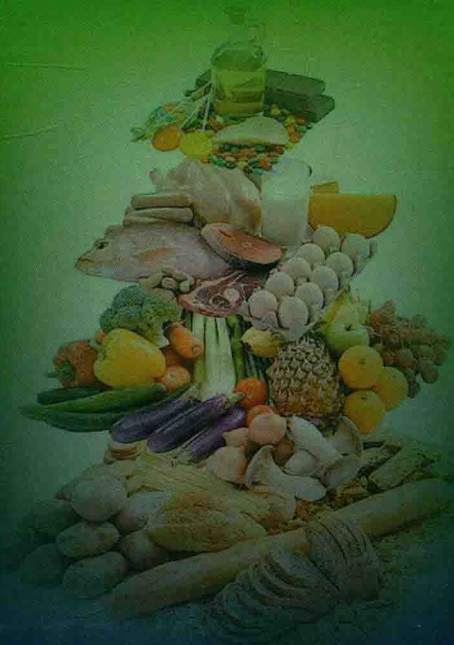


医学教育改革系列教材



Nutrition Medicine

Chief Editor Rong Xiao



高等教育出版社



Nutrition Medicine

Chief Editor

Rong Xiao

Associate Chief Editors

Aiguo Ma Lishi Zhang Wenjie Li Linhong Yuan

Contributors

Jing Cai	Jinyao Chen	Guo Cheng	Junhua Han
Shaoying Hou	Penggao Li	Wenjie Li	Ying Li
Haixia Liu	Liegang Liu	Weiwei Ma	Aiguo Ma
Lina Ma	Qinghua Meng	Mantian Mi	Kemin Qi
Yu Qin	Qiuzhen Wang	Zhixu Wang	Ling Wang
Rong Wang	Yu Wang	Yuntang Wu	Yuandi Xi
Rong Xiao	Huanling Yu	Linhong Yuan	Lishi Zhang
Xumei Zhang	Yumei Zhang	Haifeng Zhao	Yan Zhao
Ying Zheng	Cui Zhou	Huilian Zhu	Yueke Zhu



图书在版编目(CIP)数据

营养医学 = Nutrition Medicine : 英文 / 肖荣主编. — 北京 : 高等教育出版社, 2015. 12
医学教育改革系列教材
ISBN 978-7-04-044321-9

I. ①营… II. ①肖… III. ①营养学—医学院校—教材—英文 IV. ①R151

中国版本图书馆CIP数据核字(2015)第281820号

总策划 林金安 吴雪梅 席雁

策划编辑 瞿德竑 责任编辑 瞿德竑 封面设计 张志 责任印制 田甜

出版发行	高等教育出版社	咨询电话	400-810-0598
社址	北京市西城区德外大街4号	网址	http://www.hep.edu.cn
邮政编码	100120		http://www.hep.com.cn
印刷	北京人卫印刷厂	网上订购	http://www.landracom.com
开本	889mm×1194mm 1/16		http://www.landracom.com.cn
印张	20.25	版次	2015年12月第1版
字数	600千字	印次	2015年12月第1次印刷
购书热线	010-58581118	定价	39.80元

本书如有缺页、倒页、脱页等质量问题,请到所购图书销售部门联系调换

版权所有 侵权必究

物料号 44321-00

医学教育改革系列教材编委会

顾 问

徐群渊 赵继宗 贾弘禔 宫恩聪 唐朝枢
杜 杰 马长生 申昆玲

主任委员

吕兆丰

副主任委员

线福华 王晓民

委 员 (以姓氏拼音为序)

安 静	安 威	车念聪	丁 卫	丁跃中	段维明
段钟平	付 丽	郭秀花	韩德民	郝 刚	侯燕芝
贾弘禔	贾继东	贾建平	康熙雄	李春盛	李建军
李坤成	李 良	李 林	李树人	连 石	刘慧荣
刘志成	路孝琴	吕树铮	罗大力	马 路	马 辛
彭师奇	申昆玲	孙家邦	孙 正	孙志伟	童隆正
王麟鹏	王宁利	王 铁	王 崑	王晓民	王晓燕
肖 荣	徐群渊	杨凤池	张力平	张 铭	张震宇
赵 明	周德山	诸欣平			

秘书长

付 丽

秘 书

马小蕊 吴 云 潘 援

《营养医学》编委会

主 编 肖 荣

副主编 马爱国 张立实 李文杰 苑林宏

编 委 (以姓氏拼音为序)

蔡 静	陈锦瑶	成 果	韩军花
侯绍英	李鹏高	李文杰	李 颖
刘海霞	刘烈刚	麻微微	马爱国
马丽娜	孟庆华	糜漫天	齐可民
秦 玉	汪求真	汪之顷	王 玲
王 蓉	王 玉	吴蕴棠	席元第
肖 荣	余焕玲	苑林宏	张立实
张绪梅	张玉梅	赵海峰	赵 艳
郑 樱	周 催	朱惠莲	朱跃科

Foreword

Global developments in medicine and health shape trends in medical education. And in China education reform has become an important focus as the country strives to meet the basic requirements for developing a medical education system that meets international standards. Significant medical developments abroad are now being incorporated into the education of both domestic and international medical students in China, which includes students from the districts of China's Hong Kong, Macao and Taiwan that are taught through mandarin Chinese as well as students from a variety of other regions that are taught through the English language. This latter group creates higher demands for both schools and teachers.

Unfortunately there is no consensus as to how to improve the level and quality of education for these students or even as to which English language materials should be used. Some teachers prefer to directly use original English language materials, while others make use of Chinese medical textbooks with the help of English language medical notes. The lack of consensus has emerged from the lack of English language medical textbooks based on the characteristics of modern medical education in China.

In fact, most Chinese teachers involved in medical education have already attained an adequate level of English language usage. However, English language medical textbooks that reflect the culture of the teachers would in fact make it easier for these teachers to complete the task at hand and would improve the level and quality of medical education for international students. In addition, these texts could be used to improve the English language level of the medical students taught in Chinese. This is the purpose behind the compilation and publishing of this set of English language medical education textbooks.

The editors in chief are mainly experts in medicine from Capital Medical University (CCMU). The editorial board members are mainly teachers of a variety of subjects

from CCMU. In addition, teachers with rich teaching experience in other medical schools are also called upon to help create this set of textbooks. And finally some excellent scholars are invited to participate as final arbiters for some of the materials.

The total package of English medical education textbooks includes 63 books. Each textbook conforms to five standards according to their grounding in science; adherence to a system; basic theory, concepts and skills elucidated; simplicity and practicality. This has enabled the creation of a series of English language textbooks that adheres to the characteristics and customs of Chinese medical education. The complete set of textbooks conforms to an overall design and uniform style in regards to covers, colors, and graphics. Each chapter contains learning objectives, core concepts, an introduction, a body, a summary, questions and references that together serve as a scaffold for both teachers and students.

The complete set of English language medical education textbooks is designed for teaching overseas undergraduate clinical medicine students (six years), and can also serve as reference textbooks for bilingual teaching and learning for 5-year, 7-year and 8-year programs in clinical medicine.

We would like to thank the chief arbiters, chief editors and general editors for their arduous labor in the writing of each chapter. We would also like to acknowledge all the contributors. Finally, we would like to acknowledge Higher Education Press. They have all provided valuable support during the many weekends and evening hours of work that were necessary for completing this endeavor.

President of Capital Medical University

Director of English Textbook Compiling Commission

Zhaofeng Lu

August 1st, 2011

Preface

This book mainly serves as the resource for medical students and graduate students in nutrition science, clinical medicine and preventive medicine. Also, this book is useful for students in food science and public health. The importance of food and nutrition in human health and disease prevention has been extensively aware of, therefore, the aim of the present textbook is to provide basic and practical knowledge related to nutrition and health, and nutrition-related disease. The textbook includes seven chapters to introduce broad knowledge from basic nutrition to assessment of nutrition status. The textbook is structured to begin with basic nutrition knowledge introduction to provide an overview of nutrients and energy in foods. In the second chapter, the up-to-date knowledge associated with phytochemicals (also known as non-nutrient bioactive substances) is introduced, which represents the leading edge of nutrition scientific research. The next chapter outlines the food nutrition and health. Five different types of food were introduced according to their nutritional features and impacts on human beings' health. Life cycle nutrition is covered in chapter 4. In this chapter, the nutritional need and dietary guideline for women during pregnancy and lactation, infants, children, teenagers, and the elderly were described in details. Several diseases such as hyperlipidemia, type 2 diabetes, obesity, metabolic syndrome, cancer, gout, chronic kidney disease, hepatobiliary disease, and phenylketonuria were discussed in the nutrition and disease chapter. The knowledge in this chapter will be some overlap with clinical medicine or basic nutrition. However, the content in this chapter give us new insight into the nature of nutrition and disease, especially the nutrition prevention of diseases. Standards, and guidelines for assessment of nutritional status were presented in the final two chapters.

All statements only reflect the current nutrition knowledge, and all authors have provided the references associated with the content. The editors greatly appreciate to all co-authors for their hard work and great contributions to the textbook. Also, the chief editor especially appreciates to Ling Wang for her careful proofreading of the manuscript as secretary.

Rong Xiao
July, 2015

Contributors

Jing Cai 蔡静

Qingdao University, Qingdao, China

Chapter 5 Section 4

Jinyao Chen 陈锦瑶

Sichuan University, Chengdu, China

Chapter 4 Section 2, Chapter 5 Section 7, Chapter 6 Section 2

Guo Cheng 成果

Sichuan University, Chengdu, China

Chapter 6 Section 1

Junhua Han 韩军花

China National Center for Food Safety Risk Assessment, Beijing, China

Chapter 2 Section 4

Shaoying Hou 侯绍英

Harbin Medical University, Harbin, China

Chapter 1 Section 2

Penggao Li 李鹏高

Capital Medical University, Beijing, China

Chapter 3 Section 1, 2 and 5

Wenjie Li 李文杰

Zhengzhou University, Zhengzhou, China

Chapter 5 Section 5 and 6

Ying Li 李颖

Harbin Medical University, Harbin, China

Chapter 2 Section 3 and 4

Haixia Liu 刘海霞

Beijing You An Hospital

Capital Medical University, Beijing, China

Chapter 5 Section 8

Liegang Liu 刘烈刚

Huzhong University of Science and Technology, Wuhan, China

Chapter 1 Section 5

Weiwei Ma 麻微微

Capital Medical University, Beijing, China

Chapter 4 Section 1

Aiguo Ma 马爱国

Qingdao University, Qingdao, China

Chapter 5 Section 3 and 4

Lina Ma 马丽娜

Capital Medical University, Beijing, China

Chapter 5 Section 1

Qinghua Meng 孟庆华

Beijing You An Hospital

Capital Medical University, Beijing, China

Chapter 5 Section 8 and 9

Mantian Mi 糜漫天

Third Military Medical University, Chongqing, China

Chapter 1 Section 6

Kemin Qi 齐可民

Capital Medical University, Beijing, China

Chapter 4 Section 3

Yu Qin 秦玉

Third Military Medical University, Chongqing, China

Chapter 1 Section 6

Qiuzhen Wang 汪求真

Qingdao University, Qingdao, China

Chapter 7

Zhixu Wang 汪之琰

Nanjing Medical University, Nanjing, China

Chapter 1 Section 4, Chapter 5 Section 10

Ling Wang 王玲

Zhengzhou University, Zhengzhou, China

Chapter 5 Section 5 and 6

Rong Wang 王蓉

Capital Medical University, Beijing, China

Chapter 5 Section 1

Yu Wang 王玉

Lanzhou University, Lanzhou, China

Chapter 4 Section 2, Chapter 5 Section 7

Yuntang Wu 吴蕴棠

Tianjin Medical University, Tianjin, China

Chapter 5 Section 2

Yuandi Xi 席元第

Capital Medical University, Beijing, China

Chapter 2 Section 3 and 7

Rong Xiao 肖荣

Capital Medical University, Beijing, China

Chapter 1 Section 1

Huanling Yu 余焕玲

Capital Medical University, Beijing, China

Chapter 4 Section 4

Linhong Yuan 苑林宏

Capital Medical University, Beijing, China

Chapter 1 Section 1

Lishi Zhang 张立实

Sichuan University, Chengdu, China

Chapter 6 Section 1 and 2

Xumei Zhang 张绪梅

Tianjin Medical University, Tianjin, China

Chapter 5 Section 2

Yumei Zhang 张玉梅

Peking University, Beijing, China

Chapter 3 Section 2 and 5

Haifeng Zhao 赵海峰

Shanxi Medical University, Taiyuan, China

Chapter 1 Section 6, Chapter 2 Section 1 and 2

Yan Zhao 赵艳

Harbin Medical University, Harbin, China

Chapter 1 Section 3

Ying Zheng 郑樱

Qingdao University, Qingdao, China

Chapter 5 Section 3

Cui Zhou 周催

Capital Medical University, Beijing, China

Chapter 4 Section 4

Huilian Zhu 朱惠莲

Sun Yat-Sen University, Guangzhou, China

Chapter 2 Section 5 and 6

Yueke Zhu 朱跃科

Beijing You An Hospital

Capital Medical University, Beijing, China

Chapter 5 Section 9

CONTENTS

Chapter 1 Nutrients and Energy

Section 1 Protein and Amino Acids	3
1.1 Introduction	4
1.2 Amino Acids	5
1.3 Limiting Amino Acids and Protein Quality	6
1.4 Protein Deficiency and Excess	7
1.5 Recommendation and Food Sources	9
Section 2 Lipids and Fatty Acids	11
2.1 Introduction	11
2.2 Fatty Acids	13
2.3 Measuring Lipid Quality	16
2.4 Lipids and Health	17
2.5 Recommendation and Food Sources	18
Section 3 Carbohydrate and Dietary Fiber	20
3.1 Introduction	20
3.2 Carbohydrate and Health	24
3.3 Recommendation and Food Sources	28
Section 4 Energy	30
4.1 Introduction	30
4.2 Metrological Units and Sources of Energy	31
4.3 Energy Expenditure of Human Body	31
4.4 Energy Balance and its Regulation	36
4.5 Energy Imbalance and Health Problems Induced	37
4.6 Recommendation and Dietary Energy Sources	38
Section 5 Minerals	40
5.1 Introduction	40
5.2 Calcium	41
5.3 Magnesium	44
5.4 Phosphorus	45
5.5 Iron	46
5.6 Zinc	48
5.7 Iodine	50
5.8 Selenium	51

Section 6	Vitamins	54
6.1	Introduction	55
6.2	Vitamin A	55
6.3	Vitamin D	59
6.4	Vitamin E	63
6.5	Vitamin B ₁	65
6.6	Vitamin B ₂	67
6.7	Vitamin B ₆	70
6.8	Folate	72
6.9	Niacin	74
6.10	Vitamin C	76

Chapter 2 Phytochemicals and Health

Section 1	Introduction	83
1.1	Classification	83
1.2	Biological Activity	84
1.3	Overconsumption and Adverse Effects	86
Section 2	Carotenoids	88
2.1	Chemical Structure and Classification	88
2.2	Carotenoids and Health	89
Section 3	Polyphenols	91
3.1	Introduction	91
3.2	Polyphenols and Health	92
Section 4	Phytosterol	95
4.1	Introduction	95
4.2	Phytosterol and Health	97
4.3	Application of Phytosterol in Different Countries	98
Section 5	Organosulfur Compounds	100
5.1	Introduction	100
5.2	Organosulfur Compounds and Health	101
Section 6	Monoterpene Compounds	103
6.1	Introduction	103
6.2	Monoterpene Compounds and Health	104
Section 7	Protease Inhibitors	106
7.1	Introduction	106
7.2	Protease Inhibitor and Health	107

Chapter 3 Food Nutrition and Health

Section 1 Cereal	111
1.1 Introduction	111
1.2 Structure and Nutrient Distribution of Cereal Crops	111
1.3 Nutrients Contained in Cereal Crops	112
1.4 Impact of Processing and Storage on the Nutrients in Cereals	114
1.5 Cereals and Health	115
Section 2 Legume	117
2.1 Introduction	117
2.2 Types of Legumes	118
2.3 Nutrients in Legume	118
2.4 Legume Products	121
Section 3 Fruit and Vegetable	123
3.1 Introduction	123
3.2 Impacts of Processing and Preparation on the Nutrients in Fruits and Vegetables	125
3.3 Fruits/Vegetables and Health	128
Section 4 Meat, Poultry and Fish	131
4.1 Introduction	131
4.2 Impacts of Processing and Preparation on the Nutrients in Meat, Poultry and Fish	134
4.3 Meat, Poultry, Fish and Health	134
Section 5 Milk	137
5.1 Introduction	137
5.2 Milk and Health	139

Chapter 4 Life Cycle Nutrition

Section 1 Nutrition during Pregnancy and Lactation	145
1.1 Nutrition during Pregnancy	145
1.2 Nutrition during Lactation	148
Section 2 Infant and Child	151
2.1 Physiological Characters of Infant and Child	152
2.2 Nutrient Needs	153
2.3 Dietary Guidelines for Infant and Child	156
2.4 Early Life Nutrition and Later Health	159
Section 3 Teen	161
3.1 Physiological Characters of Teen	161
3.2 Nutrient Needs	163
3.3 Potential Nutrition-related Problems	167

3.4 Dietary Guideline for Teen	170
Section 4 The Elderly	173
4.1 Introduction	173
4.2 Physiological Characters of the Elderly	173
4.3 Nutrient Needs of the Elderly	175
4.4 Dietary Guideline for the Elderly	177

Chapter 5 Nutrition and Diseases

Section 1 Inpatients Nutrition	183
1.1 Introduction	183
1.2 Nutritional Assessment of Inpatients	185
1.3 Nutritional Support	189
1.4 Daily Requirements of Energy and Nutrients	189
Section 2 Hyperlipidemia	192
2.1 Introduction	192
2.2 Factors and Hyperlipidemia	194
2.3 Dietary Prevention for Hyperlipidemia	197
2.4 Education Program for Cholesterol Testing and Management	198
Section 3 Diabetes and Impaired Fasting Glucose	202
3.1 Introduction	202
3.2 Nutrition and Type 2 Diabetes Mellitus	203
3.3 Dietary Prevention	208
Section 4 Obesity and Overweight	211
4.1 Introduction	211
4.2 Nutritional Factors and Obesity	212
4.3 Obesity and Health	216
4.4 Prevention of Obesity	220
Section 5 Metabolic Syndrome	223
5.1 Introduction	223
5.2 Dietary Prevention	226
Section 6 Cancer	229
6.1 Introduction	229
6.2 Diet, Nutrition and Cancer	230
6.3 Dietary Prevention of Cancer	232
Section 7 Gout	235
7.1 Introduction	235
7.2 Dietary Prevention	237

Section 8 Protein, Salt and Chronic Kidney Disease	241
8.1 Protein and Chronic Kidney Disease	241
8.2 Salt and Chronic Kidney Disease	244
8.3 Dietary Prevention	245
Section 9 Alcohol and Hepatobiliary Disease	250
9.1 Introduction	250
9.2 Alcohol and Hepatobiliary Health	251
9.3 Dietary Prevention	254
Section 10 Phenylketonuria	257
10.1 Introduction	257
10.2 Etiology and Epidemiology	257
10.3 Screening and Diagnosis	258
10.4 Treatment	258
10.5 Results of Therapy	262

Chapter 6 Standards and Guidelines

Section 1 Dietary Reference Intakes	265
1.1 Introduction	265
1.2 Establishment of DRIs	266
1.3 Application of DRIs	267
Section 2 Dietary Guidelines	270
2.1 Food-based Dietary Guidelines	270
2.2 Chinese Dietary Guideline	272
2.3 Dietary Pattern	273
2.4 Nutrition Strategy and Policy	275

Chapter 7 Assessment of Nutritional Status

Section 1 Introduction	281
1.1 Introduction	281
1.2 The Purpose of Nutritional Assessment	282
Section 2 Patient History Related Nutritional Status	283
2.1 Introduction	283
2.2 Specific and Non-specific Physical Signs Associated with Malnutrition and Deficiency of Micronutrients	284
2.3 Other Related Signs of Malnutrition	285
2.4 Signs of Malnutrition in Certain Population	285
2.5 Advantages and Limitations of Clinical Assessment	285

Section 3	Anthropometry	287
3.1	Body Height, Weight and Proportions	287
3.2	Other Anthropometric Measurements	289
3.3	Advantages and Limitations of Anthropometry	290
Section 4	Biochemical and Hematological Parameters	291
4.1	Measurement of Nutrient Level in Body Fluids	291
4.2	Advantages and Limitations of Biochemical Assessment	296
Section 5	Dietary Intake Assessment	297
5.1	Introduction	297
5.2	Records (Food Diary)	298
5.3	24-hour Dietary Recall	299
5.4	Food Frequency Questionnaire	300
5.5	Observed Food Consumption	301
5.6	Summary of Dietary Intake Assessment	301
Section 6	Nutritional Risk Assessment	302
6.1	Introduction	302
6.2	Relationship between Risk Assessment and Nutrition	302
6.3	The Focus of Risk Assessment	303
6.4	The Process of Nutritional Risk Assessment	303
6.5	Relevant Issues in Nutritional Risk Assessment	304

Chapter **1**

Nutrients and Energy