

YEAR BOOK®

YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE® 2001

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YEAR BOOK

years of excellence

2001
YEAR BOOK OF
NEONATAL AND
PERINATAL MEDICINE®





Dedicated to Publishing Excellence

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Statement of Purpose

The YEAR BOOK Series

The YEAR BOOK series was devised in 1901 by health professionals who observed that the literature of medicine and related disciplines had become so voluminous that no one individual could read and place in perspective every potential advance in a major specialty. That has never been more true than it is today.

More than merely a series of books, YEAR BOOK volumes are the tangible results of a unique service designed to accomplish the following:

- to *survey* a wide range of journals
- to *select* from those journals papers representing significant advances and statements of important clinical principles
- to provide *abstracts* of those articles that are readable, convenient summaries of their key points
- to provide *informed commentary* about their relevance

These publications grow out of a unique process that draws on the talents of outstanding authorities in clinical and fundamental disciplines, trained literature specialists, and professional writers—all supported by the resources of Mosby, the world's preeminent publisher for the health professions.

The Literature Base

Mosby and its editors survey approximately 500 journals published worldwide, covering the full range of the health professions. On an annual basis, the publisher examines usage patterns and polls its expert authorities to add new journals to the literature base and to delete journals that are no longer useful as potential YEAR BOOK sources.

The Literature Survey

More than 250,000 peer-reviewed articles per year are scanned systematically—including title, text, illustrations, tables, and references—by the publisher's team of literature specialists. Each scan is compared, article by article, to the search strategies that the publisher has developed in consultation with the nearly 200 outside experts who form the pool of YEAR BOOK editors. A given article with broad scientific or clinical implications may be reviewed by any number of YEAR BOOK editors, from one to a dozen or more, regardless of the discipline for which the paper was originally published. In turn, each editor who receives the article reviews it to determine whether it should be included in his or her volume. This decision is based on the article's inherent quality, its relevance to readers of that YEAR BOOK, and the editor's goal to represent a comprehensive picture of a given field in each volume of the YEAR BOOK. In addition, the editor indicates when to include figures and tables from the article to help the YEAR BOOK reader better understand the information.

Of the quarter million articles scanned each year, only 5% are selected for publication within the YEAR BOOK series, thereby assuring readers of the high value of every selection.

The Abstract

The publisher's abstracting staff is headed by a seasoned medical editing professional and includes individuals with extensive experience in writing for the health professions. When an article is selected for inclusion in a YEAR BOOK, it is assigned to a member of the abstracting staff. The abstractor, guided in many cases by notations supplied by the physician editor, writes a structured, condensed summary designed to rapidly communicate to the reader the essential information contained in the article.

The Commentary

The YEAR BOOK editorial boards, sometimes assisted by guest contributors, write comments that place each article in perspective. This provides the reader with insights from authorities in each discipline that point out the value of the article and that often reflect the authority's thought processes in assessing the article.

Additional Editorial Features

The editorial boards of each YEAR BOOK organize the abstracts and comments to provide a logical and satisfying sequence of information. To enhance the organization, editors also provide introductions to sections or individual chapters, comments linking a number of abstracts, citations to additional literature, and other features.

The published YEAR BOOK contains enhanced bibliographic citations for each selected article, including extended listings of multiple authors and identification of author affiliations. Each YEAR BOOK contains a Table of Contents specific to that year's volume. From year to year, the Table of Contents for a given YEAR BOOK may vary, depending on developments within the field.

Every YEAR BOOK contains a list of the journals from which articles have been selected. This list represents a subset of approximately 500 journals surveyed by the publisher and occasionally reflects a particularly pertinent article from a journal that is not surveyed routinely.

Finally, each volume contains a comprehensive subject index and an index to authors of each selected article.

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2001

The Year Book of NEONATAL AND PERINATAL MEDICINE®

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Journals Represented

Mosby and its editors survey approximately 500 journals for its abstract and commentary publications. From these journals, the editors select the articles to be abstracted. Journals represented in this YEAR BOOK are listed below.

Acta Paediatrica
American Journal of Epidemiology
American Journal of Neuroradiology
American Journal of Obstetrics and Gynecology
American Journal of Perinatology
American Journal of Physiology
American Journal of Respiratory and Critical Care Medicine
Annals of Neurology
Annals of Otolaryngology, Rhinology and Laryngology
Annals of Surgery
Archives of Disease in Childhood
Archives of Disease in Childhood. Fetal and Neonatal Edition
Archives of Ophthalmology
Archives of Pediatrics and Adolescent Medicine
British Journal of Obstetrics and Gynaecology
British Journal of Radiology
British Medical Journal
Controlled Clinical Trials
Critical Care Medicine
Diabetes
Hepatology
Intensive Care Medicine
Journal of Cardiothoracic and Vascular Anesthesia
Journal of Clinical Investigation
Journal of Maternal-Fetal Medicine
Journal of Pediatric Gastroenterology and Nutrition
Journal of Pediatric Surgery
Journal of Pediatrics
Journal of Perinatology
Journal of the American Medical Association
Lancet
New England Journal of Medicine
Obstetrics and Gynecology
Ophthalmology
Pediatric Infectious Disease Journal
Pediatric Neurology
Pediatric Research
Pediatrics
Pharmacotherapy
Prenatal Diagnosis
Radiology
Stroke
Ultrasound in Obstetrics and Gynecology

STANDARD ABBREVIATIONS

The following terms are abbreviated in this edition: acquired immunodeficiency syndrome (AIDS), cardiopulmonary resuscitation (CPR), central nervous system (CNS), cerebrospinal fluid (CSF), computed tomography (CT), deoxyribonucleic acid (DNA), electrocardiography (ECG), health maintenance organization (HMO), human immunodeficiency virus (HIV), intensive care unit (ICU), intramuscular (IM), intravenous (IV), magnetic resonance (MR) imaging (MRI), ribonucleic acid (RNA), and ultrasound (US).

NOTE

The YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE is a literature survey service providing abstracts of articles published in the professional literature. Every effort is made to assure the accuracy of the information presented in these pages. Neither the editors nor the publisher of the YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE can be responsible for errors in the original materials. The editors' comments are their own opinions. Mention of specific products within this publication does not constitute endorsement.

To facilitate the use of the YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE as a reference tool, all illustrations and tables included in this publication are now identified as they appear in the original article. This change is meant to help the reader recognize that any illustration or table appearing in the YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE may be only one of many in the original article. For this reason, figure and table numbers will often appear to be out of sequence within the YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE.

Publisher's Preface

The publication of the 2001 YEAR BOOK series marks the 100th anniversary of the original Practical Medicine Series of Year Books. To commemorate this milestone, each 2001 Year Book includes an anniversary seal on the cover. The content and format of the Year Books remain unchanged from the beginning of the last century—each volume consists of abstracts of the best scholarly articles of the year, accompanied by expert critical commentaries.

The first Year Book appeared in 1900 when Gustavus P. Head, MD, produced the first *Year Book of the Nose, Throat and Ear*, a volume consisting of highlights from the previous year's best literature, enhanced by expert observations. Dr Head assembled a small group of distinguished physicians to serve as editors, and the first series of Year Books was published in 1901. The first volumes of the Year Book series—*General Medicine, General Surgery, The Eye, Gynecology, Obstetrics, Materia Medica and Therapeutics, Pediatrics, Physiology, and Skin and Venereal Diseases*—appeared at monthly intervals, with 10 volumes published in 1 year. The entire series was met with critical enthusiasm.

In 1904, Dr Head's brother, Cloyd, assumed responsibility for the management of the Year Books. In 1905, the volumes began to appear at regular intervals during the calendar year instead of on a monthly basis. By World War I, the Year Books had been established as an authority on medical and surgical progress.

The postwar period brought about a significant change in the practice of medicine: specialization. To accommodate the rise of specialization in medicine, the Year Books were now sold as individual volumes rather than only as a complete set. This change brought about a tremendous response and sales of the books increased. In 1922, the Year Books became even more specialized, as the books now had different editors for the different medical specialties covered in each volume. Later, in 1933, the title of the series changed from the Practical Medicine Series of Year Books to the Practical Medicine Year Books to reflect these new designs.

The Year Books have grown significantly from the first 10-volume series in 1901 to a diversified series of 32 volumes in 2001. That the Year Book series is the only series of their kind to have survived is a testament to the vision and commitment of its founders. Some minor changes in format and design have occurred throughout the years, but the mission of the Year Book series—to provide a record of exceptional medical achievements distinguished by the reflections of many of the great names in medicine today—has remained constant.

Introduction

The 2001 YEAR BOOK OF NEONATAL AND PERINATAL MEDICINE follows a similar format to its predecessors. We have once again been given the opportunity to leaf through a variety of interesting articles on a broad range of topics in the field of maternal, fetal, and neonatal disorders. Although no knockout blows to the major causes of perinatal mortality and morbidity have been delivered in the past year, there have been vast strides in many areas. These include imaging of the fetus, evaluation of pain and its alleviation in the newborn infant, understanding of the risk factors for severe hyperbilirubinemia, and the ability to predict when and in whom the ductus arteriosus is likely to be unresponsive to pharmacologic manipulation. The many randomized controlled trials annotated here will expand the evidence database and facilitate the practice of evidence-based medicine. These randomized controlled trials are complemented by case-controlled reports and some large uncontrolled reports such as the experience with biliary atresia that once again proves that outcomes are best in centers with the most experience. We have included a wealth of material on the longer term neurodevelopmental outcome of low birth weight infants.

The year 2000 was highlighted by the completion of the human genome project. The magnitude of the task and the rapidity with which it was completed is a tribute to the ingenuity of man and the effectiveness of private enterprise. Although there are only a few articles here directly related to genetics, we anticipate that more and more will be included each year. Uniparental disomy was a term totally unfamiliar to most of us a decade ago, and now there are an ever expanding number of syndromes that can be attributed to a double set of genes from one parent, including neonatal diabetes, the subject of a number of articles and commentaries in this issue.

It is our pleasurable task to thank our many contributors and commentators. They continue to give willingly and freely of their time and expertise, enhancing the quality of the YEAR BOOK. We are particularly grateful to Steven Hoath and Vivek Narendran for their excellent review article on neonatal skin, an organ that clearly needs greater attention and care in the newborn. We are grateful to Jonathan Hellman, who shared his wisdom and insight as we once again tackled all the commentaries on bioethical problems. We have chosen to include a summary of the recent international conference on neonatal jaundice that was attended by all the editors who thought it would be of interest to the readers.

We are pleased to acknowledge the outstanding editorial assistance that we receive from the YEAR BOOK-MOSBY team, ably headed by Colleen Cook.

This report, by its very length, defends itself against the risk of being read.—Winston Churchill

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Newborn Skin

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Introduction

From the moment of birth, the newborn must adapt to a changing environment. Enclosed in amniotic fluid, it is not necessary to defend against cold, prevent desiccation, provide a barrier against microorganisms, or protect against environmental hazards such as ultraviolet light or high ambient oxygen. Birth, however, changes everything. The infant is suddenly faced with an environment that poses a plethora of physical and biological challenges. Adding to these difficulties, human newborns have relatively delayed motor capabilities.¹ This vulnerability increases and prolongs dependence on the mother. Hypothetically, such bonding is enhanced by the presence of a flexible, adaptive, and aesthetically pleasing surface for caregiver interaction.

The skin is simultaneously a cellular and molecular interface and a psychological and perceptual interface.² This duality has important implications for neonatology. The skin can be approached, for example, as an important-rich and accessible surface amenable to noninvasive monitoring and objective intervention. The skin is also a critical surface for subjective assessment and nursing and parental interaction. An appreciation of these mutually overlapping roles is required to understand the functional versatility of the skin as the boundary of the body.

Many of the barrier functions of the skin reside in the outermost layer of the epidermis, called the stratum corneum.³ This thin (20 μ g-thick), flexible, and highly organized membrane is the primary structure that limits water loss at the skin surface and provides the primary barrier limiting ingress of microorganisms. Very preterm infants (less than 26 weeks gestation) have poor or absent stratum corneum development and are at high risk for problems associated with epidermal barrier incompetence.³ These problems are compounded in the first few days to weeks of life when the barrier is most immature.^{4,5} Not unexpectedly, one of the major problems encountered by preterm infants is sepsis.

In developing countries, premature infants have a prevalence of sepsis estimated at 30% to 60%, with a mortality rate of 40% to 70%.^{6,7} Approximately one fourth of all infants weighing less than 1500 g in the United States have at least one episode of sepsis after the third day of life.⁸ This incidence is increased in the most susceptible population of extremely low birth weight (ELBW) infants. These facts indicate a need for better scientific understanding of the formation of the epidermal barrier in utero and ex utero, particularly in the vulnerable population of ELBW infants.

Embryology

Embryologically, the outermost layer of the skin, the epidermis, is an ectodermal derivative like the brain.⁹ The close interconnectedness of the skin and the brain continues after birth, as evidenced by the ongoing participation of the skin in tactile, visual, and olfactory (pheromonal) perception. It is important clinically to appreciate the ramifications of this developmental interconnection. Touch, for example, is the first sensory modality to develop in all vertebrates, including humans.¹⁰ Typically, touch elicits a motor output and this output may be exaggerated in the prematurely born infant.¹¹ In newborn animals, tactile stimulation may also elicit a metabolic response.¹² Touch is always reciprocal. If you touch something, it touches you back.

This reciprocity is reflected in the circular organization of the nervous system and the structure of sensorimotor loops.¹³ Nerve endings never touch the environment directly. Operational closure of the nervous system, therefore, cannot be a primary function of sensory receptors. Closure at the boundary of the organism is, rather, a function of the material properties of the cutaneous interface itself.¹⁴ The epidermis, not the nerve endings, contacts the environment (Fig 1). ELBW infants, with their extraordinarily immature epidermal barrier, provide an opportunity to test this concept. It is important to recognize, in this context, that the normal sequence of epidermal development in utero is markedly altered by pre-

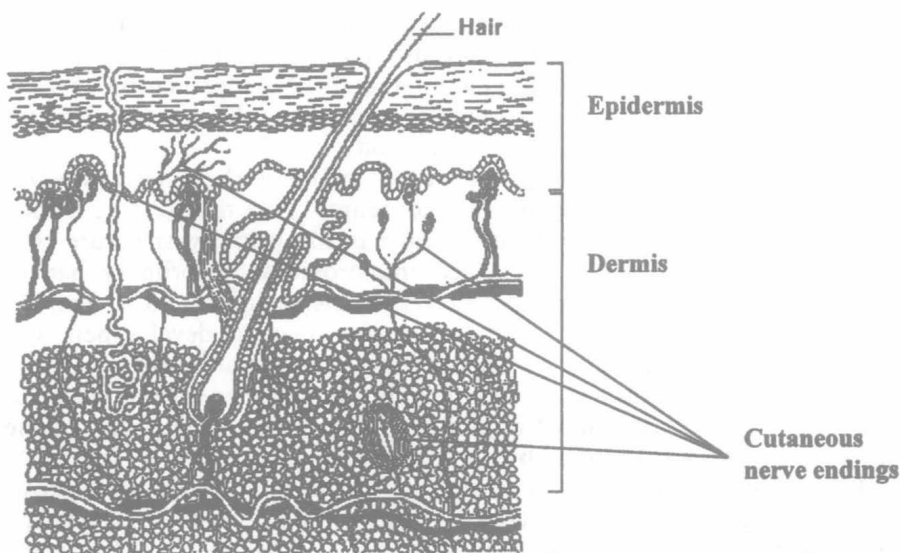


FIGURE 1.—Cross-section of the skin illustrating the relative positions of the epidermis and the dermis. A variety of specialized sensory receptors are found in the skin. These receptors never touch the environment directly. Operational closure of sensorimotor loops, required to maintain the feedback organization of the nervous system, is a function of strategically located tissues such as the skin (epidermis). The concept of circular feedback organization posits a role for the epidermis in sensory transduction and implies that sensory modalities, such as touch, are, in fact, always reciprocal with an associated motor response.