PHYSIOLOGICAL BASIS OF ACUTE CARE

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SAUNDERS
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INTRODUCTION

Oxygen is transported to the cells and tissues from the lungs by haemoglobin in the red blood cells (RBC). For this to occur, the oxygen molecule must combine with the haem in haemoglobin. It is essential for health care providers to understand the important role played by haemoglobin in the carriage of oxygen (see Figure 3.1 in Chapter 3).

OXYGEN CARRIAGE BY HAEMOGLOBIN

\[ O_2 \text{ content} = \text{oxygen bound to haemoglobin} + \text{oxygen dissolved in plasma} \]

\[ = [\text{Hb} \times 1.34 \times \text{SO}_2] + [0.003 \times \text{oxygen tension}] \]

\[ = [15 \times 1.34 \times 0.975] + [0.003 \times 100] \]

\[ = 19.5 + 0.3 \]

\[ = 19.8 \text{ mL O}_2/100 \text{ mL blood} \]

where Hb is the haemoglobin concentration in g/100 mL blood, 1.34 is the oxygen-binding capacity of haemoglobin, \( \text{SO}_2 \) is the haemoglobin saturation with oxygen and 0.003 is the number of mL of dissolved oxygen present per 100 mL of blood per mmHg O$_2$ tension.

In a patient with a normal cardiac output of 5 L/min, about \( 50 \times 19.8 \text{ mL} \) (or approximately 1000 mL) of oxygen is collectively delivered to all the organs per minute.

WHAT IS HAEMOGLOBIN?

It is a globular molecule in the RBCs that contains iron (haem). Each RBC contains many units of haemoglobin. Each unit of haemoglobin contains two \( \alpha \) and two \( \beta \) subunits, and each subunit is a polypeptide with an embedded haem moiety (Figure 7.1, overleaf). Each haem contains one iron atom that can bind one oxygen molecule. Therefore, each unit of haemoglobin can potentially carry four oxygen molecules at a time.
Physiological Basis of Acute Care is a short, easy-to-read-book that features:

* Chapters that link the management of life such as Basis of Life and Physiology of Death for frontline providers.

* Chapters covering important organ systems from airway to kidney, including energy, heat and acid-base balance.

* Special chapters on maternal-foetal, paediatrics, elderly and obesity.

* Clinical implication and application sections within each chapter for students to relate to clinical practice.

* Medical illustrations by Frank Netter, the foremost master of medical illustration.

* 58 fully coloured illustrations, diagrams and charts to enhance learning and understanding.

Also features:

* Content reviewed by international and Malaysian academicians.

* Foreword by Dr Angela Enright, President, World Federation of Societies of Anaesthesiologists (WFSA), United Kingdom.

“This book achieves its objectives of presenting simple, basic physiology in an uncomplicated manner.”

— Michael FM James, Professor and Head, Department of Anaesthesia, University of Cape Town, South Africa

“This book is simple and enjoyable to read, and presents the subject in a systematic fashion.”

— Thiam Aun Lim, Professor, Anaesthesiology Unit, Universiti Putra Malaysia, Malaysia