

**COURSE DATA****Data Subject**

Code	33062
Name	Pathogens and Illnesses
Cycle	Grade
ECTS Credits	5.0
Academic year	2018 - 2019

Study (s)

Degree	Center	Acad. year	Period
1100 - Degree in Biology	Faculty of Biological Sciences	4	Second term

Subject-matter

Degree	Subject-matter	Character
1100 - Degree in Biology	16 - Fundamentals of health biology	Optional

Coordination

Name	Department
AMARO GONZALEZ, CARMEN	275 - Microbiology and Ecology
ROCA VELASCO, VICENTE	355 - Zoology

SUMMARY

This is an optional subject belonging to the intensification Fundamentals of Health Biology (FSB) which is both theoretical and practical and is located in the second semester with the subjects Neurobiology and Immunology. This course is perfectly complemented by Immunology, laying the basis for the functioning of the immune system in response to pathogens. The objects of study in P&D are pathogens and how they cause infectious diseases. A substantial part of the subject is the analysis of pathogen-host interaction in its various forms (virulence factors, virulence genes, evasion of immune response, regulation of virulence, etc.) Analysis allows to understand, not only the infectious process, but also the strategies designed for its control.



PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

You must have passed 120 ECTS

OUTCOMES

1100 - Degree in Biology

- Conocer y saber aplicar el método científico.
- Capacidad de organización, planificación y gestión de la información usando bases de datos bibliográficas adecuadas.
- Utilización del vocabulario específico de la Biología sanitaria.
- Capacidad de resolución de problemas y toma de decisiones.
- Capacidad de elaborar artículos, informes o proyectos y de exponerlos a diferentes auditorios.
- Habilidad para el trabajo en equipo y en contextos multidisciplinares.
- Capacidad de análisis crítico de textos científicos.
- Aprendizaje autónomo y adaptación a nuevas situaciones.
- Potenciar la creatividad, iniciativa y espíritu emprendedor.
- Apreciación del rigor, el trabajo metódico, y la solidez de los resultados.
- Potenciación de la capacidad de liderazgo.
- Capacidad de utilización de herramientas matemáticas y estadísticas.
- Reflexión ética sobre la actividad profesional.
- Conocimiento de bases de legislación relacionada con la Biología.
- Saber analizar datos usando herramientas estadísticas apropiadas.
- Conocimiento de sistemas de gestión en tareas profesionales en Biología sanitaria.
- Conocer los principales métodos y técnicas experimentales aplicadas al estudio de las enfermedades humanas, su etiología y la efectividad de los tratamientos.
- Conocimiento de las enfermedades y disfunciones más frecuentes durante las distintas etapas de la vida.
- Conocer los organismos patógenos de humanos, las patologías que provocan y conocer los fundamentos de las principales estrategias terapéuticas.



- Conocer los mecanismos de interacción hospedador-patógeno para entender factores de virulencia en enfermedades infecciosas y parasitarias.
- Saber diseñar y preparar vacunas y saber realizar las vacunaciones.
- Entender la genómica de patógenos y sus implicaciones para el diseño de fármacos y vacunas.

LEARNING OUTCOMES

- Know the procedure for isolating a microorganism and / or a pathogenic parasite from a clinical specimen.
- Distinguishing between common pathogenic bacteria and parasites.
- Understand the practical application of serological and genetic methods in diagnosis and epidemiology of infectious diseases.
- Know the main methods used to study the effectiveness of treatments for infectious diseases.
- Know the usefulness of animal models for studying human diseases.
- Mastering basic microbiological techniques needed to identify pathogenic bacteria.
- Mastering basic parasitological techniques necessary to identify pathogenic parasites.
- Knowing how to properly interpret an antibiogram and its outcome.

DESCRIPTION OF CONTENTS

1. Bacteria and viruses. Generalities

Item 1. Microbial pathogens: classification and types. Transmission routes and reservoirs. Pathogenicity and virulence. Virulence factor and clone. Epidemiology. Mobile genetic elements and pathogen evolution. Genomes.

Item 2. Importance of the horizontal gene transfer (HGT) in the evolution of pathogens. Natural transformation. Conjugation: plasmids, transposons, conjugative transposons. Transduction. Pathogenicity islands. HGT and evolution. Example: Evolution in *Vibrio cholerae*

Item 3. Bacterial colonization factors. Colonization by extracellular pathogens. Fimbrial and non fimbrial adhesins; fimbriae of grampositives and gramnegatives. Biogenesis. Biofilm. Multiplication: High affinity iron uptake systems; exoenzymes. Resistance against the innate immune system. Colonization by intracellular pathogens: invasion and intracellular residence. MALT and mucosal colonization by intra and extracellular pathogens: example: *Shigella*.

Item 4. Agresins. Secretion systems. Toxins: types of toxins. Extracellular toxins: classification according to its action. Toxins A+B; choleric toxin, pertussis toxin, diphtheric toxin, botulinic and tetanic toxins, Shiga toxin. Cytotoxins. Superantigens. Injectable toxins. Modulines; LPS and septic shock.



Location of genes for toxins.

Item 5. Virulence regulation. Gene organization in procariotes. Direc and random regulation. 2-component systems. Niche-marker signals. Regulator proteins; activators and repressors. Sigma factors. Proteins HN-S. Quorum sensing. Gene amplification and reorganization. Examples: ToxR regulon and QS in *Vibrio cholerae*.

Item 6. Vaccines. Types of vaccines. Killed and live vaccines: differences. Subunitary vaccines. Recombinant and vectored vaccines. DNA vaccines. Peptidic vaccines. Eat vaccines. Trials to test a human vaccine.

2. Parasites. Generalities

Topic 7. Animal associations. Parasites and guests. Terminology in parasitology. Extension of Parasitism in the animal kingdom. Types of parasites. Origin and evolution of parasitism. Adaptations i preadaptations Parasitic-host co-evolution.

Topic 8. Life cycles of parasites. Direct cycles Indirect cycles. Importance of the guests intermediaries in the epidemiology of * parasitosis.

Topic 9. Meeting and acknowledgment of the host. Mechanisms of invasion of parasites. Outbound tracks. Effects of the parasite on the host. Host countermarines.

3. Parasites Parasitic / host interaction models.

Based on the teaching methodology ABP (problem-based learning) students, by groups, they will study a specific case stated by the teacher, from different points of view of the paràsithoste relationship.

That is, in preparing their work they will have to refer to the following aspects: Hosts.

Location of the parasite: Life cycle and mode of transmission. Pathogenesis Epidemiology. Prevention, control and treatment of parasitosis.

4. Practices

Block I Bacteria and viruses

P1. Vibriosis: Serum and genetic variability of *V. vulnificus*. Diagnosis of the disease. Epidemiology. Control and prevention. Mechanisms of pathogenicity.

P2. Isolation on different selective and non-selective media. Purification

P3. Identification through conventional methods. Gram, oxidase and API20I multiprocess system.

P4. Identification through genetic methods. Multiple PCR

P5. Resistance to human serum.

P6. Treatments: antibiogram.

Block II Parasites

P7. Anisakidosis: isolation and identification of *Anisakis simplex* larvae from fish.

P8. Teniasis and ascaridosis: recognition of spices of grapes and lizards.

P9. I. Coprological analysis: identification of parasitic forms. II. Microscopic analysis: *Plasmodium* identification and several Flagellats.

**WORKLOAD**

ACTIVITY	Hours	% To be attended
Theory classes	29,00	100
Laboratory practices	20,00	100
Tutorials	1,00	100
Development of group work	20,00	0
Study and independent work	10,00	0
Preparation of evaluation activities	32,50	0
Preparing lectures	11,50	0
Preparation of practical classes and problem	1,00	0
TOTAL	125,00	

TEACHING METHODOLOGY

The following teaching methods will be used for activities of this course:

1. **Lectures.** Method based on the exhibition / lecture and the study and resolution of issues related to the matter exposed.
2. **Practical classes.** Solving exercises and problems (testing and implementation of knowledge).
3. **Group/ personal mentoring.** Assist and guide students with regard to issues that arise during development of all kind of activities.

EVALUATION

1. **Evaluation of the knowledge of theory** will be an evaluation of the concepts worked in the theoretical sessions by conducting, at the end of the course, a test exam lasting 1 ½ hours. The value of this test is or **70%** of the final course grade.
2. **Assessment of practical skills** will take place continuously during the laboratory work and using a test that is conducted together with the theory test and will last half an hour. This test will contain questions and problems on the practices and the mark obtained will represent **30%** of the final course grade.

Attendance at lab sessions is a prerequisite to pass the course.

To pass the course it will be required to obtain a rating higher than 5 out of 10 both in the theory and practices from the two parts of the subject, independently.



Students who do not assist to any part of the final examination (theory and/or practical skills) in the first call and do not pass the course, will have the qualification of NOT EVALUATED in the records.

Call 2: Students who fail the course in the first call, will keep the note of passed parts for the second call.

Laboratory notes of 5 or greater (of 10) obtained during an academic year will be saved for the calls of the following academic year.

REFERENCES

Basic

- BROCK-BIOLOGÍA DE LOS MICROORGANISMOS. Madigan, M.T., J.M. Martinko, P.V. Dunlap & D.P. Clark. 12ª edición, Pearson. Addison Wesley. 2009
- MICROBIOLOGÍA de Prescott, Harley y Klein. Willey, J.M., Sherwood, L.M. y Woolverton, C.J. 7ª edición. McGraw-Hill-INTERAMERICANA DE ESPAÑA, S.A.U. 2009
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- Cellular Microbiology. Cossart, P., P. Boquet, S. Normand, R. Rappuoli. 2nd edition. ASM, Washington D.C. 2004
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Additional

- Bush, A.O., Fernández, J.C., Esch, G.W. & Seed, J.R. 2001. Parasitism. The diversity and ecology of animal parasites. Cambridge University Press. Cambridge
- Combes, C. 1995. Interactions durables. Écologie et évolution du parasitisme. Masson. Paris
- Flint, S.J., L.W. Enquist, R.M. Krug, A. Racaniello, and A.M. Skalka. 2000. Principles of virology: molecular biology, pathogenesis, and control. ASM, Washington D.C.
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- Seifert, H.S., H. Steven and V. J. DiRita. 2006. Evolution of microbial pathogens. ASM, Washington D.C.
- Singleton, P. and D. Sainsbury. 2001. Dictionary of Microbiology and Molecular Biology. 3rd ed. Wiley-Blackwell
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