教育部高等教育司推荐
国外优秀生命科学教学用书

Foundations in Microbiology

Basic Principles Sixth Edition

Mc Graw Hill Education

微生物学基础

第6版 影印版

Kathleen Park Talaro

高等教育出版社
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《微生物学基础》(第6版)中文序言

——一本值得学习和借鉴的优秀教材

教材是教学的载体，是完成教学的重要基础，高质量的教材是提高教学水平的关键。《微生物学基础》第6版(Foundations in Microbiology, Sixth Edition)就是这样一本高质量的教科书，本书从20世纪90年代中期出版以来，每隔两年一版，已连续出版了六版。每一次改版，都是以崭新的面貌出现，使教材内容与迅速发展的微生物学科相适应，保持了教材的科学性、先进性、新颖性。在欧美和亚洲等许多国家，这是一本颇受欢迎的优秀微生物学教科书。本书的主编是美国帕萨迪纳城市学院的Kathleen Park Talaro教授，她从事微生物学教学已近40年，对微生物学充满了深切的热爱和执着的追求。她从不满足现状，2008年新出版的《微生物学基础》第6版更体现了她一贯的风格和执着追求高水平的敬业精神。本版除保留了前五版中众多成功的特征和优点外，对结构布局进行了重要调整，内容全面更新、修改和补充，使该书更具特色，优点更加突出，值得我们学习和借鉴之处更多，具体表现在下列诸方面：

1. 以学生为本，激发兴趣，注重创新

为了使学生能真正学到有用的知识，并获得在今后工作中应具备的能力，这本书充分体现了以学生为本的教学理念，并将这种理念贯穿全书。首先，在本书的前言中，作者用了一定篇幅介绍学好这门课的技巧和其他重要因素，包括学习目的、毅力、态度，甚至如何记忆术语、词汇的“决窍”等。此外，作者对学生易混淆的词汇或术语还进行了特别提醒，如原核生物(Procaryote)和真核生物(Eucaryote)的拼写，词中的“C”是用C还是用K？革兰氏染色(Gram staining)和革兰氏阳性(gram-positive)、革兰氏阴性(gram-negative)中的“G”应是大写还是小写？其次，在本书的每章中都设有3~5篇颇具特色的插入短文，包括下列四种类型：历史、医学、发现和微生物学。在每个插入短文中都增设了问答题，其解答可在网站上查到。所述内容生动活泼，具启发性，能激发学生主动学习的积极性，培养他们的创新能力。如：“创造人工病毒!”(Artificial Viruses Created !)；“母亲为什么不排异她的胎儿?”(Why Doesn't a Mother Reject Her Fetus?)；“生命的协同作用：互惠共生”(Life Together: Mutualism)；“极端环境中的生命”(Life in the Extremes)；“光驱动的有机合成”(Light-Driven Organic Synthesis)；“利用‘热’微生物赚钱”(Cashing in on 'Hot' Microbes)；“从巫术到神奇药物”(From Witchcraft to Wonder Drugs)；“设计药物的现代探索”(A Modern Quest for Designer Drugs)；“药物抗性的增长”(The Rise of Drug Resistance)等，有的还附有漫画。每章末还附有四种习题：概念题、多项选择题、思考题和网络查询题，其最后还设有含有关键术语的章节摘要。这些习题都具有不同的侧重点、难度和形式，但都极有利于学生主动极积地学习：概念题是要求学生对概念题写出一段或二段解答；思考题是没有单一和标准答案的题型，学生们必须利用刚学过的事实和概念进行推论、解释和讨论；网络查询题既具有学习内容的先进性及拓展性，又是一种培养学生独立学习和解决问题能力的好办法。例如，“微生物遗传”这一章的网络查询题中，其中一题是要求学生通过网络查询有关“内含子”(introns)的信息，并对其可能的功能至少说出5种目前的推测。这显然是最新的学科进展方面的内容，课本中不可能详细描述，但学生在课堂上学到基本概念后，通过“网络查询题”的引导而拓展知识，更重要的是增长了学生独立获取知识的能力。

2. 体系新颖，结构严谨，逻辑性强

第6版教材整个体系有较大的改变，特别是“分类学”这一章，传统上是放在教材的后部分介绍，但在本书中却是放在第一章就介绍分类学，第4、5和6章叙述微生物类群。作者认为“学习微生物学一开始就要用到微生

物的科学名称，有分类学基础的学生，在以后的章节中出现分类就容易学习”，这一新的编排思路确实使人感到了作者是将她的丰富教学经验与创新思维进行了完美的结合，使这本书的体系新颖、结构严谨，逻辑性强。更令人耳目一新的是，在每章的开头新增设了一个栏目“微生物学中的真实案例研究”，其解答设在各章末尾。这是作者花了大量的时间和精力从临床杂志和其他可靠来源收集到的。该栏目不仅使各章显得面目一新，而且更重要的是，使学生学习每一章时，首先接触到一个真实的案例，而且该案例与本章内容相关，学生可在课文中找到“神秘疾病”的微生物线索。这既是教材的创新点，更是作者敬业精神的诠释，从而使本书达到了理论与实践的自然结合，学生的学习兴趣蕴育于其中的高境界。本书保留了第5版的许多优势和特色，例如将微生物的营养、生态学和生长作为一章(第7章)来进行综合介绍，这能更好地反映微生物生长与外界条件及生态环境的紧密关系及其规律，也充分体现了微生物学科与其他学科的交叉性，而且还减少了篇幅，显得内容少而精，标题新颖。这与目前国内外其他微生物学教材用三章的篇幅来分别介绍微生物的营养、生长和生态的传统编排体系相比，无疑有其独到之处。又如：将“药物、微生物、宿主-化学治疗的要素”作为第12章叙述，以微生物为中心，将微生物与药物以及与宿主的关系进行了精彩的描述。此外，本书还将研究微生物的方法单独列为一章，体现了微生物在研究方法上不同于其他生物的独特性，并在“培养微生物的方法”这一节中综合提出了5个“I”：接种(Inoculation)、培育(Incubation)、分离(Isolation)、检验(Inspection)、鉴定(Identification)五大基本技术。这也表明了本书布局合理，层次清楚，有机整合，综合性强，颇具创新和特色。

3. 特色鲜明，重点突出，取材新颖

本书的内容强调微生物与人的关系，体现了以人为本的理念。虽然对微生物在其他众多领域(例如工业、农业、环境保护等方面)的描述显得有些单薄，但总的来说，它是一本颇具特色的优秀教材。本书的内容重点是微生物学基本原理，且侧重于医、药和卫生方面应用的微生物学，因此无论是内容的取舍，还是插入短文，或是思考题、附录等，都充分体现了这点，而且也是本教材的特色。本书的取材新颖，增添了不少新资料和新知识，使之与迅速发展的微生物学科相适应，保持了教材的先进性。例如，对发展十分迅速的生物膜的重要性及其功能进行了拓新；根据学科的发展，对宿主、防御和免疫学章节进行了重大改变，增添了许多新的信息；对病毒及其疾病，如流行性感冒及其疫苗、朊病毒、艾滋病等部分均进行了拓展、改组和更新。在第13章还特别新增加了一个插入短文“柯赫氏法则：解决新疾病的困惑”(Koch's Postulates :Solving the Puzzle of New Diseases)，针对现在发现的许多感染因子(如病毒和专性寄生细菌)难以培养或不能被培养的事实，作者进行了图文并茂的阐述，说明柯赫氏法则（或经修改的）仍然在现代流行病学中起着重要作用这一道理。

此外，书中还适时适量地、以不同的形式介绍了一些新的技术和进展，如：用DNA测序来检测免疫缺陷疾病；微生物基因组测序；用基因芯片分析基因表达；用转基因动物生产药物；控制基因表达的小分子RNA；微生物形成的生物膜(biofilms)等。甚至在介绍最基础的微生物细胞计数时，也将库尔特计数器(Coulter counter)和流式细胞仪(flow cytometry)在微生物细胞计数中的应用进行了比较详细的介绍，这些方法不仅可精确计数，而且还可以测定细菌细胞的大小，区分死、活细胞及革兰氏阳性和革兰氏阴性细菌。

4. 照片、插图、表格设计精美，形象而生动

本书是一本集系统性、科学性、先进性于一体的微生物学教科书，同时也称得上是一本艺术作品。本书主编Kathleen Park Talaro教授不仅是一位资深的微生物学教育家，而且也是一位摄影家、插图画家。她将科学和艺术进行了完美的融汇，使本书的插图、照片、表格不仅生动形象，而且具有科学的精确性、吸引力和独特性，其中许多插图可以说是无与伦比。全书每一页几乎不是有图，就是有表，或是有照片，使读者能一目了然，做到了文字少而精，但仍能给读者深刻的印象，易读、易懂、易记，增强了教材的可读性、实用性和艺术性。这也是这本书能成为国际上优秀的微生物学教科书的重要原因之一。

沈 萍 陈向东
武汉大学生命科学学院
2008年12月25日

前　言

微生物学和整个世界

在本书的修订期间，我用了大量时间查阅有关微生物学的新信息，使我沉浸于我所钟爱了近40年的微生物学科之中。微生物的非凡重要性及其影响再一次提醒我，虽然微生物的一些普通知识能够帮助世界上大多数人改善观念，而使我倍受鼓舞，但这是远远不够的。最近一则几乎占支配地位的新闻——来自于禽流感的威胁，令人深思，假如更多的人认识到它是由一种看不见的病毒引起和传播的，这种病毒存在于空气中，通过人们的手、环境中的物体，甚至他们吃的食物而传染，那么人们就会知道如何更好地控制它，这并不需要进行大量的培训，只要懂得一些简易的非医学预防常识就可以，例如，用普通肥皂洗手，小心处理动物的尸体，利用阳光和热水清洁器具和衣服，对身体分泌物的接触会传染这些致病因子有清醒的认识。这些知识看似微不足道，但在公共卫生防御和治疗中却关系重大，它能非常有效地抑制禽流感和许多其他的易感染因子的传播。

在你的一生中，可能会遇到持续不断的这些相关疾病的挑战，你可能会面对抗药细菌、新的传染病和医学发展带来的机会病原疾病的一些问题，面对这些问题，你的微生物知识和判断的信心能够使你战胜恐惧，而这只不过是你学习微生物学将会得到的许多礼物之一。同时，你也将通过多种途径去理解微生物对于地球本身的基本功能也是必须的*。这一平衡的观点从本教科书最早的第一版起都是一直坚持的。

这本书与前一版的区别是什么？

如果你对微生物学还不甚了解，那么这本书将会使你很快明白，微生物学是一门复杂且覆盖面甚广的交叉学科，微生物学从基础生物学和细胞化学一直延伸到微生物在自然界的作用、在工业生产中的应用以及与人类社会的复杂关系。所以微生物学确实对于每个人都是有用的，不管你学习的目的是为了健康专业的培训而来提高操作技能，还是只为增进你对这个看不见的微小世界的实际知识。

具有吸引力，简明易懂的阐述

这本书的主要目标是要实现易懂和易读的风格和原则，既不太冗长，又不过分简单，清晰而生动地解释复杂的论题。与上一版一样，我仍然按概念上合乎逻辑的秩序，将前一章与后一章的内容有机地串连起来。因为学生中存在学习水平和学习态度的差异，所以本版还增强了对于学习毅力、理解和成功的教育。

生动、形象的艺术插图

对这一版中的插图都进行了改进，使其不仅与课文一致，而且有助于清楚形象地表达抽象概念。我力求自己制作的插图具有科学的精确性、吸引力和独特性，其中许多插图可以说是无与伦比。这些艺术插图可以作为理解、复习和讨论的“靶点”。

提前介绍分类学和微生物类群概况

提前介绍分类学(第1章)和微生物类群概况(第4,5和6章)是这一版的独特之处，因为学习微生物学一开始就要用到微生物的科学名称，有分类学基础的学生，在以后的章节中出现分类就容易学习，我总觉得微生物就是“名星”。如果学生们通过对微生物类群概况的学习，从而掌握了关于细菌、病毒和真核微生物主要特性的重要知识，那么他们在随后的营养、代谢、遗传学和微生物控制等论题的学习中将会受益匪浅。

有关疾病的几章内容编排

我们用微生物的类群(分类学)来组织有关病原体的章节(18～25章)，因为许多读者觉得这样安排能够使内容更有序，更集中于病原体的感染因子，而不仅

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* 在搜索引擎中键入 The DNA Files Planet of the Bugs 并下载阅读一段引人入胜的，涉及我们与微生物的“爱/恨”关系的对话。

是其解剖学和生理学特性。微生物的所有特性和它引起疾病可以同时显现，这种系统将不仅仅为进行实验室操作的学生所熟悉，而且它也有助于学生对微生物类群和它们引起的疾病之间存在的差异保持比较清晰的认识。

《微生物学基础》第6版变更的总体状况

因为微生物学的不断变化和发展，这本教科书也必须相应地变化和发展，以紧跟学科发展趋势，而可以继续被使用。因此该版的大多数章节都进行了较大的修改。我邀请了从第5版以来就为本书作出贡献的两位学者：一位是帕萨迪纳城市学院的教师，我的同事 Barry Chess；另一位是俄亥俄州迈阿密大学的 Kelly Cowan，感谢他们帮助撰写更新的部分和颇具见识的插入短文，提出新的和改良插图的想法，编辑和更新文字，改进章节的综述、摘要和问题。

内容的全面更新和修改

每章节的正文和插图均进行了全面地修改，包括新绘制和修改的图和新的照片、重写和改写的正文、增添的新问题和插入短文以及新的发现。统计资料的收集时间尽可能接近发稿时为止。我尽力通过仔细编辑和对现有论题的酌请删减或浓缩来增加新材料和插入短文，从而保持了原有的篇幅。

在第4、7、12、13、21和26章中，增加或扩展了有关生物膜的重要性及其功能的内容。第25章扩充了一节，其内容是流行性感冒及其疫苗；肝炎占有较大的篇幅，艾滋病部分进行了改组和更新，对朊病毒叙述较详细。

有关免疫学和医学实验室检验几章内容的新增和修订

宿主防御和免疫学的内容进行了重大的改变。

★第14章的题目现在已改为“非特异性宿主防御”，该章专门介绍先天应答。对涉及发炎、吞噬作用、血细胞和补体的几幅图进行了修改。

★获得性免疫的大多数内容已移到第15章，现在该章的题目是“适应性、特异性免疫和免疫法”。这一章主要是介绍免疫类型的分类。对T细胞反应的正文内容和图进行了改组和简化。前一版第16章中的疫苗部分已放置在这章的最后。

★前一版第17章免疫病理学，现在将它放入第6版的第16章“免疫失调”。

★第6版第17章是全新的“感染诊断”，将诊断传染病使用的方法集中在一起，这一章包含了从收集病人标本开始，一直到详细的生化、血清学和分子生物学方法鉴定引起疾病的微生物的全部内容。

每章新增设的案例研究

这一版中，最令人兴奋的变化之一是在每章的开头新开设了一个栏目“微生物学中的真实案例研究”，该栏目使各章显得面目一新。这些显示卫生保健和其他应用微生物学领域中的真实案例，是从临床杂志和其他可靠的来源收集到的。用这些案例研究是为了将该章中的一些概念和例子与实际相结合，当学生们阅读课文的正文部分时，他们将会从中找到揭示案例中“神秘疾病”的微生物线索。有关这些案例的解答都放在各章末尾的摘要之前。

增强了版面的视觉效果

用鲜明的色彩和更加真实的效果对大多数插图进行了重新制作，像上一版本一样，插图注意与正文描述的内容密切联系并充分地标注，尽可能精减说明文字，并将语言叙述巧妙地放入图中。

颇具见识的插入短文

插入短文栏的题目现改名为“洞察”（Insight），包括下列四种类型：历史、医学、发现和微生物学。正文中还增加了几篇新的插入短文，但我们设法保持每章中的总数不超过3~5篇。为了强调插入短文中的信息是与课文学习相关并且是很有用的，我们在每个插入短文中都增设了问题，其解答可在网站上查到。这使教师可布置插入短文和问题作为作业。

注释

在多数章中，我还增加了一些简短讨论，并将其命名为“注释……”（A note about…），其内容是从正文的相关部分引申的。这些注释有助于澄清或进一步阐明该章主题或术语的某个方面。这种特点的一个实例是在366页的“关于生物膜和药物抗性的注释”，在相关课文内容的基础上，进一步诠释了它们之间的重要关系。

设在每章末的问题

我们仔细地编辑了设在每章末的问题部分，大多数章中的问题都修订过，有些章还增添了一些新的问题。多项选择题的解答在附录E中。为了提示学生可

在书中迅速找到论题的主要位置，我们对概念题(Concept Questions)还增设了参考页码。教师可使用网站获得概念题的解答。

关注名词的拼写和使用

在教科书中，有些词的拼写和用法可能存在混淆。常出现的混淆之一是有关原核生物(Procaryote)和真核生物(Eucaryote)的拼写。在本书中，我反复考虑这两个术语应如何拼写。因为有一种拼写是用希腊语“k”替换c的拼写法，如Prokaryote(原核生物)。这两种拼写都是有效的，但在编辑上则要确定选择哪种。我决定采用伯杰氏手册(一本有关细菌鉴定的权威手册)的拼写法。

另一个易混淆的是关于革兰氏染色(Gram stain)的用法，该词是丹麦细菌学家Christian Gram发明并以他的名字命名的一种重要的细菌鉴定方法。当作为染色或用作名词时，例如，革兰氏染色(Gram staining)或革兰氏染色法(Gram stain method)，该术语的第一个字母是大写；当该词语用作修饰语的一个部分时，如：革兰氏阳性(gram-positive)和革兰氏阴性(gram-negative)，则是小写。应该注意的是，这个“G”在标题中总是大写，美国微生物学学会就是采用这种风格。

在近几年，医学教科书和期刊的编辑们已经删除了所有以个人名字命名疾病的相关词，因而Crohn's disease(克隆氏病)变成了Crohn disease(克隆病)，Kaposi's sarcoma(卡波西氏肉瘤)变成了Kaposi sarcoma(卡波西肉瘤)。这样做有双重好处，一方面简化了术语，另一方面也消除了该疾病“属于”其发明者的麻烦。

强调加强理解的学习方式

你们中的大多数人或许将这门课程作为今后从事护理、口腔卫生、医学、药学、验光配镜业或者医师助理等行业中的健康科学计划的必修课，因为你们准备从事的职业涉及与病人打交道；你们将参与传染病的控制和预防，这些都需要你们考虑微生物以及如何处理它们。这意味着，你们不仅要具备有关细菌、病毒和其他微生物的特性、它们的生理学和在地球上原居小生境的知识，而且你们还必须掌握疾病传播、感染过程、消毒程序和药物治疗。你们也需要懂得免疫系统与微生物的相互作用和免疫法的效果。所有这些领域又都会产生自己的词汇和术语——这些对于你们大多是很陌生的，而要掌握它们得需要时间、动力和心理准备。现在你们当然会问：“我怎样才能学会这些知识，从而在今后的课程学习中获得成功，并在将来也不会忘记呢?”

首先，要看指导你的教师如何组织你的课程，因为这些知识是一个学期或半个学期学不完的，所以你们的教师将选择他们认为的重点，并布置阅读和习题作业。许多教师有详细的课程提纲或者学习指导，引导班级学生学习指定的内容和词汇；其他教师也可能通过他们自己的网站来布置作业甚至小测验。所有这些提供的材料，都是你们学习的重要指导。

其次要考虑的是，最适合你自己的学习方式。想要获得成功，你必须记住基本的概念和术语，Edgar Dale提出了一个如何记住信息的称之为“学习金字塔”的记忆法：通过阅读可记住约10%；通过听可记住20%；通过看可记住30%；既看又听可记住50%；与其他人讨论可记住70%；亲自经历过的可记住80%；对其他人进行讲授的同时可记住95%。

从这样一个“学习金字塔”可以看出，有许多吸收信息的途径，但重要的启示是，你应该通过多种途径，包括阅读、写作、绘制简单图表、与其他人讨论或研究等多种方式来进行学习。这意味着你不仅要阅读这本书，而且还要从中找到重点；你必须去听课，并参加实验室会议，听你的老师或教学助理讲授这些知识；听课时记下的笔记要重新整理或理出要点，这样就启动了积累记忆的过程。你也可以与其他人(可以是辅导老师或学习小组)进行讨论，甚至有时候可充当一下教师的角色去讲授，通过这种互动的方式，使你不是死记硬背地去记，而是在理解中记忆，这样才能在今后应用它们。

自我测验是评估你对学习的理解和水平的一条重要途径。你可以利用课文中的试题、学习指导或者你自己组织进行测验。自我测验的一种技巧是根据笔记制作一套词汇抽认卡片(这种制作本身就是一种很好的训练)，然后利用此卡片来随时反馈以往你所学的概念或者词汇。这种自我测验的手段还带来另外一个好处，那就是，可使你以轻松的心情去应对考试，这也是你进行自我评估的根本所在。

学习中的另一重要因素是学习的频率。在两周中

坚持每天学习1小时左右比在一个周末临时抱佛脚学习14小时的效果好得多，因为大脑需要休息和调节。如果你积少成多地学习这些相关的词汇和主题，时间长了，你就会发现你所学的知识是融汇贯通的。总之，学习的过程是一个不断激励自己和端正态度的过程，一个人被强迫去记住一些事情和自己想要去了解、记住某事之间的效果差异颇大。不管你的最终目标是什么，取得最大的成功和获得好的成绩才是关键。虽然要真正掌握本教科书中的内容需要付出极大的努力，但是数百万的学生将会证明，这种努力和付出在他们的职业和每天的生活中是很值得的。

采用该书作教材的教师可向McGraw－Hill公司北京代表处联系索取教学课件资料，传真：(010) 62638354，电子邮件：webmaster@mcgraw-hill. com. cn。

（沈 萍 陈向东 译）

学生和教师通过浏览此导读，可了解这本书的主要特征。下面这几页是将本书的插图和教学法构架（每章均接此构架组织教学）进行形象化展示。

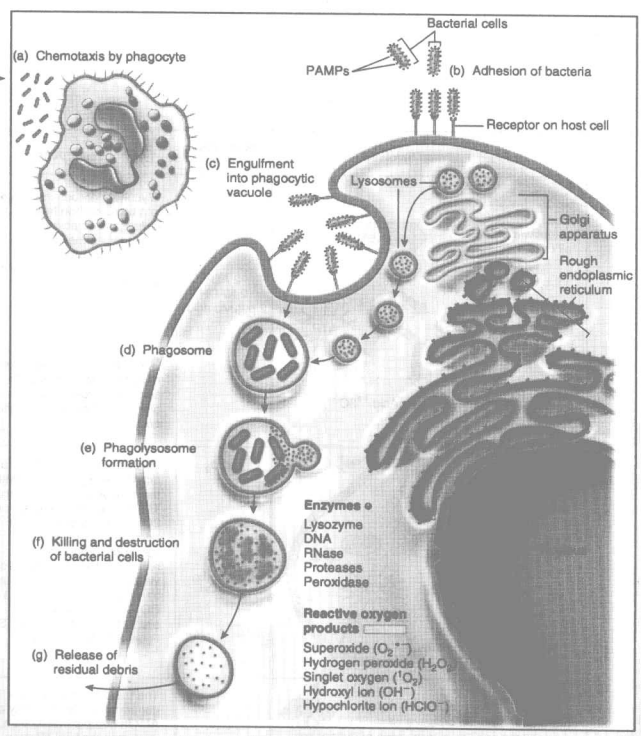
导 读

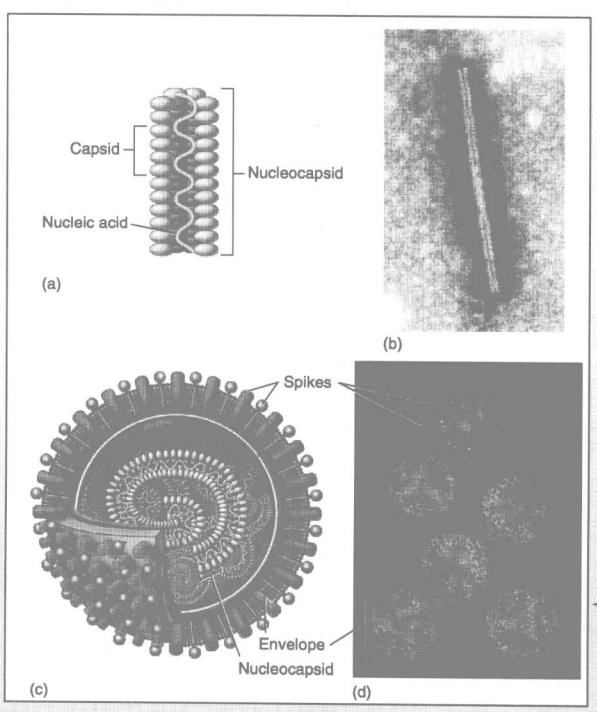
阐明概念的教学插图

《微生物学基础》为学生提供了形象生动的描绘概念的插图，每幅插图都色彩鲜明、多维而完整，概念叙述明确，使学生一个可视化的角度（一个已被证实的学习技巧）来学习微生物学中具有挑战性的概念。

过程图

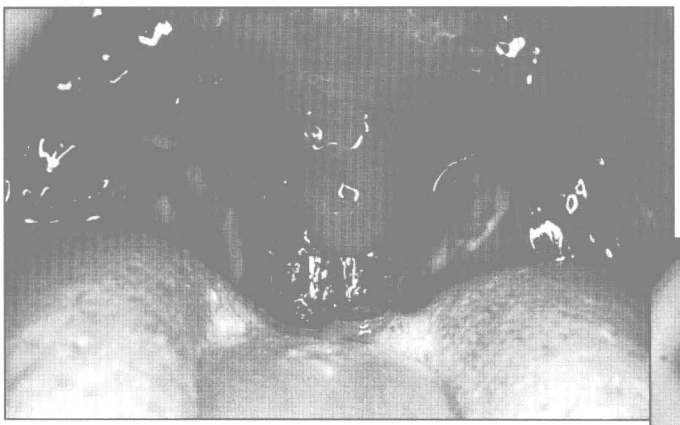
将许多困难的微生物学概念通过一步一步的图解，使学生容易理解。图中的每一步都有清楚的说明，并且与叙述相配合，使所有类型的学生都受益。

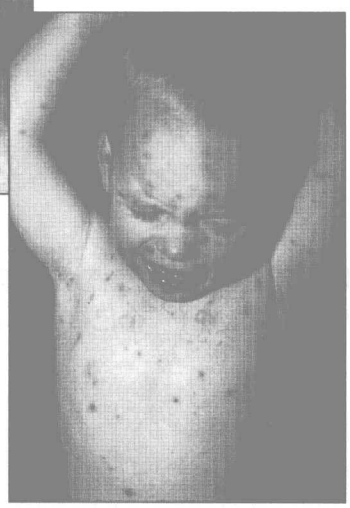




组合图

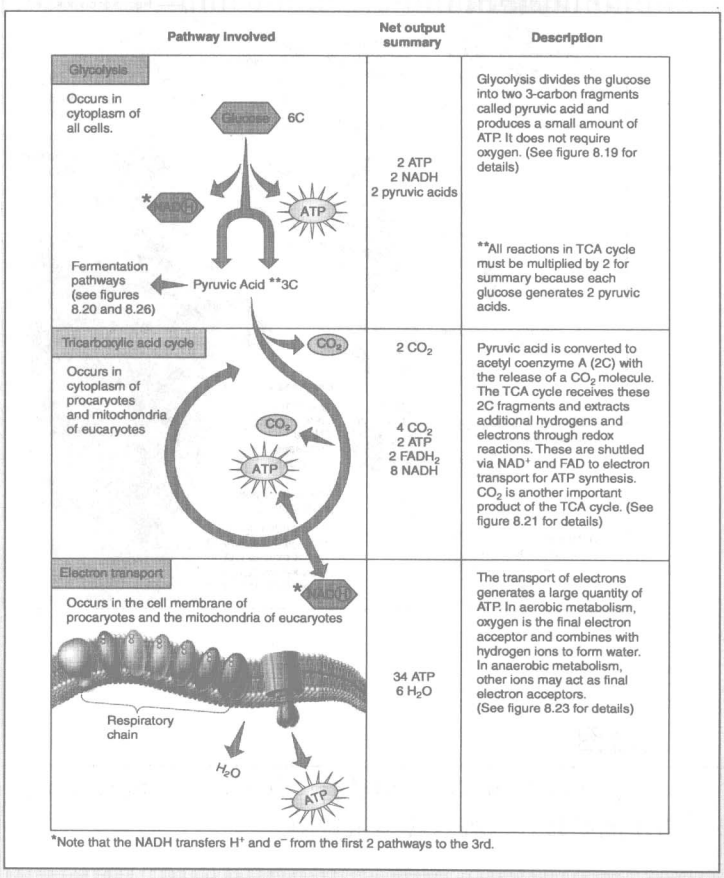
艺术线条图与照片相结合，从而给学生两种视角：真实的照片和清晰的线条示意图。





临床照片

病患者的彩色照片，给学生提供了一个真实的临床观察，使学生亲眼看到微生物是如何在人体上肆虐的。



概括图

微生物学的许多具挑战性的概念是由大量相关内容组成的，通过形象地将这些内容进行综合归纳，有助于学生将相关内容串起来，形成一个完整而理性的画面。

帮助学生系统学习的教学法

每章的内容都用统一的教学方法进行组织，这样的组织能使学生建立一致的学习策略并增进他们对概念的理解。

微生物学中的真实案例研究

所有章都是从真实案例的研究开始，它将帮助学生认识和了解微生物学对我们的日常生活究竟有怎样的影响。这些案例研究的解答都设在每章的末尾。

Real Case Studies in Microbiology

In July of 2002, a 55-year-old woman was brought into a Lane County, Oregon, hospital emergency room. She was unconscious, with low blood pressure and an irregular heart rhythm. Emergency room personnel observed that she had hives all over her body, swelling or edema in her arms and legs, and that her tongue was swollen.

The woman's daughter reported that she and her mother had been doing yard work outside, trimming a hedge beside the mother's house. Her mother gave a sudden shout, took three steps, and collapsed. The daughter immediately called 911, and paramedics arrived within 5 minutes.

Soon after doctors started attending to the woman, her heart stopped. After 30 minutes of treatment, her heart rhythm returned, but the time without blood flow caused her to suffer a massive stroke, and she never regained consciousness. Her family elected to disconnect her from life support 4 days later.

- What happened to the woman that led to her death?
- Why would this event cause death?
- What measures could be taken to have prevented what happened?

(Continued on page 509)

Real Case Studies in Microbiology

(Continued from page 481)

Further investigation by health care personnel revealed that the woman was allergic to wasp stings; a sting mark was discovered on her fingertip, and a nest of yellow jackets was found in the ground below the hedge she had been trimming.

Her death was caused by a severe, systemic allergic reaction to protein in the wasp venom, which resulted in a condition called anaphylaxis or anaphylactic shock. Anaphylactic shock initiates a host of conditions simultaneously throughout the body, causing airway blockage and circulatory collapse within a matter of minutes.

Approximately 1% to 3% of the population has some type of allergy to insect venom, usually to the venom produced by bees and that cause anaphylactic shock. People with known allergies to insect venom should wear a medical ID bracelet stating their allergy, as well as talk to their doctors about getting an insect sting allergy kit to carry with them at all times. These usually contain some form of injectable epinephrine which is a rapid antidote to the respiratory symptoms.

See: Li, J. T., and Yunginger, J. W. 1992. Management of insect sting hypersensitivity. Mayo Clin. Proc. *67:188–194.*

Muellman, R. L., Lindzon, R. D., and Silvers, N. S. 1998. Allergy, hypersensitivity and anaphylaxis. In P. Rosen, editor Emergency medicine, concepts and clinical practice. *4th ed. St. Louis: Mosby Year Book.*

Checkpoint

- Immunodeficiency diseases occur when the immune response is reduced or absent.
- The impairments to the immune system result in major problems with recurrent infections and cancers.
- Primary immune diseases are genetically induced deficiencies of B cells, T cells, the thymus gland, or combinations of these.
- Secondary immune diseases are caused by infection, organic disease, chemotherapy, or radiation.
- The best-known infection-induced immunodeficiency is AIDS.
- Cancer is caused by genetic transformation of normal host cells into malignant cells. These transformed cells perform no useful function but, instead, grow unchecked and interfere with normal tissue function.
- Cytotoxic T cells, NK cells, and macrophages identify and destroy transformed cancerous cells by means of immune surveillance. Cancerous cells survive when these mechanisms fail.

要点归纳

每章中涉及的重要内容，都在章后以摘要的形式归纳成几个要点。

“洞察”读物

现实社会使学生们必然要考虑，他们所学的知识有何实际应用价值，因此本书设置的“洞察”读物包含了四种类型：发现、历史、医学和微生物学。鉴于插入短文中的信息读起来贴切而有用，所以本版中还增加了一些问题，以便进一步促进学生的学习和理解。

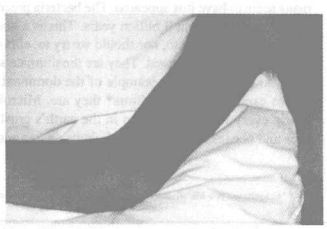
INSIGHT 25.3 Medical

AIDS-Defining Illnesses (ADIs)

In AIDS patients who do not receive, or do not comply with, antiretroviral therapy (and even in some who do), the slow destruction of the immune system results in a wide variety of infectious and noninfectious conditions, called AIDS-associated illnesses, or AIDS-defining illnesses (ADIs). It is almost always one or more of these conditions that causes death in AIDS patients.

Because the virus eventually destroys an essential immune function, it is not surprising that the body is beset by normally harmless microorganisms, many of which have been living in or on the host for decades without causing disease. The spectrum of AIDS-associated illnesses also provides insight into how vital the immune system is in controlling or mitigating cancerous changes in our cells. AIDS patients are at increased risk for Burkitt lymphoma, Kaposi sarcoma (KS), and invasive cervical carcinomas, all of which are associated with viral infections.

Since the beginning of the AIDS epidemic in the early 1980s, the CDC has maintained a list of conditions that are part of the case definition. The list has been modified periodically over the two decades of its existence. One of the ways that people currently meet the case definition for AIDS is if they are positive for the virus, *and* experience one or more of these ADIs. The ADIs are listed in **table 25.A.** The diseases are listed according to the organ system where the presenting symptoms might be found. (Some of the conditions may be listed in more than one column.)



Kaposi sarcoma lesion on the arm. The flat, purple tumors occur in almost any tissue and are frequently multiple.

You can see that many of them—or at least, the way they occur in AIDS patients—are very rare in the otherwise healthy population.

■ **What accounts for the enormous variety in AIDS-defining illnesses?**

Answer available at www.mhhe.com/talaro6

注释

大多数章都没有从正文引申出的简短讨论，我们将其称之为“注释……”，它可及时地帮助学生澄清或进一步阐明论题或术语的某一个方面。

A Note About Biofilms and Drug Resistance

In chapters 4 and 7, we emphasized the universal existence of microbial biofilms in ecological settings. Recall that in these complex communities, certain “pioneer” microbes anchor themselves to a substrate by secreting an extracellular matrix. More than being just an inert film, this initial colonization stimulates a network of cross-attachment by other microbes migrating into the film. In some habitats (soil, for example), nearly all microbes are adapted to this sort of biofilm partnership.

It is estimated that around 60% of infections also involve biofilms containing single or multiple species of microbes (dental infections for instance). Often the infections occur on natural tissues—for example, bacterial infections of the heart valves, middle ear, and urinary tract. The increased use of indwelling medical devices has created yet another habitat in which biofilms may become tenaciously attached. Catheters, artificial valves and pacemakers, endotracheal tubes, and prosthetic joints can all serve as sites for persistent colonizations that are very difficult to treat and remove.

TABLE 1.1 (*continued*)

E. Biotechnology
This branch includes any process in which humans use the metabolism of living things to arrive at a desired product, ranging from bread making to gene therapy. It is a tool used in industrial microbiology, which is concerned with the uses of microbes to produce or harvest large quantities of substances such as beer, vitamins, amino acids, drugs, and enzymes (see chapters 10 and 26).

Genetic Engineering and Recombinant DNA Technology
These branches involve techniques that deliberately alter the genetic makeup of organisms to mass-produce human hormones and other drugs, create totally new substances, and develop organisms with unique methods of synthesis and adaptation. This is the most powerful and rapidly growing area in modern microbiology (see chapter 10).

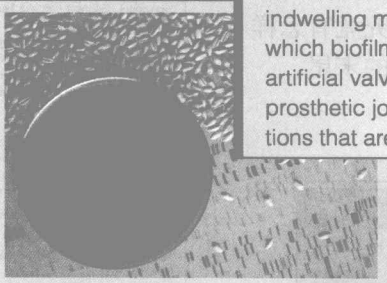


Figure E. These wheat seeds have been protected against disease with a genetically engineered bacterial culture that destroys fungi. In the background is a DNA fingerprint of the bacterium.

F. Branches of Microbiology

Branch	Chapter	Involved in the Study of:
Bacteriology	4	The bacteria—small single-celled procaryotic organisms
Mycology	5, 22	The fungi, a group of eucaryotes that includes both microscopic eucaryotes (molds and yeasts) and larger organisms (mushrooms, puffballs)
Protozoology	5, 23	The protozoa—animal-like and mostly single-celled eucaryotes
Virology	6, 24, 25	Viruses—minute, noncellular particles that parasitize cells
Parasitology	5, 23	Parasitism and parasitic organisms—traditionally including pathogenic protozoa, helminth worms, and certain insects
Phycology or Algology	5	Simple photosynthetic eucaryotes, the algae, ranging from single-celled forms to large seaweeds
Microbial Morphology	4, 5, 6	The detailed structure of microorganisms
Microbial Physiology	7, 8	Microbial function (metabolism) at the cellular and molecular levels
Microbial Taxonomy	1, 4, 5	Classification, naming, and identification of microorganisms
Microbial Genetics, Molecular Biology	9, 10	The function of genetic material and biochemical reactions of cells involved in metabolism and growth
Microbial Ecology	7, 26	Interrelationships between microbes and the environment; the roles of microorganisms in the nutrient cycles of soil, water, and other natural ecosystems

figure 1.1 how long that took! On the scale pictured in the figure, humans seem to have just appeared. The bacteria preceded even the earliest animals by about 3 billion years. This is a good indication that humans are not likely to, nor should we try to, eliminate microorganisms from our environment. They are the ultimate survivors.

Another dramatic example of the dominant influence of microbes exert is how **ubiquitous*** they are. Microbes can be found nearly everywhere, from deep in the earth's crust, to the polar ice caps and oceans, to the bodies of plants and animals. Being mostly invisible, the actions of microorganisms are usually not as obvious or familiar as those of larger plants and animals. They make up for their small size by occurring in large numbers and living in places that many other organisms cannot survive. Above all, they play central roles in the earth's landscape that are essential to life.

Microbial Involvement in Energy and Nutrient Flow

Microbes are deeply involved in the flow of energy and food through the earth's ecosystems.[1] Most people are aware that plants carry out

*ubiquitous (yōō-bĭk'wĭ-tŭs) being, or seeming to be, everywhere at the same time.

1. Ecosystems are communities of living organisms and their surrounding environment.

表格

本版书包含有大量带图的表格，这些表格由线条分格，便于阅读和理解。

脚注

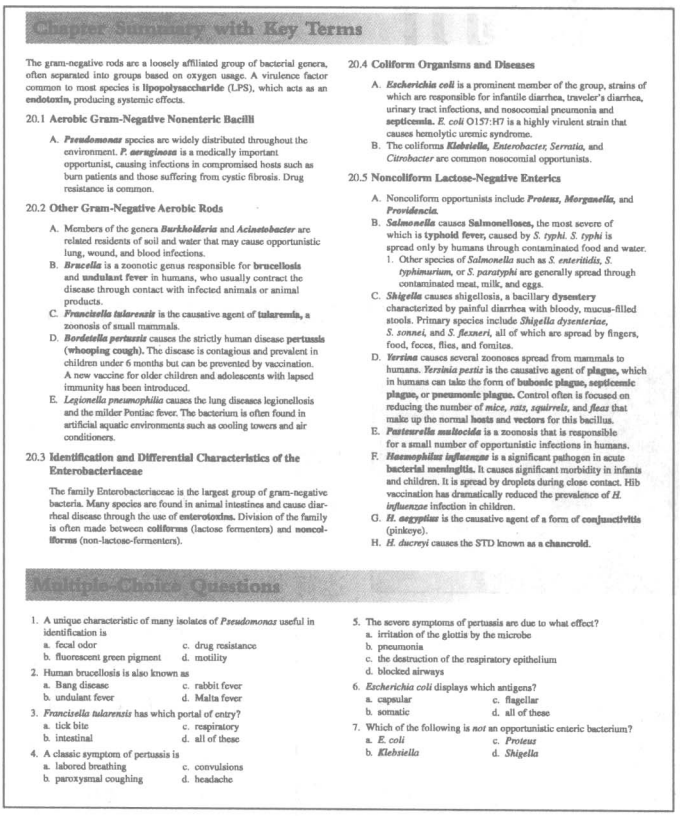
脚注用来补充说明课文中的某些内容，从而帮助读者理解。

术语

用*标示某些词，向读者提供这些词的发音和解释。

含有关键术语的章节摘要

为学生提供每章中主要概念的简要提纲，并突出重要的术语。



Chapter Summary with Key Terms

The gram-negative rods are a loosely affiliated group of bacterial genera, often separated into groups based on oxygen usage. A virulence factor common to most species is **lipopolysaccharide** (LPS), which acts as an **endotoxin,** producing systemic effects.

20.1 **Aerobic Gram-Negative Nonenteric Bacilli**

A. ***Pseudomonas*** species are widely distributed throughout the environment. ***P. aeruginosa*** is a medically important opportunist, causing infections in compromised hosts such as burn patients and those suffering from cystic fibrosis. Drug resistance is common.

20.2 **Other Gram-Negative Aerobic Rods**

A. Members of the genera ***Burkholderia*** and ***Acinetobacter*** are related residents of soil and water that may cause opportunistic lung, wound, and blood infections.
B. ***Brucella*** is a zoonotic genus responsible for **brucellosis** and **undulant fever** in humans, who usually contract the disease through contact with infected animals or animal products.
C. ***Francisella tularensis*** is the causative agent of **tularemia,** a zoonosis of small mammals.
D. ***Bordetella pertussis*** causes the strictly human disease **pertussis (whooping cough).** The disease is contagious and prevalent in children under 6 months but can be prevented by vaccination. A new vaccine for older children and adolescents with lapsed immunity has been introduced.
E. ***Legionella pneumophila*** causes the lung diseases legionellosis and the milder Pontiac fever. The bacterium is often found in artificial aquatic environments such as cooling towers and air conditioners.

20.3 **Identification and Differential Characteristics of the Enterobacteriaceae**

The family Enterobacteriaceae is the largest group of gram-negative bacteria. Many species are found in animal intestines and cause diarrheal disease through the use of **enterotoxins.** Division of the family is often made between **coliforms** (lactose fermenters) and **noncoliforms** (non-lactose-fermenters).

20.4 **Coliform Organisms and Diseases**

A. ***Escherichia coli*** is a prominent member of the group, strains of which are responsible for infantile diarrhea, traveler's diarrhea, urinary tract infections, and nosocomial pneumonia and **septicemia.** *E. coli* O157:H7 is a highly virulent strain that causes hemolytic uremic syndrome.
B. The coliforms ***Klebsiella,*** *Enterobacter, Serratia,* and *Citrobacter* are common nosocomial opportunists.

20.5 **Noncoliform Lactose-Negative Enterics**

A. Noncoliform opportunists include ***Proteus, Morganella,*** and ***Providencia.***
B. ***Salmonella*** causes **Salmonelloses,** the most severe of which is **typhoid fever,** caused by *S. typhi. S. typhi* is spread only by humans through contaminated food and water.
1. Other species of *Salmonella* such as *S. enteritidis, S. typhimurium,* or *S. paratyphi* are generally spread through contaminated meat, milk, and eggs.
C. ***Shigella*** causes shigellosis, a bacillary **dysentery** characterized by painful diarrhea with bloody, mucus-filled stools. Primary species include ***Shigella dysenteriae,*** *S. sonnei,* and *S. flexneri,* all of which are spread by fingers, food, feces, flies, and fomites.
D. ***Yersina*** causes several zoonoses spread from mammals to humans. ***Yersinia pestis*** is the causative agent of **plague,** which in humans can take the form of **bubonic plague, septicemic plague, or pneumonic plague.** Control often is focused on reducing the number of *mice, rats, squirrels,* and *fleas* that make up the normal **hosts** and **vectors** for this bacillus.
E. ***Pasteurella multocida*** is a zoonosis that is responsible for a small number of opportunistic infections in humans.
F. ***Haemophilus influenzae*** is a significant pathogen in acute **bacterial meningitis.** It causes significant morbidity in infants and children. It is spread by droplets during close contact. Hib vaccination has dramatically reduced the prevalence of *H. influenzae* infection in children.
G. ***H. aegyptius*** is the causative agent of a form of **conjunctivitis** (pinkeye).
H. *H. ducreyi* causes the STD known as a **chancroid.**

多项选择题

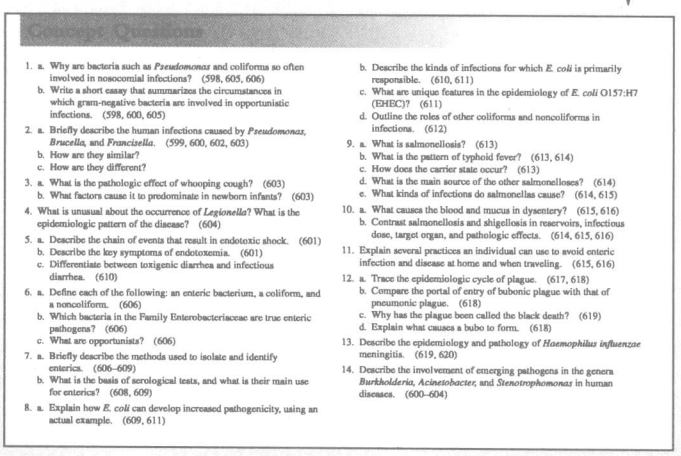
学生通过回答每章末的多项选择题，可以评定他们对知识掌握的情况。这些题的答案在附录 E 中。

Multiple-Choice Questions

1. A unique characteristic of many isolates of *Pseudomonas* useful in identification is
a. fecal odor　c. drug resistance
b. fluorescent green pigment　d. motility
2. Human brucellosis is also known as
a. Bang disease　c. rabbit fever
b. undulant fever　d. Malta fever
3. *Francisella tularensis* has which portal of entry?
a. tick bite　c. respiratory
b. intestinal　d. all of these
4. A classic symptom of pertussis is
a. labored breathing　c. convulsions
b. paroxysmal coughing　d. headache
5. The severe symptoms of pertussis are due to what effect?
a. irritation of the glottis by the microbe
b. pneumonia
c. the destruction of the respiratory epithelium
d. blocked airways
6. *Escherichia coli* displays which antigens?
a. capsular　c. flagellar
b. somatic　d. all of these
7. Which of the following is *not* an opportunistic enteric bacterium?
a. *E. coli*　c. *Proteus*
b. *Klebsiella*　d. *Shigella*

概念题

建议作为一种“从写到学”的经历，要求学生对概念题写出一段或两段解答，答案相关内容的页码附在每题之后。

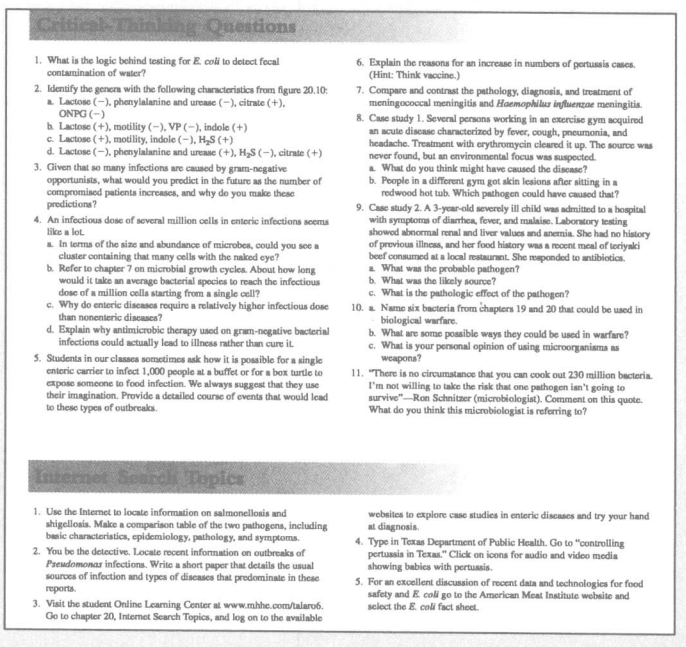


Concept Questions

1. a. Why are bacteria such as *Pseudomonas* and coliforms so often involved in nosocomial infections? (598, 605, 606)
b. Write a short essay that summarizes the circumstances in which gram-negative bacteria are involved in opportunistic infections. (598, 600, 605)
2. a. Briefly describe the human infections caused by *Pseudomonas, Brucella,* and *Francisella.* (599, 600, 602, 603)
b. How are they similar?
c. How are they different?
3. a. What is the pathologic effect of whooping cough? (603)
b. What factors cause it to predominate in newborn infants? (603)
4. What is unusual about the occurrence of *Legionella*? What is the epidemiologic pattern of the disease? (604)
5. a. Describe the chain of events that result in endotoxic shock. (601)
b. Describe the key symptoms of endotoxemia. (601)
c. Differentiate between toxigenic diarrhea and infectious diarrhea. (610)
6. a. Define each of the following: an enteric bacterium, a coliform, and a noncoliform. (606)
b. Which bacteria in the Family Enterobacteriaceae are true enteric pathogens? (606)
c. What are opportunists? (606)
7. a. Briefly describe the methods used to isolate and identify enterics. (606–609)
b. What is the basis of serological tests, and what is their main use for enterics? (608, 609)
8. a. Explain how *E. coli* can develop increased pathogenicity, using an actual example. (609, 611)
b. Describe the kinds of infections for which *E. coli* is primarily responsible. (610, 611)
c. What are unique features in the epidemiology of *E. coli* O157:H7 (EHEC)? (611)
d. Outline the roles of other coliforms and noncoliforms in infections. (612)
9. a. What is salmonellosis? (613)
b. What is the pattern of typhoid fever? (613, 614)
c. How does the carrier state occur? (613)
d. What is the main source of the other salmonelloses? (614)
e. What kinds of infections do salmonellas cause? (614, 615)
10. a. What causes the blood and mucus in dysentery? (615, 616)
b. Contrast salmonellosis and shigellosis in reservoirs, infectious dose, target organ, and pathologic effects. (614, 615, 616)
11. Explain several practices an individual can use to avoid enteric infection and disease at home and when traveling. (615, 616)
12. a. Trace the epidemiologic cycle of plague. (617, 618)
b. Compare the portal of entry of bubonic plague with that of pneumonic plague. (618)
c. Why has the plague been called the black death? (619)
d. Explain what causes a bubo to form. (618)
13. Describe the epidemiology and pathology of *Haemophilus influenzae* meningitis. (619, 620)
14. Describe the involvement of emerging pathogens in the genera *Burkholderia, Acinetobacter,* and *Stenotrophomonas* in human diseases. (600–604)

思考题

思考题没有单一的标准答案，学生必须用刚学过的知识和概念进行推理、解释或讨论来回答思考题。



Critical-Thinking Questions

1. What is the logic behind testing for *E. coli* to detect fecal contamination of water?
2. Identify the genera with the following characteristics from figure 20.10:
a. Lactose (−), phenylalanine and urease (−), citrate (+), ONPG (−)
b. Lactose (+), motility (−), VP (−), indole (+)
c. Lactose (+), motility, indole (−), H_2S (+)
d. Lactose (−), phenylalanine and urease (+), H_2S (−), citrate (+)
3. Given that so many infections are caused by gram-negative opportunists, what would you predict in the future as the number of compromised patients increases, and why do you make these predictions?
4. An infectious dose of several million cells in enteric infections seems like a lot.
a. In terms of the size and abundance of microbes, could you see a cluster containing that many cells with the naked eye?
b. Refer to chapter 7 on microbial growth cycles. About how long would it take an average bacterial species to reach the infectious dose of a million cells starting from a single cell?
c. Why do enteric diseases require a relatively higher infectious dose than nonenteric diseases?
d. Explain why antimicrobic therapy used on gram-negative bacterial infections could actually lead to illness rather than cure it.
5. Students in our classes sometimes ask how it is possible for a single enteric carrier to infect 1,000 people at a buffet or for a box turtle to expose someone to food infection. We always suggest that they use their imagination. Provide a detailed course of events that would lead to these types of outbreaks.
6. Explain the reasons for an increase in numbers of pertussis cases. (Hint: Think vaccine.)
7. Compare and contrast the pathology, diagnosis, and treatment of meningococcal meningitis and *Haemophilus influenzae* meningitis.
8. Case study 1. Several persons working in an exercise gym acquired an acute disease characterized by fever, cough, pneumonia, and headache. Treatment with erythromycin cleared it up. The source was never found, but an environmental focus was suspected.
a. What do you think might have caused the disease?
b. People in a different gym got skin lesions after sitting in a redwood hot tub. Which pathogen could have caused that?
9. Case study 2. A 3-year-old severely ill child was admitted to a hospital with symptoms of diarrhea, fever, and malaise. Laboratory testing showed abnormal renal and liver values and anemia. She had no history of previous illness, and her food history was a recent meal of teriyaki beef consumed at a local restaurant. She responded to antibiotics.
a. What was the probable pathogen?
b. What was the likely source?
c. What is the pathologic effect of the pathogen?
10. a. Name six bacteria from chapters 19 and 20 that could be used in biological warfare.
b. What are some possible ways they could be used in warfare?
c. What is your personal opinion of using microorganisms as weapons?
11. “There is no circumstance that you can cook out 230 million bacteria. I’m not willing to take the risk that one pathogen isn’t going to survive”—Ron Schnitzer (microbiologist). Comment on this quote. What do you think this microbiologist is referring to?

网络搜索题

为了进一步学习章节中的各种论题，在每章末都提供了网搜索题，以方便学生搜寻。

Internet Search Topics

1. Use the Internet to locate information on salmonellosis and shigellosis. Make a comparison table of the two pathogens, including basic characteristics, epidemiology, pathology, and symptoms.
2. You be the detective. Locate recent information on outbreaks of *Pseudomonas* infections. Write a short paper that details the usual sources of infection and types of diseases that predominate in these reports.
3. Visit the student Online Learning Center at www.mhhe.com/talaro6. Go to chapter 20, Internet Search Topics, and log on to the available websites to explore case studies in enteric diseases and try your hand at diagnosis.
4. Type in Texas Department of Public Health. Go to “controlling pertussis in Texas.” Click on icons for audio and video media showing babies with pertussis.
5. For an excellent discussion of recent data and technologies for food safety and *E. coli* go to the American Meat Institute website and select the *E. coli* fact sheet.

作者简介

凯瑟琳·帕克·特拉诺(Kathleen Park Talaro)

凯瑟琳·帕克·特拉诺是美国帕萨迪纳城市学院的微生物学家和教育学家。她出生在美国爱达荷州，在位于波卡特罗的爱达荷州立大学开始了她的大学教育，在那里，她还找到了一份适合她独特能力和兴趣的轻松工作，即利用业余时间绘制科学插图和做教学辅助工作。大学毕业后，她进入亚利桑那州立大学开始研究生学习，重点研究沙漠生物的生理生态学，并尽可能地参加了斯克里普斯海洋学会资助的大不列颠哥伦比亚探险调查。凯西其后继续扩充她的学术资历，首先在西方学院获得了硕士学位，随后在加州理工学院和加利福尼亚州立大学进修微生物学专业课程。

凯西讲授医学微生物学和生物学主修课程已30年，她专心致力于微生物学的课程建设和实验指导的更新，而且她还是学院医学专业协会的顾问。凯西在她的整个职业生涯中，培育了学生对微生物世界的极大热爱和对这个微小世界重要性的积极传播。当她看到她的学生们从对微生物知之甚少到能够深入地理解它们在自然现象中的重要意义时，心中充满了极大的满足。

凯西是美国微生物学会的会员。她一直精力充沛地开展自学和研究工作，出席各种研讨会和学术会议，使自己紧跟微生物学领域发展的前沿。此外，她还应用微生物学的简易课程，教育从幼儿园到高中的学生，所以她在科普教育方面同样做出了贡献。

郑重声明

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