Micro-biology

Microbiology Release Notes 2021

Publish Date:

June 2021

Revision Number:

3 4 5 6 7 8 9 10 CP 21 18 16

Page Count Difference:

The page count in this revision is 1,263, down from 1,317 in the previous version. The reduction is due to introducing a redesigned style and implementing errata updates throughout.

Errata:

Below is a table containing submitted errata, and the resolutions that OpenStax has provided for this latest text.

Location	Detail	Resolution Notes	Error Type
Various locations throughout	Photographs of conditions, diseases, and infections were presented only on lighter-toned skin.	Replace existing or add new images that present the conditions on darker-toned skin, and make minor text adjustments as needed.	Major book revision
Various locations throughout	Illustrations of bodies or body parts predominantly portrayed lighter-toned skin.	Recolor many illustrations to present a spectrum of skin tones, in order to better reflect the population.	Major book revision
Various locations throughout	"Gonorrheae" should be spelled with three Os, "gonorrhoeae", throughout: i. e. "Neisseria gonorrhoeae"	When referencing scientific name, ensure that "gonorrheae" is spelled with three Os, "gonorrhoeae", throughout.	Typo
Chapter 1 An Invisible World: Section 1.1 What Our Ancestors Knew	I noticed in the microbiology textbook in section "1.1 What Our Ancestors Knew", it says that Otzi the Iceman was carrying Piptoporus betulinus. This fungus has been reclassified to Fomitopsis betulinus since 2016.	Revise from "Piptoporus betulinus" to "Fomitopsis betulinus".	Other factual inaccuracy in content

Chapter 1 An Invisible World: Section 1.2 A Systematic Approach	The text explains binomial nomenclature and states that the second part of a scientific name (like the "sapiens" in "Homo sapiens") is called the "species." This is incorrect. The second name is referred to as the "specific epithet." The species name refers to both parts of the name. If someone asks you what species you are, the answer is "Homo sapiens," not "sapiens." Thanks!	Revise as indicated.	Other factual inaccuracy in content
Chapter 1 An Invisible World: Section 1.2 A Systematic Approach	When discussing how small subunit rRNA gene sequences are used to classify organisms it is more accurate to say small subunit rRNA gene sequences rather than just rRNA. Most scientists use the DNA version of the sequence to classify organisms and not the RNA version. When gene is left it lets our students assume only RNA sequences are used in classification when in fact RNA is rarely used since it is so much more challenging to work with. I propose whenever small subunit rRNA is included that the word gene is added after rRNA to help students see how important the DNA gene sequences are.	Revise the 2nd paragraph as follows: In the 1970s... differences they observed in the gene sequences coding for small subunit ribosomal RNA (rRNA) of different organisms. In the process... in terms of their small subunit rRNA gene sequences. To accommodate this... (Figure 1.11). Analysis of small subunit rRNA gene sequences suggests archaea, bacteria, and eukaryotes ...	Other factual inaccuracy in content
Chapter 1 An Invisible World: Section 1.2 A Systematic Approach	link to learning about phylogenetic trees redirects to http://www.wellcometreeoflife.org/interactive/ but it doesnt seem to load	This link will be updated.	Broken link

Chapter 1 An Invisible World: Section 1.3 Types of Microorganisms	Scale bars on the coccus and spirochete possibly mislabeled: perhaps should be nanometers not micrometers? (According to the scale bar as labeled that coccus bacterium is 800um in diameter; 0.8um (800nm) would make more sense.)	Revise Figure 1.13.	Other factual inaccuracy in content
Chapter 1 An Invisible World: Section 1.3 Types of Microorganisms	Candida albicans is not just a yeast: it makes buds, pseudohyphae, and true septate hyphae; it is dimorphic.	Revise two paragraphs as appropriate.	Other factual inaccuracy in content
Chapter 1 An Invisible World: Section 1.3 Types of Microorganisms	In the textbook, it says that algae are plant-like. I think that is not very good wording and misleading; it seems like a reference to the older classification systems in which they were considered with the plants. There is also a statement that, Protists are unicellular eukaryotes that is very misleading as some are colonial or multicellular. Ideally, it might be worth mentioning that they are an informal grouping and no longer a formal taxonomic group.	Our reviewers accepted this change.	Typo
Chapter 2 How We See the Invisible World: Introduction	second sentence of second paragraph. Microscopes are not routinely used to look at colonies. Occasionally a dissecting scope is used to look at colony morphology but this is rare and usually not diagnostic. I would propose deleting "and colonies" from the sentence.	Delete the reference to colonies.	Other factual inaccuracy in content

Chapter 2 How We See the Invisible World: Section 2.1 The Properties of Light	/l/22aperture is listed as Not Secure by browsers, which causes the spider to report it as broken	This link will be updated.	Broken link
Chapter 2 How We See the Invisible World: Section 2.3 Instruments of Microscopy	The formula for total magnification says "ocular magnificatio √ó objective magnificatio"	This issue is only present in the PDF, and does not occur in the webview. PDF should be updated to match webview.	Typo
Chapter 2 How We See the Invisible World: Section 2.3 Instruments of Microscopy	leads to a broken link	This link will be deleted.	Broken link
Chapter 2 How We See the Invisible World: Section 2.4 Staining Microscopic Specimens	The photo is supposed to show the heat-fix but you cannot fix the culture by holding the slide to the side of the Bacti-cinerator. Instead, the photo should show the slide in front of the opening of the Bacti-cinerator.	This figure will be updated.	Other factual inaccuracy in content

Chapter 3 The Cell: Section 3.1 Spontaneous Generation	The figure that describes the famous flask experiment by Pasteur states that air does not enter the flask. It shows liquid in the middle on the "swan neck". The figure legend and the text state the contrary, that air but not bacteria can reach the broth. ¬†The latter is correct. ¬† The change needs to be made in the drawing and embedded text.	This figure and alt text will be updated.	Other factual inaccuracy in content
Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	"Which of the following experimented with raw meat, maggots, and flies in an attempt to disprove the theory of spontaneous generation." The question should end with a question mark. Under "Show Solution," the correct answer is given as C, when it should be D.	Revise exercise 3 as follows: Which of the following scientists experimented with raw meat, maggots, and flies in an attempt to disprove the theory of spontaneous generation? Revise the solution to "D".	Incorrect answer, calculation, or solution
Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	The legend for Figure 3.19 says (d) is magnetosomes and (e) is gas vacuoles, but it should be reversed.	Revise the caption for Figure 3.19 as follows: ... (d) A transmission electron micrograph of gas vacuoles. (e) transmission electron micrograph of magnetosomes. ...	Other factual inaccuracy in content
Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	Figure 3.19 The photos labeled "d" and "e" are incorrectly labeled. "d" is currently labeled magnetosomes which is not correct. The magnetosomes (500 nm and 50 nm) are illustrated in the photo identified as "e".	In the caption for Figure 3.19, switch the descriptions for parts (d) and (e).	Typo

Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	In the section "Ribosomes", the first sentence, "structures responsible protein synthesis", the "for" is missing.	In the 1st sentence, revise "responsible protein synthesis" to "responsible for protein synthesis".	Typo
Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	The first image of the coccus cell has an incorrect scale bar. I suspect it is a typo and should read 200 nm but I propose 0.2 um. Also it would be helpful to add a scale bar to all of the other images in this figure 3.13. And as a general suggestion I think it would be really helpful to add scale bars to all micrographs throughout the text to help students better appreciate the size and scale of all the cells and structures covered. Without scale these images are very abstract to the beginning student.	This figure will be updated.	Other factual inaccuracy in content

Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	These are the same figure for the most part but the membranes of prokaryotes and eukaryotes are not the same. Figure 3.21 is indicated as the bacterial membrane but it has two major problems: first it shows and labels cytoskeleton, which is a eukaryote not prokaryote thing. Second, it shows sterols in the membrane (although they are not labeled), which again is a eu- not pro- thing unless this is mycobacterium specifically, which is shouldn't be. This figure should probably be used as Figure 3.51 instead, and when positioned there should have a label for the sterols. Figure 3.51 could then go in the 3.21 spot, but it still has to have the sterols removed from the art and it should probably have fewer carbohydrates on it. I know carbohydrates are now known to be attached to some of the membrane molecules of prokaryotes but I thought it was still believed to be fewer than on eukaryotes.	Revise Figure 3.21 and 3.51 as indicated.	General/pedagogical suggestion or question
Chapter 3 The Cell: Section 3.3 Unique Characteristics of Prokaryotic Cells	Hello, I would just like to let you know that the openstax microbiology Book has a typo in chapter 3 on page 107. In the paragraph about ribosomes, it says structures responsible protein synthesis but I believe it is simply missing the word "for" so as to be structures responsible for protein synthesis. Thank you for your incredible work!	Our reviewers accepted this change.	Typo

Chapter 3 The Cell: Section 3.4 Unique Characteristics of Eukaryotic Cells	The units are listed as ¬µM (with a capital M) to indicate molarity instead of a lower case m as in ¬µm to indicate micrometers. Thanks!	Change to a lowercase "m".	Typo
Chapter 3 The Cell: Section 3.4 Unique Characteristics of Eukaryotic Cells	The caption on this figure is confusing. It looks like most of the electron micrograph is taken up by the nucleus, which is pale with dark patches of chromatin. There is a large, dark round structure in the bottom half of the image that I think is the nucleolus. The caption states the nucleus is "is the large, dark, oval-shaped structure in the lower half of the image." I believe this will mislead students to think that the nucleolus is the nucleus and the surrounding pale circle with dark patches is the cytoplasm, when this is actually the nucleus with both euchromatin (light) and heterochromatin (dark) regions.	Revise the caption to "Eukaryotic cells have a well-defined nucleus surrounded by a nuclear membrane. The nucleus of this mammalian lung cell is located in the bottom right corner of the image. The large, dark, oval-shaped structure within the nucleus is the nucleolus."	Other factual inaccuracy in content
Chapter 3 The Cell: Section 3.4 Unique Characteristics of Eukaryotic Cells	All of the microbiology texts seem to have this same problem: binary fission is explained in detail for the prokaryotic cells, but mitosis and meiosis are ignored for eukaryotic cells, although they are always mentioned (but never explained) in later chapters when discussing reproduction strategies in the various groups. I always have to add this in to keep the cell comparisons balanced. Please	Section on mitosis will be included in the next print update.	General/pedagogical suggestion or question

	consider adding mitosis and cytokinesis, and the basic steps of a generic meiosis to the cell chapter, or as an appendix. Thanks.		
Chapter 3 The Cell: Section 3.4 Unique Characteristics of Eukaryotic Cells	3.4 Unique Characteristics of *Eukaryotic* Cells Learning objective - Describe internal and external structures of *prokaryotic* cells in terms of their physical structure, chemical structure, and function 3.3 Unique Characteristics of *Prokaryotic* Cells Learning objective - Describe common cell morphologies and cellular arrangements typical of *prokaryotic* cells and explain how cells maintain their morphology 3.3. and 3.4 have the same learning objective, and both contain the word *prokaryotic*. Pretty sure the LO in 3.4 should be *eukaryotic* given the section title.	Change "prokaryotic" to "eukaryotic."	Typo
Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes	In the paragraph on mutualism, the name "Bacteroides thetaiotetraiotamicron" appears. Other sources do not seem to have this spelling for the species, and instead have the following: "B. thetaiotaomicron". Exmample	Revise the spelling to "Bacteroides thetaiotaomicron".	Typo

	http://jb.asm.org/content/198/20/2763.full		
Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes	The environment should be added to the definition of "microbial ecology" in Chapter 4: "The study of these interactions between microbial populations and their environment is called microbial ecology."	Number 29 is a different question in the ISM than the Textbook. Also, psychotroph should be psychrotroph A psychrophile is microorganisms that can grow at 0 ¬∞C and below, have an optimum growth temperature close to 1+[@[Resolution Notes]]5 ¬∞C, and usually do not survive at temperatures above 20 ¬∞C. So it cannot be A. water heater set at 50.	Other factual inaccuracy in content
Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes	In Ch. 4, in the section entitled "Symbiotic Relationships": The text says: "Scientists have coined the term¬†microbiome¬†to refer to all prokaryotic and eukaryotic microorganisms that are associated with a certain organism." This definition seems too limited to me.¬† Considering the importance of the soil microbiome, perhaps changing the end of the sentence in the text to ", prokaryotic and eukaryotic microorganisms that are associated with a given environment" would be preferable?¬† Example of an article that would make the text's definition seem too limiting:¬†https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5209367/	In the 9th paragraph, revise the explanation of microbiome as follows: Scientists have coined the term microbiome... associated with a certain organism or environment.	General/pedagogical suggestion or question

Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes	In the paragraph addressing amensalism, the text presents Lucilia sericata as a bacterium. If my understanding is correct, Lucilia sericata is a green blowfly. As noted in the article below, the maggots of this blowfly are used surgically for wound debridement, disinfection, and for promotion of healing. They are known as "surgical maggots" in what is called "maggot debridement therapy" in the US and "biosurgery" in the UK. While the L. sericata larvae seem to destroy S. aureus as noted in the Microbiology text, I have only found evidence that the maggots are used for wound care. (The text states that too much handwashing can affect the relationship between L. sericata and S. aureus, and thereby increase S. aureus disease and transmission. This suggests that the L. sericata larvae are regular residents of intact skin, and I have not found any evidence of this.) Reference article: https://link.springer.com/article/10.1134/S0013873813060018	Revise the 5th and 6th paragraphs as follows: A type of symbiosis ... other species of bacteria. The microbiota of the skin is composed of a variety of bacterial species, including Staphylococcus epidermidis and Propionibacterium acnes. Although both species have the potential to cause infectious diseases when protective barriers are breached, they both produce a variety of antibacterial bacteriocins and bacteriocin-like compounds. S. epidermidis and P. acnes are unaffected by the bacteriocins and bacteriocin-like compounds they produce, but these compounds can target and kill other potential pathogens. In another type of symbiosis... in any way. S. epidermidis provides an excellent example of how the classifications of symbiotic relationships are not always distinct. One could also consider the symbiotic relationship of S. epidermidis with humans as mutualism. Humans provide a food source of dead skin cells to the bacterium, and in turn the production of bacteriocin can provide an defense against potential pathogens.	Other factual inaccuracy in content

Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes	"Scientists have coined the term microbiome to refer to all prokaryotic and eukaryotic microorganisms that are associated with a certain organism or environment." There seems to be a semantic debate about the term microbiome - I think many scientists define the microbiome as just the collection of microbial genes within an organisms, whereas microbiota is the collection of microbial organisms.	Revise the sentence "...all prokaryotic and eukaryotic microorganisms that are..." to "...all prokaryotic and eukaryotic microorganisms and their genetic material that are..."	Other factual inaccuracy in content
Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes	You post that there is an online version of Bergey's Manual and then link to the 1957 edition. This reference is hugely outdated and I tell my students they have to use the current version which is only in our library and not online.	Revise the Link to Learning text to "The 7th edition (published in 1957) of Bergey's Manual of Determinative Bacteriology is now available online. More recent, updated editions are available in print."	Other factual inaccuracy in content

Chapter 4 Prokaryotic Diversity: Section 4.1 Prokaryote Habitats, Relationships, and Microbiomes and Chapter 4 Prokaryotic Diversity: Section 4.2 Proteobacteria	The¬†text says that¬†Chlamydia¬†lack a cell wall.¬† There was the "Chlamydial Anomaly" described here:https://www.sciencedaily.com/releases/2013/12/131211133945.htm, but in 2014, functional peptidoglycan was found in¬†Chlamydia¬†using a new labeling technique:¬†https://www.nature.com/nature/journal/v506/n7489/full/nature12892.html. Chlamydia¬†are said to have no cell wall under "Classification by Staining Patterns" but they are clearly included with the Proteobacteria (all Gram Negative), and Table 4.2 notes in the "Microscopic Morphology" column that¬†Chlamydiaare Gram-negative.¬†The text itself says that¬†Chlamydia¬†both lacks a cell wall AND is Gram-negative, which would be confusing for any students who happen to notice the discrepancy.¬†¬†So perhaps the¬†text could note that Chlamydiae are Gram-negative, as noted in the first sentence of the introduction of the following article:¬†https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4886739/	Subsec: Classification by Staining Patterns In the 1st paragraph, revise the 2nd to last sentence to "Included in the atypical category are species of Mycoplasma and Chlamydia." Subsec: Alphaproteobacteria In the 5th paragraph, revise the 2nd sentence to "Members of this genus are gram-negative, obligate intracellular pathogens that are extremely resistant to the cellular defenses, ..."	General/pedagogical suggestion or question

Chapter 4 Prokaryotic Diversity: Section 4.2 Proteobacteria	While Chapter 15 says Shiga toxin inhibits protein synthesis, Ch. 4 text pg. 161 says that " However, some strains produce a potentially deadly toxin called Shiga toxin, which perforates cellular membranes in the large intestine, causing bloody diarrhea and peritonitis (inflammation of the inner linings of the abdominal cavity)." I think the Chapter 4 mechanism of action for Shiga is incorrect according to https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4270005/. Or maybe I am not appropriately interpreting what is meant by Ch. 4 text.	Revise the 2nd paragraph below Figure 4.9 as follows: E. coli has been perhaps the most studied bacterium since it was first described in 1886 by Theodor Escherich (1857, 1911). Many strains of E. coli are in mutualistic relationships with humans. However, some strains produce a potentially deadly toxin called Shiga toxin. Shiga toxin is one of the most potent bacterial toxins identified. Upon entering target cells, Shiga toxin interacts with ribosomes, stopping protein synthesis. Lack of protein synthesis leads to cellular death and hemorrhagic colitis, characterized by inflammation of intestinal tract and bloody diarrhea. In the most severe cases, patients can develop a deadly hemolytic uremic syndrome. Other E. coli strains may cause traveler's diarrhea, a less severe but very widespread disease.	Other factual inaccuracy in content

Chapter 4 Prokaryotic Diversity: Section 4.2 Proteobacteria	In Section 4.2, one-word descriptions of alphaproteobacteria as "oligotrophs" and betaproteobacteria as "eutrophs" do not appropriately describe the diversity within the divisions. Several examples provided in the tables in section 4.2 specifically contradict the oligotroph or eutroph description, such as referring to obligate intracellular parasites as oligotrophs. Some "Check your Understanding" questions (at least two), Chapter 4 summary statements, and multiple choice question #5 should be revised. (Unfortunately, there is rarely "one word" that is adequate to describe any microbial group which has been diverging through hundreds of millions/billions of years of evolution, as much as it might help our students if there were.)	The sections on Alphaproteobacteria and Betaproteobacteria will be revised, along with the summary and question #5.	General/pedagogical suggestion or question
Chapter 4 Prokaryotic Diversity: Section 4.2 Proteobacteria	In Sections 4.2 and 4.3, Chlamydia are described as members of the Alphaproteobacteria. However, Chlamydia are members of the PVC (Planctomycetes-Verrucomicrobia-Chlamydiae) group, divergent from the proteobacteria (see LifeMap,at http://lifemap-ncbi.univ-lyon1.fr/)	Move the paragraph "C. trachomatis is a human pathogen that..." after Figure 4.5, before Table 4.2.	Other factual inaccuracy in content

Chapter 4 Prokaryotic Diversity: Section 4.2 Proteobacteria	You listed that Chlamydia as a part of the alphaproteobacteria. However, it is a part of the nonproteobacteria.	This section will be revised to list Chlamydia as nonproteobacteria.	General/pedagogical suggestion or question
Chapter 4 Prokaryotic Diversity: Section 4.3 Nonproteobacteria Gram-Negative Bacteria and Phototrophic Bacteria	In Ch. 4 under Nonproteobacteria, Table 4.7 aims to summarize "the characteristics of some of the most clinically relevant genera of nonproteobacteria".¬† In the table, however,¬†Borrelia, which causes a significant disease burden in humans, is left out, while¬†Sphingobacterium¬†is included, even though the "Unique Characteristics" column for that genus notes that the members "rarely cause disease in humans".	In Table 4.7, revise the row for Sphingobacterium as follows: Borrelia Gram-negative-like spirochete; very thin; better viewed by darkfield microscopy B. burgdorferi causes Lyme disease and B. recurrens causes relapsing fever	General/pedagogical suggestion or question
Chapter 4 Prokaryotic Diversity: Section 4.3 Nonproteobacteria Gram-Negative Bacteria and Phototrophic Bacteria	In the second sentence of the section, Planctomycetes is spelled as "Plantomycetes".	Revise "Plantomycetes" to "Planctomycetes".	Typo

Chapter 4 Prokaryotic Diversity: Section 4.6 Archaea	In Section 4.6, under "Euryarcheota", methanogens are described as "producing hydrogen sulfide, making 'marsh gas'." While methanogens do produce marsh gas, this gas is methane. Methanogens are not known for dissimulatory sulfate reduction, although some environments may be shared by both methanogens and sulfide-producing bacteria, such as Desulfovibrio. In Section 4.6, the statement, "Some genera of methanogens, notably Methanosarcina, can grow and produce methane in the presence of oxygen, although the vast majority are strict anaerobes." should be revised in my opinion. Virtually everything we know about the biology and biological significance of methanogenesis is anaerobic, not aerobic. According to a 2015 paper (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0117331), M. acetivorans could become adapted to 1% oxygen after a 6 month period. Of all the things that might be important to tell novice microbiology students about methanogenesis, aerobic methanogenesis seems like a distracting tangent.	Before the sentence, "Some scientists have even..." add the sentence "Methanogens also produce gases in ruminants and humans." Delete the paragraph beginning "Methanogens are thought to contribute...".	General/pedagogical suggestion or question

Chapter 4: Prokaryotic Diversity, Section: Prokaryote Habitats, Relationships, and Microbiomes, Subsection: Symbiotic Relationships	The chapter defines a symbiosis as any interaction between different species within a community. This is NOT correct. A symbiosis only occurs when the two species are associated in some way, interacting not just if they are in the same community. For example, it is not a symbiosis if one organism consumes another organism (predation) even if they live in the same community. There is an example of neutralism in the text, but it doesnt seem very good to me (do they mean spores and vegetative cells of the same species?). As an ecologist, this section really bothers me.	Our reviewers accepted this change.	Typo
Chapter 5 The Eukaryotes of Microbiology: Section 5.1 Unicellular Eukaryotic Parasites	Under "Amoebozoa", the textbook states "Naegleria fowleri" is also classified within the Amoebozoa." The Taxonomy appendix has Naegleria listed in phylum Percolozoa in supergroup Excavata.	Revise the end of this paragraph, starting with the sentence beginning "The notorious "brain eating..." to "Another member of this group that is pathogenic to humans is Acanthamoeba, which can cause keratitis (corneal inflammation) and blindness. The notorious "brain eating amoeba," Naegleria fowleri, is a considered a distant relative of the Amoebozoa and is classified in the phylum Percolozoa."	Other factual inaccuracy in content

Chapter 5 The Eukaryotes of Microbiology: Section 5.1 Unicellular Eukaryotic Parasites	It says Diatoms have flagella. I'm not a diatom expert, but most are non-motile so I don't think so. I have read they make sperm with flagella, but the diatom itself in my understanding does not.	Remove "flagella and" from the sentence beginning "Diatoms have flagella..." and revise the last sentence in this paragraph to "Additionally, diatoms can reproduce sexually and asexually, and the male gametes of centric diatoms have flagella providing directed movement to seek female gametes for sexual reproduction."	Other factual inaccuracy in content
Chapter 5 The Eukaryotes of Microbiology: Section 5.3 Fungi	Near the top of the diagram for the Zygomycetes life cycle, the words "germination" and mitosis" have been switched. The word "germination" should be next to the upwards arrow, as spores germinate to form the hyphae; the word "mitosis" should be next to the downwards arrow as hypha yield spores via mitosis, according to the text. It seems a little confusing that zygospores and asexually-produced spores are the same in the diagram; perhaps the caption could be updated to mention that whether spores are produced through sexual or asexual processes, they can germinate into haploid hypha.	This figure will be update. Add the following to the end of the caption: "Whether spores are produced through sexual or asexual processes, they can germinate into haploid hyphae."	Typo

Chapter 5 The Eukaryotes of Microbiology: Section 5.5 Lichens	While I don't believe this to be a complete inaccuracy, I do find it misleading. The sentence reads "Lichens are also important soil stabilizers in some desert environments and they are an important winter food source for CARIBOU and REINDEER." Reindeer are just domesticated caribou and the way this sentence reads, it leads the reader to assume that you are talking about two different species.	Remove "and reindeer" from this sentence.	Other factual inaccuracy in content
Chapter 5 The Eukaryotes of Microbiology: Section 5.5 Lichens	On page 233 it says a lichen is composed of an ascomycete fungus. (First sentence of Characteristics) On page 234 it say Ascomycota and Basidiomycota. (First sentence of Diversity) Need consistency.	Remove "ascomycete" from the first sentence of the Characteristics section.	General/pedagogical suggestion or question
Chapter 6 Acellular Pathogens: Review Questions: Multiple Choice	Delete the "s" after "following" in the stem of multiple choice question 11. Currently it reads, "Which of the followings cannot be used to culture viruses?"	Revise "followings" to "following".	Typo
Chapter 6 Acellular Pathogens: Section 6.1 Viruses	The scale bar in Figure 6.2a is 50 micrometer. However tobacco mosaic virus is 300 nanometer long. I believe the scale bar is supposed to read 50 nanometer.	This figure will be updated.	Other factual inaccuracy in content

Chapter 6 Acellular Pathogens: Section 6.2 The Viral Life Cycle	The artwork in figure 6.10 parts 5 and 6 shows that completed Influenza virus particles egress from the cell after the influenza virions already have been fully enveloped in the cytoplasm. Although cartoons always represent oversimplifications of complex processes, it's fundamental to the nature of enveloped viruses for the nascent virions to pick up viral glycoproteins that are embedded in a host cell membrane as a part of their budding process. The virions should not be portrayed as fully assembled the cytoplasm in part 5 nor should the "purple line" of the cell membrane be drawn exterior to the virion's glycoprotein spikes in part 6 and then "lost" somehow as the virions float away. Thank you! I appreciate all the work on this text and am thrilled to share an OER with my students!	This figure will be updated.	General/pedagogical suggestion or question
Chapter 6 Acellular Pathogens: Section 6.2 The Viral Life Cycle	The last sentence of the first paragraph of section 6.2 says the RNA viruses tend to replicate in the cytoplasm. Why not demonstrate this in the figure then? Figure 6.10 about virus replication step 4 says the viral RNA enters the nucleus. Given the oversimplifications of the descriptions of the replication process, at least keep themes consistent. DNA virus	Revise the sentence "RNA viruses that infect..." to "With a few exceptions, RNA viruses that infect animal cells replicate in the cytoplasm. An important exception that will be highlighted later is Influenza virus." Add "Influenza virus is one of the few RNA viruses that replicates in the nucleus of cells." to Figure 6.10 caption.	General/pedagogical suggestion or question

	replication in the nucleus, RNA virus replication in the cytoplasm.		
Chapter 6 Acellular Pathogens: Section 6.2 The Viral Life Cycle	This video illustrates the stages of the lysogenic life cycle of a bacteriophage and the transition to a lytic phase. This link, points to a private video.	This link will be updated.	Broken Link
Chapter 6 Acellular Pathogens: Section 6.2 The Viral Life Cycle	HIV is a +ssRNA virus and the figure implies that it is a dsRNA virus as inficated by the red and pale orange lines in the illustration. I propose removing one of those colored strands so that it represents a ssRNA virus.	This figure will be updated for clarity. Note that our reviewers determined that HIV viral particles actually do contain two independent (not double stranded, but coiled) pieces of +ssRNA.	Other factual inaccuracy in content
Chapter 6 Acellular Pathogens: Section 6.2 The Viral Life Cycle	Figure 6.8 error in the lysogenic lifecycle illustration	This figure will be updated.	Other factual inaccuracy in content
Chapter 6 Acellular Pathogens: Section 6.3 Isolation, Culture, and Identificatio n of Viruses	Figure 6.23 does not represent antibody-antigen binding correctly. It's really important for students to understand that the Fab region (two per antibody) is specific to the antigen. Figure 6.23 should be redrawn to illustrate the proper relationship between antibody and antigen. Figure 20.22 is better than 6.23 in terms of antibody function, but 20.22 does not make it as clear as 6.23 that a patient's sample would have supplied the antigens which must first be	This figure will be updated.	Other factual inaccuracy in content

	trapped by antibodies adherent to the surface before the enzyme-linked antibodies are added.		
Chapter 6 Acellular Pathogens: Section 6.3 Isolation, Culture, and Identification of Viruses	Figure 6.17 contains two photos which are correctly described in the caption beneath the photos. However, the sentences above the Figure 6.17 does not agree with the caption or common microbiology practices. Currently, it states that "Bacteriophages can be grown in the presence of a dense layer of bacteria (also called a bacterial lawn) grown in a 0.7 % soft agar in a Petri dish or flat (horizontal) flask (see Figure 6.17)" Later in the paragraph there is a second reference to figure 6.17 describing the plaques that form in a bacterial lawn. This second reference to figure 6.17 is correct. But I would change the paragraph to read: "Viruses can be grown in vivo (within a whole living organism, plant, or animal) or in vitro (outside a living organism in cells in an artificial environment). Flat horizontal	Revise the first two sentences in this paragraph to: "Viruses can be grown in vivo (within a whole living organism, plant, or animal) or in vitro (outside a living organism in cells in an artificial environment. Flat horizontal cell culture flasks (Figure 6.17(a)) are a common vessel used for in vitro work. Bacteriophages can be grown in the presence of a dense layer of bacteria (also called a bacterial lawn) grown in a 0.7 % soft agar in a Petri dish or flat (horizontal) flask (see Figure 6.17(b))."	General/pedagogical suggestion or question

	cell culture flasks (Figure 6.17, left) are a common vessel used for in vitro work. Bacteriophages can be grown in the presence of a dense layer of bacteria (also called a bacterial lawn) grown in a 0.7 % soft agar in a Petri dish (see Figure 6.17, right)"		
Chapter 6 Acellular Pathogens: Section 6.3 Isolation, Culture, and Identificatio n of Viruses	The text says "John Hopkins Hospital" which is incorrect. The hospital and school are named Johns Hopkins.	Revise "John" to "Johns".	Typo
Chapter 6 Acellular Pathogens: Section 6.4 Viroids, Virusoids, and Prions	/l/22cdccontaminat goes to CDC Not Found	The CDC link will be removed.	Broken link

Chapter 7 Microbial Biochemistry: Section 7.1 Organic Molecules	Submitted by Customer Support on behalf of user, Case 00033154 I was reading in 7.1 of your Microbiology book. It has isomers of glucose, and I believe your depictions are not correct. For Glucose there are 13 hydrogens which is not right, and one is off of the aldehyde which is the misplaced one. Then Galactose is missing a hydrogen off of its carbon with the aldehyde. I love using your books so I am just trying to help! Thank you. I just put a link to the figure that I am talking about so you can take a look for yourself.	This figure will be updated.	Other factual inaccuracy in content
Chapter 7 Microbial Biochemistry: Section 7.1 Organic Molecules	Figure 3 has an error with the glucose molecule having too many oxygen atoms drawn on the Fischer projection.	Update Figure 3.	Other factual inaccuracy in content
Chapter 7 Microbial Biochemistry: Section 7.1 Organic Molecules	The D- and L-forms of alanine are missing their alpha carbons and the methyl groups (the R-groups) have been drawn as -CH0 instead of -CH3. Caption reads that the L-forms are "found in human cells" which is true but misses the point that the L-form is common in all creatures' proteins. Thanks!	This figure will be updated.	Other factual inaccuracy in content
Chapter 7 Microbial Biochemistry: Section	This error was previously reported as 7154. It is obviously an error. See attached screen shot. Thanks	Our reviewers accepted this change.	Other

7.1 Organic Molecules			
Chapter 7 Microbial Biochemistry: Section 7.1 Organic Molecules	Chemical symbol for vanadium is V not Va	Change symbol from "Va" to "V."	Other factual inaccuracy in content
Chapter 7 Microbial Biochemistry: Section 7.1 Organic Molecules	Says "inorganic compounds make up 1-1.5% of a living cells mass". Dry weight? Water is inorganic and is most (70%+) of a cell's mass.	Change to "Inorganic compounds make up 1%, 1.5% of the dry weight of living cells."	Other factual inaccuracy in content
Chapter 7 Microbial Biochemistry: Section 7.3 Lipids	17. Lipids are a naturally occurring group of substances that are not soluble in water but are freely soluble in organic solvents. This is true not false	Revise the solution to "True".	Incorrect answer, calculation, or solution
Chapter 8 Microbial Metabolism: Section 8.1 Energy, Matter, and Enzymes	18. Fatty acids having no double bonds are called "unsaturated." This is false not true. "Fatty acids with hydrocarbon chains containing at least one double bond are called unsaturated fatty acids because they have fewer hydrogen atoms." page 294	Revise the solution to "False".	Incorrect answer, calculation, or solution
Chapter 8 Microbial Metabolism: Section 8.1 Energy, Matter, and Enzymes	Figure 8.4 shows glucose to polysaccharide. The figure legend however says "polypeptide formation"...it should read "polysaccharide formation" or the figure should be changed to show amino acids to polypeptides.	Revise "polypeptide" to "polysaccharide".	Other factual inaccuracy in content

Chapter 8 Microbial Metabolism: Section 8.4 Fermentation	The top row of the table describes EMP pathway for Pseudomonas aeruginosa. However, P. aeruginosa does not have phosphofructokinase and instead, only uses the Entner Doudoroff pathway of glycolysis. The ATP yield from glycolysis would be 1, not 2, and the overall ATP yield would only be 37 (not 38) as stated in the table. How about changing the organism name to Staphylococcus aureus instead of P. aeruginosa? Then the ATP yield will be correct for each part of the process as currently written: also, changing to S. aureus will be more relevant to section 8.4 since S. aureus is able to ferment and is much more of a "sugar lover" than P. aeruginosa. (https://link.springer.com/chapter/10.1007/978-1-4899-0120-0_2)	Revise "Pseudomonas aeruginosa" to "Staphylococcus aureus".	Other factual inaccuracy in content
Chapter 8 Microbial Metabolism: Section 8.4 Fermentation	A question at the end of section 8.4 that has an incomplete answer. Look for the Matching question and when you click on the answer you'll see that all the answers are not there. #1 is missing. e; 2. a; 3. d; 4. b; 5. c	Add the number "1" before "e".	Typo

Chapter 8 Microbial Metabolism: Section 8.6 Photosynthesis	25. Which are two products of the light-dependent reactions are _____. The double "are"s make this question confusing. Service ticket #17064 Change the question of #25 of Review Questions from "Which are two products of the light-dependent reactions are_____." to "The two products of the light-dependent reactions are _____."	Revise as follows: 25. Which of the following are two products of the light-dependent reactions?	Typo
Chapter 8 Microbial Metabolism: Section 8.6 Photosynthesis	There is an error in the second row that summarizes glycolysis. Pyruvate is incorrectly listed as being a 2 carbon molecule (2C) in the "Carbon Flow" column. (2C) should be changed to (3C) for pyruvate at this place. In the next row for "Transition reaction", pyruvate is correctly indicated as a 3 carbon molecule (3C).	In Figure 8.16, in the second row, revise "2C" to "3C".	Typo
Chapter 8 Microbial Metabolism: Section 8.7 Biogeochemical Cycles	The "check your understanding" question asks, "What are the three steps of the nitrogen cycle?" but to reflect a complete cycle consistent with the statements above the question, it ought to say "What are the four steps of the nitrogen cycle?" (nitrogen fixation, ammonification, nitrification, denitritrification).	Revise "three" to "four".	Other

Chapter 8 Microbial Metabolism: Section 8.7 Biogeochemical Cycles	The figure shows "Organic Matter (R-H2)" should read "Organic Matter (R-NH2)"	This figure will be updated.	Typo
Chapter 8: Microbial Metabolism, Section: Cellular Respiration, Figure 8.15	In section 8.3 it seems odd not to include an illustration of an electron transport chain. This is an extremely challenging concept for students to learn and a visual is extremely helpful in learning the process. It would also be helpful to provide a link to an animation of the process along with oxidative phosphorylation.	Our reviewers accepted this change.	General/pedagogical suggestion or question
Chapter 9 Microbial Growth: Section 9.1 How Microbes Grow	"Figure 9.9 Fluorescence staining can be used to differentiate between viable and dead bacterial cells in a sample for purposes of counting. Viable cells are stained green, whereas dead cells are stained red. (credit: modification of work by Panseri S, Cunha C, D'Alessandro T, Sandri M, Giavaresi G, Maracci M, Hung CT, Tampieri A)" The cells shown in the figure are not bacteria, but eukaryotic osteoblast-like cells. The picture shown is taken from Figure 2 in Panseri S, Cunha C, D'Alessandro T, Sandri M, Giavaresi G, Marcacci M, Hung CT, Tampieri A. J Nanobiotechnology. 2012 Jul 24;10:32.	This figure will be updated.	Other factual inaccuracy in content

	PMID: 22828388. Please find a picture that shows live/dead staining of bacteria or correct the legend to identify the cells correctly.		
Chapter 9 Microbial Growth: Section 9.2 Oxygen Requirements for Microbial Growth	The label of "alpha hemolysis" in part (a) should be removed. The "beta hemolysis" label in part (a) is clearly pointing at nice beta hemolysis, but the alpha hemolysis label is not pointing at alpha hemolysis. Alpha hemolysis would be a dark green or gray zone around bacterial colonies. This looks like beta-hemolysis right next to stabbing in the blood agar. Since the figure legend only focuses on beta hemolysis, I would recommend removing the alpha hemolysis label for	In Figure 9.24 part a, remove the label "alpha hemolysis".	Other factual inaccuracy in content

	part (a) and keep the label for the beta hemolysis.		
Chapter 9 Microbial Growth: Section 9.2 Oxygen Requirements for Microbial Growth	In the section Detoxification of Reactive Oxygen Species, the chemical formula for superoxide in the chemical equation for the superoxide dismutase reaction is incorrect. The text shows the 2 as a superscript, but the 2 should be a subscript.	Revise the superscript 2 to be set as subscript.	Typo
Chapter 9 Microbial Growth: Section 9.4 Temperature and Microbial Growth	Number 29 is a different question in the ISM than the Textbook. Also, psychotroph should be psychrotroph A psychrophile is microorganisms that can grow at 0 ¬∞C and below, have an optimum growth temperature close to 15 ¬∞C, and usually do not survive at temperatures above 20 ¬∞C. So it cannot be A. water heater set at 50.	Revise exercise 29 as follows: Revise "psychotroph" to "psychrotroph". Revise A to "food spoiling in refrigerator" Revise E to "garden compost" Revise the solution to: A, D, E, B, C.	Incorrect answer, calculation, or solution

Chapter 9 Microbial Growth: Section 9.4 Temperature and Microbial Growth	I believe their should be a comma and a clarification as well. I propose: "Additional secondary structures, ionic and covalent bonds, as well as the..."	Revise "Additional secondary ionic and covalent..." to "Additional secondary structures, ionic and covalent...".	Typo
Chapter 9 Microbial Growth: Section 9.6 Media Used for Bacterial Growth	/l/22bloodagar redirects to a 404	This link will be updated.	Broken link
Chapter 10 Biochemistry of the Genome: Section 10.2 Structure and Function of DNA	This figure of DNA contains a number of errors in the chemical structure. Each of the bases contain an extra H atom drawn in between the base and the bond from the 1' carbon. The 3' oxygen on cytosine contains an extra H. The 1' carbon in guanosine is shown bonded to the amine on the Watson-Crick face. The guanosine contains an extra N where the 5-carbon should be. The cytosine amine contains and extra H and is double bonded to the C. I have attached a .PNG file with each of these errors circled in blue.	This figure will be updated.	Other factual inaccuracy in content
Chapter 10 Biochemistry of the Genome: Section 10.2 Structure and Function of DNA	I believe I've found an error in the guanine molecule in figure 10.12 and 10.13 of this page: https://openstax.org/books/microbiology/pages/10-2-structure-and-function-of-dna The number 5 carbon in guanine shows a nitrogen in that position instead.	These two figures will be updated.	Other factual inaccuracy in content

Chapter 10 Biochemistry of the Genome: Section 10.2 Structure and Function of DNA	First sentence says "In Microbial Metabolism, we discussed three classes of macromolecules...", the microbial metabolism part is in red, I assume this is a hyperlink to that chapter (I'm working from paper so I don't know), should that not be Microbial Biochemistry (chapter 7) not Metabolism (chapter 8)? (Fix the word in the text and hyperlink in electronic versions if necessary)	Revise the first two sentences in this paragraph to "In Microbial Metabolism, we discussed the microbial catabolism of three classes of macromolecules: proteins, lipids and carbohydrates. In this chapter, we will discuss the genetic role of a fourth class of molecules: nucleic acids."	Other factual inaccuracy in content
Chapter 10 Biochemistry of the Genome: Section 10.3 Structure and Function of RNA	Number 14 in Chapter 10 is missing from the Answer key on page 1268.	Revise the answer choice for b from "polypeptides" to "carbohydrates". Add the answer for exercise 14 to the answer key.	Typo
Chapter 10 Biochemistry of the Genome: Section 10.3 Structure and Function of RNA	This charged tRNA has been linked to the amino acid incorrectly: as currently drawn, the 3' end of the tRNA connects to the amino acid R-group whereas it ought to be connected to the carboxyl carbon of the amino acid (in this specific case, an ester linkage is drawn -- which is correct -- but most amino acids will not contain a carboxyl in their R-group). Also, it would be most correct to draw the glutamate in its zwitterion form; see diagram at https://www.mun.ca/biology/scarr/iGen3_06-11.html	This figure will be updated.	Other factual inaccuracy in content

Chapter 10 Biochemistry of the Genome: Section 10.4 Structure and Function of Cellular Genomes	Paragraph 3 indicates that Mycoplasma genitalium and Treponema pallidum are obligate intracellular pathogens, but they are not. While their genome sizes are indeed small (similar to the obligately intracellular pathogens Rickettsia and Chlamydia), M. genitalium is a facultative intracellular pathogen that can be isolated on agar media (see https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3612323/) while T. pallidum is "generally thought to be an extracellular pathogen" see: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3612323/ This "Micro Connections" box is vitally important; perhaps just change paragraph 3 to state that "small genome sizes of around 1 million base pairs are found in obligate intracellular pathogens such as Chlamydia and Rickettsia. Other small-genome pathogens have such a minimal genetic repertoire that they are specialized to a niche in their host's bodies, making their cultivation in the lab difficult (Mycoplasma genitalium) if not impossible (Treponema pallidum).	Revise "From a clinical perspective, obligate intracellular pathogens..." to "From a clinical perspective, obligate and facultative intracellular pathogens...". Revise "Because host cells supply..." to "Because host cells can supply..." Revise "...encoding metabolic functions." to "...encoding metabolic functions, making their cultivation in the laboratory difficult if not impossible."	Other factual inaccuracy in content

Chapter 10 Biochemistry of the Genome: Section 10.4 Structure and Function of Cellular Genomes	There is no caption to explain why a Pap smear is shown in Figure 10.26.b. I suggest keeping the caption for 10.26.a. as is, but adding a statement such as "In the light micrograph on the right, misshapen cervical cells can be seen in this Pap smear; the presence of DNA from Human Papillomavirus (HPV) in some cell's nuclei causes cellular abnormalities which are correlated to an increased risk of cervical cancer." HPV is mentioned in the text just above Figure 10.26, but there is no reference to the figure.	Add the following to the end of the caption: "The cells shown in (b) represent cells obtained from a pap smear. The cells on the left are normal squamous cells whereas the cells on the right are infected with human papillomavirus and show enlarged nuclei with increased staining (hyperchromasia)."	Other
Chapter 11 Mechanisms of Microbial Genetics: Section 11.2 DNA Replication	This animation illustrates the process of DNA replication. Link does not work	This link will be updated.	Broken link
Chapter 11 Mechanisms of Microbial Genetics: Section 11.3 RNA Transcription	The 5'end of the mRNA is not a complement of the DNA on the template strand. They become complementary (like they should be) where they are in close proximity in the RNA polymerase oval. Why? It is confusing. The promoter should be indicated further upstream, or the RNA should be shorter, and all DNA bases that can be seen below the RNA should be complementary to the bases on the RNA.	This figure will be updated.	General/pedagogical suggestion or question

Chapter 11 Mechanisms of Microbial Genetics: Section 11.4 Protein Synthesis (Translation)	There is an error in the labeling of the left part of this figure. The "DNA" label is actually pointing at a strand of amino acids of a developing protein. If you meant to label the DNA, that label needs to be moved up and point at one of the light blue lines of DNA. If you meant to label the developing protein coming out of the ribosome, then change the label to "Protein"	In Figure 11.13, replace the label "DNA" on the lefthand side with "polypeptide" and label the blue line "DNA".	Other factual inaccuracy in content
Chapter 11 Mechanisms of Microbial Genetics: Section 11.4 Protein Synthesis (Translation)	In the last sentence in the first paragraph under Termination, the word initiation is bisected. Currently, it says "init iation".	Thank you for the feedback. We've corrected this typo.	Typo
Chapter 11 Mechanisms of Microbial Genetics: Section 11.5 Mutations	Two "Check your Understanding" boxes repeat the same question, "How does an intercalating agent introduce a mutation?". This question is relevant the first time that it is posed; delete from the second box. (see attached screen shots)	Delete the question from the second Check Your Understanding box.	Other
Chapter 11 Mechanisms of Microbial Genetics: Section 11.5 Mutations	In figure 11.20, a diagram of a guanosine nucleoside and an acycloguanosine are shown in part a (see attached screen shot). However, the caption describes the way in which 5-bromouracil acts as a nucleotide analog. At no point in the text is acycloguanosine mentioned. I suggest revising Figure 11.20 to show thymine nucleoside and its analog, 5-	This figure will be updated.	Other factual inaccuracy in content

	bromouracil, highlighting the portions of the 5-bromouracil ring structure that can base pair with "G"		
Chapter 11 Mechanisms of Microbial Genetics: Section 11.7 Gene Regulation: Operon Theory	As currently written, the patient's necrotizing fasciitis is attributed to Group A Strep that is said to be "resistant to methicillin" and that the methicillin resistance problem is "becoming more common in Group A Strep through horizontal gene transfer". However, Group A Strep is specifically known for its unique susceptibility to beta-lactam antibiotics (although of course there are fears that this someday could change, see https://www.contagionlive.com/news/investigators-warn-group-a-strep-could-be-on-its-way-to-antibioticresistance). Also, the phage-related process that contributed the streptococcal exotoxins is probably lysogenic conversion, e.g., by phage T12 (not transduction). I do not have a good suggestion for changing this clinical case if the intended teaching message is about HGT / antibiotic resistance. Possibly the etiologic agent could be changed to Staph aureus or a polymicrobial infection with S. aureus + S. pyogenes; in that case, the story could focus on gaining of antibiotic resistance genes by S. aureus, specifically (not S. pyogenes). Note, however, that methicillin would not have been provided	Revise all references to group A streptococcus or strep with Staphylococcus aureus. In the third paragraph, revise the sentence "Methicillin resistance is..." to "Methicillin resistance is genetically coded and is increasing among strains of S. aureus through horizontal gene transfer. Strains of S. aureus that are resistant to methicillin are typically resistant to virtually all beta-lactam antibiotics and other classes of antibiotics as well." Revise the sentence "Through genomic analysis..." to "Through genomic analysis by the CDC of the strain isolated from Mark, several of the important virulence genes were shown to be encoded within pathogenicity islands that were associated with prophages. Horizontal transfer of pathogenicity island-encoded virulence factors between strains of S. aureus has been shown to occur through induction of prophage and can be induced by treatment with antibiotics."	Other factual inaccuracy in content

	empirically for a patient who presents with apparent necrotizing faciitis (cephalosporins and clindamycin; https://www.cdc.gov/groupastrep/diseases-hcp/necrotizing-fasciitis.html		
Chapter 13 Control of Microbial Growth: Section 13.1 Controlling Microbial Growth	The scales and colors are inaccurate. Both lines represent the same data - so they need different scales. Both scales listed are logarithmic. Red line is actually for logarithmic scale - but label is wrong color.	This figure will be updated.	Other factual inaccuracy in content
Chapter 13 Control of Microbial Growth: Section 13.1 Controlling Microbial Growth	Key on the Microbial death curve has the labels reversed. The red line should be labeled "Logarithmic scale" and the blue line should be labeled "Arithmetic scale". Also, not sure if this is intentional, but the y-axis labels in red and in blue are identical values. The blue y-axis labels should correspond to the blue line and show an arithmetic progression.	This figure will be updated.	Typo

Chapter 13 Control of Microbial Growth: Section 13.2 Using Physical Methods to Control Microorganisms	Within the radiation section of 13.2 and figure 12. Most sources agree that UV light is not strong enough to sterilize due to the numerous conditions that limit its effectiveness. See this CDC report on page 54 and 55 and note that UV is not included in the sterilization section of the document. It is worth pointing out to the students that under ideal conditions it can sterilize but those conditions are rarely encountered. I propose referring to this method of control as UV disinfection omit the word sterilize when describing its application unless you are careful to qualify when it sterilizes. Here is the link to the CDC reference: https://www.cdc.gov/infectioncontrol/pdf/guidelines/disinfection-guidelines.pdf	Throughout the section, revise "sterilization" to "disinfection".	Other factual inaccuracy in content
Chapter 13 Control of Microbial Growth: Section 13.3 Using Chemicals to Control Microorganisms	It would be helpful for students to see a table/figure that summarizes in one place all of the categories of chemical disinfectants with their mechanism of action and when they are typically used. Much like you have already done in section 13.2 with figure 12 and 13 for the physical methods of control.	Add a table at the end of the section that summarizes chemical disinfectants.	General/pedagogical suggestion or question
Chapter 13 Control of Microbial Growth: Section 13.3 Using Chemicals	On page 579, the book says that Cryptosporidium is a fungus. It is not. It is a protozoa. On page 1084, it is described correctly.	Revise "The fungus Cryptosporidium " to "The protozoan parasite Cryptosporidium".	Other factual inaccuracy in content

to Control Microorganisms			
Chapter 13 Control of Microbial Growth: Section 13.3 Using Chemicals to Control Microorganisms	/l/22CDChandanipri is broken	This link will be updated.	Broken link
Chapter 13 Control of Microbial Growth: Section 13.3 Using Chemicals to Control Microorganisms	Now that the triclosan story has come to an end it would be great to update the story in the text now the FDA has deemed them unsafe and ineffective. You could add a short paragraph on alkyl benzalkonium chloride as we follow the next antimicrobial in the story.	Revise the current last two sentences before the Micro Connections box to: "Initially used in toothpastes, triclosan has also been used in hand soaps and impregnated into a wide variety of other products, including cutting boards, knives, shower curtains, clothing, and concrete, to make them antimicrobial. However, in 2016 the FDA banned the marketing of over-the-counter antiseptic products containing triclosan and 18 other chemicals. This ruling was based on the lack of evidence of safety or efficacy, as well as concerns about the health risks of long-term exposure (See Micro Connections below). In 2019 the FDA issued an updated ban ruling to included 28 chemicals. Rulings on benzalkonium chloride, ethyl alcohol, and isopropyl alcohol have been deferred to allow	General/pedagogical suggestion or question

		for the submission of additional safety and efficacy data."	
Chapter 14 Antimicrobial Drugs: Section 14.1 History of Chemotherapy and Antimicrobial Discovery	The answer to number 2 is missing.	Add the solution for exercise 2 to the Answer Key.	Typo
Chapter 14 Antimicrobial Drugs: Section 14.1 History of Chemotherapy and Antimicrobial Discovery	"Antimicrobial drugs typically work by destroying or interfering with microbial structures and enzymes, either killing microbial cells or inhibiting of their growth." I think it should be "inhibiting their growth" or "inhibition of their growth"	Delete "of".	Typo
Chapter 14 Antimicrobial Drugs: Section 14.3 Mechanisms of Antibacterial Drugs	"diarylquinolones" should be spelled "diarylquinolines". This should be corrected in the index as well.	Revise "diarylquinolones" to "diarylquinolines" in the chapter content and in the index.	Typo
Chapter 14 Antimicrobial Drugs: Section 14.3 Mechanisms of Antibacterial Drugs	https://cnx.org/contents/5CvTdmJL@5.28:pFqSkA-N@6/Mechanisms-of-Antibacterial-Drugs openstax.org/l/22MSUantireslea is broken	This Link to Learning feature will be updated.	Broken link
Chapter 14 Antimicrobial Drugs: Section 14.4 Mechanisms	Antiprotozoan drug table 14.8 is linked to table 14.9.	This link will be updated to Table 14.8.	Typo

of Other Antimicrobial Drugs			
Chapter 14 Antimicrobial Drugs: Section 14.5 Drug Resistance	The sentence currently reads, "This protein binds fluoroquinolones, sequestering them and keeping them from binding to DNA, providing M. tuberculosis resistance to fluoroquinolones." The word, gyrase, has been omitted. Sentence should read, "This protein binds fluoroquinolones, sequestering them and keeping them from binding to DNA gyrase, providing M. tuberculosis resistance to fluoroquinolones." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5648319/	Revise this paragraph to "A recently discovered mechanism of resistance called target mimicry involves the production of proteins that prevent drugs from binding to their bacterial cellular targets. For example, fluoroquinolone resistance by Mycobacterium tuberculosis can involve the production of a protein that resembles DNA. This protein is called MfpA (Mycobacterium fluoroquinolone resistance protein A). The mimicry of DNA by MfpA results in DNA gyrase binding to MfpA, preventing the binding of fluoroquinolones to DNA gyrase."	Other
Chapter 14 Antimicrobial Drugs: Section 14.7 Current Strategies for Antimicrobial Discovery	https://cnx.org/contents/5CvTdmJL@5.28:rr8AStY4@4/Current-Strategies-for-Antimicrobial-Discovery openstax.org/l/22MSUAntResLeaH is broken	This link will be updated.	Broken link
Chapter 15 Microbial Mechanisms of Pathogenicity: Section 15.2 How Pathogens Cause Disease	Figure 4. Glycocalyx is missing in the web view of the text. The description is present, but the image is missing. (The image is present in the 2016 print text p 671, Fig 15.7)	This is appearing correctly in webview now.	Other

Chapter 15 Microbial Mechanisms of Pathogenicity: Section 15.2 How Pathogens Cause Disease	Figure 3 in section 15.2 should label the ears as a portal of entry.	Our reviewers accepted this change.	General/pedagogical suggestion or question
Chapter 15 Microbial Mechanisms of Pathogenicity: Section 15.3 Virulence Factors of Bacterial and Viral Pathogens	"Hylauronan" should be spelled "hyaluronan".	Ensure "Hylauronan" is spelled "hyaluronan".	Typo
Chapter 15 Microbial Mechanisms of Pathogenicity: Section 15.3 Virulence Factors of Bacterial and Viral Pathogens	/l/22pathochol is broken	This link will be updated.	Broken link
Chapter 15 Microbial Mechanisms of Pathogenicity: Section 15.3 Virulence Factors of Bacterial	https://openstax.org/l/22CellDeath redirect is broken. Needs new link.	This link will be updated.	Broken link

and Viral Pathogens			
Chapter 15 Microbial Mechanisms of Pathogenicity: Section 15.3 Virulence Factors of Bacterial and Viral Pathogens	Click this link to see an animation of how the botulinum toxin functions. YouTube no longer hosts this video.	This link will be updated.	Broken link
Chapter 16 Disease and Epidemiology: Section 16.2 Tracking Infectious Diseases	/l/22CDCpointsourc goes to the front page of the CDC DSEPD instead of a point source resource	This link will be updated.	Broken link
Chapter 16 Disease and Epidemiology: Section 16.2 Tracking Infectious Diseases	the link to the website for The Ghost Map does not currently link to a relevant page. When selected, it currently connects readers to a Health Blog with the same name (Ghost Map) here: http://www.theghostmap.com/. It is supposed to link to The Ghost Map, a book about John Snow's work related to the Broad Street pump cholera outbreak.	Delete the first resource and link in this Link to Learning box.	Other
Chapter 16 Disease and Epidemiology: Section 16.4 Global Public Health	Replace Figure 16.17 as it is inaccurate.	This figure will be updated.	Other factual inaccuracy in content

Chapter 17 Innate Nonspecific Host Defenses: Section 17.1 Physical Defenses	In chapter 17, it says that Eosinophil produces Histamine. I am not sure if it does. Also, it says that the skin is composed of 3 layers. Skin is only composed of two layers, dermis and epidermis. The hypodermis is not part of the skin. It is called superficial fascia. https://openstax.org/books/microbiology/pages/17-3-cellular-defenses	This figure will be updated.	Other factual inaccuracy in content
Chapter 17 Innate Nonspecific Host Defenses: Section 17.4 Pathogen Recognition and Phagocytosis	The sentence: Other enzymes are involved a respiratory burst. Should read: Other enzymes are involved in a respiratory burst. -Mike	This typo has been fixed.	Typo
Chapter 17 Innate Nonspecific Host Defenses: Section 17.4 Pathogen Recognition and Phagocytosis	Question 10, inwhich is one word. 10. Hematopoiesis occurs inwhich of the following?	Thank you for the feedback. We've corrected this typo!	Typo
Chapter 18 Adaptive Specific Host Defenses: Section 18.1 Overview of Specific	Chapter 18, question 1, the answer should be C instead of A.	Revise the answer choice for d to "Macrophages".	Typo

Adaptive Immunity			
Chapter 18 Adaptive Specific Host Defenses: Section 18.3 T Lymphocytes and Cellular Immunity	While I was reading I ran into two typos on your online version of the book I thought I might let you know about. Chapter: 18.3 T Lymphocytes and Cellular Immunity Section: T Cell Production and Maturation In the Second paragraph it reads, "The maturation of thymocytes within the thymus can be divided into tree critical steps of positive and negative selection, collectively referred to as thymic selection." I am pretty positive what is meant to be written is 'three' critical steps. Section: Superantigens and Unregulated Activation of T Cells In the first paragraph it reads, "However, if T cell activation is unregulated and excessive, the result can be a life-threatening." Here, I am not sure if its supposed to be 'a life-threatening one' or just omitting the use of 'a' before life-threatening in that sentence.	Revise "tree critical steps" to "three critical steps". Revise "However, if T cell activation is unregulated and excessive, the result can be a life-threatening" to "However, if T cell activation is unregulated and excessive, the result can be life-threatening."	Typo
Chapter 19 Diseases of the Immune System: Section 19.1	The ABO blood type is due to carbohydrate antigen and the Rh factor is a protein antigen.	Our reviewers accepted this change.	Typo

Hypersensitivities			
Chapter 19 Diseases of the Immune System: Section 19.1 Hypersensitivities	https://openstax.org/l/22actbloodtyping redirect is broken. Needs new link.	This link will be updated.	Broken link
Chapter 19 Diseases of the Immune System: Section 19.1 Hypersensitivities	At the bottom of this figure in the box for step 2, IL-12 should actually be IL-13. ¬†The figure legend correctly identifies IL-13 as the cytokine that stimulates Bcells to produces IgE. ¬†However, the actual figure incorrectly says IL-12.	This figure will be updated.	Other factual inaccuracy in content
Chapter 20 Laboratory Analysis of the Immune Response: Section 20.2 Detecting Antigen-Antibody Complexes	No alt text for Figure 20.5.(https://cnx.org/contents/5CvTdmJL@7.1:em26PrnZ@4/20-2-Detecting-Antigen-Antibody-Complexes) No alt text for Figure 24.16 (https://cnx.org/contents/5CvTdmJL@7.1:56q4RyYr@4/24-3-Bacterial-Infections-of-the-Gastrointestinal-Tract) No alt text for Figure 24.40 (https://cnx.org/contents/5CvTdmJL@7.1:F1-V2GCQ@4/24-6-Helminthic-Infections-of-the-Gastrointestinal-Tract)	Alt text will be added to these three figures.	Other

Chapter 20 Laboratory Analysis of the Immune Response: Section 20.3 Agglutination Assays	In reference to the interpretation of the HIA, I think the concluded titer is incorrect. The text above the figure explains "The titer of the patient's serum is the highest dilution that blocks agglutination (Figure 20.20)." But the figure concludes that the titer is the dilution that it is the lowest dilution that does not show inhibition (the opposite); or 128 for sample A and 64 for sample C. I propose it should be 64 for sample A and 32 for sample C.	Revise the last two sentences of the caption to "The highest dilution of patient serum that blocks agglutination is the titer of antibody in the patient's serum. In the case of this test, Sample A shows a titer of 64, and Sample C shows a titer of 32."	Other factual inaccuracy in content
Chapter 22 Respiratory System Infections: Section 22.3 Viral Infections of the Respiratory Tract	https://openstax.org/l/22mycotublegpnean redirect is broken. Needs new link.	This link will be updated.	Broken link
Chapter 22 Respiratory System Infections: Section 22.3 Viral Infections of the Respiratory Tract	Online textbook: Influenza: "Commonly known as the flu, influenza is a common viral disease of the lower respiratory system [Errata] caused by an orthomyxovirus." Influenza viruses mainly attack the upper respiratory system. Brooks, G.F., Carroll,Butel, J.S., Morse, S.A., and Mietzner, T.A. (2013) Chapter 39 Orthomyxoviruses (Influenza Viruses), Clinical Findings, p.584 in Jawetz, Melnick, & Aldelberg's Medical	Revise the sentence beginning "Commonly known as the flu..." to "Commonly known as the flu, influenza is a common viral disease caused by an orthomyxovirus that primarily affects the upper respiratory tract but can also extend into the lower respiratory tract."	Other factual inaccuracy in content

Chapter 22 Respiratory System Infections: Section 22.4 Respiratory Mycoses	https://openstax.org/l/22HPVpercep redirect is broken. Needs new link.	This link will be updated.	Broken link
Chapter 24 Digestive System Infections: Section 24.4 Viral Infections of the Gastrointestinal Tract	The following links need a new target: (https://openstax.org/22Hepvirus)	Revise the URL for https://openstax.org/22Hepvirus to: https://www.cdc.gov/hepatitis/resources/professionals/pdfs/abctable.pdf Revise text as follows: Learn more information about hepatitis virus (https://openstax.org/22Hepvirus) infections.	Broken link
Chapter 25 Circulatory and Lyphatic System Infections: Section 25.2 Bacterial Infections of the Circulatory and Lymphatic Systems	redirect /l/22blackdeath broken. Needs a new link.	This link will be updated.	Broken link
C | Metabolic Pathways	In the reaction from fatty acyl CoA to trans-enoyl CoA, FAD [not FAD+] is reduced to FADH2. In the reaction from beta-hydroxyacyl-CoA to beta-ketoacyl-CoA, NAD+ is reduced to NADH/H+ [not FAD+ to FADH2].	This figure will be updated.	Other factual inaccuracy in content

C | Metabolic Pathways	Figure C3, the reaction from glyceraldehyde-3-phosphate to pyruvate shows 2 ATP --> 2 ADP. It should show 2 ADP --> 2 ATP.	This figure will be updated.	Other factual inaccuracy in content
C | Metabolic Pathways	First thank you for adding the ETC figure! I think it is a great improvement over the version without the figure. I think it would help to add a label to the right half of the figure 1 in section 8.3 to indicate that it is oxidative phosphorylation and move the ATP synthase label somewhere else, perhaps within the protein itself. In the methabolic pathways section the title of the figure should read electron transport chain and oxidative phosphorylation. Again, the ATP synthase label should read oxidative phosphorylation. Students have a hard time learning these two connected processes and it would be really helpful to give them clear labels to visualize where each process is occurring.	Revise "Oxidative Phosphorylation" to "Electron Transport Chain and Oxidative Phosphorylation" above Figure C8.	Other factual inaccuracy in content

C | Metabolic Pathways	Figure C3 describes ethanol as a final end-product of the Entner Douderoff (E-D) pathway. The end-products of E-D are two pyruvates (plus one ATP). Ethanol might be considered an end-product if the E-D pathway were used for fermentation (e.g, Xymomonas) but many non-fermenters use the E-D pathway without any production of ethanol. Change the figure to eliminate the bracket at far right and the arrow to "2 ethanols" at the bottom. Change the caption to read "...converts glucose to two pyruvates plus one ATP". For example, See "Glycolysis for the Microbiome Generation" by Wolfe, 2015 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4507297/pdf/nihms689782.pdf)	This figure will be updated.	Other factual inaccuracy in content
D | Taxonomy of Clinically Relevant Microorganisms	Diptheria should be spelled Diphtheria in the first row of the Phylum Actinobacteria table.	Revise the spelling of "Diptheria" to "Diphtheria".	Typo
E | Glossary	The entry for Proton Motive Force reads: proton motive force electrochemical gradient formed by the accumulation of hydrogen ions (also known as protons) on one side of a membrane relative to the other protozoan (plural: protozoa) a unicellular eukaryotic organism, usually motile. It appears the entry for	Revise so that "protozoan" is set as it's own glossary entry.	Typo

	protozoan was added to the definition of Proton Motive Force		