

Design of Experiments and Research Projects

Code: 103972
ECTS Credits: 3

Degree	Type	Year	Semester
2502445 Veterinary Medicine	OT	5	2

Contact

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Use of Languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Other comments on languages

This subject is taught 50% in Spanish and 50% in Catalan

Teachers

Jesús Piedrafita Arilla
Patri Vergara Esteras

Prerequisites

Have passed at least the first 3 years of the degree. It is recommended that the student review the statistical content taught in Epidemiology and Statistics course (in the second year)

Objectives and Contextualisation

This is an optional subject for the fifth year, where the main objective is to give the Veterinary student the knowledge to be accredited for the D function (Design of Procedures and Projects) * established in Royal Decree 53/2013, which It refers to the protection of animals used for scientific purposes and where the issues related to the training and training of staff working with experimental animals are regulated. This subject is aimed at all those students who contemplate to work in the research field, and especially to those who wish to continue their education with third cycle studies.

The main focus where the whole subject is based is the application of the principle of 3Rs in the design of procedures and their impact on the experimental data obtained. All the factors involved in the experimental design will be tackled step by step: from the approach of the hypothesis to the choice of the experimental model, the impact of animal welfare and the control of the environmental factors, the choice of the experimental design and the appropriate statistical analysis, and finally the dissemination of results.

The specific training objectives are:

1- Understand the national and international legal and regulatory framework in which the research projects are designed and managed.

2- Understand and respond appropriately to the ethical and welfare issues that arise in the procedures in which experimental animals are used.

3- Learn how to design and manage an experimental procedure in order to achieve the established objectives, while guaranteeing compliance with current regulations.

4- Know how to develop the analysis of the data in order to present the results and the corresponding report.

Students who pass this subject may request the corresponding accreditation to develop the D function in the species of veterinary interest (domestic carnivorous, ruminants, equidae, birds, pigs, fish and lagomorphs) to the Directorate General for Environmental and Natural Environment Policies. Veterinary graduates who have also passed the subject "Science of laboratory animals" may include rodents in the list of species for which they request accreditation for the development of function D

Competences

- Analyse, synthesise and resolve problems and make decisions.
- Demonstrate knowledge and understanding of standards and laws in the veterinary field and regulations on animals and their trade.
- Demonstrate knowledge and understanding of the aspects of organisation, finance and management in all fields of the veterinary profession.
- Demonstrate knowledge and use of statistical concepts and methods applicable to veterinary science.
- Recognise ethical obligations in the exercise of responsibilities in terms of the profession and society.
- Seek and manage information related with professional activity

Learning Outcomes

1. Analyse the relation between variables.
2. Analyse, synthesise and resolve problems and make decisions.
3. Apply the main experimental designs to research in different veterinary fields.
4. Describe applicable legislation on the utilisation of laboratory animals.
5. Distinguish the factors that influence the welfare of laboratory animals, both during maintenance and during use in experimental procedures.
6. Explain basic statistical inference and its relation with scientific behaviour.
7. Identify and define the concepts involved in the design of biological experiments and estimate sample size and potency of the test.
8. Identify the functions of the Ethical Committee in animal experimentation.
9. Recognise personal limitations and know when to ask for professional advice and help.
10. Seek and manage information related with professional activity
11. Use suitable software to resolve different designs, including parametric and non-parametric methods, in accordance with the nature of the data studied.

Content

THEORETICAL and PRACTICAL PROGRAM

Topic 1. Introduction to experimental design. Legal requirements and "3Rs". Steps to follow to perform the correct design of a procedure. Relation between experimental design and statistics. Consequences of an incorrect experimental design.

Topic 2. Systematic information search. Approach to hypotheses and objectives. Research of alternative methods to the use of laboratory animals (Go3Rs). ARRIVE guidelines for the dissemination of results

Topic 3. Type of variability: fixed variability and random variability. Sources of variability associated with the animal. Types of experimental models. Use and limitations of isogenic strains, not consanguineous and

genetically modified.

Topic 4. Sources of variability associated with environmental factors. Importance of animal welfare in design and its effects on results. Application of refinement to guarantee animal welfare. Causes of the appearance of bias and ways to reduce them. Standardization

Topic 5. Identification of the experimental unit. Choice of treatments. Establishment of the experimental groups. Choice of variables to measure. Utility of pilot studies.

Topic 6. Types of experimental designs. Approach and use of complete random designs, random blocks, factorials, Latin squares and repeated measures in the same animal. Choice of design depending on the type of procedure and the factors involved.

Topic 7. Hypothesis test. Contrast of normality. Comparison of two averages: test power and sample size.

Topic 8. Analysis of designs ANOVA: complete random, factorial, random blocks, Latin square, repeated measures. Non-parametric methods.

Topic 9. Association of variables: correlation and regression. Analysis of covariance.

Topic 10. Responsibilities of the research staff regarding the use of animals for experimentation.

Topic 11. Preparation of projects for their evaluation in accordance with ethical principles and current legislation.

PROGRAM OF SEMINARS

Seminar: a teamwork session to design an experimental procedure

Methodology

26 hours of theoretical-practical sessions. In these sessions, students will learn about the theoretical concepts that will be applied later in cases to be solved in the classroom. A 2-hour seminar will be held in which students will have to work as a team to design an experimental procedure, which will subsequently be discussed. Students will have to present three cases or exercises that will be scored and will be used to carry out the assessment. The resolution of each case is associated with 2.5 hours of tutoring that the student can use to resolve doubts, present the work in preparation, obtain advice, etc.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Seminars	2	0.08	2, 3, 5, 7
Theoretical-practical sessions	26	1.04	1, 2, 3, 10, 4, 5, 6, 7, 8, 9, 11
Type: Supervised			
Tutorial	8	0.32	1, 2, 3, 4, 5, 6, 7, 8, 11
Type: Autonomous			
Cases resolution	39	1.56	1, 2, 3, 10, 4, 5, 6, 7, 8, 9, 11

Assessment

The evaluation will be based on the resolution of 3 cases:

1. Design of an experimental procedure: 25% of the final mark

2. Analysis and presentation of the experimental data: 40% of the final mark. It will have to solve a minimum of two exercises on data analysis.
3. Preparation and presentation of an experimental project for its ethical evaluation: 35% of the final grade

Criteria for passing the subject:

- 1-To pass the subject, at least 20 hours of class attendance is required.
1. In each case, at least 4 must be attained.
2. The final grade is obtained by adding the weighted notes of each one of the cases, and the approved one is placed in the 5.

Re-evaluation (recovery):

1. Each one of the cases in which the mark obtained has been less than 4 must be recovered.
2. The final grade is obtained by adding the weighted notes of the recovered cases (as long as their rating is equal to or greater than 4) with the weighted notes of the cases approved in the first instance.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Resolution of 3 cases	100%	0	0	1, 2, 3, 10, 4, 5, 6, 7, 8, 9, 11

Bibliography

M.J. Crawley. 2013. The R book. Wiley, Hoboken N.J. (electrònic a UAB)

M.F.W. Festing, P. Overend, R. Gaines Das, M. Cortina Borja & M. Berdoy. 2002. The design of animal experiments. Reducing the use of animals in research through better experimental design. Laboratory Animals Ltd, London

G.D. Ruxton & N. Colegrave. 2003. Experimental design for the life sciences (second edition). Oxford University Press Inc, New York.

A. Petrie & P. Watson. 2013. Statistics for veterinary and animal science. Wiley-Blackwell, Oxford.

Software

Software for the exercises of statistics