A. A. Bühlmann

Decompression Sickness

Springer-Verlag Berlin Heidelberg New York Tokyo

A. A. Bühlmann Decompression – Decompression Sickness

This monograph presents the results of applied research carried out at the Medical Clinic of the University of Zürich from 1961 to 1981. Studies of the wellbeing and functional ability of man in abnormal atmospheric conditions led to the development of a new method of low-risk decompression, which can be calculated for every imaginable exposure with air or oxyhelium and helium-nitrogen mixtures upon the basis of pressure and time. This method was tested under conditions of increased as well as decreased atmospheric pressure. Well-known physicochemical factors such as molecular weight and the solubility coefficients of gases are used to document the empirically determined tolerances of various organs. Complicated biophysical models and mathematical derivations have been avoided to make the information accessible not only to specialists in hyperbaric medicine but also to the non-specialist in related fields. "Decompression – Decompression Sickness" will prove to be of vital interest to all who deal with the physiological response of humans to an atmosphere of abnormal pressure and composition.

ISBN 3-540-13308-9
ISBN 0-387-13308-9

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With 20 Figures and 24 Tables

Springer-Verlag
Berlin Heidelberg New York Tokyo 1984

Preface

The Laboratory of Hyperbaric Physiology of the Medical Clinic of the University of Zurich came into existence in 1960 thanks to private initiative and a readiness to undertake risks; the successful start was made possible with help from the French Navy and the United States Navy. A prerequisite for the development of the laboratory was also the benevolence of the authorities of the University of Zurich toward a research project from which scarcely any practical use could be expected for the land-locked country of Switzerland. The development of the laboratory and the systematic research were supported generously from 1964 by Shell Internationale Petroleum Maatschappij of The Hague.

The basic theme of the research was always the well-being and functional ability of the human being in an atmosphere of abnormal pressure and or abnormal composition.

Many connections became obvious with respiratory physiology, circulatory physiology, and physiology at great heigts, and close contact with other special laboratories of the Medical Clinic proved very valuable. With a relatively small number of steady collaborators it was possible to master an extensive experimental program. Special thanks are due to Mr. Benno Schenk, who as technical head was responsible for the exact performance of all the hyperbaric experiments.

Without the enthusiasm and willingness for enterprise of the many voluntary collaborators the program of experiments could not have been realized. Mr. Rino Gamba, who participated from 1964 until 1968 in all of the important experiments at depths of 30, 220, and 300 m, is mentioned here as representative of all the voluntary collaborators.

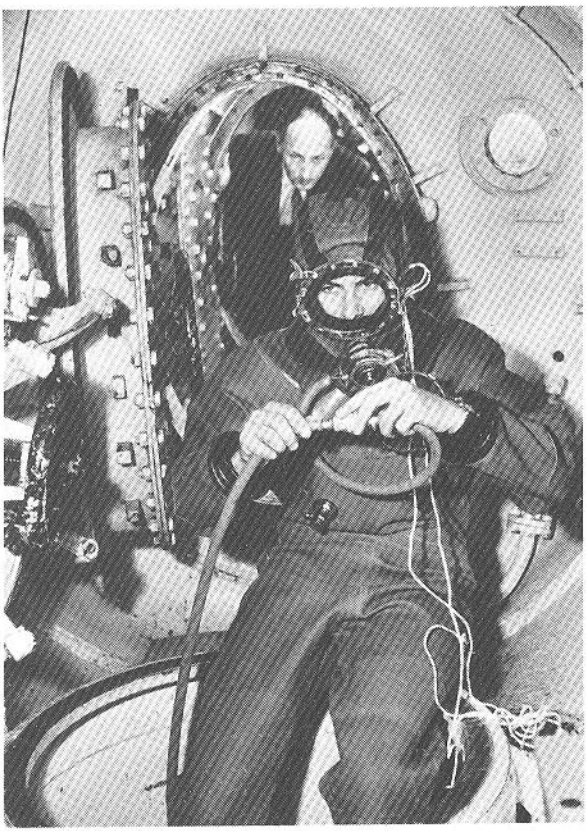
Decompression was the principal problem encountered during preparation for the first deep diving trials. The persistent reexamination and expansion of the original concept finally yielded a method of decompression that is theoretically sound and has been tested widely for nitrogen and helium. In research there are no terminal solutions, but the Swiss practice of decompression has reached a state that justifies a summary description. So much detail has been amassed in the special literature that it is scarcely possible to read it all, but what has been lacking is the

description of a method by which a low-risk decompression can be calculated for every imaginable exposure upon the basis of pressure, time, and gas breathed.

In Zurich, diving medicine and research on decompression are applied research related to internal medicine. This monograph is intended not only for the specialists in hyperbaric medicine and hyperbaric technic, but also for physiologists, internists, neurologists, specialists in intensive care, occupational physicians, and practitioners of medicine connected with insurance.

By avoiding the description of complicated biophysical models and mathematical derivations, for which he is not competent anyway, the author hopes to have improved the readability of the monograph and therefore also the understanding of that which he believes useful.

Zurich, May 1984 A. A. Bühlmann



Hannes Keller climbing into the water tank of the pressure chamber of the French Navy in Toulon on 25 April 1961. The first simulated dive corresponding to a depth of 300 m

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