Drivers of Innovation in Pediatric Nutrition
Drivers of Innovation in Pediatric Nutrition

Editors

Berthold Koletzko, Munich, Germany
Sibylle Koletzko, Munich, Germany
Frank Ruemmele, Paris, France
Contents

VII Preface
IX Foreword
XI Contributors

Infant Feeding

1 Innovations in Infant Milk Feeding: From the Past to the Future
Koletzko, B. (Germany)

19 Novel Insights into Human Lactation as a Driver of Infant Formula Development
Lönnerdal, B. (USA)

Clinical Nutrition

31 The Clinical Challenge of Preventing and Treating Malnutrition
Cooper, P.A. (South Africa)

41 Progress of Enteral Feeding Practice over Time: Moving from Energy Supply to Patient- and Disease-Adapted Formulations
Koletzko, S. (Germany)

Determinants of Innovative Progress

55 Molecular Mechanisms of Pediatric Nutrition
Ruemmele, F. (France)

65 Epidemiological Research Drives a Paradigm Shift in Complementary Feeding – The Celiac Disease Story and Lessons Learnt
Nordyke, K.; Olsson, C.; Hernell, O.; Ivarsson, A. (Sweden)
81 Technological Progress as a Driver of Innovation in Infant Foods
Ferruzzi, M.G.; Neilson, A.P. (USA)

97 Health Economic Perspectives of Pediatric Malnutrition: Determinants of Innovative Progress
Spieldenner, J. (Switzerland)

111 Economic Perspectives on Pediatric Obesity: Impact on Health Care Expenditures and Cost-Effectiveness of Preventive Interventions
John, J. (Germany)

125 Sustainable Clinical Research, Health Economic Aspects and Medical Marketing: Drivers of Product Innovation
Haschke, F.; Klassen-Wigger, P. (Switzerland)

143 Evaluation of Dietetic Product Innovations: The Relative Role of Preclinical and Clinical Studies
Makrides, M.; Gibson, R.A. (Australia)

151 Regulatory Environment and Claims – Limits and Opportunities
Martin, A. (France)

161 The Role of Consumers
Raats, M.M. (UK)

173 Bioethics and Innovation in Pediatric Nutrition Research
Solomons, N.W. (Guatemala)

191 The Role of Pediatricians as Innovators in Pediatric Nutrition
Greer, F.R. (USA)

205 Promoting Innovation in Pediatric Nutrition
Bier, D.M. (USA)

217 Conclusions on Innovation in Pediatric Nutrition
Koletzko, B. (Germany)

225 Subject Index
Preface

The 66th Nestlé Nutrition Institute Workshop was dedicated to an important but rather abstract topic analyzing potential drivers of innovation in pediatric nutrition. This topic clearly goes beyond the usual scope of academic pediatricians. The themes of other recent Nestlé Nutrition Institute Workshops such as nutritional challenges in emerging societies, personalized nutrition in pediatrics, or nutrition from before pregnancy to the age of 2 years relate closely to pediatric research, clinical practice, and public health. In contrast, this workshop aimed to address and to identify forces that potentially drive innovation in pediatric nutrition, a vision which surpasses research, clinical and academic thinking. While preparing this workshop, we came to appreciate that even if research comes up with the best innovative concepts, the likelihood of translational application of this knowledge will very much depend on a variety of other factors. Often, challenging preclinical and clinical studies must be performed to evaluate potential effects, effect sizes, suitability and safety. The commercial introduction of new or modified dietetic products for infants and children into markets depends on the regulatory standards and environments which differ considerably in various geographical regions and countries. In addition, policy and politics on child health and nutrition may be of considerable importance. The forces of marketing have become very influential, and these forces may not always agree with science and research. Economic considerations, intellectual property protection, adequate availability of safe and suitable raw materials, the state of food technology, as well as feasibility of production and distribution of a conceived new product are determinants of whether and how a product can be brought to the market. Expectations and response of both consumers and health care professionals, and many other factors also are of very high importance. As one might imagine, it was not easy for us to put a balanced program together on the variety and complexity of questions that are of relevance here, but it has been a truly enjoyable and informative experience. Given that this topic has more technological and commercial implications than other topics that are usually addressed by the Nestlé Nutrition Institute Workshops, we involved a slightly
higher proportion of expert speakers who are in one way or another related to the company, which we trust readers will understand.

It was a great pleasure and privilege to organize and co-chair this workshop. We wish to thank Dr. Petra Klassen-Wigger, Prof. Ferdinand Haschke and their colleagues at the Nestlé Nutrition Institute in Switzerland for the dedicated work and support, as well as Lois Lin, Dr. Lawrence Li and their colleagues at Nestlé Nutrition China who realized the symposium in China with cordial affection, meticulous attention to detail, and enormous enthusiasm. We also thank the speakers and discussants at the workshop who contributed to the intellectual content of this book.

Berthold Koletzko
Sibylle Koletzko
Frank Ruemmele
Foreword

‘Drivers of Innovation in Pediatric Nutrition’ was the topic of a unique workshop held in Sanya, China, on 1–5 November 2009. Innovation is defined in the dictionary as: ‘the introduction of something new’ or ‘a new idea, method, or device: novelty’. When applying ‘innovation’ to pediatric nutrition, a large variety of different expertise needs to be taken into consideration in order to successfully develop new products from the idea to the shelf. These include: innovative ideas in research and development that are technically feasible, accepted by health care professionals and regulatory authorities and, last but not least, by the consumer.

In this context, the topics discussed in this workshop ranged from the history of infant feeding practices, novel insights into human lactation as a driver of infant formula development, to new approaches through modern analytical tools such as molecular biological assays, and finally the regulatory settings and consumer behavior. Altogether, the workshop was a rich source of information to paint the future of innovation in pediatric nutrition.

We would like to warmly thank the three chairpersons, Prof. Bert Koletzko and Prof. Sibylle Koletzko from Germany and Prof. Frank Ruemmele from France, who are very well-known experts in the area of pediatric nutrition and drivers of innovation themselves, for assembling the outstanding scientific program.

Our special thanks go to Mr. Lawrence Li and Ms. Lois Lin and their team for the superb logistical support of the workshop and the warm hospitality.

Prof. Ferdinand Haschke, MD, PhD
Chairman
Nestlé Nutrition Institute
Vevey, Switzerland

Dr. Petra Klassen, PhD
Scientific Advisor
Nestlé Nutrition Institute
Vevey, Switzerland
Contributors

Chairpersons & Speakers

Prof. Dennis M. Bier
USDA/ARS Children’s Nutrition Research Center
Baylor College of Medicine
1100 Bates Street
Houston, TX 77030
USA
E-Mail dbier@bcm.tmc.edu

Prof. Peter A. Cooper
Department of Paediatrics & Child Health
University of the Witwatersrand & Charlotte Maxeke Johannesburg Academic Hospital
Private Bag X 39
Johannesburg, 2000
South Africa
E-Mail peter.cooper@wits.ac.za

Dr. Mario G. Ferruzzi
Purdue University
Food Science Building
745 Agriculture Mall Drive
West Lafayette, IN 47907-2009
USA
E-Mail mferruzz@purdue.edu

Prof. Frank Greer
Department of Pediatrics
University of Wisconsin/Meriter Hospital
202 S. Park Street
Madison, WI 53715
USA
E-Mail frgreer@pediatrics.wisc.edu

Prof. Ferdinand Haschke
Nestlé Nutrition Institute
Avenue Reller 22
CH–1800 Vevey
Switzerland
E-Mail Ferdinand.haschke@nestle.com

Ass. Prof. Anneli Ivarsson
Epidemiology & Global Health
Department of Public Health and Clinical Medicine
Umea University
SE–90185 Umea
Sweden
E-Mail anneli.ivarsson@epiph.umu.se

Dr. Jürgen John
Institute of Health Economics and Health Care Management
Helmholtz Zentrum München
German Research Center for Environmental Health (GmbH)
Ingolstädter Landstrasse 1
DE–85764 Neuherberg
Germany
E-Mail john@helmholtz-muenchen.de

Prof. Berthold Koletzko
Dr. von Hauner Children’s Hospital
Ludwig Maximilians University
Lindwurmstrasse 4
DE–80337 München
Germany
E-Mail office.koletzko@med.uni-muenchen.de
Contributors

Prof. Sibylle Koletzko
Dr. von Hauner Children’s Hospital
Ludwig Maximilians University
Lindwurmstrasse 4
DE–80337 München
Germany
E-Mail Sibylle.Koletzko@med.uni-muenchen.de

Prof. Bo Lonnerdal
Department of Nutrition
University of California
One Shield Avenue
Davis, CA 95616
USA
E-Mail bllonnerdal@ucdavis.edu

Prof. Maria Makrides
Women’s & Children’s
Health Research Institute
University of Adelaide
North Adelaide, SA 5006
Australia
E-Mail maria.makrides@cywhs.sa.gov.au

Prof. Ambroise Martin
Lyon-Est Medical School
University Claude Bernard
Lyon 1
8 avenue Rockefeller
F–69373 Lyon Cedex 08
France
E-Mail ambroise.martin@sante.univ-lyon1.fr

Prof. Monique Raats
Co-Director: Food, Consumer
Behaviour and Health Research Centre
Department of Psychology
Faculty of Arts and Human Sciences
University of Surrey
Guildford Surrey GU2 7XH
UK
E-Mail m.raats@surrey.ac.uk

Prof. Frank Ruemmele
INSERM U989
Pediatric Gastroenterology
Hepatology and Nutrition
Hôpital Necker-Enfants Malades
149 Rue de Sèvres
FR–75743 Paris Cedex 15
France
E-Mail frank.ruemmele@nck.aphp.fr

Prof. Noel Solomons
Center for Studies of Sensory Impairment
Aging and Metabolism (CeSSIAM)
Avenida 17, 16-89 (interior)
Zona 11 (Anillo Periférico)
Guatemala, 01011
Guatemala
E-Mail cessiam@guate.net.gt

Dr. Jörg Spieldenner
Health Economics-Epidemiology
Nestlé Nutrition Institute
Avenue Reller 22
CH–1800 Vevey
Switzerland
E-Mail joerg.spieldenner@nestle.com

Prof. Weiping Wang
Fudan University
220 Handan Road
Shanghai, 200433
China
E-Mail wpwang@shmu.edu.cn

Dr. Wei Cai
Shanghai Pediatric Research Institute
800 Dongchuan Road
Shanghai, 200240
China
E-Mail caiw204@yahoo.com.cn

Moderators

Dr. Weiping Wang
Fudan University
220 Handan Road
Shanghai, 200433
China
E-Mail wpwang@shmu.edu.cn

Dr. Wei Cai
Shanghai Pediatric Research Institute
800 Dongchuan Road
Shanghai, 200240
China
E-Mail caiw204@yahoo.com.cn

Dr. Meng Mao
West China 2nd University Hospital
No. 20 Section 3, Renmin Nan Road
Chengdu, Sichuan, 610041
China
E-Mail dfmmmao@126.com
Invited Attendees

Robert Gibson/Australia       Jiakang Yu/China
Mohammad Serajul Akbar/Bangladesh     Rong Zhang/China
Manzoor Hussain/Bangladesh       Getu Zhao Ri/China
MD Nurul Islam/Bangladesh       So King Woon Alan/Hong Kong
Mohammad Sirajul Islam/Bangladesh     Michael Lentze/Germany
Ilse Hoffman/Belgium              Santosh Kumar Mittal/India
Tongxin Chen/China                Priyankar Pal/India
Runmin Jin/China                   Arvind Shenoi/India
Guanghui Li/China                  Sunit Singh/India
Guicun Li/China                    Rhishikesh Thakre/India
Haiqi Li/China                     Mario de Curtis/Italy
Qiuping Li/China                   Fredrick Were/Kenya
Xiaonan Li/China                   Arturo Ludan/Philippines
Yongbai Li/China                   Hania Szajewska/Poland
Kun Liang/China                    Elena Kornienko/Russia
Guanghui Liu/China                 Sultan Alenezi/Saudi Arabia
Kezhan Liu/China                   Ali Dhansay/South Africa
Qingya Tang/China                  Linono Sebotsa/South Africa
Shaotao Tang/China                 Olle Hernell/Sweden
Baoxi Wang/China                   Hung-Chieh Chou/Taiwan
Ying Xiong/China                   Yao-Hsu Yang/Taiwan
Fan Yang/China                     Sirinuch Chomtho/Thailand
Jie Yang/China                     Pensri Kosuwon/Thailand
Mingji Yi/China                    Ruangvith Tantibhaedhyangkul/Thailand
Fei Yin/China                      D’Ann Finley/USA
Lei Yu/China

Nestlé Participants

Catherine Chen/China              Ann Yuan/China
Nicole Chen/China                 Sanjeev Ganguly/India
Christine Chu/China               Maria Lourdes Pamintuan/Philippines
Li Guan/China                      Grace Uy/Philippines
Xiaolan Huang/China                Marco Turini/Singapore
Lawrence Li/China                  Stefan Bodenstab/Switzerland
Spring Li/China                    Petra Klassen Wigger/Switzerland
Lois Lin/China                     Nelly Jeanne Marmy Conus/Switzerland