

1. Module identification code.

Name of the institution:	Universidad Autónoma de Nuevo León
Name of the school:	Faculty of Medicine
Name of the degree program:	Clinical Chemistry
Name of the course (learning unit):	Diagnostic Medical Microbiology
Total number of class hours-theory and practice:	120
Class hours per week:	4 hours
Independent study:	40
Course modality:	Schooled
Module level:	Seventh semester
Core/elective module:	Core
Curricular area:	ACFP-I
UANL credits points:	4
Create date:	17/04/2018
Date of last amendment made:	28/06/2024
Person(s) responsible for the design and amendment of the module:	Dr. C. Néstor Casillas Vega

2. Presentation:

The learning unit (LU) of Diagnostic Medical Microbiology will be developed through 3 stages; the first will include the pre-analytical phase in the microbiology laboratory, in which the conditions of collection, storage, and transport of clinical samples will be determined according to the regulatory guidelines that ensure the quality of the sample for the detection of the different etiological agents. The second stage will comprise the analytical phase, where the identification tests for the microbiological diagnosis of infectious diseases will be selected, describing the fundamentals of the main cutting-edge microbiological tests such as molecular and mass spectrometry. In the post-analytical phase of the laboratory, the results of the microbiological tests carried out by different methodologies for the preparation of the microbiological report will be integrated. Finally, a written report will be made of the solution of clinical cases associated with different etiological agents.

3. Purpose:

The purpose of this LU is to contribute to achieving the profile of the graduate in what corresponds to microbiological analysis in clinical specimens by developing the necessary skills to analyze, select, and execute antibiotic identification and susceptibility tests, collaborating with medical personnel for the prevention, diagnosis, and treatment of infectious diseases in various anatomical systems.

The LU collaborates with the achievement of three general competencies by using traditional and cutting-edge research methods and techniques to diagnose microorganisms associated with different human pathologies and generate new knowledge. It empowers graduates to practice different values, such as professional ethics and responsibility in their personal and professional sphere, complying with laboratory rules, and respect for their class. Likewise, this unit helps resolve personal and social conflicts according to the different diagnostic tests applied to microbiology in the health sector.

In this LU, specific competencies will be acquired in the graduate's profile, such as executing microbiological procedures in collecting, handling, storing, and analyzing samples to contribute to a reliable clinical diagnosis. Incorporate new methodologies that contribute to the functional improvement of processes in the clinical laboratory to respond to needs in the health area and interpret the results of the tests based on the established standards, protocols, and criteria that allow timely and relevant decision-making in microbiological diagnosis.

The LU of Diagnostic Medical Microbiology is taught in the seventh semester of the Educational Program of the Bachelor's Degree in Clinical Chemistry and Biology and is related to the subjects of Basic Microbiology, Medical Parasitology, Mycology and Virology, Medical Bacteriology and Immunology, integrating knowledge regarding the morphology, physiology, forms of transmission, immune response and epidemiology of microorganisms to support the appropriate bio-analytical methods that allow the identification of the etiological agent in the different samples to be analyzed. The learning units of more advanced semesters are related to clinical pathology and professional practice

by analyzing various clinical cases where laboratory tests are used in this area based on their sensitivity, specificity, and cost-benefit.

4. Competencies of the graduate profile:

General competencies to which the module (learning unit) contributes:

- *Instrumental competences:*
 8. To use traditional and cutting-edge research methods and techniques for the development of their academic work, the exercise of their profession and the generation of knowledge.
- *Personal and social interaction skills:*
 11. To practice the values promoted by the UANL: truth, equity, honesty, freedom, solidarity, respect for life and others, peace, respect for nature, integrity, ethical behavior and justice, in their personal and professional environment to contribute to building a sustainable society.
- *Integrative competencies:*
 14. To resolve personal and social conflicts, in accordance with specific techniques in the academic field and in their profession for appropriate decision-making.

Specific competencies of the graduate profile to which the learning unit contributes:

2. To execute physical, chemical and/or biological procedures in the collection, handling, storage and analysis of samples to contribute to a reliable clinical, toxicological, chemical, food, forensic and environmental diagnosis.
5. To incorporate new analytical methodology that contributes to the functional, economic and/or environmental improvement of laboratory processes to respond to needs in health areas.
6. To interpret the results of analyses based on established criteria that allow timely and pertinent decision-making in clinical, toxicological, chemical, food, forensic, and environmental diagnosis.

5. Course roadmap:

Stage 1: Pre-analytical phase

Determine the conditions for the collection, storage, and transportation of clinical samples according to regulatory guidelines that ensure the quality of the sample for the detection of different etiological agents.



Stage 2: Analytical phase

Select microbiological identification tests based on the isolated microorganism, urgency of the result, and available methods (traditional and cutting-edge) for the diagnosis of infectious diseases.



Stage 3: Post-analytical phase

Integrate the results of microbiological tests performed using different methodologies for the preparation of the microbiological report.



PIA: Written report on the resolution of clinical cases associated with different etiological agents.

6. Structuring in stages or phases:

Stage 1: Pre-analytical phase in the microbiology laboratory

Component(s) of the competence: Determine the conditions for taking, storing, and transporting clinical samples according to the normative guidelines that ensure the quality of the sample for the detection of the different etiological agents.

Evidence of student learning	Performance criteria	Learning activities	Contents	Resources
Evidence 1. Presentation on the pre-analytical phase in the microbiology laboratory.	<ul style="list-style-type: none"> -Make a presentation in a graphic design program that includes taking, storing, and transporting a clinical sample in the microbiology laboratory. - The presentation is by a team of 3. -The presentation should not exceed 5 minutes. 	<ul style="list-style-type: none"> -The professor gives a general presentation of the LU and distributes the samples or clinical situations for which each team is responsible. -The student reads about the correct guidelines for clinical considerations in the pre-analytical phase in the microbiology laboratory. -The teacher explains the concepts related to collecting, transporting, and general processing of samples in the microbiology laboratory. - The student presents the topic in person with the support of a graphic design program of free choice. -The teacher highlights the most relevant aspects. 	<ul style="list-style-type: none"> - Review of the LU program. -Clinical considerations -Clinical samples are recommended for the microbiological diagnosis of the most common infections. -Collection and transport of samples -Taking samples for microbiological diagnosis. - Transport systems for the research of aerobic and anaerobic microorganisms. - Sample acceptance and rejection criteria/decision-making -Maintenance of samples after processing. 	<ul style="list-style-type: none"> - Microsoft Teams platform - Graphic design program of free choice. <p>Bibliography:</p> <ul style="list-style-type: none"> - Procedures of Diagnostic Medical Microbiology (1st ed.). Mexico: McGraw Hill. - Clinical Microbiology Procedures Handbook. American Society for Microbiology. <p>Web resources for free use:</p> <ul style="list-style-type: none"> - World Health Organization. (2006). <i>Manual of Biosafety in the Laboratory</i>. World Health Organization. - Official Mexican Standard NOM-087-ECOL-SSA1-2002.

Stage 2: Analytical phase in the microbiology laboratory

Component(s) of the competence: Select microbiological identification tests according to the isolated microorganism, urgency of the result, and available methods (traditional and cutting-edge) for diagnosing infectious diseases.

Evidence of learning	Performance criteria	Learning activities	Contents	Resources
<p>Evidence 2. Portfolio of knowledge exams.</p>	<ul style="list-style-type: none"> - Make the case report individually during class time according to the established schedule. -Identify the problem based on the data described in the case. -Indicates a viable solution or diagnosis. -Argue the possible causes or solutions using appropriate medical terminology. - The use of electronic devices for the case solution is prohibited. 	<ul style="list-style-type: none"> - Before the theoretical session, the teacher shares the reference literature on the topic through MS Teams, following the established schedule. -The student reads the reference literature beforehand before the session. -At the beginning of the session, individually, the student solves the knowledge exam of the content of phase 2 in person, which includes topics from 1 to 15. -During the class, the teacher exposes the key concepts using electronic presentations, infographics, and examples related to the content. -The student actively participates in the sessions, individually analyzing the contents reviewed during the theoretical sessions. 	<ol style="list-style-type: none"> 1. Molecular techniques in microbiology. 2. Urinary tract infections. 3. Infections in the genital tract. 4. Infections in the digestive tract. 5. Upper respiratory tract infections. 6. Lower respiratory tract infections. 7. Mycobacteria. 8. Bloodstream infections. 9. Infections in the central nervous system. 10. Infections in sterile liquids. 11. Skin and wound infections. 12. Fungal Infections 13. Infections caused by parasites. 14. Infections caused by viruses. 	<ul style="list-style-type: none"> -MS Teams platform. -The professor prepares an electronic presentation for free use. <p>Bibliography:</p> <ul style="list-style-type: none"> - Procedures of Diagnostic Medical Microbiology (1st ed.). Mexico: McGraw Hill. - Clinical Microbiology Procedures Handbook. American Society for Microbiology. - Procedures in Clinical Microbiology. Recommendations of the Spanish Society of Infectious Diseases and Clinical Microbiology - Basic Medical Microbiology: Fundamentals and Clinical Cases. Elsevier Health Sciences. <p>Web resources for free use:</p> <ul style="list-style-type: none"> - World Health Organization. (2006). <i>Manual of Biosafety</i>

		-The teacher asks interspersed questions about the content during the presentations.		<i>in the Laboratory.</i> World Health Organization. - Official Mexican Standard NOM-087-ECOL-SSA1-2002.
Evidence of learning	Performance criteria	Learning activities	Contents	Resources
Evidence 3. Partial Theoretical Evaluation 1. Topics 1 to 7.	-Develops in 1 hour. -Individually answer 100% of the questions correctly.	-The teacher prepares the theoretical evaluation of 30 clinical situations according to the reviewed content. -The student correctly answers the first theoretical assessment in person.	- Collection, transport, and general processing of microbiological laboratory samples. - Methods of bacterial identification in the microbiology laboratory. - Collection, transport, and general processing of microbiological laboratory samples. - Methods of bacterial identification in the microbiology laboratory.	-Examsoft and MS Teams platforms - Notes in class - Procedures of Diagnostic Medical Microbiology (1st ed.). Mexico: McGraw Hill. - Clinical Microbiology Procedures Handbook. American Society for Microbiology Web resources for free use: CDC, A. W. (2020). Centers for disease control and prevention. -World Health Organization WHO/WHO -American Society for Microbiology. - Official Mexican Standard NOM-087-ECOL-SSA1-2002.

Evidence of learning	Performance criteria	Learning activities	Contents	Resources
Evidence 4. Theoretical Evaluation Part 2. Topics 8 to 14.	-Develops in 1 hour. -Individually answer 100% of the questions correctly.	-The teacher prepares the theoretical evaluation of 30 clinical situations according to the reviewed content. -The student correctly answers the second theoretical assessment in person.	- Viral identification methods - Fungal identification methods - Parasitic identification methods - Microbiological, molecular, and mass spectrometry tests.	-Examsoft and MS Teams platforms - Notes in class - Procedures of Diagnostic Medical Microbiology (1st ed.). Mexico: McGraw Hill. - Clinical Microbiology Procedures Handbook. American Society for Microbiology - US Centers for Diseases Control and Prevention (CDC) -World Health Organization WHO/WHO -American Society for Microbiology.
Evidence of learning	Performance criteria	Learning activities	Contents	Resources
Evidence 5. Presentation of clinical cases on tests for identifying bacteria, viruses, fungi, and parasites.	-Make a presentation that includes four clinical cases associated with the diagnosis of infectious diseases, explaining the main methods of identification in the microbiology laboratory (bacteria, viruses, fungi, and parasites). - The presentation is held by a team of three.	-The teacher distributes the topics for which each team is responsible. -The student reads and analyzes the texts using the correct guidelines for selecting microbiological identification tests. - The student presents the topic in person with the	- Objectives and usefulness in bacterial phenotypic identification. - Microscopic and macroscopic features. -Culture media. - Infectious Disease Basics - Identification of the causal agents. - Objectives and usefulness of viral identification methods in the laboratory. -Viral isolation.	- Microsoft Teams platform - Graphic design program of free choice. Bibliography: - Procedures of Diagnostic Medical Microbiology (1st ed.). Mexico: McGraw Hill. - Clinical Microbiology Procedures Handbook. American Society for Microbiology.

	<p>-It must be sent to the teacher one week before review.</p> <p>-The presentation should not exceed ten minutes.</p>	<p>support of a graphic design program of free choice.</p> <p>-The teacher highlights the most relevant aspects of the presentation.</p>	<p>-Serological methods of viral identification.</p> <p>- Microbiological methods for diagnosing, managing, and studying fungal infection.</p> <p>-Classification of mycoses</p> <p>-In vitro susceptibility studies to antifungals.</p> <p>- Parasitic identification methods.</p> <p>-Study of fecal matter</p> <p>-Main preservatives of stool samples</p> <p>- Methods for obtaining and/or extracting DNA.</p> <p>- Foundation of molecular identification techniques.</p> <p>- Genes used as molecular targets for the identification of microorganisms.</p> <p>- New technologies in microbial molecular identification.</p> <p>-Working procedure</p> <p>-Interpretation of the results</p> <p>-Advantages, disadvantages and limitations of the diagnostic tests used.</p>	<p>- Basic Medical Microbiology: Fundamentals and Clinical Cases. Elsevier Health Sciences</p> <p>Web resources for free use:</p> <ul style="list-style-type: none"> - US Centers for Diseases Control and Prevention (CDC) -World Health Organization - WHO/WHO -American Society for Microbiology.
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Stage 3: Post-analytical phase in the microbiology laboratory

Component(s) of the competence: Integrate the results of microbiological tests performed by different methodologies for preparing the microbiological report.

Evidence of learning	Performance criteria	Learning activities	Contents	Resources
Evidence 6. Problem sample resolution in the laboratory.	<ul style="list-style-type: none"> -Develop the algorithm for identifying the indicated sample. -Select and perform identification tests - Integrates the results of microbiological tests performed by different methodologies to identify the test sample. - Prepare the microbiological report. -Individually. 	<ul style="list-style-type: none"> -The teacher gives each student clinical cases with a sample of problems. -The student develops an algorithm for identifying possible causal agents of infections associated with the clinical picture and sample delivered. - The student selects the sample's material, procedure, inoculation and incubation. Primary tests required for confirmation at the genus and species level. - The student submits a report of results with the presumptive identification of the microorganism. 	<ul style="list-style-type: none"> - Reporting of results of infections of: <ol style="list-style-type: none"> 1. Urinary tract. 2. Genital tract. 3. Digestive tract. 4. Upper respiratory tract. 5. Lower respiratory tract. 6. Bloodstream. 7. Central nervous system. 8. Fungi. 9. Parasites. 10. Viruses. 	<p>Bibliography:</p> <ul style="list-style-type: none"> - Procedures of Diagnostic Medical Microbiology (1st ed.). Mexico: McGraw Hill. - Clinical Microbiology Procedures Handbook. American Society for Microbiology. - Basic Medical Microbiology: Fundamentals and Clinical Cases. Elsevier Health Sciences <p>Web resources for free use:</p> <ul style="list-style-type: none"> - World Health Organization. (2006). <i>Manual of Biosafety in the Laboratory</i>. World Health Organization. - Official Mexican Standard NOM-087-ECOL-SSA1-2002.

7. Summative evaluation:

Stage	Evidence	Weighting
Phase 1	Evidence 1. Presentation on the pre-analytical phase in the microbiology laboratory.	2 %
Phase 2	Evidence 2. Portfolio of knowledge exams.	5 %
	Evidence 3. Partial Theoretical Evaluation 1. Topics 1 to 8.	20 %
	Evidence 4. Partial Theoretical Evaluation 2. Topics 9 to 15.	20 %
	Evidence 5. Presentation of clinical cases on tests for the identification of bacteria, viruses, fungi and parasites.	3 %
Phase 3	Evidence 6. Problem sample resolution in the laboratory.	20 %
CIP	Written report of the solution of clinical cases associated with different etiological agents.	30 %

Total: **100 %**

8. Course integrative project/product:

30.0 % Written report of the solution of clinical cases associated with different etiological agents.

9. References:

- **Casillas-Vega, N. (2020). "Procedures of Diagnostic Medical Microbiology". McGraw Hill.**
- CDC, A. W. (2020). Centers for disease control and prevention.
- Clinical Microbiology Procedures Handbook. American Society for Microbiology.
- Green, L. H., & Goldman, E. (Eds.). (2021). *Practical handbook of microbiology*. CRC press.
- Mahon, C. R., & Lehman, D. C. (2022). *Textbook of Diagnostic Microbiology-E-Book: Textbook of Diagnostic Microbiology-E-Book*. Elsevier Health Sciences.
- Murray, P. R. (2024). Murray. Basic Medical Microbiology: Fundamentals and Clinical Cases. Elsevier Health Sciences.
- World Health Organization. (2006). *Manual of Biosafety in the Laboratory*. World Health Organization.
- Procedures in Clinical Microbiology. Recommendations of the Spanish Society of Infectious Diseases and Clinical Microbiology.
- Riedel, S., Morse, S. A., Mietzner, T. A., & Miller, S. (2022). Medical Microbiology by Jawetz, Melnick & Adelberg-28. McGraw Hill.
- Rosales-Castillo, A., Hidalgo, J., & Tenorio, C. (2020). Infectious Diseases and Clinical Microbiology. *Enferm Infecc Microbiol Clin*, 20200(38), 5.
- Sánchez, J. E. G., Centelles, M. L. G. L., López, F. C. R., & Gil, A. T. (2006). Procedures in clinical microbiology. *Recommendations of the Spanish Society of Infectious Diseases and Clinical Microbiology*.
<https://seimc.org/contenidos/documentoscientificos/procedimientosmicrobiologia/seimc-procedimientomicrobiologia1.pdf>

Free to use resources:

- Official Mexican Standard NOM-007-SSA3-2011. <http://www.salud.gob.mx/cdi/nom/compi/NOM-007-SSA3-2011.pdf>
- Official Mexican Standard NOM-087-ECOL-SSA1-2002. <http://www.salud.gob.mx/unidades/cdi/nom/087ecolssa.html>
- Pan American Health Organization. www.paho.org/ -
- World Health Organization – www.who.int/