

- 全国高等医药院校药学类实验双语教材
- 教育部普通高等教育“十五”国家级规划教材

生理学 实验与指导

EXPERIMENT AND GUIDE
FOR PHYSIOLOGY

主编 丁启龙 李运曼



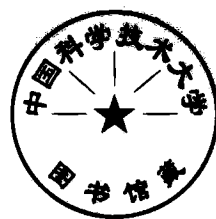
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生理学实验与指导

EXPERIMENT AND GUIDE FOR PHYSIOLOGY

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内 容 提 要

本书包括 43 个实验，重点突出生理学实验中的基本操作、基本技能和基本理论。所列实验除少数可供选择的以外，在大多数院校生理实验室都有条件做到。本书还介绍了常用的实验动物、动物活体解剖技术以及生理实验的常用仪器设备，以供不同专业的教学需要。本书可作为高等医药院校、药学类专业生理实验课教材，也可供有关教师实验教学时参考。

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编写说明

为适应我国高等医药教育的改革和发展、满足市场竞争和医药管理体制对药学教育的要求，全国高等医药院校药学类教材编委会组织编写了“全国高等医药院校药学类教材”。

本系列教材是在充分向各医药院校调研、总结归纳当前药学教育迫切需要补充一些教学内容的基础上提出编写宗旨的。本系列教材的编写宗旨是：药学特色鲜明、具有前瞻性、能体现现代医药科技水平的高质量的药学教材。也希望通过教材的编写帮助各院校培养和推出一批优秀的中青年业务骨干，促进药学院校之间的校际间的业务交流。

参加本系列教材的编写单位有：中国药科大学、沈阳药科大学、北京大学药学院、广东药学院、华西医科大学药学院、山西医科大学、同济医科大学药学院、复旦大学药学院、西安交通大学药学院、山东大学药学院等数十所药学院校。

教材的编写尚存在一些不足，请各院校师生提出指正。

全国高等医药院校药学类
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2001.9.3

序

实验教学是高等药学院校最基本的教学形式之一，对培养学生科学的思维与方法、创新意识与能力，全面推进素质教育有着重要的作用。飞速发展的科学技术，已成为主导社会进步的重要因素。高等药学院校必须不断更新教学内容，以学科发展的前沿知识充实实验课程内容。

近年来，中国药科大学坚持以研究促教改，通过承担教育部“世行贷款——21世纪初高等教育教学改革项目”及立项校内教改课题等多种方式，调动了广大教师投身教学改革的积极性，将转变教师的教育思想观念与教学内容、教学方法的改革紧密结合起来，取得了实效。此次推出的国家“十五”规划教材——药学专业双语实验教学系列，是广大教师长期钻研实验课程教学体系，改革教学内容，实现教育创新的重要成果。他们站在21世纪教育、科技和社会发展趋势的高度，对药学专业实验课程的教学内容进行了“精选”、“整合”和“创新”，强调对学生的动手能力、创新思维、科学素养等综合素质的全面培养。这套教材具有以下的特点：

1. 教材将各学科的实验内容进行了广泛的“精选”，既体现了高等药学教育“面向世界、面向未来、面向现代化”，也考虑到我国药学教育的现状与实际；既体现了各门实验课程自身的独立性、系统性和科学性，又充分考虑到各门实验课程之间的联系与衔接，有助于学生在教学大纲规定的实验教学学时内掌握基本操作技术，提高动手能力，养成严谨、求实、创新的科学态度。

2. 教材中新增的综合性、设计性实验有利于学生全面了解和综合掌握本门实验课程的教学内容。这一举措既满足了学生个性发展的需要，更注重培养学生分析问题、解决问题的能力 and 创新意识。

3. 教材中适当安排一些反映药学学科发展前沿的实验，有利于学生在掌握实验基本技术的同时，对药学学科的新进展、新技术有所了解，激发他们学习药学知识与相关学科的兴趣。

4. 教材以实践教学为突破口，采用双语体系编写，为实验课程改革构建数字化、信息化和外语教学的平台，有利于提高学生的科技英语水平。通过我校多年的药学专业系列实验课程双语教学实践，证明学生完全能够接受此套教材的教学。

国家十五规划教材——药学专业双语实验教学系列教材的陆续出版，必

将对推动我国高等药学教育的健康发展，产生积极而深远的影响。由于采用双语体系编写药学教学实验丛书尚属首次，缺乏经验，在内容选择及编写方法上的不妥之处，在所难免。欢迎从事药学教育的同行们批评赐教。

吴峻明

(中国药科大学校长、博士、教授、博士生导师)

2003年1月于南京

Preface

Experimental teaching is one of the most fundamental teaching means in pharmaceutical colleges, playing an important role in training scientific thoughts and methods, creative consciousness and ability of the students as well as in promoting quality – oriented education in all – round way. Fast – advancing science and technology has come to be an important factor in dominating social progress. Teaching materials must be updated continually in pharmaceutical colleges, especially enriching the materials of experimental courses with the most advanced knowledge in the subject.

In recent years, China Pharmaceutical University have been stressing the promotion of teaching reform on the basis of research, succeeding in stimulating teachers' enthusiasm for teaching reform by various means such as undertaking the project of teaching reform in higher education at the beginning of 21st century sponsored financially by World Bank and entrusted by the Ministry of Education as well as approving and ratifying internal programs on teaching reform. Meanwhile, it yields fruits to integrate the transforming of teachers' educational ideology into the reform of teaching materials and methods. This series of textbook of national “Tenth – five” planning – bilingual pharmaceutical experimental teaching series, is an important achievement made through studying teaching system of experimental courses for long, reforming teaching materials and carrying out educational innovation of all the teachers concerned.

Meeting the new demands for education, science and technology and social growth, they select, integrate and innovate the teaching materials of pharmaceutical experimental courses, stressing the overall cultivation of comprehensive qualities, including experimental ability, creative thought and scientific attainments. This set of textbook possesses the following features:

1. These textbooks make an extensive “selection” of the experimental materials of each subject, reflecting the goal of facing the world, facing the future and facing the modernization in higher pharmaceutical education, and taking into account the status quota and reality of our pharmaceutical education; meanwhile embodying the individuality, systematicness and scientificness of each experimental courses, which helps the students to grasp basic techniques of operation within the class hours of experimental teaching prescribed by teaching syllabus and to improve their experimental ability and finally to cultivate a scientific approach of precision, practicality and creation.

2. The comprehensive designing experiments newly supplemented in the textbooks help the students to learn totally and grasp comprehensively the teaching materials of the experimental courses, which not only meets the students' needs for individual development but also trains their ability to analyze and solve problems and cultivates their creative consciousness.

3. Some experiments representing the latest development in pharmacy are properly included in the textbooks, which helps the students to learn about new advance and technology in pharmacy and to further arouse their interests in studying pharmacy and relevant subjects while grasping some basic techniques of experiment.

4. The textbooks take experimental teaching as starting point and are compiled in a system of bilingualism and aim to set up a platform of digitalization, information and foreign language teaching for the purpose of reforming experimental courses, which serves to enhance the students' level of technological English. It has been proved that the students have no difficulty being adapted to the teaching of this set of textbook through many years of bilingual teaching practice carried out in a series of pharmaceutical experimental courses of our university.

The successive publishing of the series of textbooks used for bilingual pharmaceutical experimental teaching – the national “Tenth—five” planning textbooks, will surely produce good and far – reaching influence in promoting the sound development of higher pharmaceutical education of our country. Since it is the first time that we have compiled this series of textbook of pharmaceutical teaching experiment in a bilingual system, we lack experience and thus some defects in choice of materials and way of compilation are inevitable. Experts engaged in pharmaceutical education are welcome to give any criticisms and advice.

Wu Xiaoming

Ph. D, prof. , and supervisor of doctoral candidates
President of China Pharmaceutical University

Nanjing

Jan, 2003

前 言

根据教育部“药学类专业课程基本要求”的精神，结合我校多年教学实践，并参考国内外有关资料，我们编写了这本《生理学实验与指导》教材。

本书包括43个实验，重点突出生理学实验中的基本操作、基本技能和基本理论。所列实验除少数可供选择的以外，在大多数院校生理实验室都有条件做到。本书还介绍了常用的实验动物、动物活体解剖技术以及生理实验的常用仪器设备，以供不同专业的教学需要。

与前版相比，本书增加了相应的英文译文。由于感觉器官系统的实验在药类专业类院校较少开展，故本版不再编入。生理现象或反应的记录以D95微机化生理药理实验教学系统为主，辅以二道生理记录仪，淘汰记纹鼓。

本书可作为高等医药院校、药学类专业生理实验课教材，也可供有关教师实验教学时参考。

参加本书编写的人员为中国药科大学生理教研室的丁启龙、王秋娟、李运曼、吴玉林、郭青龙、傅纪华、颜天华、刘冰冰等老师。

由于编者水平有限，错误和不妥之处一定难免，欢迎兄弟院校师生和读者指正，以便再版时改进。

编 者

PREFACE

According to the spirit of Ministry of Education “Basic requirement of medicine special course”, combining our teaching practice, and referring to domestic and international relevant information, we have compiled the teaching material, “physiology experiment and guide” .

This book, included 45 experiments, gives prominence to the basic theory , the basic operating and the basic ability. These experiments can be accomplished in the most physiological laboratories, besides a few for option. This book has still introduced general experiment animal and animal vivisection technology as well as instrument and equipment used in physiological experiment frequently, to offer the teaching needs of different speciality.

Compared with former edition, this book has increased corresponding English text. Because experiments in sense organ system have not been done frequently in pharmic college, so they have not been put in this edition again. The record of physiological phenomenon or reaction has been done with D95 – computer teaching system of physiological and pharmacological experiment dominating, supplemented with 2 – channel physiological recorder and eliminated the recording drum.

This book can be chosen as physiological experiment teaching material by pharmic and medical specialty or college, and also as reference for relevant teachers.

Compilers attending this book are teachers in Department of Physiology in China Pharmaceutical University. Their names are Qilong Ding, Qiujuan Wang, Yunman Li, Yulin Wu, Qinglong Guo, Jihua Fu, Tianhua Yan, Bingbing Liu, etc

Since our level is limited, wrong and improper place is surely hard to avoid. We welcome teachers and students in brother colleges and reader to make a comment, to improve it in next edition.

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