第5版



# Nutrition in Pediatrics

儿科营养学

Basic Science • Clinical Applications



Duggan • Watkins • Koletzko • Walker



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# 儿科营养学

第5版

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# NUTRITION IN PEDIATRICS

### **BASIC SCIENCE • CLINICAL APPLICATIONS**

# FIFTH EDITION VOLUME TWO

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To the continued successful growth and nourishment	of Michael,	Brendan,	and Emily	Duggan	and in g	gratitude fo	or many	teachers
and students in the field of pediatric nutrition.								

-Christopher Duggan, MD, MPH

To the children, parents, and staff of the growth and nutrition program whose shared knowledge, caring, and expertise enriches us all and to our grandchildren: Mariposa, Charlotte, Lillie, Gwen, and their "Pinkhouse" partners in "Friendship."

-John B. Watkins, MD

To a wonderful group of teachers, colleagues, and friends that I have been privileged to work with and to learn from, and to my family, especially my wife Sibylle, for all their patience and support.

-Berthold Koletzko, MD, PhD

To my youngest grandchild William McDonald Walker (Mac), the paradigm of healthy nutrition in children.

—W. Allan Walker, MD

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#### Zoë McCallum, MBBS, FRACP

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#### Janey S. Pratt, MD

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#### Melanie Reyes, MS, RD, LD

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#### Katalin M. Ross, RD, LDN

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#### Paul J. Rozance, MD

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#### William E. Russell, MD

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Food Allergies (54)

#### Ian R. Sanderson, MD, MSc, MRCP

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#### Theresa O. Scholl, PhD, MPH

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#### Thibault Senterre, MD, PhD, FRCPC

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#### Mandana Amir Shaghaghi, MSc, RD

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#### James H. Shaw, MD, PhD

Professor of Nutrition Emeritus Harvard University School of Dental Medicine Boston, Massachusetts Diet and Dental Disease (64) Deceased

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#### Sumathi Swaminathan, PhD

Assistant Professor Division of Nutrition St. John's Research Institute Bangalore, India Obesity in Developing Economies (45)

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Professor of Pediatrics Pontifical Catholic University of Chile Santiago, Chile Childhood Malnutrition: Prevention and Control at the National Level (15)

#### Charles P. Venditti, MD, PhD

Investigator, National Human Genome Research Institute Director, Organic Acid Research Unit National Institutes of Health Bethesda, Maryland Inborn Errors of Metabolism and the Liver (49)

#### Eduardo Villamor, MD, DrPh

Professor of Epidemiology University of Michigan School of Public Health Department of Epidemiology Ann Arbor, Michigan Vitamins (10)