



## A novel educational approach: Using sheep as a model in teaching veterinary pathology<sup>☆</sup>

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### ABSTRACT

Veterinary undergraduates, after completion of five academic years, need to have developed a set of skills for working as veterinary practitioners. Sheep as an educational model in veterinary pathology offers to students the opportunity to study with an easily handled animal species, which shows various diseases. In the present model, sheep are treated as individual patients; a thorough individual examination is made with all laboratory tests that are considered necessary. Undergraduates can study main sheep diseases, but also disorders occurring less often and carry out an individual animal investigation as it is normally done in companion animals. Final diagnosis is confirmed by pathological examination, so they can check if there is agreement or disagreement between clinical and pathological diagnosis. The opinion of students about this teaching model was obtained from a questionnaire and it provided an encouraging and valuable information and feedback. Moreover, information collected from monitoring, clinical examination and pathological examination of animals is directly transferred to the farmers and this has obvious benefits in terms of flock health management and disease surveillance.

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### 1. Introduction

The European Space for Higher Education (ESHE) was promoted in Europe after the Bologna Declaration and should have been implemented in 2010. It is for that reason that all Spanish Universities are undergoing important changes to adopt a common framework of comparable degrees; the process is also taking place in veterinary teaching establishments of the country. Furthermore, educational modifications are promoted from the ESHE, particularly focusing on specific professional competences for veterinary students. Veterinary undergraduates have to develop a set of skills that include technical competencies,

effective communication, decision making and professionalism (Baillie et al., 2010).

Students receive the veterinary degree after completion of 5 years of academic studies and are supposed to have been trained to work as clinicians. Recent reports project a deficiency of veterinary pathologists, indicating a need to train highly qualified veterinary pathologists, particularly in academic veterinary medicine (Lairmore et al., 2007). In general, veterinary students receive more clinical learning during their final years at university, although it has been a historic demand that, by the 3rd year of their studies, they can compare healthy with sick animals when they were learning clinical investigation.

Faced with the request made by students about increasing the number of clinical practices, we designed a novel teaching system, using sheep as an educational model for general clinical training. This system has been used since the academic year 2004–2005, with very encouraging results. Objective of this paper is to explain implementation and operation of this teaching system and to present feedback from students.

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## 2. Materials and methods

In a geographical area with over 2 million sheep, use of these animals in the veterinary clinical training is a claim for the students and a reality for lectures. Sheep are animals easily handled by students, with a varied range of pathological conditions; moreover, there are the added advantages of low cost and availability in the respective geographical area. Undergraduates can perform clinical examination, laboratory tests and treatments to the animals with no pressure from the owner and can follow all the clinical process, concluding at the post-mortem room with a pathological examination.

The project has received financial support from the University of Zaragoza, through the grants of teaching innovation. The first grant was received in the academic year 2004–2005, followed by subsequent grants in 2008–2009, 2009–2010 and 2010–2011.

### 2.1. Planning and operating the teaching system

Teaching planning and operation is supported by the following steps. In all cases, the process is carried out according to European Animal Welfare legislation and is monitored by the Ethics Committee on Animal Use in Veterinary Practice.

Sheep would be admitted to the faculty by one of the following two different ways. In the first approach, a member of academic staff, of those involved in the project, visits, at the beginning of each academic term, the collaborating farms to choose sheep that are considered interesting for teaching purposes; each sheep usually has various disorders; in these cases, the price of the animals is usually low, because the animals selected are among those to be culled. In the alternative approach, practicing veterinarians referred and farmers brought in sick animals to the faculty; examinations and treatments are performed by students, with help by academic staff.

In order to transport animals to the faculty with no bureaucratic issues and low cost, respective agreements were reached with the local government a farming cooperative, with the incentives to help teaching of veterinary students and veterinary services to local farmers. After arrival at the faculty, animals are housed at the facilities of the service support section.

The selected animals are used during the academic term in different subjects, including Clinical propaedeutics, medicine, pathology, as well as in the clinical rotations undertaken by the students. Based on these animals, 3rd-year students learn to develop clinical examination techniques and animal handling, 4th-year students learn clinical medicine and gross-pathology and 5th-year students develop treatment and control techniques, mainly on animals brought into the faculty.

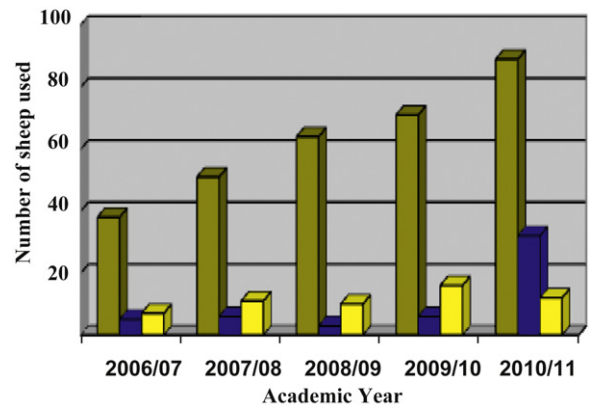
Over these years, a survey of the main disorders found in the sheep used for teaching has been conducted. Examination records are maintained in all cases and all data (including results of any ancillary tests performed and findings of the pathological examination) are entered into a central database. Descriptive statistical analysis of the results has been performed by means of SPSS system (v. 12.0) (IBM Co., Armonk, NY, USA).

### 2.2. Evaluation of the teaching system by students

Students of the faculty have been asked to evaluate the educational approach by means of a questionnaire, which was completed anonymously, immediately after the end of their practice, during academic year 2010–2011. The questionnaire was designed in two parts.

The first part included three quantitative questions, aiming to assess importance of this approach within the general clinical training (1st question) and within the ruminant training in particular (2nd question), as well as general satisfaction with the approach (3rd question). In their answers, students gave a score on a '1' (worst) to '5' (best) scale.

The second part of the questionnaire also included three quantitative questions. The first question referred to whether overall ruminant training received during the studies was considered to be insufficient, sufficient or excessive. The second question explored the students' interest to potentially working with ruminants in their future professional life and, finally, the third question investigated the preferred animal species in their future professional life, by asking them to score on a 1–6 scale for horses, dogs/cats, exotic animals/wildlife, ruminants, swine/poultry, no animal contact.



**Fig. 1.** Total number of sheep used in teaching from academic year 2006–2007 to academic year 2010–2011 and their sources (brown bars: purchased animals, blue bars: animals referred by practicing veterinarians referred or brought in by farmers brought, yellow bars: lambs born on the premises). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

## 3. Results

### 3.1. Materials used in teaching

Number of animals used for teaching purposes as described above has increased progressively in the last 5 years. In the academic year 2006–2007, 46 adult sheep and 7 lambs were used, whilst in 2010–2011 these numbers increased to 121 adult and 12 lambs, respectively. During the last five academic years (2006–2007 to 2010–2011), total numbers of animals were 365 adult sheep and 56 lambs (Fig. 1).

Various disorders have been diagnosed in these animals. Frequently, several problems were diagnosed in the same animal, usually one severe illness and one or more other different problems of lesser severity and importance for the farmer, which, nevertheless, had an academic interest (Table 1). In this context, it is important to differentiate

**Table 1**

Diseases and disorders diagnosed in 365 adult sheep used in teaching from academic year 2006–2007 to academic year 2010–2011.

Disease or disorder	Affected animals (n)	Proportion of the 365 sheep studied (%)
General disease	301	82
Mucous, skin, wool disorders	284	78
Mouth, teeth, jaw disorders	277	76
Disorders of legs and feet	170	47
Mammary disorders	161	44
Respiratory diseases	139	38
Eye disorders	65	18
Genital and urinary systems problems	45	12
Gastrointestinal system diseases	30	8
Lymphadenitis	8	2
Behavioural and neurological problems	7	2
Cardiovascular diseases	7	2
Ear disorders	7	2
Total	1501	

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