

# oxygen transport in blood

**oxygen transport in blood** is a vital physiological process that ensures every cell in the body receives the oxygen necessary for survival and energy production. This intricate system involves complex interactions between red blood cells, plasma, hemoglobin, and the cardiovascular system. Understanding how oxygen is carried from the lungs to tissues helps explain many aspects of health, disease, and physical performance. In this article, we'll explore the mechanisms of oxygen transport in blood, the role of hemoglobin, factors that affect oxygen delivery, and how the body adapts to various conditions. We'll also discuss clinical relevance, disorders related to oxygen transport, and important physiological concepts. Whether you are a student, healthcare professional, or simply curious about how your body works, this comprehensive guide offers a wealth of information on the essential topic of oxygen transport in blood.

- Overview of Oxygen Transport in Blood
- Mechanisms of Oxygen Delivery
- The Role of Hemoglobin in Oxygen Transport
- Factors Affecting Oxygen Transport
- Adaptations to Oxygen Demand and Changes
- Clinical Relevance and Disorders
- Key Physiological Concepts

## Overview of Oxygen Transport in Blood

Oxygen transport in blood is a fundamental process that supports cellular metabolism and energy production. Oxygen, inhaled through the lungs, must be efficiently delivered to tissues via the circulatory system. Blood serves as the primary medium for oxygen transport, utilizing specialized cellular and molecular mechanisms. Most oxygen in the blood is bound to hemoglobin within red blood cells, while a small fraction is dissolved directly in plasma. The body's ability to distribute oxygen effectively is crucial for maintaining homeostasis and responding to varying oxygen demands.

Without efficient oxygen transport, organs and tissues cannot function optimally. The process is tightly regulated and influenced by multiple physiological variables, including cardiac output, pulmonary function, and

blood composition. Understanding the basics of oxygen transport in blood lays the foundation for appreciating how the body responds to stress, disease, and environmental changes.

## **Mechanisms of Oxygen Delivery**

Oxygen delivery refers to the movement of oxygen from the lungs into the bloodstream and then to the tissues. This journey involves several sequential steps, beginning with oxygen diffusion across the alveolar-capillary membrane within the lungs. Once in the blood, oxygen is predominantly carried by red blood cells, which travel through the circulatory system to reach every part of the body.

## **Steps Involved in Oxygen Transport**

- **Ventilation:** The process of moving air into and out of the lungs.
- **Gas Exchange:** Oxygen diffuses from alveoli into pulmonary capillaries.
- **Binding to Hemoglobin:** Oxygen attaches to hemoglobin molecules in red blood cells.
- **Circulation:** Blood is pumped by the heart to distribute oxygen throughout the body.
- **Release to Tissues:** Oxygen is released from hemoglobin at tissue sites where it is needed.

Each step in oxygen transport is essential for maintaining adequate tissue oxygenation. The efficiency of these mechanisms depends on factors such as lung function, cardiac output, and the integrity of blood vessels.

## **Oxygen Dissolved in Plasma**

A small percentage of oxygen is transported dissolved in plasma, governed by Henry's Law. Although this fraction is minor compared to hemoglobin-bound oxygen, it plays a crucial role in maintaining blood oxygen levels, especially under conditions of increased demand or when hemoglobin function is compromised.

# The Role of Hemoglobin in Oxygen Transport

Hemoglobin is the key protein responsible for oxygen transport in blood. It is found within red blood cells and has a high affinity for oxygen molecules. Each hemoglobin molecule can bind up to four oxygen molecules, allowing for efficient transport from the lungs to peripheral tissues.

## Structure and Function of Hemoglobin

Hemoglobin consists of four protein subunits, each containing an iron ion that binds oxygen. The binding of oxygen to hemoglobin is a reversible process, allowing oxygen to be picked up in the lungs and released in tissues where it is needed. Hemoglobin's oxygen-carrying capacity is influenced by factors such as pH, temperature, and the presence of carbon dioxide.

## Oxyhemoglobin and Deoxyhemoglobin

- Oxyhemoglobin: Hemoglobin bound to oxygen, found in arterial blood.
- Deoxyhemoglobin: Hemoglobin without oxygen, found in venous blood.

The dynamic conversion between oxyhemoglobin and deoxyhemoglobin is essential for effective oxygen delivery and removal of carbon dioxide, a waste product of metabolism.

## Factors Affecting Oxygen Transport

Several physiological and environmental factors influence oxygen transport in blood. These variables can enhance or impair the body's ability to deliver oxygen to tissues, impacting overall health and performance.

## Partial Pressure of Oxygen

The partial pressure of oxygen ( $P_{aO_2}$ ) in the blood determines how much oxygen is available for binding to hemoglobin and diffusion into tissues. Higher  $P_{aO_2}$  levels facilitate greater oxygen transport, while lower levels can lead to hypoxemia and tissue hypoxia.

## **Blood pH and Temperature**

- Decrease in pH (acidosis) reduces hemoglobin's affinity for oxygen, promoting release to tissues.
- Increase in temperature similarly decreases affinity, aiding oxygen unloading during physical activity.

These adjustments, known as the Bohr effect, optimize oxygen release in active or metabolically demanding tissues.

## **Carbon Dioxide Levels**

Elevated carbon dioxide levels in the blood result from increased metabolic activity. CO<sub>2</sub> binds to hemoglobin and alters its structure, facilitating the release of oxygen to tissues in need. This phenomenon helps match oxygen delivery to metabolic requirements.

## **Adaptations to Oxygen Demand and Changes**

The body can adapt to varying oxygen demands and environmental changes through several mechanisms. These adaptations are critical for survival under conditions such as high altitude, intense physical exercise, or chronic illness.

### **High Altitude Adaptation**

At high altitudes, reduced atmospheric oxygen pressure challenges the body's ability to transport oxygen. The body compensates by increasing red blood cell production, enhancing hemoglobin concentration, and improving lung ventilation. These changes help maintain adequate oxygen delivery despite lower oxygen availability.

### **Exercise and Oxygen Utilization**

- During exercise, cardiac output increases to deliver more oxygen to active muscles.
- Muscles extract oxygen more efficiently, aided by changes in blood flow and hemoglobin affinity.

- Increased respiratory rate boosts oxygen uptake in the lungs.

These physiological responses ensure that oxygen transport in blood meets the heightened demands of physical activity.

## **Clinical Relevance and Disorders**

Disorders affecting oxygen transport in blood can have significant health consequences. Conditions such as anemia, carbon monoxide poisoning, and pulmonary diseases directly impact the body's ability to carry and deliver oxygen.

### **Anemia and Hemoglobinopathies**

Anemia, characterized by reduced red blood cell count or hemoglobin concentration, leads to diminished oxygen transport capacity. Hemoglobinopathies, such as sickle cell disease or thalassemia, alter hemoglobin structure and function, impairing oxygen delivery and contributing to clinical symptoms.

### **Carbon Monoxide Poisoning**

Carbon monoxide binds to hemoglobin with a much higher affinity than oxygen, preventing oxygen from binding and severely limiting transport. This can result in tissue hypoxia and requires prompt medical intervention.

## **Respiratory and Cardiovascular Diseases**

- Chronic obstructive pulmonary disease (COPD) impairs gas exchange in the lungs.
- Heart failure reduces circulatory efficiency, limiting oxygen delivery.
- Pulmonary fibrosis and other lung diseases decrease oxygen diffusion capacity.

Managing these conditions often involves therapies aimed at improving oxygen transport in blood and enhancing tissue oxygenation.

# Key Physiological Concepts

A few key physiological concepts help to further understand the intricacies of oxygen transport in blood. These include oxygen saturation, oxygen content, and the oxygen-hemoglobin dissociation curve.

## Oxygen Saturation

Oxygen saturation ( $SpO_2$ ) reflects the percentage of hemoglobin molecules bound to oxygen. It is commonly measured using pulse oximetry and provides a quick assessment of oxygen transport efficiency in clinical settings.

## Oxygen-Hemoglobin Dissociation Curve

This curve illustrates the relationship between oxygen partial pressure and hemoglobin saturation. It demonstrates how hemoglobin's affinity for oxygen changes in response to various physiological conditions, ensuring optimal oxygen delivery to tissues.

## Oxygen Content in Blood

- Total oxygen content depends on both hemoglobin-bound and dissolved oxygen.
- Hemoglobin concentration and oxygen saturation are key determinants.

Understanding these principles is essential for interpreting laboratory values and managing conditions impacting oxygen transport in blood.

## Trending and Relevant Questions & Answers About Oxygen Transport in Blood

**Q: What is the primary function of oxygen transport in blood?**

**A:** The primary function of oxygen transport in blood is to deliver oxygen from the lungs to tissues and organs throughout the body, enabling cellular respiration and energy production.

## **Q: How does hemoglobin facilitate oxygen transport?**

A: Hemoglobin binds oxygen molecules in the lungs, carries them through the bloodstream, and releases them at tissue sites where oxygen is needed, greatly increasing the blood's oxygen-carrying capacity.

## **Q: What factors can decrease oxygen transport in blood?**

A: Factors such as anemia, respiratory diseases, carbon monoxide poisoning, and low hemoglobin levels can decrease the efficiency of oxygen transport in blood.

## **Q: Why is oxygen dissolved in plasma important?**

A: Although only a small amount of oxygen is dissolved in plasma, it is crucial for immediate oxygen availability and plays a significant role when hemoglobin function is impaired or during increased oxygen demand.

## **Q: How does exercise affect oxygen transport in blood?**

A: During exercise, increased cardiac output and respiratory rate enhance oxygen delivery to muscles, while physiological changes in blood flow and hemoglobin affinity optimize oxygen utilization.

## **Q: What happens to oxygen transport at high altitudes?**

A: At high altitudes, reduced oxygen pressure leads to adaptations such as increased red blood cell production and enhanced lung ventilation to maintain adequate tissue oxygenation.

## **Q: What is the oxygen-hemoglobin dissociation curve?**

A: The oxygen-hemoglobin dissociation curve describes the relationship between oxygen partial pressure and hemoglobin saturation, illustrating how hemoglobin releases oxygen more readily at lower oxygen concentrations.

## **Q: How is oxygen saturation measured?**

A: Oxygen saturation is commonly measured with a pulse oximeter, which assesses the percentage of hemoglobin molecules carrying oxygen in arterial blood.

## Q: What role does carbon dioxide play in oxygen transport?

A: Elevated carbon dioxide levels promote oxygen release from hemoglobin to tissues, helping match oxygen delivery to metabolic activity through the Bohr effect.

## Q: What clinical conditions can impair oxygen transport in blood?

A: Conditions such as anemia, sickle cell disease, COPD, heart failure, and carbon monoxide poisoning can impair oxygen transport, leading to tissue hypoxia and associated symptoms.

## Oxygen Transport In Blood

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**oxygen transport in blood:** *Oxygen Transport to Tissue XVII* Can Ince, J. Kesecioglu, L. Telci, K. Akpir, 2012-12-06 and The 22 meeting of the International Society on Oxygen Transport to Tissue (LS. O. T. T. ) of which this volume is the scientific proceedings, was held in Istanbul, Turkey on August 22-26, 1994. It was a historical occasion in that it was almost 200 years to the day that one of the founding fathers of oxygen research, Antoine Lavoisier, on May 8, 1794 found his early demise at the hands of the guillotine. This spirit of history set the tone of the conference and in the opening lecture the contribution that this part of the world has given to the understanding of oxygen transport to tissue was highlighted. In particular, the contribution of Galen of Pergamon (129-200) was discussed who for the first time demonstrated that blood flowed through the arteries and whose view on the physiology of the circulation dominated the ancient world for well over a millennium. A forgotten chapter in the history of the circulation of the blood is the contribution made by Ibn al Nafis of Damascus (1210-1280) who for the first time described the importance of the pulmonary circulation by stating that all venous blood entering the right ventricle of the heart passes to the left ventricle, not through pores in the septum of the heart as had been postulated by Galen, but through

the circulation of the lungs.

**oxygen transport in blood:** *Oxygen transport in blood and tissue* D. W. Lübbers, 1968

**oxygen transport in blood:** *Oxygen Transport to Tissue XV* Peter Vaupel, Rolf Zander, Duane F. Bruley, 2012-12-06 Seventeen years after the 2nd International Symposium on Oxygen Transport to Tissue, which was held in Mainz in March 1975, the local Organizing Committee and the Board of ISOTT were pleased to host the ISOTT Conference in Mainz on the Rhine again. The venue of the 20th meeting was the prestigious, fully restored Schloss Waldthausen (Waldthausen Castle) which provided a special setting for ISOTT 1992. The beautiful front view of the castle became part of the ISOTT 1992 logo. The 20th ISOTT Meeting was held in Mainz from August 26th through August 30th, 1992. The Conference attracted 200 active participants from 16 countries. The theme of this meeting emphasized oxygen transport to tumors but as in earlier meetings, essentially all aspects of oxygen transport within the body were covered as demonstrated by the manuscripts comprising this volume of the series *Oxygen Transport to Tissue*. All manuscripts were reviewed. Extensive revisions were made in about 25% and modest revision in about another 30%. Because we had to compromise between the aim of rapid publication on the one hand and the need for thorough review on the other, minor errors in format and some typographical errors were not corrected. Except for some revisions, all of the original camera-ready manuscripts in this volume were prepared by the authors themselves and we greatly appreciate their cooperation.

**oxygen transport in blood: The Physiological Ecology of Vertebrates** Brian Keith McNab, 2002 Though physiological ecology has been a discipline since the 1950s, McNab redresses a perceived absence of a theoretical framework with a comparative, inductive approach to studying vertebrate evolution and ecology. He discusses the patterns and limits of adaptation to the environment, acclimation to temperature variation and material exchange with the environment, and the energetics of locomotion and growth. The final section treats the significance of energetics for population ecology and distribution. Includes a taxonomic as well as subject index. Suitable for advanced students and researchers in the biological and ecological sciences. The Gainesville, FL-based author is referred to by the foreword writer as a keen naturalist, but his credentials are not stated. Annotation copyrighted by Book News Inc., Portland, OR.

**oxygen transport in blood: Oxygen Transport to Tissue—VI** Duane F. Bruley, 2013-03-14 The theme of the 1983 annual ISOTT meeting emphasizes a dual scientific approach, utilizing interdisciplinary theoretical and experimental methodology, to unravel the secrets of oxygen transport to tissue. ISOTT is leading the way in the development and application of forefront techniques to allow a more basic understanding of this important physiological phenomena. The Society can be proud of its contributions in helping to advance the gross analysis techniques of the past to the synergistic study of tissue micro areas by sophisticated mathematical and experimental means. There is a tremendous need to continue the pursuit of basic knowledge at the regional tissue level and to move rapidly to the examination of fundamental biochemical reactions at the cellular level. To accomplish this, it will be necessary to take advantage of the most powerful computing machinery presently available and to apply state-of-the-art experimental methodology, such as polarographic, autoradiographic and nuclear magnetic resonance techniques in our studies. Our Society must continue to work hard to push back barriers to enhance our understanding of mechanisms that lead to pathology. Hopefully, our efforts will be significant in helping science to overcome the many dreadful diseases that mankind faces in today's world. Duane Bruley Haim Bicher Daniel Reneau v ACKNOWLEDGEMENT We are forever indebted to Connie Staggs and Ellie Topakoglu for their energy and sacrifice in preparing for and managing the 1983 ISOTT meeting.

**oxygen transport in blood: Clinical Biochemistry** Allan Gaw, 2008-01-01 2014 BMA Medical Book Awards Highly Commended in Basic and Clinical Sciences category! This fully revised edition of *Clinical Biochemistry* offers essential reading for today's medical student and all those who require a concise, practical introduction to this subject. Topics are clearly presented in a series of double-page 'learning units', each covering a particular aspect of clinical biochemistry. Four sections provide a core grounding in the subject: Introducing clinical biochemistry gives a basic insight in to

the workings of a modern hospital laboratory and the interpretation of test results; Core biochemistry covers the bulk of routine analyses undertaken and their relevance in a clinical setting; Endocrinology covers the thyroid, adrenal, pituitary and gonadal function testing; Specialised investigation provides an overview of less requested yet important analyses. Every 'learning unit' has been thoroughly checked and updated to reflect the latest field developments and clinical best practice and all new material is included on: Myocardial infarction Gastrointestinal disorders Osteoporosis Proteinuria The diagnosis of diabetes Trace metals Screening tests Paediatrics Covers clinical biochemistry from the point of view of the clinician using the diagnostic service Presents topics in easily accessible two-page spreads Includes mini case histories, key point boxes, flowcharts, and summary points Well illustrated with four-color drawings and clinical photographs New appendix added of annotated web resources for students to take further many of the topics covered in the book. To reflect the difficulties people have sometimes in analyzing hyper- and hypo-kalaemia, the existing spread is split into two - one spread on hyperkalaemia and another on hypokalaemia. The spread on hypertension will be revised and updated to reflect the fact that biochemistry is used as much or more in guiding treatment as it is in screening for secondary hypertension. Spreads on Myocardial Infarction, Cancer and Tumour Markers will all substantially revised and updated.

**oxygen transport in blood: Oxygen Transport to Tissue IX** Haim I. Bicher, Duane F. Bruley, 2013-11-21 These papers stem from the ISOTT Meeting held at Churchill College, Cambridge, from July 27th to 30th, 1986. Although the sun did not shine so brightly as during the Cambridge meeting in 1977, the communications and discussions were as lively and informative and some heat, as well as light, was generated in the presentation of differing views. The meeting was conducted in a generally informal way which allowed maximum time for discussion but the relatively unstructured nature of the debates made them unsuitable for publication. The amount of editing necessary meant that the printed version of the exchanges would bear little resemblance to the original, hence their omission. All the papers presented here have been scrutinized and retyped in a standard format. However, the diverse interests of ISOTT's members, reflected in the wide spectrum of the material submitted, made total editorial uniformity an unrealistic goal. Complete consistency in the use of symbols, abbreviations and units seemed less important than speed of publication.

**oxygen transport in blood: Fluid, Electrolyte, and Acid-base Regulation** Jack L. Keyes, Keyes, 1990 This is an intermediate to advanced text on the physiology and pathophysiology of fluid, electrolyte, and acid-base regulation. It is intended for students and health care professionals who are engaged in caring for patients with disturbances of fluid, electrolyte, and acid-base balance in any of the myriad of clinical settings.

**oxygen transport in blood: Oxygen Transport to Tissue X** M. Mochizuki, 2012-12-06 The International Society on Oxygen Transport to Tissue (ISOTT) was founded in 1973 to facilitate the exchange of scientific information among those interested in any aspect of the transport and/or utilization of oxygen in tissues. Its members span virtually all disciplines, extending from various branches of clinical medicine such as anesthesiology, ophthalmology and surgery through the basic medical sciences of physiology and biochemistry to the physical sciences and engineering. The fifteenth annual meeting of ISOTT was held in 1987 for three days, from July 22 to 24, at Hokkaido University in Sapporo, Japan. Previously, all ISOTT meetings had been held in Europe or the USA alternatively. This time, however, the meeting was held for the first time in an Asian country. When we first started preparing for this meeting some of our members were afraid that the number of those attending would not exceed '30. Fortunately the results were quite different. We had more than 60 participants from abroad and an even greater number from Japan. In addition to three special lectures and two symposia there were a total of 88 posters presented over the three days of the meeting. These covered all aspects of physiological oxygen transport including convection, diffusion, chemical reaction, and control of oxygen demand in blood and various tissues as well as the methods, models and instrumentation for their study. The 92 papers which comprise this volume encompass all of these areas.

**oxygen transport in blood: Essentials of Oxygenation** Thomas Ahrens, Kimberley A. Rutherford Basham, 1993

**oxygen transport in blood:** *Oxygen Transport to Tissue XXXI* Eiji Takahashi, Duane F. Bruley, 2010-03-10 The International Society on Oxygen Transport to Tissue (ISOTT, [www.isott.info](http://www.isott.info)) is an interdisciplinary society comprising about 250 members worldwide. Its purpose is to further the understanding of all aspects of the processes involved in the transport of oxygen from the air to its ultimate consumption in the cells of the various organs of the body. The annual meeting brings together scientists, engineers, clinicians and mathematicians in a unique international forum for the exchange of information and knowledge, the updating of participants on latest developments and techniques, and the discussion of controversial issues within the field of oxygen transport to tissue. Founded in 1973, the society has been the leading platform for the presentation of many of the technological and conceptual developments within the field both at the meetings themselves and in the proceedings of the society. These have been published first by Plenum Publishing (1973), then by Kluwer Academic/Plenum Publishers and presently by Springer Publishing, all in the Advances In Experimental Medicine and Biology Series. The 36th Annual ISOTT conference was held in Sapporo, Japan during August 3-7, 2008. It was the second occasion that the ISOTT meeting was held in Japan; the first one was held in the same place in 1987 organized by Professor Masaji Mochizuki.

**oxygen transport in blood:** *Oxygen Transport to Tissue — II* Jurgon Grote, 2013-04-17

**oxygen transport in blood:** Clinical Anesthesia Paul G. Barash, 2009 The premier single-volume reference in the field of anesthesia, Clinical Anesthesia is now in its Sixth Edition, with thoroughly updated coverage, a new full-color design, and a revamped art program featuring 880 full-color illustrations. More than 80 leading experts cover every aspect of contemporary perioperative medicine in one comprehensive, clinically focused, clear, concise, and accessible volume. Two new editors, Michael Cahalan, MD and M. Christine Stock, MD, join Drs. Barash, Cullen, and Stoelting for this edition. A companion Website will offer the fully searchable text, plus access to enhanced podcasts that can be viewed on your desktop or downloaded to most Apple and BlackBerry devices.

**oxygen transport in blood:** Organfunktion und Stoffwechsel in der perioperativen Phase Konrad Reinhart, Klaus Eyrich, 2013-03-07

**oxygen transport in blood:** **Oxygen Transport in Blood and Tissue** d. w. Lubbers (+ and others), 1968

**oxygen transport in blood:** Oxygen Transport to Tissue XVI Michael C. Hogan, Odile Mathieu-Costello, David C. Poole, Peter D. Wagner, 2012-12-06 Since its inception in 1973, The International Society on Oxygen Transport to Tissue (ISOTT) has provided a unique forum to facilitate and encourage scientific interaction and debate. Welcoming scientists and clinicians from a broad spectrum of disciplines, each with their own particular skills and expertise, ISOTT unites them under the common theme of oxygen transport. The successful blend of scientific presentations and informal discussion which characterizes ISOTT is epitomized best by the many fundamental discoveries and technical advancements which it has spawned. The breadth and strengths of The Society's scientific base promotes the rapid progression of ideas from theoretical concepts to rigorous scientific testing and often, ultimately to the clinical arena. Each publication of the ISOTT proceedings has been recognized by Science Citation Index listing and the papers frequently establish scientific precedents and become considered as standard works in their respective fields. The 21st ISOTT Meeting was held in San Diego from August 14th through August 18th, 1993. The San Diego Meeting attracted about 150 registrants and 40 accompanying persons. Ten state-of-the-art lectures were presented by international experts in ~ transport and there were in addition two symposia -one dealing with assessment of tissue hypoxia and the other with functional heterogeneity in different organ systems. There were 100 free communications, consisting of posters accompanied by an abbreviated oral summary. All manuscripts were reviewed by the Editors for form and content, but as is customary for the ISOTT proceedings, rigorous scientific peer review was not undertaken.

**oxygen transport in blood: Concise Textbook of Human Physiology** Indu Khurana, 2018-04-23 ? Thoroughly revised and updated second edition retains its well accepted unique style of organization of the text in three parts and twelve sections. ? Presentation of the text with various levels of headings, subheadings, boldface and italics has been maintained to help the students easily understand, retain and reproduce. ? Text has been updated incorporating the recent advances in each section including more aspects of molecular physiology. ? Applied physiology has been updated with recent concepts on pathophysiology, and recent advances in the basic investigations and therapeutic principles. ? To further upgrade the book, many new figures, tables and flowcharts have been added. Online Content: - FAQs with reference for the answers in the book

**oxygen transport in blood: Oxygen Transport to Tissue XIV** Wilhelm Erdmann, Duane F. Bruley, 2012-12-06 The International Society on Oxygen Transport to Tissue (IS OTT) was founded in 1973 as a scientific society providing a forum for bioengineers, basic scientists (physiologists, biochemists and physicists) and clinicians (including anesthesiologists, intensive care specialists, pediatricians, neonatologists, internists, surgeons and other specialists) to facilitate the exchange of scientific information among those interested in any aspect of the transport and/or utilization of oxygen in tissues. From the ranks of its members, many fundamental discoveries and inventions have been made involving the many aspects of oxygen transport and utilization by biological tissues. The ISOTT proceedings, now in its 14th edition, has become a standard work in the field as witnessed by the inclusion in the Science Citation Index of all volumes published so far. The 19th ISOTT Meeting was held in Curaçao from August 24th through August 30th, 1991. The Curaçao Meeting attracted 145 registrants and 45 accompanying persons. The format originated by Dr. Ian Llngmuir in 1985, consisting of posters accompanied by an abbreviated oral summary, was again successfully handled with slight modifications. The meeting was introduced by 6 review lectures covering the whole field of oxygen transport from bioengineering, the problem of diffusion in lung, blood and tissue through pathology of oxygen uptake in the lung, oxygen supply dependency of the critically ill to artificial oxygen carriers. A special session dealt with oxygen supply under ambient pressure changes.

**oxygen transport in blood: Regulation of Tissue Oxygenation, Second Edition** Roland N. Pittman, 2016-08-18 This presentation describes various aspects of the regulation of tissue oxygenation, including the roles of the circulatory system, respiratory system, and blood, the carrier of oxygen within these components of the cardiorespiratory system. The respiratory system takes oxygen from the atmosphere and transports it by diffusion from the air in the alveoli to the blood flowing through the pulmonary capillaries. The cardiovascular system then moves the oxygenated blood from the heart to the microcirculation of the various organs by convection, where oxygen is released from hemoglobin in the red blood cells and moves to the parenchymal cells of each tissue by diffusion. Oxygen that has diffused into cells is then utilized in the mitochondria to produce adenosine triphosphate (ATP), the energy currency of all cells. The mitochondria are able to produce ATP until the oxygen tension or  $PO_2$  on the cell surface falls to a critical level of about 4-5 mm Hg. Thus, in order to meet the energetic needs of cells, it is important to maintain a continuous supply of oxygen to the mitochondria at or above the critical  $PO_2$ . In order to accomplish this desired outcome, the cardiorespiratory system, including the blood, must be capable of regulation to ensure survival of all tissues under a wide range of circumstances. The purpose of this presentation is to provide basic information about the operation and regulation of the cardiovascular and respiratory systems, as well as the properties of the blood and parenchymal cells, so that a fundamental understanding of the regulation of tissue oxygenation is achieved.

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