

**AMERICAN UNIVERSITY OF BEIRUT
FACULTY OF ARTS AND SCIENCES
DEPARTMENT OF BIOLOGY**

Course

Advances in Microbiology (Biology 341), 3 credits
Baron et al. (1999). Medical Microbiology

References

Principles of Food Sanitation (4th edition) – N.G. Marriott
Food Poisoning and Food Hygiene (6th edition) – B.C. Hobbs and
R.J. Gilber
Quantity sanitation (3rd edition) – K. Longree
Food Hygiene – C.P. Collins
Modern Food Microbiology (2nd edition) – J.M. May
Food Science (5th edition) – N.N. Potter
Siegel, Robert (2001) Notes in Microbiology. Stanford Univ.
U.S. Food and Drug Administration (Bad Bug)
World Health organization publications
Bitton, G. (1997). Wastewater Microbiology. 2nd edition
Jay, J.M. (1992). Modern Food Microbiology, 2nd edition

Objectives:

This course is given to graduate Biology students and focuses primarily on the basic applications in industrial, medical and environmental fields. It studies the physiological changes resulting from growth of microorganisms in the environment such as food and water and in hospital environment. In addition to studying the resistance of those isolates to antibiotics and other antibacterial agents. The importance of plasmids in antibiotic resistance is emphasized and the involvement of such a resistance with the presence of plasmids and when applicable to outer membrane proteins. Its goal is to simplify subjects that seem complex and abstract into workable and understandable units using different modern methods of teaching. To achieve this objective, a scientific approach will be followed where students are encouraged to participate by giving presentations, writing a proposal and making constructive suggestions or criticisms to published papers in the field.

Upon the completion on the course, students should:

1. Have an understanding of environmentally related bacterial diseases caused by both aerobic and anaerobic bacteria.
2. Explain the basic features and characteristics of the different groups of bacteria involved in environmentally and industrially borne diseases.
3. Master understanding methods for the detection, isolation and prevention mechanisms related to microbial flora in the environment.
4. Have a complete understanding of quality control and sanitation programs in the food industry and their role in preventing foodborne diseases.
5. Be acquainted with modern research done on industrial food microbiology and sanitation.
6. Have acquired the ability to present, and analyze recently published papers in this domain and to interpret and discuss the papers' results.
7. Practice the ability to write a scientific paper and to perform a well-paraphrased literature review on any topic.
8. Write a scientific proposal on a related field.

Course content

Microbial metabolism: Catabolic and anabolic reactions, enzymes, energy production, Fermentation, lipid and protein catabolism, biochemical tests and bacterial identification, summary of energy production mechanisms, metabolic diversity among organisms, metabolic pathways of energy use and the integration of metabolism.

General characteristics of bacterial groups. Emphasis on their role in the degradation of organic compounds such as foods in the environment under both anaerobic and aerobic conditions.

Food quality control and hygiene

Relation of microorganisms to food borne diseases with emphasis on bacteria.

Food contamination sources.

Personal hygiene and hygienic food handling.

Role of HACCP in hygiene and reducing the role of microorganisms in the degradation of the environment.

The significance of antibiotic resistance bacteria isolated from the environment in the industrial, medical and environmental fields.

Quality assurance programs in relation to

Groups of bacteria studied include:

Gram Negative Rods-enteric

A. Enterobacteriaceae

- a. *Escherichia coli*
- b. *Salmonella spp. and Typhoid Fever*
- c. *Shigella spp.*
- d. *Yersinia spp.*

B. *Vibrio cholera*

C. *Campylobacter spp. and Helicobacter spp.*

Cocci Infections

A. Gram positive

a. *Streptococci spp.*

b. *Staphylococci spp.*

B. Gram negative

a. *Brucella spp.*

Gram Positive Bacilli

A. *Spore forming*

a. *Bacilli spp.*

b. *Clostridium spp.*

B. *Non-Spore forming*

a. *Listeria spp.*

Spirochetes

a. Leptospira spp.

Presentations

Students should present one lecture that is prepared by me on a certain organism. In addition, each student must present four recent journal articles related to the topics we discuss in class (Topics are related to what has been mentioned earlier. They include role of microorganisms in the degradation of industrial products, antibiotic resistance of degrading organisms, transfer of plasmids conferring resistance, HACCP applications, etc.).

Discussions

Each student should practice to discuss real laboratory data on at least two papers.

Proposal

Every student will be required to write and defend a scientific proposal in related fields.

Attendance:

Attendance is a must based on AUB rules. Missing one Fifth of the classes during the semester without a valid reason would result in course withdrawal.

Grading Criteria

- All covered material is equally important.

- **NO FINAL EXAM**
- Total possible points = 100
 - Presentations = 20 points
 - Attendance and participation = 10 points
 - Proposals = 40
 - Discussions of papers = 30

Good Luck