The Competence Program Diving 2007-2011

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Background

- In 2005 Statoil, Norsk Hydro and ExxonMobil challenged the Norwegian expertise in diving medicine and physiology to prepare a proposal for a program that would ensure the maintenance and further development of the expertise.

- Based on the response from the R&D institutions and subsequent cooperation between these institutions and the oil companies, The Competence Program Diving 2007-2011 was initiated January 1st 2007.

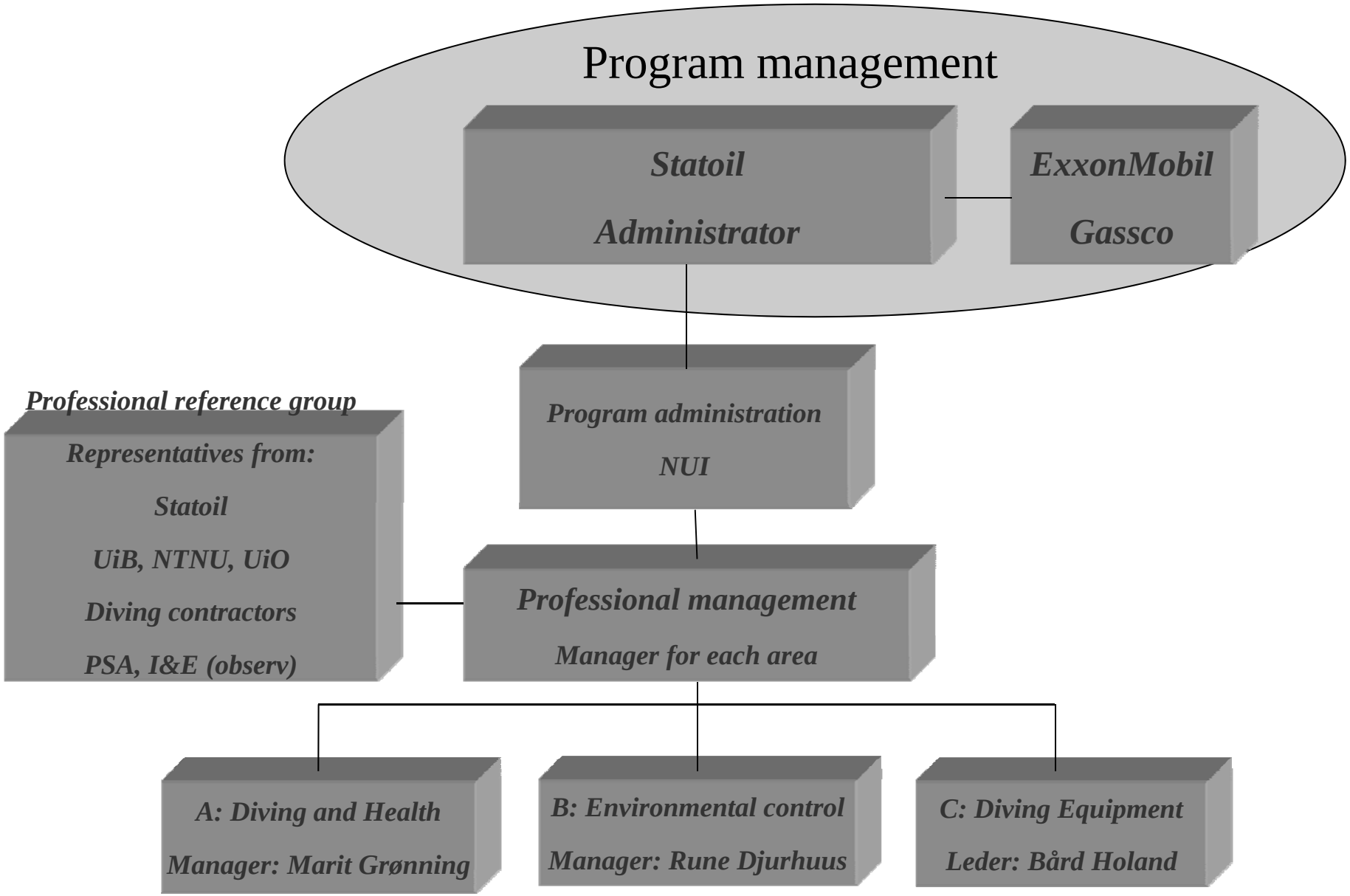
Main objectives

- To ensure sufficient expertise in questions related to diving medicine and physiology, both by maintaining and developing competence of key personnel and by recruiting new personnel through PhD projects.

- To contribute to the development of new procedures and methods in commercial diving in order to increase safety and reduce the risk of adverse health effects

Participating organisations

- Norwegian University of Science and Technology (NTNU), Trondheim
- Thelma AS, Trondheim
- SINTEF, Trondheim
- Haukeland University Hospital (HUS), Bergen
- University of Bergen (UiB), Bergen
- NUI AS, Bergen


Program management
Statoil
Administrator
ExxonMobil
Gassco
Program administration
NUI
Professional reference group
Representatives from:
Statoil
UiB, NTNU, UiO
Diving contractors
PSA, I&E (observ)
Professional management
Manager for each area
A: Diving and Health
Manager: Marit Grønning
B: Environmental control
Manager: Rune Djurhuus
C: Diving Equipment
Leder: Bård Holand

Project groups

- **Diving and Health**
- **Environmental Control**
- **Diving Equipment**

Diving and health, main goals

- Characterise and quantify potential health effects due to the current procedures for saturation diving.

- Contribute to further development of the procedures for saturation diving at depths down to 225 msw with respect to efficiency and reduced strain on the divers.

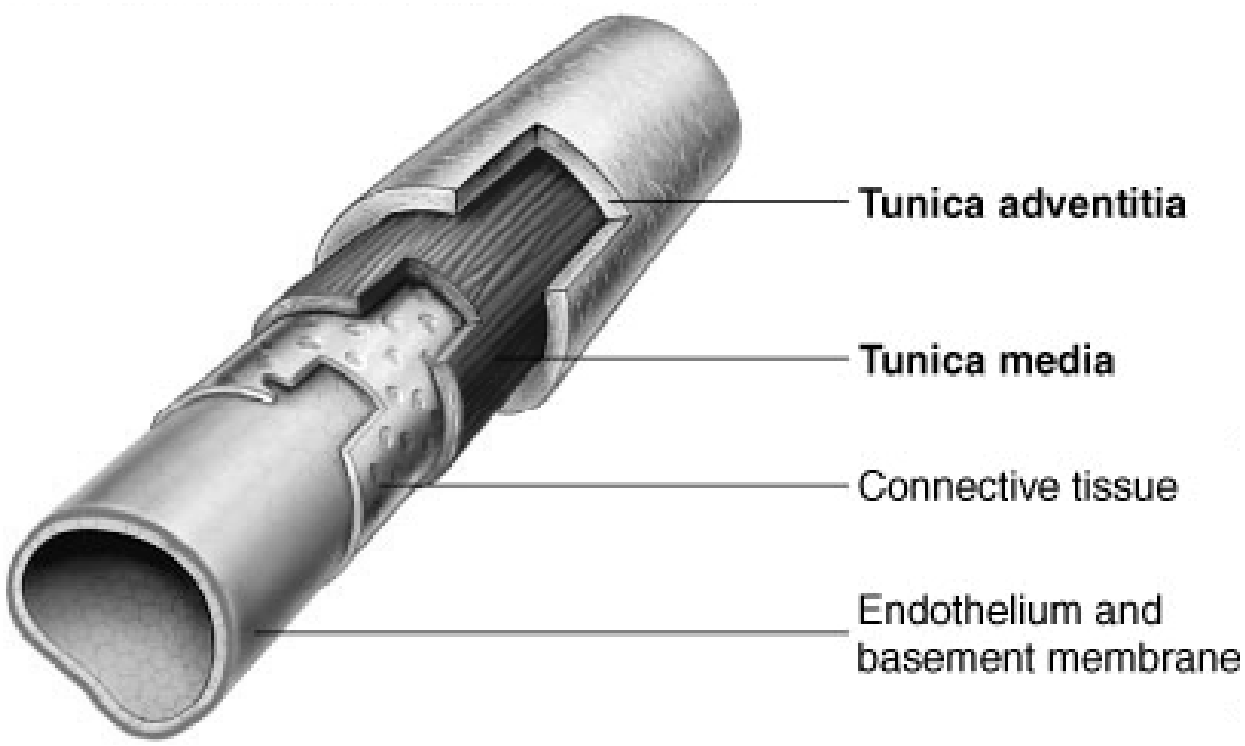
- Contribute to recruitment of scientists to maintain a sufficient level of expertise and scientific competence for future diving activities. This should mainly be achieved through PhD students.

Diving and health, projects

- **Mechanisms for endothelial dysfunction in diving (NTNU)**
- **Endothelial damage and cellular defence mechanisms (NUI)**
- **Saturation decompression and DCS – studies in rats and mice (NUI)**
- **Exposure to hyperoxia (UiB)**
- **CNS-effects of diving (HUS)**

ENDOTHELIUM

- **THIN LAYER OF CELLS LINING THE INSIDE OF THE VASCULAR SYSTEM**



DECOMPRESSION

ENDOTHELIUM

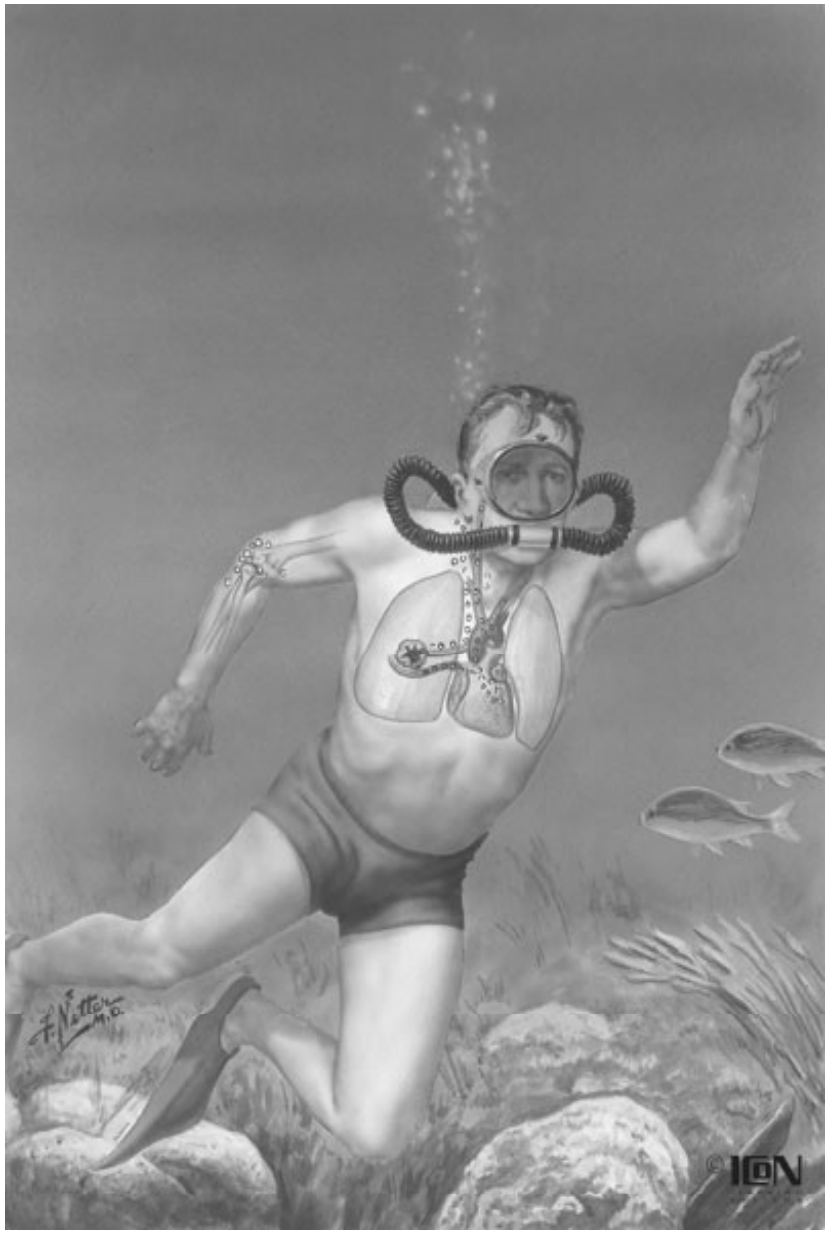
GAS BUBBLE

FORMATION

ENDOTHELIUM

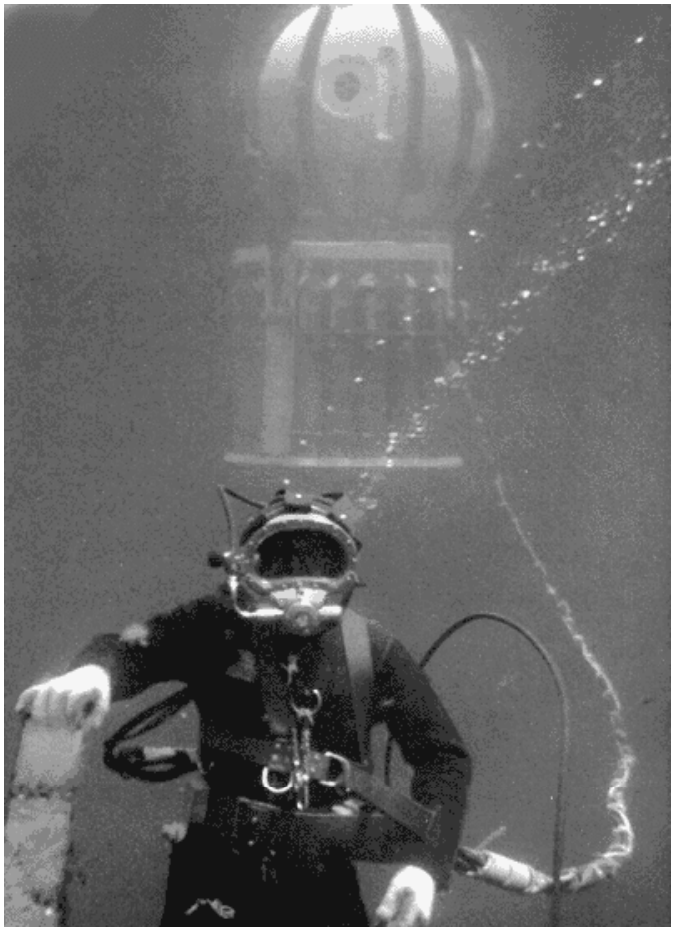
DECOMPRESSION

SICKNESS



Clinical, prospective study of saturation divers

- Objective: to monitor health of saturation divers from start of career through questionnaires and clinical examinations
- 13 divers included in 2008
- The group will be expanded when more saturation diving courses are held
- Results compared to control group



Diving and health, PhD students

- Cecilie Caspersen (UiB):

  Exhaled nitric oxide and pulmonary lung function at exposure to hypoxia and hyperoxia

- Lise Fismen (UiB/NUI):

  Decompression injury and cellular defence mechanisms

- Marianne Havnes (NTNU):

  Effects of decompression on CNS

Project groups

- **Diving and Health**
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Environmental control, main goals

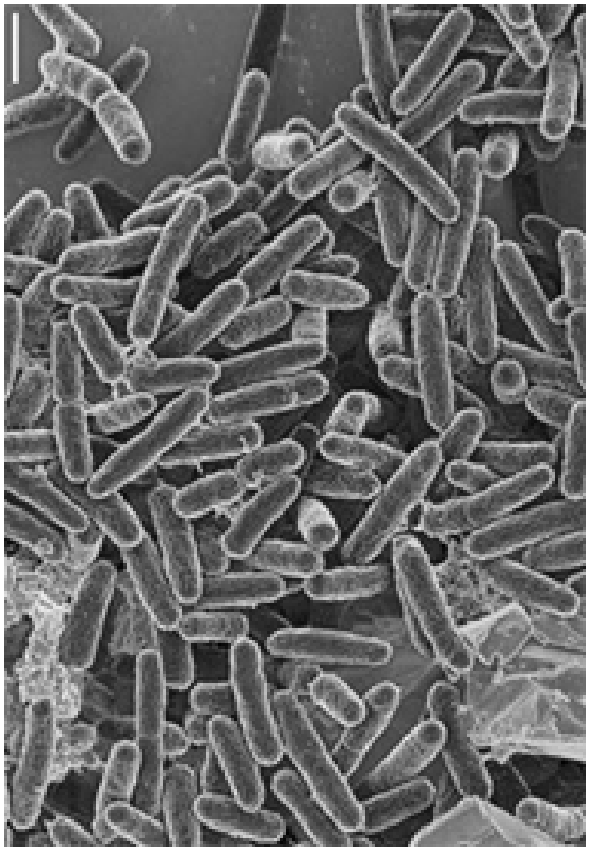
- Ensure a satisfactory working environment with particular focus on chemical and microbiological contamination.
- This can be achieved by developing procedures to prevent contamination and to monitor the environment.
- It is also important to update and implement available knowledge of health risk attributed to different types of contamination.

Environmental control, projects

- **Hyperbaric exposure limits for benzene (NUI)**
- **Passive sampling in hyperbaric atmospheres (NUI)**
- **Pseudomnas aeruginosa as an agent of infection in saturation diving systems (SINTEF)**
- **Pseudomonas aeruginosa – biofilm (UiB/SINTEF)**

Pseudomonas Aeruginosa as an agent of infection in saturation diving systems

- **P. Aeruginosa is found in the freshwater system of the diving vessels and is the most common cause of skin infections in divers**
- **The bacteriae persist in the water system through formation of biofilm**
- **PhD student Rune Skjåstad is working on strategies for eliminating biofilm**



Project groups

- **Diving and Health**
- **Environmental Control**
- **Diving Equipment**

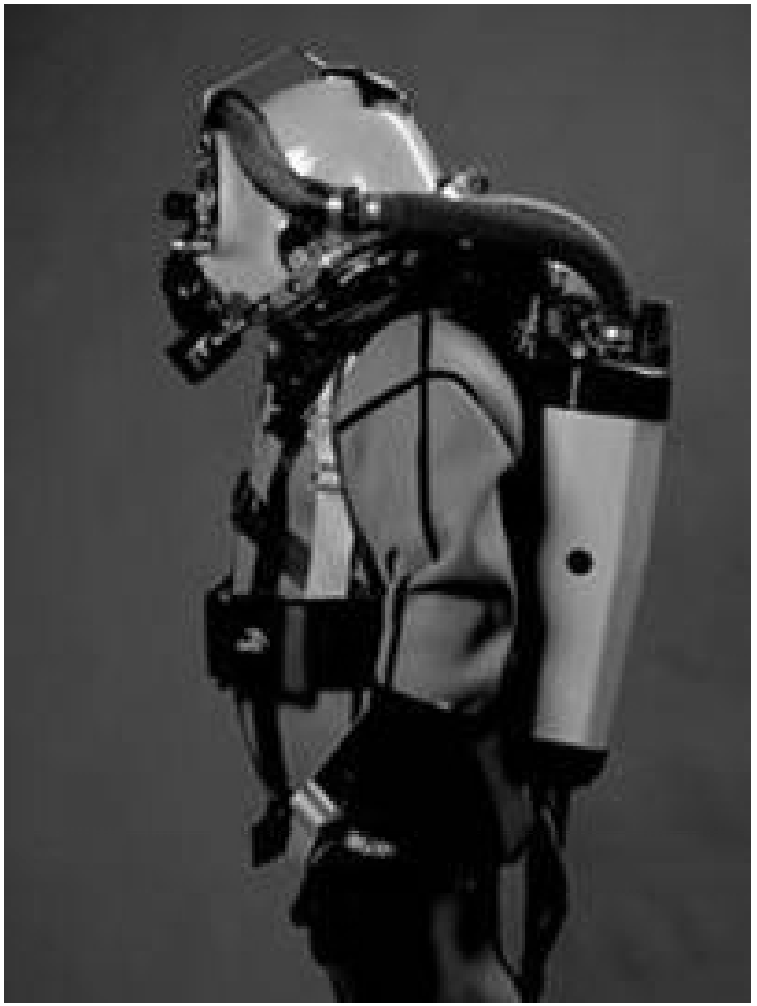
Diving equipment

- Focus on the safety and efficiency of equipment used for professional diving.
- Set and maintain standards, establish verification methods and acceptance criteria for different types of equipment and tools.
- Develop and maintenance EN and NORSOK U-100 standards for manned underwater operations, breathing apparatus, equipment for thermal protection, communication and emergency situations
- Close co-operation with diving contractors and manufacturers is imperative

Diving equipment, projects

- Standardisation (Norsok U series, EN)

- Personal diving equipment for saturation diving
  - Dry suit
  - Rebreather



Overall results

- 26 articles published in peer reviewed journals
- 4 PhD students recruited
- Increased knowledge of
  - mechanisms behind decompression related injuries
  - hyperbaric toxicology
  - hyperbaric microbiology
- New method for measuring VOC in hyperbaric chambers
- New and revised industry standards for diving

The way forward…

- Recruitment
- Cooperation between research institutions
- Cooperation with other research areas
- Promote diving related research in established national and international research programmes
- Focus on issues related to occupational hygiene within physical, chemical and biological working environment
- Involve all operators who employ diving in subsea operations