PROGRAMME

16th Capita Selecta Duikgeneeskunde

Diving pathophysiology and cases; with special attention to dehydration, thermal stress and the cardiopulmonary system.

An advanced course for dive physicians and other care professionals.

Date: Saturday, 21 November 2015

Venue: Academic Medical Centre, University of Amsterdam
Room 120 B1, Building B, Meibergdreef 9, 1105 AZ Amsterdam

Subjects
(Patho)physiology and medicine.

Aim
This course aims to give insight into the physiology and pathophysiology of various homeostatic systems eminent for save diving. These imply the maintenance of a correct fluid balance, body temperature and well functioning cardiopulmonary system, just before, during and after diving. How a failure of these homeostatic systems causes or increases the symptoms of DCI but also may lead to a non-DCI accident due to cardiopulmonological disorders will be addressed by a series of cases.
Knowledge of the above matter is crucial for the medical examiner.
After this seminar, the physician will have the knowledge of important physiological systems which enable save diving and in case pathology occurs he knows what impact this may have on DCI risk and other diving disorders. Intrinsic sub-optimal homeostasis and resulting sub-optimal functioning or disorders can also be relevant for the medical exam.
This seminar should be regarded as an advanced course. An elementary course on diving medicine (in the Netherlands e.g. SHF or VSG) is a prerequisite for physicians.

Teachers
- Prof. Dr. Jacques Regnard, MD, Faculty of Medicine of Besançon, and University Hospital Minjoz, University of Franche Comté, France.
- Adel Taher MD, director of the Hyperbaric Medical Centre in Sharm el Sheik, Egypt.

Participants
Diving physicians, academic and higher educated paramedics, high qualified instructors with higher education.

Recommendation
The course is recommended by the expert group of dive medicine of the Vereniging voor Sportgeneeskunde (Soc Sports Med) and by the Nederlandse Vereniging voor Duikgeneeskunde (NVD, Dutch Soc Dive Med).

Accreditation
The program comprises **6 oral contact hours** and is assumed to give **6 accreditation points** for the Dutch NVAB, NVD, VSG and most other medical societies (credit point outside own specialism).
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 level of the course is accordance with that of EDTC and ECHM for Medical Examiner (Level I) and Diving Physician (Level IIa), 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 with the "Boerema Tank", the first clinical hyperbaric chamber in Europe and called after its founder. 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, and diving instructors.
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, medical physicist an diving physiologist), Tjeerd van Rees Vellinga MD (occupational and hyperbaric physician), Erik van der Sande (family and sport physician) and Marga Schweigmann (hyperbaric & diving physician), and ad hoc Jacques Regnard (physiologist, sports physician, diving and hyperbaric physician) and Adel Taher (hyperbaric and diving physician).

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.

Programme

Diving pathophysiology and cases; with special attention to dehydration, thermal stress and the cardiopulmonary system.

08:30-09:00 Welcome

09:00-09:15 ***Nico Schellart, Introduction***

1. 09:15-10:00 ***Jacques Regnard, Fluid balance: specific changes during immersion or diving.***
   10:00-10.10 Discussion

2. 10:10-10:55 ***Adel Taher***, **Dehydration: a definite contributing factor to diving accidents.**
   10:55-11:05 Discussion

Break

3. 11:25-12.10 ***Jacques Regnard,*** **Consequences of warm and cold stress during submersion.**
   12:10-12.20 Discussion

Lunch

4. 13:00-13:45 ***Adel Taher, Hyperthermia: the often forgotten culprit in diving accidents!***
   13:45-13.55 Discussion

5. 13:55-14:40 ***Jacques Regnard, Peripheral and cardiothoracic vascular effects of submersion. Interconnections with fluid balance, thermal stress and cardiopulmonary function.***
   14:40-14.50 Discussion

Break

6. 15:05-15:50 ***Adel Taher, Cardio vascular conditions and their contribution to dive accident and fatalities statistics.***
   15:50-16.10 Discussion and general discussion

16:10 16:25 Test

16:25 16:40 Evaluation of test

Drinks

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


Jacques Regnard


Adel Taher

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The lecturers

Jacques Regnard graduated as MD and in Sport Medicine, and later in Diving and Hyperbaric Medicine at the university René Descartes (Paris). He was involved in field and laboratory studies about human physiology during cold exposure and exercising. Conducted pulmonary functional testing in University hospitals. Published research studies about lung function, bronchial reactivity, pulmonary heat exchanges and vascular airway behaviour (PhD in 1990). He then studied autonomic cardiovascular control in health and disease. Professor of Physiology at the University of Franche Comté from 1993, he teaches Physiology, directed PhD degrees, and has set up functional testing of vascular function. Author of original papers in the fields of respiratory, cardiovascular, and exercise physiology. The recent publications and current works deal in particular with integrated cardiovascular, renal and respiratory responses to immersion and diving, with concomitant influences of hyperoxia and autonomic/endocrine stimulations. Member of EUBS, the Société de Médecine Subaquatique et Hyperbare de langue française and of the Société de Physiologie. He was formerly SCUBA diver.

Adel Taher, a diving instructor and diving medical specialist at the time, he was the driving force behind the multi-place, multi-lock chamber in Sharm el Sheik as he saw the need for a facility to specialize in diving related accidents. The chamber was built in the USA. He is, in addition to being director of the Hyperbaric Medical Centre in Sharm el Sheik also the founder and director of the diving chamber of Dahab. With over 200 diver-HBO treatments per year, he is without any doubt world leader and trained many physicians in hyperbaric medicine. Dr Adel Taher is member of many international medical diving committees, and lectures about his work at universities, courses, etc. all over the world. He is also the director of DAN-Egypt, a member of the UHMS and of the EUBS (as the other lecturers). He also was the driving force behind the EUBS Annual Scientific Meeting in Sharm el Sheik in 2007. He is a recognized invited speaker at congresses such as those of EUBS and UHMS. Diving is still his passion. He worked intensively on diver education and raising the awareness level of dive professionals and divers regarding proper management of dive accidents in remote areas and the proper utilization of normobaric oxygen. The Hyperbaric Medical Center in Sharm hosts dive medical specialists from all over the world in attachments to gain hands-on experience.

The course manager

Nico Schellart graduated as biologist and specialized in physiological and biomedical physics. He investigated visual information processing of the retina, resulting in a PhD in 1973 (University of Amsterdam). He is an associate professor with the dept. of Biomedical Engineering and Physics of the AMC and was associate editor of a bioengineering journal. He has investigated information processing of the visual and auditory system in the brain, with animals and with humans by fundamental and clinical EEG and MEG research. His neuroscience studies have been published in some 50 papers, 80 abstracts and 10 contributions in textbooks and published an electronic free textbook in biomedical physics. He has studied the brain and the visual system under hypoxic and hyperoxic conditions both in the lab and in the field, including pre-cordial Doppler studies, and recommends HBO treatment for patients with cerebral radiation damage. He published these dysbaric and HBOT studies in e.g. Cancer, J Appl Physiol and UHM, and in conference proceedings (like EUBS and UHMS) and is regularly reviewer of journals in applied, sports and environmental medicine. He teaches diving physiology. He is member of UHMS and EUBS and often participated with contributions in their annual meetings. Also, he 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.

Description of lectures

1. ***Jacques Regnard, Fluid balance: specific changes during immersion or diving.***
The lecture will start with a concise introduction about the pathophysiology of acute dehydration in relation to exercise in endurance sports activities. During immersion, hydrostatic pressure phenomena are ultimately caused by the high density of water compared with air. The hydrostatic pressure applied over the body is not the same for the whole body; head, trunk and legs are subjected to different pressures. The pressure differences results in a cascade of physiological changes, which will be high-lighted. It will be explained how it immediately results in "functional hypervolemia", that in its turn finally gives adjustments of blood volume and intravascular pressures, and fluid exchanges between plasma, interstitial and intracellular fluids. The relation between the adjustment of fluid volumes managed by the kidney, depending on the level of physical activity and on the duration of immersion will be discussed. Water and electrolytes exchanges between plasma and interstitial fluids occur at higher rate during immersion than in terrestrial exercising, and they are often differently oriented in peripheral muscles and in trunk viscera : the underlying mechanisms will be addressed.. It will be explained why, in all watery compartments, fluid repartition changes slowly but markedly when immersion lasts several hours. Further, the influence of the elastic tension of the "humid" neoprene thermal suit is an additional factor. The fluid balance adjustments aim to adapt hemodynamic pressures in accordance to the immersion status (external pressure, blood volume distribution in the body, transmural pressure balances). It will be discussed how at the end of immersion/dive (or series of dives), by resuming terrestrial life the hemodynamic conditions in large and small blood vessels change suddenly and the required adaptive processes occur only slowly, while the recovery is long-lasting.

2. ***Adel Taher***, **Dehydration: a definite contributing factor to diving accidents.**
The statistical studies addressing the relation between decompression sickness (DCS) and dehydration will be reviewed. Our experience at the Hyperbaric Medical Center in Sharm el-Sheikh could only stress the general observation that dehydration increases DCS risk. Diving activities in tropical and subtropical regions in addition to the act of diving itself are all dehydration inducing. The effect of the immersion reflex, immersion dieresis, evaporation, perspiration, hydrating the dry breathing gas, caffeine intake and the occasional vomiting associated with seasickness are only some of the factors that will be considered.
The alcohol intake is another major problem emerging and playing a role in dehydration, especially that most dive destinations are now labeled as "resorts".
Preventing *dehydration* and stressing *fluid therapy* as one of the first measures in the first aid provided for diving accidents, should be on our priority list, when teaching diving.
The subject will be addressed by a number of studious cases that happened in the Sharm el Sheik region.

3. ***Jacques Regnard,*** **Consequences of warm and cold stress during submersion.**
Body warming occurs during immersion in hyperthermic water (heat flow from water to body) and also in more temperate water because of sustained exercising (finning etc.), facilitated by the thermal barrier of a diving suit. Warm and cold stress evoke vasomotor responses, especially in the skin and muscles. Another response is sweating as also happens during terrestrial heat exposure. The consequences for the fluid and salt balance will be addressed as well as the changes occurring in combination with the immersion effects on fluid balance with its marked plasma decreases, causing severely impeding hemodynamics. Their physical consequences at the time of emersion and resuming terrestrial activities will be discussed. During hyperthermic water immersion, heat stress rises rapidly due to the high heat inflow without a good efficiency of sweating response as skin evaporation is impossible. The thermal consequence of using a rebreather in hyperthermic water will be addressed. The importance of cold exposure (heat flow from body to water) evoking a number of physiological responses will be discussed such as changes in arterial resistances and the left ventricular afterload, hence heart workload. Effects of sympathetic and vagal activation combine. How this may result in variable consequences for heart rate, vascular pressure, blood redistribution with local hyper- and hypovolemia will be elucidated.

4. ***Adel Taher, Hyperthermia: the often forgotten culprit in diving accidents!***
Diving in the tropics and sub-tropics in warm waters and with the sun shining is every divers dream. Sport and recreational divers learn about the dangers of hypothermia and the survival times in the North Sea and how to properly rewarm the victim, but few have the slightest knowledge about the dangers related to *hyper*thermia and what precautions could be taken to minimize the danger.
In the presentation it will be addressed how hyperthermia can quickly progress from *heat aesthemia to heat cramps, heat exhaustion and heat stroke.* It can end fatally. It will be illustrated that hyperthermia is also a danger inside recompression chambers, diving bells and saturation diving operations (hot water dive suits). Commonly, dehydration is a catalyst.

After establishing the above clinical problems of hyperthermia, the subject will be addressed by a number of striking cases of the author.

5. ***Jacques Regnard, Peripheral and cardiothoracic vascular effects of submersion. Interconnections with fluid balance, thermal stress and lung function.***
The immersion-linked reduction of overall vascular capacitance causes peripheral vascular filling and increased cardiac preload. Hemodynamic postural changes are blunted. It will be discussed how during thermoneutral immersion, hemodynamic and autonomic rearrangements facilitate peripheral blood flow and ease transmural capillary hydromineral fluid exchanges, as well as plasma/interstitial gas exchanges. Next, the high cardiac preload that eases cardiac output, and the increased cardiac work despite lowered arterial resistances will be explained. The role of cardiac peptides ANP and BNP will be addressed.
The change of the work of breathing, including the effect of the breathing device and the effect of depth on airway dynamic resistances, having major cardiac consequences, will be discussed. It will be explained how cold exposure influences arterial resistances and finally cardiac afterload. Thus, functional burdens become easily high on healthy hearts and vascular systems during immersion and diving. And the burden may easily out-pass lower abilities in aging-limited or disease-impaired cardiac functions. The presentation will make clear that diving conditions enhance cardiovascular and breathing workloads, impede functions and lower the thresholds for pathological events as pulmonary immersion edema and acute cardiac failure.

6. ***Adel Taher, Cardiovascular conditions and their contribution to dive accident and fatalities statistics.***
The seventies was the golden age for SCUBA diving and hundreds of thousands all over the world were eager to try out the “silent world” portrayed by J.-Y. Cousteau and the US series ”Sea Hunt” by Lloyd Bridges.
Today, about 22 million people wear dive gear and engage in some sort of underwater activity. The problem is that many of them are the ones that learned in the seventies, only they are now around 40 years older! They suffer hypertension, left ventricular hypertrophy, coronary heart disease, valvular and congenital heart diseases as well as cardiac arrhythmias. Their body fluids will be affected by immersion and they have to manage a certain amount of exercise load that becomes progressively more difficult to overcome with increasing age.
Unfortunately, 20 to 30% of all recreational diving fatalities are related to some cardiac disease and often present through what is known as “Sudden Cardiac Death” (SCD), especially of the older diver. Data about this subject will be reviewed and will be illustrated by teachable cases of the author.

Fees

From € 65 to € 235 dependent on profession and (the number) of requested accreditations (see subscription form).

The fee includes reader, lunch and drinks, test&certificate (if applicable).

Hotels

Suggestions for nearby hotels are:

Hotel Abcoude
Kerkplein 7, 1391 GJ Abcoude
+31 294 281 271, info@hotelabcoude.nl
Rooms from ca. 75 €/day
Bus connection with AMC: no. 120 and no. 126, 2 times per hour (ca. 20 min in total).

Bastion Hotel Amsterdam/Amstel
Verl. Van Marwijk Kooystraat 30, 1096 BX Amsterdam
+31 (0)20-6634567, http://www.bastionhotels.nl/nl/onzehotels/amsterdam
Rooms from ca. 118 €/day
Metro connection with AMC: many times per hour (ca. 20 min in total).

Entertainment

Stay one more night for culture and entertainment in one of the most exciting cities of Europe.

The **Koninklijk Concertgebouw** (Royal Concert Hall)
- (*Ticket should be ordered long in advance).*

The **Muziek Theater** (Stopera)
- (*Ticket should be ordered long in advance).*

And many more flamboyant podium art theatres.

Museums

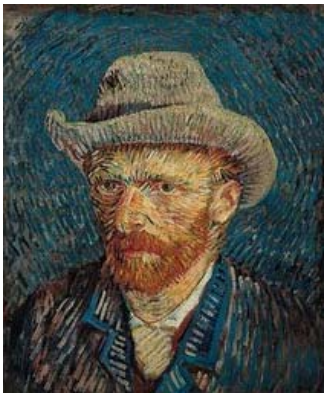
- **Rijksmuseum** (The National Museum), completely renovated and with the Vatican Museum and the Louvre one of the best general museum of the world.

- **Van Gogh Museum**

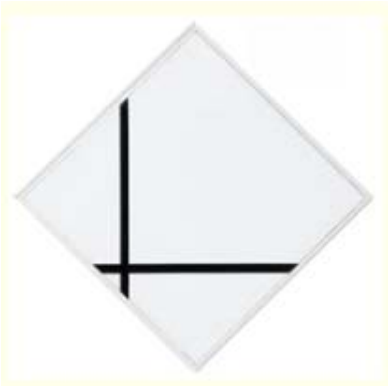
- **Stedelijk Museum** (City Museum) with 20 Century Art

- Many more attractive museums.

Rijksmuseum
Rembrandt van Rijn
The "Nachtwacht"



Van Gogh Museum
Vincent van Gogh
Selfportrait



Stedelijk Museum,
Piet Mondiaan
Composition with 2 lines

Scheepvaartmuseum

The Amsterdam Canals