

European Journal of Underwater and Hyperbaric Medicine



CONTENTS

EUBS Newsletter, Volume 9 No 1, Spring 2002

Impressum & EUBS Executive Committee		Overleaf
Editorial		1
President's Column		1
An International Federation in the making?	Don Chandler	2
COST Action B14 (Hyperbaric Oxygen)	M.R. Hamilton-Farrell	Back Cover
Last minute information	Ole Hyldegaard	Back Cover

Proceedings of the 3rd International Symposium on Occupational Risks in Hyperbaric Tunnelling and Commercial Diving, Hamburg/Germany, September 12, 2001

Editors: B. Neubauer & R. Zander

**For: Employment, Health and
Social Welfare Authority,
Hamburg/Germany**



Contents	3
Preface	4
Papers	5 - 44

Instructions to Authors

Inside Back Cover

DISCLAIMER:

All opinions expressed are given in good faith and in all cases represent the views of the writer and are not necessarily representative of the policy of the EUBS.

PUBLISHED quarterly by the European Underwater and Baromedical Society **EUBS**
<http://www.eubs.org>

EDITOR Peter HJ Mueller eubs@hbo-mannheim.de
Speyerer Strasse 91-93, D-68163 Mannheim/Germany

ASSISTANT EDITOR Hyperbaric Medicine and Clinical Applications: Till S. Mutzbauer
ASSISTANT EDITOR Occupational Medicine, Compressed Air Work: Birger Neubauer
ASSISTANT EDITOR Physiology and Medicine of Diving, Fitness to Dive: Kay Tetzlaff

Printed in Germany by Druckerei Johannes May, D-68163 Mannheim

EUBS EXECUTIVE COMMITTEE

PRESIDENT

Dr. Ramiro Cali-Corleo
Hyperbaric Unit, St. Luke's Hospital
G'Mangia, Malta
Tel.: +356-234765
Fax: +356-372484
e-mail: irocali@daneurope.org

VICE PRESIDENT

Dr. Noemi Bitterman
S. Neaman Institute
Technion, Technion City
Haifa 32000, Israel
Tel.: +972-4-8347171
Fax: +972-4-8346631
e-mail: noemib@tx.technion.ac.il

IMMEDIATE PAST PRESIDENT

Dr. Greta Bolstad
HelPro as
N-7012 Trondheim, Norway
Tel.: +47-73596899
Fax: +47-73591005
e-mail: gretabolstad@hotmail.com

PAST PRESIDENT

Dr. Juergen Wenzel
Walhallstrasse 36
D-51107 Koeln, Germany
Tel.: +49-2203-6013370
Fax: +49-2203-68323
e-mail: juergen.wenzel@dlr.de

SECRETARY

Dr. Joerg Schmutz
Foundation for Hyperbaric Medicine
Kleinhuningerstrasse 177
CH-4057 Basel, Switzerland
Tel.: +41-61 631306
Fax: +41-61-6313006
e-mail: joerg.schmutz@hin.ch

TREASURER & MEMBERSHIP SECRETARY

Mrs. Angela Randell
Benview, Prospect Terrace
Port Elphinstone
Inverurie, AB51 3UN, United Kingdom
Tel. & Fax: +44-1467-620408
e-mail: benview@abel.co.uk

MEMBER AT LARGE 2001

Dr. Einar Thorsen
NUI, PO Box 6
N-5034 Ytre Laksevåg, Norway
Tel.: +47-53-41600
Fax: +47-53-46936
e-mail: einar.thorsen@haukeland.no

MEMBER AT LARGE 2000

Dr. Martin Hamilton-Farrell
London Hyperbaric Medicine Ltd.
Whipps Cross University Hospital
Leytonstone, London, E11 1NR, United Kingdom
Tel.: +44-20-85395522
Fax: +44-20-85391333
e-mail: mrhf@dircom.co.uk

MEMBER AT LARGE 1999

Dr. Mikael Gennser
FOA Naval Medicine
National Defence Research Establishment
S-13061 Horsfjorden, Sweden
Tel.: +46-8-50263474
Fax: +46-8-50034735
e-mail: mikaelge@sto.foa.se

JOURNAL & NEWSLETTER EDITOR

Dr. Peter HJ Mueller
HBO-Zentrum Rhein-Neckar
Diakoniekrankenhaus
Speyerer Str. 91-93
D-68163 Mannheim, Germany
Tel.: +49-621-8102 390
Fax: +49-621-8102 393
e-mail: eubs@hbo-mannheim.de

EDITOR'S COLUMN

Dear Readers!

The **European Journal of Underwater and Hyperbaric Medicine** is now in its 3rd year and with each issue the workload for the Editor has been growing. This is not a complaint about this position but rather a plea for more support from the membership of the Society! Anyone of you who is interested in the growth of this Journal should ask themselves: what can I do to help?

Areas where I would need primary support are:

- Promotion of the Journal locally in your country and within the scientific societies
- Volunteers as peer reviewers for the papers submitted
- Acquisition of advertisement to reduce the strain of the Journal's budget on the society's income.

However, the most important things for you to do are:

- Pay your membership dues, and
- Inform the Membership Secretary about any changes in your address instantly.

With these prerequisites the **EUBS** will be able to keep you well informed about what's going on in underwater and hyperbaric medicine in and around Europe. Please keep in mind, that the Society also has a frequently updated website at <http://www.eubs.org>.

Since the deadline for submission of abstracts to the XIV International Congress on Hyperbaric Medicine, October 2-5, 2002, to be held in San Francisco, California/USA, had already passed we could not place the Call for Abstracts in this issue. It was therefore put on the EUBS website, where you can also find the link to the ICHM website at <http://www.ichm.net>, which gives you all the information on the meeting.

Another important scientific meeting will be the one of our newly moving closer and closer (see next page) transatlantic sister society UHMS, June 28-30, 2002, held in San Diego, California/USA, with the usual Annual Scientific Meeting, a Pre-course on Decompression Illness, plus a Symposium on Oxygen honouring the lifetime work of Dr. Chris Lambertsen. All the information is easily found at <http://www.uhms.org>.

This issue of the Journal has been dedicated to publish the proceedings of a well attended symposium on occupational hazards of commercial diving and hyperbaric working environments held in

conjunction with the Annual Scientific Meeting of the **EUBS** in Hamburg last year. Dr. Neubauer from Hamburg, the organiser of this symposium and his co-chair, Prof. Zander from the Physiology Institute of the University of Mainz/Germany, have prepared the Proceedings for the Hamburg Employment, Health and Social Welfare Authority. With all the excellent papers I'm sure that this issue will immediately become a very important desk reference for many of you.

Enjoy reading it! Peter

PRESIDENT'S NOTE

Dear Friends!

Those of us who are active in diving medicine and particularly in diver fitness certification have often faced the dilemma of whether to recommend or not an individual who is eager to dive but suffers from a chronic medical condition that may not be compatible with diving.

Diving is now a mass activity and no longer the domain of the young and fit. However this has brought with it the problem of those middle aged individuals who although fit enough are now suffering from one or more conditions, usually well controlled with medication who believe, rightly or wrongly, that they are entitled to dive if they want to and do not need "Big Brother" to tell them what to do.

Keeping this in mind, the latest report from Divers Alert Network on diving accidents and fatalities makes interesting reading.

First of all, the absolute number of recorded accidents and fatalities has been relatively stable since 1990, even though this is the period where the main boom into "popular" recreational diving took place with millions of people who sometimes never even swam before took up diving, even if only as part of a holiday experience, never to be done again.

Smoking and Heart Disease were found to be the commonest chronic medical conditions associated with fatalities while smoking and allergies were the ones most commonly associated with DCI. The male to female ratio was of 3:1. and the fatalities were commonest in the 40-60 age group.

By far the commonest problem associated with both fatalities and injuries were buoyancy problems even though the great majority of the divers involved were qualified divers, this may be pointing out that

there is the need for divers to be more familiar with and experienced in basic diving techniques before being 'released' to do their own thing. This is also corroborated by the fact that a low number of annual dives was common in both the fatality and the injury groups.

The commonest acute conditions associated with the fatalities were Upper Respiratory Tract Infections and Alcohol abuse. Again this points out the need for better diver education on when to dive or not.

As is expected, over 60% of the DCI cases were neurological with most of the remainder being 'pain only' cases. Also interesting was the continued confirmation that first aid treatment with 100% oxygen improved the outcome both with regard to

the number of treatment cycles necessary and the final clinical outcome.

I am sure that we will be hearing similar reports from other scientific teams during our 2002 conference to be held in Belgium.

Winter is reaching its end for those of us who are in the south of Europe and diving activity will be coming out of its annual short hibernation. Those of us in the north will have to wait a little longer. Never mind, Spring will reach you too soon

My best regards to all of you

Iro Cali-Corleo
President EUBS

UHMS/EUBS/JSHM/SAUHMA/LAUHMA/CCMH/SPUMS AN INTERNATIONAL FEDERATION IN THE MAKING?

By Don Chandler

In September 2001 a conversation began between two people concerning the formation of an international federation of like societies. The conversation took place during the EUBS meeting in Hamburg, Germany and ultimately involved four people representing EUBS, UHMS, and SPUMS. The conversations centered on how we could help each other through a federation and what we could do together that would strengthen our separate societies.

Dr. Peter Mueller (EUBS), Dr. Ramiro Cali-Corleo (EUBS), and Don Chandler (UHMS) met for lunch in Hamburg and discussed the matter in a conceptual context (Dr. Mueller later spoke to a SPUMS representative). They agreed that the first move would be to meet again during the annual UHMS meeting in 2002, but this time with representatives from each of the several societies. If from that meeting a favorable reaction to the concept remained, it would be the time to begin the work to formally organize the federation.

It was discussed that one of the things we several societies could do together, through a federation, would be to combine our journals into one international journal and have it translated into several languages. During the conversation it was pointed out that DAN has already done the hard work, as regards translations, with their magazine *Alert Diver* which is published in several languages already.

Another thought, though more difficult to plan and execute than a combined journal, would be to organize a joint meeting of all our like societies. Two or three societies have met together, but a meeting of this scale has never been done and once done might not be done again for ten years, but it could be accomplished. It would be a huge meeting to be sure and the location and venue would be critical issues.

The federation council, or whatever we might call the oversight body, could be made up of two or three representatives of each society who could meet annually (probably at one of the society annual meetings) to plan joint ventures and to take what ever action was needed to bring our societies closer together, both functionally and organizationally.

Dr. Folke Lind (Sweden) is the Chairman of the UHMS International Affairs Committee and is in the loop on information about this idea. The UHMS plans to call a meeting of the International Affairs Committee during the annual meeting in La Jolla in June and invite representatives from the several societies; particularly the journal editors and presidents. One topic for discussion will be forming an international federation for the express purpose of bringing our several societies closer together.

Whether or not such a venture would have success is beyond anyone's supposition at this stage in the process, but it is worth looking into and has generated interest in the several conversations on the subject that have occurred since that first one in Hamburg in September of last year. Comments from readers are invited and should be forwarded to any appropriate person such as any of the society Presidents, the editor of this journal (or the editor of other society journals), Don Chandler at UHMS, or Folke Lind at Karolinska Hospital in Stockholm.

Don Chandler, Executive Director
Undersea and Hyperbaric Medical Society
10531 Metropolitan Avenue
Kensington, Maryland, 20895 USA
e-mail: execdir@uhms.org

Proceedings of the 3rd International Symposium „Occupational Risks in Hyperbaric Tunnelling and Commercial Diving“

Wednesday, September 12, 2001, 8.00 a.m. – 5.30 p.m.,
Bernhard-Nocht-Institut fuer Tropenmedizin, Hamburg/Germany

EDITORS: Birger Neubauer & Rolf Zander



Freie und Hansestadt Hamburg
Behörde für Arbeit, Gesundheit und Soziales
Staatlicher Gewerbearzt

Employment, Health and Social Welfare Authority, Hamburg/Germany

CONTENTS

	Page
Preface	4
<i>Birger Neubauer & Rolf Zander</i>	
Mercury intoxication during Vienna subway construction	5
<i>Josef Zeitlhofer</i>	
Mercury quantification in hyperbaric tunnelling	7
<i>Dieter Otti</i>	
Fire in compressed air tunnels	9
<i>Donald R. Lamont</i>	
Compressed air work in kerosene contaminated soil	13
<i>Jean-Claude Le Péchon</i>	
Breathing gas contamination by volatile hydrocarbons	17
<i>Valerie Flook</i>	
Commercial diving in sewage tanks	28
<i>Wolfgang Förster & J Mattes</i>	
Welding fumes in hyperbaric environments	29
<i>Peter Szlagowski</i>	
Mineral dust in hyperbaric tunnelling	33
<i>Richard Kessel</i>	
Underwater acoustics	34
<i>Marie E. Knafelc</i>	
Remote control underwater vehicles	39
<i>Willi Hornfeld & Jürgen Wernstedt</i>	

„Occupational Risks in Hyperbaric Tunnelling and Commercial Diving“

PREFACE

During hyperbaric tunnelling and commercial diving particular risks arise due to the environmental circumstances. Since the beginning of hyperbaric tunnelling in French coal mining in 1839 in-numerous efforts had been made to solve problems related to decompression sickness as well as decompression procedures. However, recent building grounds where hyperbaric tunnelling is performed at depth beyond 30 m, e.g. the Elbe Tunnel as well as the Western Scheldt Tunnelling project, have shown, that mathematical assessed decompression tables still have to be empirically proven.

In contrast to the field of decompression several other severe occupational and environmental problems are not in the focus of scientific attempts. In the previous years studies dealing with common occupational stress in connection with hyperbaric environments have been underrepresented at international scientific meetings.

Several problems which are easily handled at normal atmospheric pressure are still not solved at increased ambient pressure, e. g. assessment of air contamination in caissons (mineral dust, toxic and welding fumes), diving in contaminated environments (chemical and biological contamination), water borne sound, etc.. Especially welding fumes and toxic substances have caused severe accidents in Hamburg during compressed air tunnelling. It may be expected that new compounds (e. g. glues, coatings), which probably release solvents, organic volatiles and dust into the ambient atmosphere will be introduced in caisson work in the future. Procedures to protect caisson workers against the above-mentioned hazards are still not satisfying and are not well established.

The problems related to compressed air tunnelling and professional diving are not exclusively limited to building-grounds in any special global region as hyperbaric tunnelling in Europe, Asia and South America demonstrate. In general the environmental conditions during caisson work or hyperbaric tunnelling are similar all over the world. Geographical

boarders do not limit the above mentioned occupational hazards.

To find technical or legislative solutions for these occupational problems the "Health and Safety Department", Employment, Health and Social Welfare Authority, Hamburg/Germany, has planned a scientific symposium as a satellite to the Annual Scientific Meeting of the European Underwater and Baromedical Society in September 2001 in Hamburg. The Symposium did especially address occupational problems related to compressed air tunnelling and professional diving. The aims of this symposium were:

- to give an overview of the actual knowledge of occupational hazards related to hyperbaric work and commercial diving
- to uncover technical deficits in assessing hazards in hyperbaric environments
- to incite technical developments in the fields of protective equipment, routines regarding use and handling of chemical substances and measurement devices
- to incite scientific attempts
- to initiate an international discussion between the Labour Inspectorates concerning the necessity of legislation (threshold limits, technical requirements etc.).

The vision is that this Symposium will initiate and stimulate further research and education efforts into improving safety for personnel and supervisors in the hyperbaric working environment. Special thanks to the Symposium Faculty, the Employment, Health and Social Welfare Authority of Hamburg, the Workers Compensation, and the EUBS who all have supported this important meeting.

The Editors

Address for correspondence and requests for further copies should be addressed to:

Dr. med. Birger Neubauer

**Zentrum für Hafenzärztliche Dienste
und Schiffsmedizin**

Hamburg Port Health Center (HPHC)

Seewartenstrasse 10

D-20459 Hamburg, Germany

Telefon: +49 (0)40 428 894 460

Telefax: +49 (0)40 428 894 511

E-mail: Birger.Neubauer@bug.hamburg.de

INSTRUCTIONS TO AUTHORS

The **EJUHM** welcomes contributions (including letters to the Editor) on all aspects of diving and of hyperbaric medicine. Manuscripts must be offered exclusively to the **EJUHM**, unless clearly authenticated copyright exemption accompanies the manuscript. All manuscripts will be subject to peer review, with feedback to the authors. Accepted contributions will be subject to editing.

Manuscripts are accepted in English, and also in major European languages (French, Spanish, Italian and German) when accompanied by an English abstract and a letter of recommendation of a member of the **International Editorial Board**.

Contributions should be sent to

Dr. Peter HJ Mueller, Editor EJUHM, C/o HBO-Zentrum Rhein-Neckar am Diakonienkrankenhaus Mannheim, Speyerer Strasse 91-93, D-68163 Mannheim/Germany. Fax: +49-621-8102 393. Phone: +49-621-8102 390. E-mail: eubs@hbo-mannheim.de

Requirements for Manuscripts

The **EJUHM** is composed on a PC using Word processing. Documents are acceptable on disc or by e-mail. Illustrations and tables should **NOT** be embedded in the Word document, only their position indicated. All tables are to be separate documents. Illustrations should be separate documents in Word or TIFF, clearly marked with the format used. **References should be in the correct format, shown in the next column.** Submissions must be accompanied by two printed copies of all text, tables and illustrations.

The printed copies should be double-spaced, using both upper and lower case, on one side of the paper only, on A4 paper. Headings should conform to the format in the **Journal**. All pages should be numbered. No part of the text should be underlined. These requirements also apply to the abstract, references, and legends to figures. Measurements are to be in SI units (mm Hg are acceptable for blood pressure measurements) and normal ranges should be included. All tables should be double spaced on separate sheets of paper. **No vertical or horizontal rules are to be used.**

Photographs should be glossy black-and-white and slides should be converted to photographs before being sent. Colour reproduction is not available. Legends should be less than 40 words, and indicate magnification.

Abbreviations do not mean the same to all readers. To avoid confusion they should only be used after they have appeared in brackets after the complete expression, e.g. decompression illness (DCI) can thereafter be referred to as DCI.

The preferred length for original articles is 2,500 words or less. Inclusion of more than 5 authors requires justification. Original articles should include a title page, given the title of the paper and the first names and surnames of the authors, an abstract of no more than 200 words and except in unusual situations be subdivided into Introduction, Methods, Results, Discussion and References. After the references the authors should provide their initials and surnames, their qualifications, and the positions held when doing the work being reported. One author should be identified as Correspondent for the Editor and for readers of the Journal. The full current postal address of each author, with the Telephone, facsimile numbers and e-mail address of the corresponding author, should be supplied with the contribution. No more than 20 references per major article will be

accepted. Accuracy of the references is the responsibility of authors. Acknowledgments should be brief.

Abstracts are also required for all case reports and reviews. Letters to the Editor should not exceed 400 words (including references which should be limited to 5 per letter).

References

Authors are responsible for verifying references against the original documents. References must be numbered consecutively in the order in which they first appear in the text, and identified in the text by arabic numerals in parentheses. References cited only in tables or legends should be numbered in accordance with a sequence corresponding to the first mention of the table or figure in the text. The reference list must be double spaced. List names and initials of all authors when six or less, when seven or more, list only the first three authors and add et al. Citations in the reference list are to be in the form used by the U. S. National Library of Medicine and *Index Medicus*.

1. Thorsen E, Risberg J, Segadal K, Hope A. Effects of venous gas microemboli on pulmonary gas transfer function. *Undersea Hyperbaric Med* 1995; 22:347-353.
2. Hempleman HV. History of decompression procedures. In: Bennett PB, Elliott EH, eds. *The physiology and medicine of diving*. London: WB Saunders, 1993:324-375.
3. Kindwall EP, Goldmann RW. *Hyperbaric medicine procedures*. Milwaukee, WI: St. Luke's Medical Center, 1970.

Manuscripts that have been accepted should be cited in the reference list as regular references, with "in press" in place of journal pages. Citations such as "unpublished observations", "personal communication", "manuscript in preparation", or "to be published" are not to appear in the reference list, although reference to such a communication, if it exists in written form, may be cited in the text in parentheses. References to government reports should not be cited unless such reports are easily available to all readers.

Consent

The **EUBS** endorses the principles of the Declaration of Helsinki on the treatment of human subjects and approved guiding principles in the care and use of animals. Any report of experimental investigation on human subjects must contain evidence of informed consent by the subjects and of approval by the relevant institutional ethical committee.

REPRINTING OF ARTICLES

Permission to reprint original articles will be granted by the Editor, subject to the author's agreement, provided that an acknowledgment, giving the original date of publication in the **EJUHM**, is printed with the article. Where the author has claimed copyright at the end of the article requests for permission to reprint should be addressed to the author, whose address appears at the end of the article.

Papers that have been reprinted from another journal, which have been printed with an acknowledgment, require permission from the Editor of the original publication before they can be reprinted. This being the condition for publication in the **EJUHM**.

COOPERATION ON SCIENCE AND TECHNOLOGY ACTION B14 (HYPERBARIC OXYGEN)

By Martin Hamilton-Farrell

The European Commission has sponsored an international working party on Hyperbaric Oxygen, as part of the Cooperation on Science and Technology (COST) initiative. The group (called 'Action B14') has representatives of most European countries, including some which are not members of the EU.

Action B14 has drawn up a list of research fields where we think that international multi-centre trials may be suitable and possible. Some of these are already in the process of activation in some countries. These include:-

1. HBO in the acute treatment of sudden idiopathic sensori-neural hearing loss (co-ordinator A Barthelemy, Marseille, France)
2. Re-irradiation of recurrent squamous cell carcinoma of the head and neck after HBO sensitisation (co-ordinator KA Hartmann, Dusseldorf, Germany)

Role of Hyperbaric Oxygen in enhancing radio-sensitivity on glioblastoma multiforme (co-ordinator F Fehlauer, Hamburg, Germany)

3. Osseo-integration in irradiated patients; adjunctive Hyperbaric Oxygen to prevent implant failures (co-ordinator C Granstrom, Stockholm, Sweden)
4. Hyperbaric Oxygen in the treatment of foot lesions in diabetic patients (co-ordinator D Mathieu, Lille, France)

There are further protocols in the finalisation phase. If you would like more details about participating in any of these trials, please contact the co-ordinator concerned. More details will be available in the June edition of the European Journal.

Dr. Martin R. Hamilton-Farrell
London Hyperbaric Medicine Ltd.
Whipps Cross University Hospital
Leytonstone
London E11 1NR
United Kingdom
Tel: + 44-20-8539-1222
Fax: +44-20-8539-1333
E-mail: mrhf@dircon.co.uk

Dear Friends !

Extremely Important.

The dates for the Copenhagen EUBS meeting are now clarified and will be held:

Copenhagen
The Panum Institute,
University of Copenhagen
27th - 30th of August 2003.

We are preparing a presentation at the 2002 meeting as usual.

All the best,

Ole Hyldegaard
Secretary General.

Gebühr bezahlt beim Postamt Neckarau, D-68199 Mannheim
 If undeliverable please return to: EJUHM-Editor Dr. Peter HJ Müller, c/o
 HBO Rhein-Neckar, Speyerer Strasse 91-93, D-68163 Mannheim/Germany