

# Hyperbaric Oxygenation Therapy

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Editors

# Hyperbaric Oxygenation Therapy

Molecular Mechanisms and Clinical  
Applications

 Springer

*Editors*

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# Preface

Hyperbaric oxygen (HBO) therapy is a well-known traditional treatment method for patients with tissue hypoxia. It improves tissue oxygen levels and brings increased capacity of wound healing/tissue remodeling. It also revitalizes the cell activity to increase survival and modulates anti-inflammatory/immunological function of immune cells, which leads to the recovery of hosts from severe infection. The application of HBO therapy has a wide range of choices including carbon monoxide poisoning, infectious diseases refractory to regular antibiotics treatment such as necrotizing soft tissue infections, gas gangrene and osteomyelitis, traumatic ischemia, crush injury, diabetic foot, and so on. It can also be applied for curing diving-related disorders such as gas embolism and decompression illness; in such cases, HBO is used as a specialized method of treatment named recompression therapy. However, HBO therapy is not a dream-like therapy but a complementary one to support other treatment methods or express effects in cooperation with other treatment options. Then why does HBO bring successful outcome in patients with such complicated situations? To understand the effectiveness of HBO, it is essential to clarify basic mechanisms how HBO improves the cellular function of hypoxic tissues and which players are involved in the process of the recovery of cell function. To this end, this book focuses on basic molecular mechanisms of HBO as well as hyperbaric stress itself. Also it introduces how HBO can be applied to the treatment of intractable diseases.

In the first half of this book (Part I), basic molecular mechanisms of HBO and their potential applications for clinical activities are outlined. Chapter 1 describes physiological and molecular basis of HBO therapy. Chapter 2 introduces hosts response against not only HBO stress but also hyperbaric stress itself. Chapter 3 shows a unique concept of HBO preconditioning which might be used for artificial induction of neuroprotection. In the latter half (Part II), the rational how the HBO therapy should be introduced into suitable clinical cases is described with successful clinical reports. Chapter 4 introduces current situation of HBO treatment for strokes and ileus in Japan with the concept of guidelines. Chapter 5 shows basic overview of the treatment of refractory osteomyelitis by HBO with the provision of typical clinical cases. Chapter 6 introduces the fundamental concept how severe soft

tissue injuries should be managed and how HBO therapy can be applied to those cases. Chapter 7 is a unique review that raised a question about the evaluation of HBO therapy as a first-line treatment for carbon monoxide poisoning. Chapter 8 describes basic as well as applied recompression therapies for diving-related disorders such as decompression sickness and arterial gas embolism.

HBO therapy has been proved to show strong effectiveness on several specific diseases based on the clinical evidences, but understanding of precise indication of this regimen how it should be applied to which cases is not clearly achieved. This book provides clear evidences on this issue and answers fundamental questions from the viewpoints of basic physiology and molecular biology.

This book is written primarily for HBO clinicians, but it is also useful for physiologists and basic research scientists. It may also attract clinicians who have an interest in this field and think of starting HBO therapy. We hope systematic knowledge provided by this book will enhance the readers' understanding about HBO therapy and related medical topics so that the HBO therapy becomes more popular and establishes a solid position in modern medicine.

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