
COURSE: Insect biotechnological applications in medicine, industry and bio-control (6 CFU)

ACADEMIC YEAR: 2016-2017

TYPE OF EDUCATIONAL ACTIVITY: (Free choice)

TEACHER: Prof. Patrizia Falabella

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Language: **ITALIAN**

ECTS: 6(4 of lectures and 2 of
tutorials/practice)**n. of hours: 56**(32 of lectures and 24 of
tutorials/practice)Campus: **Potenza****Department of Sciences:**Program: **Biotechnology (L2)****Semester: I**(from October, 3rd
2016 to January, 15th-
31st 2017)

EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

The course is the first one analyzing the possible applications of Insect biotechnology in medicine, industry and in bio-control. It will allow the gain of deep knowledge on Insects as new biological systems, alternative to mammals, with their possible application in pharmaceutical and biomedical experimentation, as innovative source for the identification of new molecules and processes of natural origin, in order to improve human activities.

Lectures content will be based on the results of the most innovative scientific research, including reading, understanding and critical evaluation of the most recent scientific works.

The knowledges provided will be:

- An overall picture on insect morphology and functional anatomy;
 - Insect Biotechnology in Medicine;
 - Insect Biotechnology in Plant Protection;
 - Industrial Applications of Insect Biotechnology;
 - Insect proteins and nucleic acid extraction;
 - Recombinant proteins production;
 - In vivo* and *in vitro* bioassays to functional characterize bioactive gene and molecules of interest;
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PRE-REQUIREMENTS

It is important to have basic knowledges on:

- General and inorganic chemistry;
 - Organic chemistry;
 - Biochemistry;
 - Cellular Biology
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SYLLABUS

Lectures: 32h

1) An overall picture on insect morphology and functional anatomy (8h):

- Tegument
- Muscular, nervous, digestive, circulatory, respiratory Systems
- Immunity

2) Insect Biotechnology in Medicine (8h):

- The greater waxmoth *Galleria mellonella* as an alternative model host for human pathogens;
- Fruit Flies as models in biomedical research;
- Therapeutic potential of anti-microbial peptides from insects;
- From traditional maggot therapy to modern biosurgery;
- Insect-associated microorganisms as a source of novel secondary metabolites with therapeutic potential;
- Potential pharmaceuticals from insects and their co-occurring microorganisms.

3) Insect Biotechnology in Plant Protection (8h):

- Insect antimicrobial peptides as new weapons against plant pathogens;
- Protection of crops against insect pests using RNA interference;
- Insect transgenesis and the technique of the sterile insect;
- Host parasitoid interactions as source of new genes and molecules with potential insecticidal activity.

4) Industrial Applications of Insect Biotechnology (8h):

- Insect cells for heterologous production of recombinant proteins;
 - Biotechnologies based on silk;
 - Biosensors based on insect olfaction;
 - Insect-inspired technologies: insects as a source for biomimetics.
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Tutorials/practice 24h**5) Analysis and manipulation of insect nucleic acids:**

- DNA and RNA extraction from insect;
- Amplification of Insect DNA by PCR;
- Reverse transcription of Insect RNA;
- Evaluation of the expression levels of insect genes by classical methods (Northern blot) and innovative ones (Quantitative Real time PCR);
- Molecular hybridization with specific probes by dot-blot and Southern blot;
- Preparation of cDNA library from insects tissues and screening methods;
- RNA interference

6) Production of recombinant proteins from insect genes in bacterial vectors and in insect cell lines (8 h):

- Electrophoresis of proteins and Western blot;
- Preparation and analysis of the transcriptome of insect tissues (RNA seq and the use of the main bioinformatics tools);
- *In vivo* bioassays (injection in Insects) and *in vitro* (in insect cell lines) for the functional analysis of genes and molecules of interest.

TEACHING METHODS

Lectures (32 h), Laboratory tutorials (24h), Project works, Reading and discussion of International scientific papers on the main topic reported during the lectures.

EVALUATION METHODS

Oral examination and Discussion of a project work.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

E. Tremblay – Entomologia applicata. Volume primo: generalità e mezzi di controllo

P.J. Gullan P.S. Cranston Lineamenti di Entomologia Zanichelli

Vilcinskas, A. Insect Biotechnology- Springer

Power Point Lessons

Selected Scientific Articles

INTERACTION WITH STUDENTS

At the beginning of the course, after describing the objectives, the program and the methods of evaluation, the teacher will provide the material (lessons in Power Point, Scientific Articles). Simultaneously, a list of students who intend to enroll the course, together with name, serial number and email, will be drafted.

Office hours: on Tuesday and on Thursday from 15:30 to 16:30 in the teacher office. In addition to the weekly reception, the teacher will be available by e-mail or cell phone.

EXAMINATION SESSIONS (FORECAST)

See on the web site <https://unibas.esse3.cineca.it/Home.do>

SEMINARS BY EXTERNAL EXPERTS YES X NO ☐ when possible

FURTHER INFORMATION
