, gender and smoking. In this lesson the students are informed about the background and mechanisms of the adverse effects of these factors and learn how their patents can cope with them without giving out sport diving.
Also professional divers have to do with these predisposing factors. How do they affect passing of the medical examination. Attention will be paid to new findings and insights.

Jean Claude Le Péchon. Prevention of environmental hazards
The major environmental danger is immersion but other dangers should also be considered.
A review of the potentially adverse effects of immersion includes: drowning, dehydration, hypothermia, water movements, stability of the support vessel and weather condition, access to and egress from the sea when diving from shore, buoyancy control, visibility and orientation, lost diver situation...
Among the other dangers of the environment should also be considered: depth, cave dives, wreck dives, under ice dives, high altitude dives, diving in remote places with no emergency service available.
Marine life may also be a source of danger in some places where fauna can be stinging, biting, or venomous.
For each specific danger a risk assessment is required to make sure the next dive will be carried out in the range of accepted risks and that contingency plans are prepared to cope with the remaining accepted risk.
(conservatism of profile (descent and ascent pace, MDD with air and Nitrox, OTU, safety stops, O2-decompression, surface interval,). Cases.

Nico Schellart, Incidental predisposing and physiological factors
Incidental predisposing factors only hold at the time of diving, since they have a temporal character. They go beyond the medical exam and at the best they can be managed by a physician or instructor at the dive site. For instance, the diver suffers from hyperthermia. There are many of these factors, potential as well as more or less established based on research of various groups. The effect of hyper- and hopythermia, dehydration, high blood alcohol levels, drugs abuse, etc. and preconditioning factors such as vibration, anti-oxidants and heating will be discussed. Further, there are profile bound physiological factors, such as heavy physical activities before diving,

during compression and decompression after decompression, high $PaCO_2$. The impact on an intended dive will be discussed and the conditions when the dive be should cancelled.

Marga ***Schweigmann*** Management and preclinical treatment of DCI.
Management of diving accidents, whether DCI or due to other causes, starts with being prepared. Preparedness in terms of equipment and accident plans will be discussed shortly.
Tools to differentiate between other medical conditions and DCI will be addressed, as well as how to handle uncertainty in diagnosis. Information about patient characteristics (medical history, medication), behavioural characteristics (consumption of alcohol and/or drugs, stress) and incidental factors (dehydration, diarrhoea) can be helpful in this. The same applies to factors like onset of first symptom, profiles of the last few dives as well as diving conditions. A neurological exam (for instance DAN 5 minute neuro-exam) can reveal new and important symptoms to confirm the diagnosis of DCI.
Management includes first aid (basic life support, normobaric oxygen, re-hydration, protection against environmental elements, psychological support) as well as organisation of (transport to) more definitive treatment. Diving accidents in remote locations are specially challenging: benefits and risks of in-water-recompression are discussed shortly.

Marga ***Schweigmann*** Cases of “What is decompression illness (DCI)?” and “Preclinical treatment of DCI.“