DEGREE CURRICULUM

PHARMACEUTICAL BIOTECHNOLOGY

Coordination: RIBAS FORTUNY, JUDIT

Academic year 2021-22

PHARMACEUTICAL BIOTECHNOLOGY 2021-22

Subject's general information

<table>
<tr><td>Subject name</td><td>PHARMACEUTICAL BIOTECHNOLOGY</td></tr>
<tr><td>Code</td><td>101625</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Biotechnology</td><td>4</td><td>OPTIONAL</td><td>Attendance-based</td></tr>
<tr><td>Master's Degree in Biomedical Research</td><td></td><td>COMPLEMENTARY TRAINING</td><td>Attendance-based</td></tr>
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<tr><td>Course number of credits (ECTS)</td><td>6</td></tr>
<tr><td>Type of activity, credits, and groups</td><td>
<table>
<tr><th>Activity type</th><td>PRALAB</td><td>PRAULA</td><td>TEORIA</td></tr>
<tr><th>Number of credits</th><td>0.3</td><td>1.4</td><td>4.3</td></tr>
<tr><th>Number of groups</th><td>1</td><td>1</td><td>1</td></tr>
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<tr><td>Coordination</td><td>RIBAS FORTUNY, JUDIT</td></tr>
<tr><td>Department</td><td>EXPERIMENTAL MEDICINE</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Lectures: 60 hours
Independent Student Work: 90 hours</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan or Spanish</td></tr>
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PHARMACEUTICAL BIOTECHNOLOGY 2021-22

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BOIX TORRAS, JACINT	jacint.boix@udl.cat	,4	
RIBAS FORTUNY, JUDIT	judit.ribas@udl.cat	5,6	

Subject's extra information

Pending Translation

Learning objectives

The student who passes the subject must know (Knowledge objectives):

1. Relations between biotechnology, the pharmaceutical industry and the drug market.

2. The language and concepts of basic and experimental pharmacology.

3. Biotechnological drugs already marketed.

4. The biological targets behind biotechnological drugs.

The student who passes the course must be able to (Capacity Objectives):

1. Assess the relationships between biotechnology, the pharmaceutical industry and the drug market.

2. Assess the biotechnological drugs already marketed and the perspectives in this field.

3. Assess the biological targets behind biotechnological drugs.

4. Process and assess the information present on the "Internet" about the pharmaceutical biotechnological industry, both in its scientific and (to a lesser extent) business aspects.

Competences

- CG1 Being able to search for and selectively use sources of information necessary to achieve the training objectives.
- CG2 Interpret scientific-technical information with a critical sense, and be able to make presentations based on this information
- CG3 Work as a team, with a multidisciplinary vision and with the ability to make a rational and effective distribution of tasks among team members.
- CG4 Know and properly use the scientific and technical vocabulary of the different areas of Biotechnology.
- CE44 Know the main fields of application of Biotechnology and acquire basic training in some of them

Subject contents

Topic 1. Introduction to biotechnological drugs. Analyze the origins of medicines. Observe and explain the roles of

the pharmaceutical industry and health authorities in the drug market. Describe the phases in the development of a drug. Briefly characterize these phases. Biotechnology and the pharmaceutical industry. Basic notions of pharmacology and therapeutics.

Topic 2. Pharmacokinetics. Absorption and distribution of drugs. Variables that regulate these phenomena. Compartments and barriers. Pharmacotechnics: drug formulation. Biotransformation and excretion of drugs: concept and regulatory factors. Phase I and phase II reactions. Bioavailability. Plasma half-life of a drug. Quantitative pharmacokinetics.

Topic 3. Pharmacodynamics and drug interactions. Pharmacodynamics concept. Mechanisms of action of a drug. Actions and effects of drugs. Study of the relationship between effects and dose. General receptor theory. Drug interaction: synergism and antagonisms.

Topic 4. Synthetic peptides and informational drugs. Pharmacologically characterize these products. To study the analogues of somatostatin and gonadorelin as an example of peptidomimetics. synthetic DNA and RNA. Hybridons and/or antisense oligonucleotides (AOs or ASOs). The triplex strategy with oligonucleotides. Interfering RNAs: Mechanisms of action and therapeutic potential.

Topic 5. Recombinant proteins applied to human therapeutics. Refer the history of Humulin, human recombinant insulin. Insulin formulations, an example of pharmacotechnics. Unnatural insulins. Discuss the problems with recombinant proteins: the case of recombinant somatotropins. Identify other products of this type currently on the market. Recombinant cytokines in human therapeutics. The case of interferons and their therapeutic applications. Recombinant false receptors.

Topic 6. Vaccines. Define vaccines as specific immunoactivating drugs based on antigen processing. Identify the types of vaccines by their origin and composition. The immunology of adjuvants. Vaccine applications: infectious, autoimmune and cancer diseases. Perspectives in the development of new vaccines.

Topic 7. Monoclonal antibodies and immunotoxins. Define immunoglobulins and antisera as passive specific immunoactivating drugs. Distinguish immunoglobulins from antisera. Place monoclonal antibodies, humanized monoclonal antibodies, and immunotoxins in this context. Pharmacologically characterize these products. Identify products of this type currently marketed.

Topic 8. Molecular pharmacology: conventional drugs with a biotechnological appearance. Protein kinases as a pharmacological target: BCR-ABL, KIT, EGFR, BRAF and ALK. Other molecular targets of pharmacological and therapeutic interest in cancer.

Topic 9. Antibiotics: biotechnological drugs with a conventional appearance. Define antibiotic. Expose the molecular bases of anticancer, antiviral, antibacterial, immunosuppressive selectivity, etc. Classify these products.

PRACTICAL ACTIVITIES:

Practical activity 1. Apply the pKa parameter to the chemical characterization of drugs. Solve how ion sequestration determines the greater / lesser absorption / elimination of a drug, depending on the basic or acid nature of this drug and its pKa.

Practical activity 2. Resolution of problems of determination of balances in the plasmatic concentrations of the drugs.

Practical activity 3. Measure the affinity of an agonist for the receptor through PD2. Measure the affinity of a competitive antagonist for its receptor through the PA2 or antagonistic potential.

Practical activity 4. Simulations of experimental pharmacodynamics in cell cultures (measurement of cell death), organ baths (neuromuscular junction) and animals (spinal cat).

Practical activity 5. Analysis of the information on the Internet about a biotechnological product and the biotechnological or pharmaceutical industry that develops it. Oral presentation made by the students, in groups of 2-3 students, under the supervision of the pharmacology faculty.

Practical activity 6. Self-assessment exercises.

Methodology

Pending Translation

Development plan

Following the official calendar / schedule of the course, non-routine teaching activities will be announced sufficiently in advance for an adequate development of the subject.

In the event of a health emergency, measures will be taken to guarantee the continuity of the course.

Evaluation

A first examination based on questions and problems of pharmacokinetics and pharmacodynamics will be carried out. It will generate 28% of the final grade for the subject, therefore it will not be recoverable.
The presentation made on a biotechnological product and the development industry will be evaluated. This presentation generates 22% of the final grade for the subject, therefore it will not be recoverable.
There will be a theoretical exam. It will generate 50% of the final grade for the subject, therefore it will be recoverable.
The final pass of the subject is situated at 5, that is, 50%, adding the scores of the 3 evaluations mentioned above. There is no minimum grade in any of the 3 exams that is incompatible with passing the course.
In all the exams and especially in the theoretical one, if the blank answers exceed 50% of all those in the exam, it will mean that the exam is null, that is, the NP (Not Presented) grade.
The exams will be objective and multiple choice. Each question will present 4 options of which only one is correct. The blank answer adds 0 points. The error answer subtracts ¼ from the value assigned to the question. * In the event that the exam is carried out remotely, the type of exam may vary. This fact will be communicated to the students in the Convocation prior to the exam.
A correction coefficient will be added to the final grade, the calculation of which will be explained on the first day of the course. This coefficient will be applied only to students who pass a grade of 6 (60%) in the theoretical exam. At the discretion of the teachers, the coefficient can be modified or stopped applying when aberrant results are generated.
Honors will be awarded to students with the best grade after obtaining the qualifications of the first call.
(*) Exceptionally and due to health emergency situations, the evaluation will be carried out through the existing tools on the Virtual Campus. In this case, the make-up exam will become oral.

Bibliography

Books:

1. Farmacología. Rang, H.P. et al. (7ª ed.), Elsevier España S.A., 2008
2. Pharmaceutical Biotecnology. Fundamentals and applications. Crommelin D.J.A. et al. (3rd ed), Informa Healthcare USA, Inc., 2008

Journals:

1. Annual Reviews of Pharmacology and Toxicology (http://arjournals.annualreviews.org/loi/pharmtox)
2. Trends in Pharmacological Sciences (TIPS), Elsevier
3. Current Opinion in Pharmacology, Elsevier
4. Trends in Biotechnology, Elsevier
5. Current Opinion in Biotechnology, Elsevier

Webs:

1. Agencia Española del Medicamento, Ministerio de sanidad y consumo (http://www.agemed.es/)
2. Agencia Europea del Medicamento (http://www.emea.europa.eu/)

3. U.S. Food and Drug Administration, Center for Drug Evaluation and Research: (http://www.fda.gov/cder)
4. Rx List, the internet drug index (http://www.rxlist.com/)