

PROGRAMME



Capita Selecta Duikgeneeskunde

Pulmonology and Diving; the lung at depth

An advanced course for dive physicians and other care professionals.

Date: Saturday 6 September, 2014

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

Subjects

(Patho)physiology and medicine of the lungs at depth and the examination.

Aim

This course aims to give insight into the differences between the physiology and pathophysiology of the lung under normobaric, hyperbaric and also hypobaric (space and aviation) conditions. The theme includes safety aspects, both medical as well as general.

Knowledge of the above matter is crucial for the medical examiner. For professional divers the criteria for passing a physical in case of lung disorders are generally clear, but for recreational diving they are much less clear-cut. In fact, during the past decennia, the 'grey zone' has expanded. Under particular conditions, despite lung disorders such as specific cases of for instance asthma and starting COPD diving is allowed.

After this seminar, the physician will have the knowledge to decide whether a professional diver, should be passed for his physical and whether a recreational diver should be allowed to dive and under what conditions in relation to his or her clinical characteristics and physiological performance of the lungs.

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

- Pascal Constantin, MD, Médecin en chef, Unité fonctionnelle Hyperbarie et Plongée Hôpital d'Instruction des Armées du Val-de-Grâce, Paris.
- Prof. Dr. Jacques Regnard, MD, Head of the Physiologie-Explorations fonctionnelles, Faculty of Medicine of Besançon, Hopital Minjoz, University of Franche Comté.
- Dr. Nico A.M. Schellart, assoc. prof., dept. of Biomedical Engineering and Physics of the AMC.

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 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 level of the course is accordance with that 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, from 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 and diving physiologist), Marga Schweigmann (hyperbaric & diving physician), Erik van der Sande (family and sport physician), Tjeerd van Rees Vellinga MD (occupational and hyperbaric physician) and ad hoc Pascal Constantin (hyperbaric and diving physician), and Jacques Regnard (physiologist, sports physician, diving and hyperbaric 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).

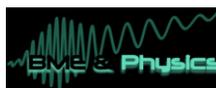
Announcements

Ongoing announcements about future courses can be found at www.duikresearch.org, www.diverresearch.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

Medication and Diving

08:30-09:00 Welcome

09:00-09:20 **Nico Schellart**, Introduction and Physics of the lung under pressure.

1 09:20-10:15 **Jacques Regnard**, Respiratory physiology at rest and during exercise on ground

2 10:15-11:00 **Pascal Constantin**, a) Pulmonary barotrauma and b) Gas bubbles and the lung

Break

11:20-11:45 **General discussion of lecture 1 and 2 and cases**

3 11:45-12:45 **Jacques Regnard**, Respiratory function during diving; changes with immersion and submersion

Lunch

4 13:30-14:40 **Pascal Constantin** a) Long-term effects of diving on lung function
b) Pulmonary aspects of fitness to dive

14:40-15:20 **Discussion of lecture 3 and 4 and cases**

15:20-15:40 **Pascal Constantin** Demo with portable lung-function test apparatus

Break

16:00 16:20 Examination

16:20 16:40 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.



Pascal Constantin



Jacques Regnard,



Nico Schellart ...

The lecturers

Pascal Constantin graduated as MD at the Medical Faculty of the University of Lyon. He is physician specialist of diving medicine of the French Military Health Service, assigned to the Military Hospital of Val-de-Grâce in Paris, responsible for the hyperbaric unit since 2011. He is member of the Scientific Council of the French Society of Underwater and Hyperbaric Medicine since 2012, federal monitor of the second level of the French federation of study and underwater sport, Lecturer at the Universities of Paris, Marseille and Lille where he teaches underwater and hyperbaric medicine. He is responsible for the clinician supports of the daily hyperbaric and diving emergencies in the Paris region. His recent research respects extracorporeal membrane oxygenation in an hyperbaric chamber, the neuroprotective aspects of inert gases and the validation of procedures for deep diving. He is author of publications about neurological disorders of professional and recreational divers and HBOT, mostly in collaboration with the army research institute and university in Toulon. He is professional and military diver.

Jacques Regnard graduated as MD and in Sport Medicine, and later in Diving and Hyperbaric Medicine at the university René Descartes (Paris 5). He was involved in field and laboratory studies about human physiological responses to cold exposure and to 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 assessed autonomic cardiovascular control in health and disease. Professor of Physiology at the University of Franche Comté, headed the Physiology department of the university hospitals of Besançon since 1993. Coordinated a research unit until 2012. He teaches Physiology, directed Master and PhD degrees, and has set up functional testing of vascular function and its control. Author or co-author of more than 80 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. Author of two chapters in the textbook "Physiologie et médecine de la plongée" (2006), member of EUBS, the Société de Médecine Subaquatique et Hyperbare de langue française, of the Société de Physiologie, he was also member of the American Thoracic Society and of the European Respiratory Society. He was formerly SCUBA diver.

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 "Medical and Biological Engineering and Computation". Some decades, he has investigated multi-sensory information processing of the visual and auditory system in the brain, with animals by single unit electrophysiology and with humans by fundamental and clinical EEG and MEG research. His neuroscience studies have been published in some 50 papers and 80 abstracts and in 10 contributions in textbooks. 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). 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.

Description of lectures

Nico Schellart, Physics of the lung under pressure

The flow of gases and liquids in tubes and other 3-D structures is governed by a number of physical laws. Even in more or less ideal physical systems, such as a network of tubes, flow cannot be calculated easily. But with liquids (blood) and static flow of a gas, the volume flow and flow profile in a tube can rather well be approximated, even in bifurcations. With non-static flow of gases (pressures changing in time), volume flow is more difficult to calculate due to the compressibility of the gas. In the body, a complicating factor is the compliance of the vessel and airway walls. The basics of the gas flow in the airways are often studied with the Weibel model of the airways. Its applications are not only physiological, but also clinical. By applying the law of Poiseuille (laminar flow) and the so called Reynolds numbers to the model, insight can be obtained about gas flow under normobaric and hyperbaric pressures, for healthy lungs as well as lungs with impeded functionality.

Jacques Regnard, Respiratory physiology at rest and during exercise on ground

Many useful landmarks stem from reminding physiological traits of breathing mechanics, including breathing work, and gas exchange ($V\text{CO}_2$ release and VO_2 intake, interplay with blood flow) that are challenged with exercising in healthy subjects, young and older, and with some disease-impaired conditions (asthma, COPD, inflammations). Further attention will be paid to bronchial reactivity: airway smooth muscle, airway mucosal blood flow, autonomic responses to postural thoracic hemodynamic changes and mechanical hemodynamic burdens of increased breathing work. These points are considered with reference to changes brought on by immersion and diving to functional requirements. Understanding the requirements and consequences of breathing work is pivotal to gas flow in the airways, efficient respiratory gas exchange, and coping with exercise. Thermal exchanges in the airways and the inflammatory effect of hyperoxia can both trigger airway reactivity. There are both mechanical and autonomic nervous interplay between breathing and hemodynamics.

Pascal Constantin, a) Pulmonary barotrauma and b) Gas bubbles and the lung

a) Pulmonary barotrauma After a brief remind on changes in gas volumes related to pressure and in lung compliance correlated to immersion, we will consider the clinical forms of pulmonary barotrauma. We will discuss pulmonary barotrauma in scuba and snorkeling (surface, descent and ascent). Finally, we approach the management of barotrauma on the scene of the accident and in an hyperbaric center, before giving some elements on recovery after this diving accident.

b) Gas bubbles and the lung We will consider the characteristics of intravascular gaseous emboli; their kinetics, their effect on lung function and hemodynamic consequences. We then discuss the passage of bubbles through the lung to better integrate elements of this forcing made by bubbles. This will lead us to consider the clinical and laboratory diagnosis of intravascular and intra pulmonary bubbles, all of these data leading to the pathophysiology of DCI accidents.

Jacques Regnard, Respiratory function during diving; changes with immersion and submersion

With immersion per se and dive (i.e. the supplemental effects of breathing apparatus and increasing depth) different physical conditions (such as immersion static lung load) led to an impeded breathing work and its consequences. In addition the physiology has to cope with CO_2 retention and immersion pulmonary oedema. The limitations of gas flow in the airways and of respiratory gas exchanges, the increased work of respiratory muscles all contribute to fitness limitation and heavier physiological

burdens during submersion, and can lead to several diving hazards. The immersion-induced or cold-linked changes in peripheral and thoracic blood flow and in autonomic balance add their own functional challenges, further facilitating health hazards.

Understanding these effects and their physiological -functional- consequences provide rationale landmarks for medical examination and counseling in diving ability, limitations or contra-indications.

Pascal Constantin a) Long-term effects of diving on lung function and b) Pulmonary aspects of fitness to dive.

a) Long term effect of diving on lung function We define the characteristics of exposure to underwater activity, then discuss the adaptive mechanisms and pulmonary pathological consequences of this activity. We describe the various changes in pulmonary function observed during medical surveillance of professional divers before concluding on the impact of quality of life.

b) Pulmonary aspects of fitness to dive We will target objectives depending on the type of dives planned and then discuss the various diseases that may affect the integrity of anatomical or functional value of the pulmonary system. We will discuss each of these limits that allow or not to issue an aptitude for underwater diving.

Then we will deal quickly with the clinical examination before describing the various paraclinical investigations that may have an interest in the evaluation of pulmonary fitness.

Fees

From € 65 to € 235 dependent on profession and requested accreditation (see subscription form).

The fee includes reader, test, certificate, lunch and drinks.

Hotels

Suggestions for nearby hotels are:

Hotel Abcoude

Kerkplein 7, 1391 GJ Abcoude

+31 294 281 271, info@hotelabcoude.nl

Rooms from ca. 85 €/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. 85 €/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)

- 5 and 6 September with a program of Mahler, Berg and Wagner (*Ticket should be ordered long in advance*).

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The **Muziek Theater** (Stopera)

- 5 and 6 September Ballet: Claudio Monteverdi's Orfeo (*Ticket should be ordered long in advance; from 3 June*))

And many more flamboyant podium art theatres.

Museums

- The completely renovated **Rijksmuseum**, with the Vatican Museum and the Louvre one of the best general museum of the world.
- Further the **Van Gogh Museum**, the **Stedelijk Museum** with 20 Century Art, and many more attractive museums.