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Executive Summary

The rearrangement of the global policy of Fundação para a Ciência e a Tecnologia (FCT) will imply, within a short range of time, the implementation of new structural approaches with a direct impact on the national scientific network. Having that in mind and following a major reorganization process in 2010, the Animal and Veterinary Research Centre (CECAV) applied for funding of RD&T Strategic Projects with public Interest promoted by Associated Laboratories and R&D Units. This strategic project was approved by FCT and will govern the structural arrangement of CECAV for the biennium of 2011-2012.

The first report issued by the Scientific Advisory Committee (SAC) in November of 2010 was also an important tool to promote the analysis of CECAV's performance. During this year most of the issues raised by the SAC were analysed with the research groups and new measures were implemented in order to cope with the reported recommendations.

In general terms CECAV has concentrated its efforts in the pursuit of multidisciplinary projects aiming to reinforce the integration of a wide number of researchers in larger research projects. Furthermore the development of partnerships with the industry stakeholders was also stimulated.

Finally, considerable efforts were developed in order to promote the basis of a strategic approach for the implementation of a consortium of research units within the agricultural sciences.

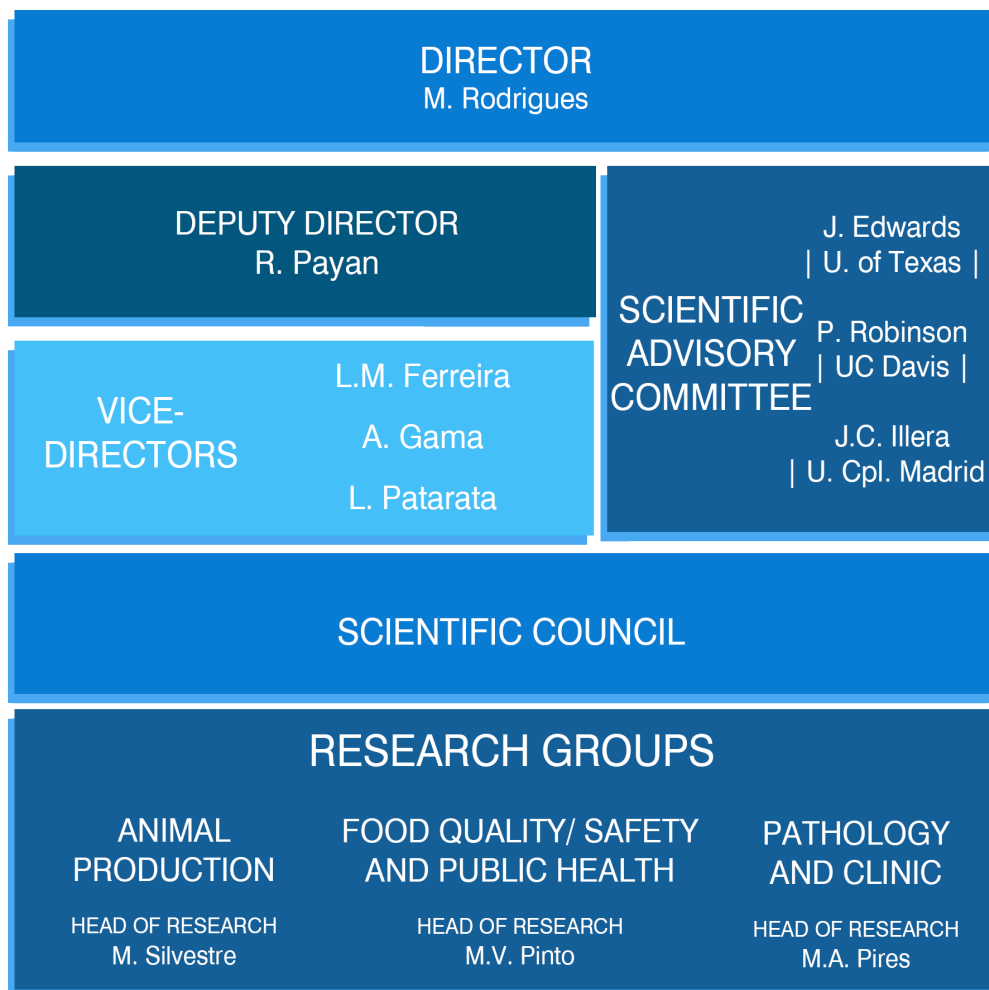




Unit description

CECAV currently integrates 44 PhD members from the Departments of Animal Production and Veterinary Sciences from the University of Trás-os-Montes and Alto Douro (UTAD) and from the Polytechnic Institute-Agrarian School of Bragança. In addition, it also integrates, as Collaborators, 29 researchers (PhD and MSc) belonging to UTAD and other Institutions.

According to its administrative organization, CECAV is structured in a Directive Board (DB), which is constituted by a Director, one Deputy Director and three Vice-Directors, and a Scientific Council (SC) including all integrated research members.





The Scientific Council elects the Directive Board for a three year period. Inclusion criteria for integrated member of CECAV are based on the scientific productivity of that PhD member in the former three years.

Criteria for distribution of the FCT base funding are also centred on the scientific productivity of the teams, which is scored/graded according to the number, type (full paper, review article, short note) and quality of the manuscripts (impact factor; quartile in category) published on international peer reviewed journals.

According to FCT's regulation for the multi-year funding program for R&D Units, CECAV is counselled by a Scientific Advisory Committee (SAC) that incorporates three renowned personalities external to CECAV and to UTAD: Professor J. Edwards from the University of Texas, Professor P Robinson from the University of Davis-California, and Professor J C Illera from the University Complutense of Madrid. This Committee is responsible for the analysis of the unit's performance.

The research activity of CECAV is mostly conducted at UTAD facilities. Besides using different laboratories of the Animal Production and Veterinary Sciences Departments (histology and histopathology, animal cell culture, clinical pathology, microbiology and parasitology, animal nutrition, animal physiology, meat hygiene and technology), research is also developed in animal facilities prepared for nutrition and production studies, animal surgery rooms, controlled environment rooms for farm animals and an experimental abattoir. Furthermore, biochemistry, instrumental and phytochemical laboratories of the Chemistry, Biology and Environmental Sciences, or the Agronomy Departments may also be used by CECAV researchers. Occasionally, part of the research activity is developed outside the UTAD, in national and international Centres, enhancing the cooperation and the establishment of network research.

The general management and financial control of the Centre is under the supervision of the Directive Board but is carried out by the administrative and financial structures of the host institution.



General objectives

General objectives of CECAV were established on the basis of the strategic project PEst - OE/ AGR/ UI 0772/ 2011 approved by the FCT. In this way several objectives were established for this year:

a) During 2011 increased efforts were conducted towards the strengthening of the integrative and collaborative research between members of the different research groups and to the establishment of more homogeneous research lines in order to increase the scientific identity of the research groups integrating CECAV. Regarding this issue, and following the guidelines of the SAC, each research group implemented a program to specifically address the main capabilities of its members and to evaluate which areas of research should be maintained or eliminated. A program to evaluate the research facilities and equipment that should be relocated, acquired or upgraded was also an important objective for 2011.

b) The strategic plan for this year also included the need to discuss with the administrative services and the Rector of UTAD the organization of the new research building in order to create integrated research facilities.

c) The research Centre maintained its efforts to strengthen collaborative research with other national and international Research Centres as well as with industry partners.

d) The upturn of students (PhDs and MSc) coming from other national or international institutions along with the participation of the Centre in post-graduate studies was a priority as well, in order to increase the overall critical mass of the research groups.

e) Dissemination of the scientific activity of CECAV, overcoming the problems with our webpage, a more selected participation in meetings, conferences or seminars, as well as publication of our research in peer review journals, were also assumed as important tasks of the Unit as a whole





Main Achievements

Main achievements were centred on:

a) The consolidation of each research group implicated the departure of two integrated members. In addition five former collaborators were accepted as integrated members, and a new member from another research Centre was also integrated. Overall, CECAV increased its integrated members to 44 PhD researchers.

At this stage, the Clinical Sciences and Pathology group is targeting towards the study of biological strategies in the area of development, tumour progression and tumorigenesis promotion, including the role for the immune system and immune-related molecules. The Food Quality/Safety and Public Health group is focusing their research in zoonotic agents and spoilage organisms integrated in public health and food safety issues. The research lines of the Animal Production group are now being directed to the improvement of sustainable animal production systems especially targeting marginal agrarian areas.

b) One of the main issues raised by SAC was related to the outdated animal research facilities and laboratories, the lack of certification of laboratories and the underuse of some facilities. The board of direction of CECAV took all the possible measures to discuss this issue with the Rector of UTAD and direct its efforts to the allocation of several laboratories to the new research facilities. During this year several meetings took place and it is expected that in 2012 an integrated proposal of all the research centres will be discussed by the administrative services.

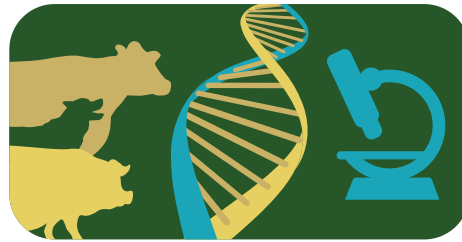
c) Collaborative research was reinforced during 2011. Most of the publications (90%) were done in straight cooperation with scientists from renowned research Centres. Furthermore, the development of new projects also was done in straight cooperation with other research centres and industry partners. Although only subjected to approval in 2012, the participation of CECAV together with the Centre for Agro-Environmental and Biological Technologies (CITAB) (project leader) in the FP7 framework - Integration of research entities from the EU's Convergence and Outermost regions in the ERA and enhancement of their innovation potential (REGPOT-2012-2013) should be highlighted.

d) During this year CECAV has fostered the research activities of foreign students coming from the Federal University of Bahia (Brasil), Federal University of Santa Catarina (Brasil), Wageningen University (Netherlands) and Ghent University (Belgium). These contacts are also being developed in order to enhance cooperation in research international projects. Following its participation in the approval of the accreditation process of the PhD in Animal Science, CECAV is now also the research Centre that supports the PhD in Veterinary Sciences sanctioned in 2011 by the National Agency for the Evaluation and Accreditation of University Degrees. During 2011, 2 PhD and 16 MSc Thesis were completed by students whose research activities were supported by CECAV.

e) In 2011 there was a high number of publications in peer review journals of ISI and book chapters, corresponding to an increase of 35% (56 papers) and 90% (14 book chapters) when comparing to 2010.

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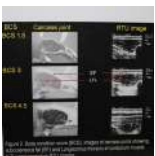
António Mario Domingues Silvestre, Arnaldo A. Dias da Silva, Cristina V. de Miranda Guedes, Divanildo Outor Monteiro, Jorge Antonio Colaço, Jorge Manuel T. de Azevedo, José Carlos Almeida, José Luís Teixeira de Abreu M. Mourão, José Manuel Almeida, Luis M. Mendes Ferreira, Miguel António Machado Rodrigues, Severiano J. Cruz da Rocha e Silva, Victor Manuel de Carvalho Pinheiro, Virgínia Alice Cruz dos Santos

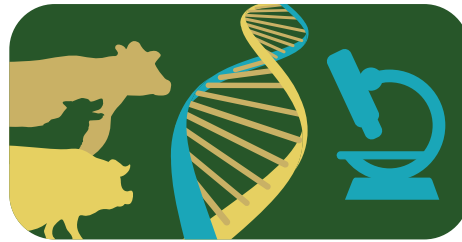
Ana Luisa Lourenço, Ana Sofia Santos, Maria José Gomes, Paulo Russo Almeida, Filipe Silva, Mário Cotovio, John Cone, Koldo Osoro



Objectives


The main goal of the Animal Production group was to develop research focused on livestock production systems of less favoured agrarian regions, including animal nutrition studies, the evaluation of grazing behaviour of free-ranging domestic herbivore species and the evaluation of meat quality of species raised under these systems. Furthermore, studies on the development of methodologies that guarantee food safety of animal products and the study of mastitis resistance through animal breeding were also envisaged.






Main achievements

The main scientific research achievements were the following:



a) Grazing behaviour studies showed that diet composition estimates can be obtained using long chain fatty acids as faecal markers in all ruminant species. These markers can be used in alternative or as complement with alkanes to improve accuracy of diet composition estimates. In addition, it was also verified that limiting nutritive quality of heath lands restricts both cattle and horse performance, implying the need for other vegetation communities with higher quality (e.g. grasslands). Mares and cows showed different foraging behaviour in these vegetation conditions that seemed to affect their productive responses.



b) Included in the general objective of the development of integrative solutions that could help solving some problems of less favoured agrarian areas, studies on the nutrition of Garrano autochthonous equine breed have been conducted. Given the importance and the impact of the Garrano breed on the landscape management of the Northwest region of Portugal, more specifically in mountain areas, studies have been conducted to evaluate its caecum-colon ecosystem and the influence of nitrogen and energy sources on its metabolism.

c) The food demand for animal protein and healthy quality products has been increasing constantly. In last decade studies with several domestic species have shown that the knowledge of muscle fibres characteristics and their possible modulations during growth is important for meat quality. The results obtained with buffaloes (*Bubalus bubalis*), slaughtered at different live weights, showed difference in the frequency of muscle fibre types according to slaughter weights, which demonstrate that the slaughter weight influences the profile of muscle fibres from buffaloes. Taking advantage from these results it is in perspective to enlarge this methodology to future studies of meat quality from cattle, sheep and goat raised in extensive systems. In addition, results obtained in rabbit's meat quality support the adoption of open-air raising systems. This could be implemented in marginal areas thus supporting the development of extensive and more sustainable rabbit production systems.

d) The heritability for somatic cell score will be an important step towards the genetic evaluation for somatic cell scores in dairy cows. Somatic cell score has been considered the most suitable indicator trait for mastitis resistance. To improve genetic mastitis resistance in general can reduce the use of chemical medications and a longer productive life of cows thus contributing to a sustainable animal production.



Group productivity

Full papers in ISI®

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Celaya, R., Ferreira, L.M.M., García, U., Rosa García, R., Osoro, K., 2011. Diet selection and performance of cattle and horses grazing in heathlands. *Animal*, 5:1467-1473. IF=1.458.

Ferreira, L.M.M., Celaya, R., Santos A.S., Falco, V., Guedes, C., Rodrigues, M.A.M., Osoro, K., 2011. Evaluation of long-chain alcohols as diet composition markers in goats grazing heathland areas. The utilization of long-chain fatty acids as markers for diet composition estimates in ruminants: effects of animal species, diet composition and marker combination. *Grass Forage Sci.*, 66: 183-195. IF=1.402.

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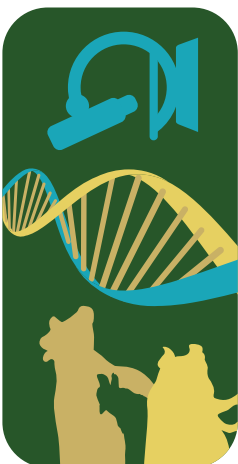
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Ferreira, L.M.M., Celaya, R., Benavides, R., García, U., Osoro, K., 2011. Comparison of animal performance of domestic herbivores grazing on partially improved heath lands. New trends for innovation in the Mediterranean animal production. Bouche, R., Derkimba, A., Casablanca, F. (Eds.), EAAP publication Wageningen Academic Publishers, Wageningen, The Netherlands no. 129, p. 143-147.

Osoro, K., Ferreira, L.M.M., García, U., Celaya, R., 2011. Performance of domestic herbivores in marginal heathlands. New trends for innovation in the Mediterranean animal production. Bouche, R., Derkimba, A., Casablanca, F. (Eds.), EAAP publication Wageningen Academic Publishers, Wageningen, The Netherlands no. 129, p. 148-152.

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Barbosa, J., Freitas, A., Moura, S., Mourão J.L., Noronha da Silveira, M.I., Ramos, F., 2011. Resíduos de furaladona e de nifursol em músculo, fígado e moela de galinhas. Poster. Painel Análises Químico-Biológicas. Livro de comunicações do "IV Congresso Ibero Americano de Ciências Farmacêuticas". 23 e 24 de junho. Faculdade de Farmácia da Universidade de Lisboa, Lisboa. p.173.

Celaya, R., Ferreira, L.M.M., García, U., Rosa, R., Osoro, K., 2011. Productive performance and foraging behavior of cattle and horses grazing in Cantabrian heathlands. 12th European Heathland Workshop, Spain-Portugal, Southern European heathlands-diverse landscapes under global change. Workshop, Symposium and Excursion Guide, 12-18 June 2011. University of León-Universidade de Trás-os-Montes e Alto Douro. p. 113.

Celaya, R., García, U., Ferreira, L.M.M., Rosa, R., Rodrigues, M.A.M., Osoro, K., 2011. Horse performance grazing on heather- or gorse-dominated shrublands. 12th European Heathland Workshop, Spain-Portugal, Southern European heathlands-diverse landscapes under global change. Workshop, Symposium and Excursion Guide, 12-18 June 2011. University of León-Universidade de Trás-os-Montes e Alto Douro. p. 114.

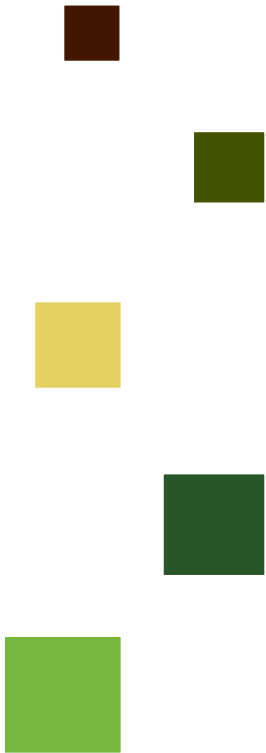
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Santos, A.S., Cotovio, M., Silva, S.R., 2011. Utilização da análise de imagem digital para determinação à distância de medidas biométricas em equinos. II Jornadas do GTIE. 26 de junho, Ponte de Lima. CD-Rom

Tavares, T., Mourão, J.L., Kay, Z., Spring, P., Vieira, J., Gomes, A., Vieira-Pinto, M., 2011. Efeito da substituição dos oligoelementos inorgânicos por levedura orgânica de selénio e oligoelementos quelatados na qualidade da carcaça e da carne de frango industrial. Poster. Livro de comunicações do "Congresso Ciências Veterinárias". 13 a 15 de outubro. Fonte Boa, Vale de Santarém. p. 173.

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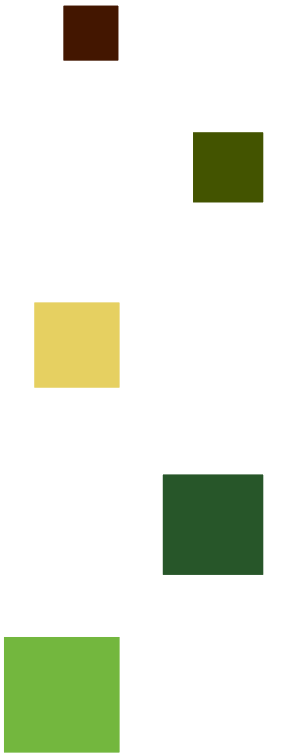
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MSc thesis

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Fragateiro, D.P., 2011. Gilt behavior in intensive production system. Universidade de Trás-os-Montes e Alto Douro, Vila Real. pp. 59.

Lebre, P.J.A., 2011. Goat voice changes after cirurgical procedure. Universidade de Trás-os-Montes e Alto Douro. Vila Real. pp. 125.

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FOOD QUALITY, SAFETY
AND PUBLIC HEALTH

Alexandra Esteves, Ana Cláudia Coelho, António Silva, Jorge de Almeida Rodrigues, Luís Patarata, Madalena Vieira-Pinto, Maria da Conceição Fontes, Maria José Felix Saavedra, Nuno Alexandre Silva, Patrícia Poeta

Alexandre Fradeira Gonçalves, Anabela Portela Borges, Ana Cristina Outeiro Correia de Matos, Carla Sofia Dias, Carla Sofia Gomes, Catarina Coelho, Cristina Saraiva, Radhouani Hajer, Sónia Ramos.

Objectives

The objectives during 2011 were similar to those established for 2010. The group still deriving its research activity mainly in five research areas:

a) Probiotics, produced by different microorganisms and its application in human, veterinary medicine and in food conservation

b) Antibiotic resistance and molecular characterization of virulence factors in microbiota from different ecological niches from humans and animals

c) Prevalence and epidemiological studies on foodborne pathogens (*Salmonella* sp., *Campylobacter* spp., *E. coli*, *Listeria* spp., *Aeromonas* spp.) from food of animal origin

d) Zoonotic agents, mainly on epidemiological evaluation and diagnosis of mycobacteriosis in slaughtered animals (cattle, sheep and pigs) and game (wild boars, red deer)

e) Assessment of the factors that determine sensory characteristics of meat and meat products and evaluation/increase of shelf life based on the control of spoilage microflora and pathogenic microbiota.

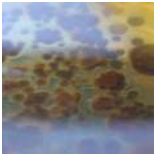


CECAV

FOOD QUALITY, SAFETY
AND PUBLIC HEALTH

Main achievements

The main achievements of the Food Quality/Safety and Public Health group derived from the scientific activity developed under an important multidisciplinary collaboration between UTAD, national and international Centres/Institutes. During 2011 research was once again directed to Antibiotic resistance and virulence factors in important pathogens from animals, food, humans and different ecological niches, under a genomics and proteomics approach. Studies were also developed on important foodborne pathogens (*Salmonella* sp., *E. coli*, *Aeromonas* spp.) under a molecular, serotyping and phylogenetic approach in order to improve knowledge on prevalence, definition of contamination sources, risk to public health and strategies to improve food safety, such as packaging, temperature, and improvement of traditional methods for meat products (fermentation, drying, spices and herbes, wine...). Concerned to the epidemiological evaluation and diagnosis of zoonosis, the research studies were mainly derived on *M. bovis* and MAC complex in slaughtered animals (cattle, sheep and pigs) and game (wild boars, red deer) and include epidemiological, histopathological and genetic diagnosis tests.



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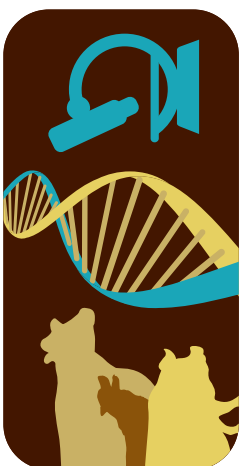
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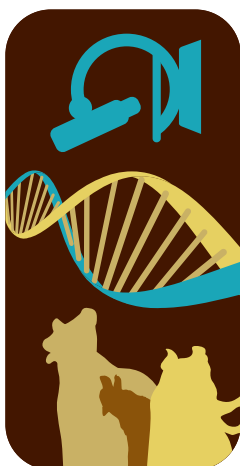
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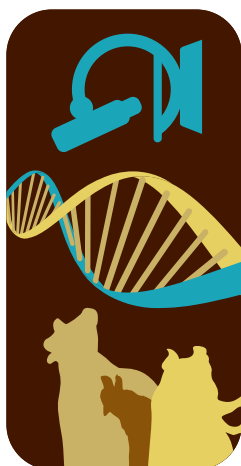
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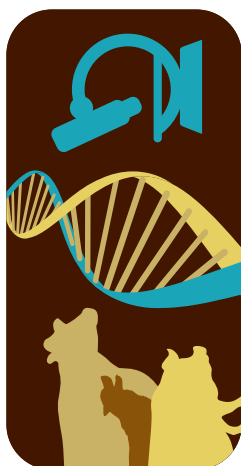
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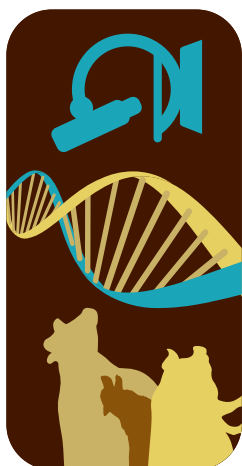
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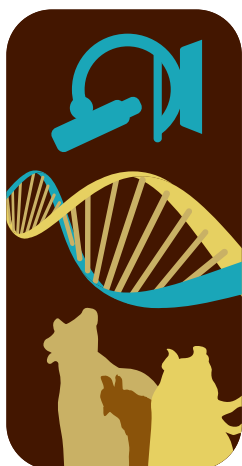
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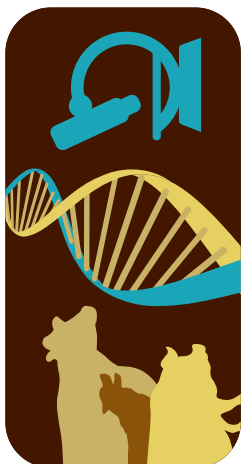
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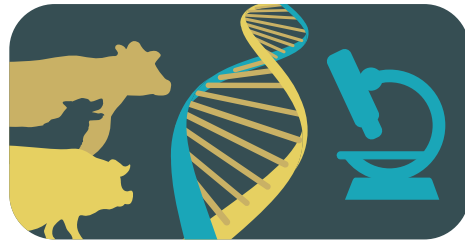
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CECAV
PATHOLOGY AND CLINIC

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Ana Laura Saraiva, Ana Margarida Calado, Bruno Colaço, Carlos Venâncio, Carmen Nóbrega, Fernanda Ferreira, Maria João Pires, Maria do Rosário Leite, Miguel Quaresma, Regina Rodrigues Arantes.

Objectives

The group of Clinical Sciences and Pathology integrates a multidisciplinary researchers cooperating to common goals on the study of the developmental mechanisms, the molecular markers of inflammation, and in carcinogenesis, along with the study of changes associated to endogenous and exogenous influences, such the ambient toxicants.



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Main achievements



To achieve the purposed goals, the Group uses both experimental (rodents) and spontaneous species (mainly dogs and cats) as models to the study of individual and external influences on carcinogenesis, inflammation and disruption of the normal development in different organs and systems, including fertility.

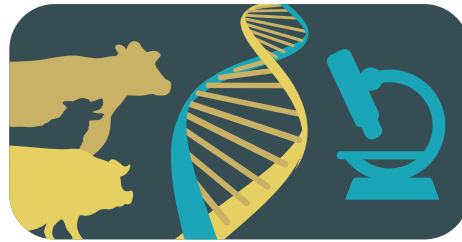
Human fertility is decreasing along with an increase on the incidence of the tumours, in a way that is suggestive of the interference of external or environmental factors. Dogs and cats are excellent models for studies of external effects on the reproductive function and carcinogenesis, as these animals live together and often in close contact with humans, thus sharing the same environment. They can reflect those interferences by presenting the same sort of spontaneous problems found in the human co-habitants (sentinel animals).

Furthermore, exogenous administration of toxicants or drugs to experimental models can provide information on the influences of cumulative effects and dose-related changes on the fertility parameters or the incidence of tumours, along with information on the physiopathological mechanism underlying such influences.



The information gathered in these studies ought to provide new biological markers for diagnostic that may be useful for medicine and potentially used in the industry; and for determination of prognostic as well as identification of new therapeutic targets, in particular concerning cancer.

With the aims previously described, the group focus his attention on the study of biological markers of proliferation, oxidative stress and cell response to injury, apoptosis, inflammatory modulators, protective molecules, besides the development of a lipidomic approach to the relationship between mitochondria and the nucleus, with particular interest in the situations involving tumours, inflammation and degenerative diseases.



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Among the ongoing projects, the group has the following assignments :

a) Vitamin A signalling pathways during lung development and maturation in foetal and perinatal stages (from the 15th gestational day till the 3rd day of life) in a murine model

b) The study of fertility parameters and molecular markers of fertility in dogs and stallions and its application in the improvement of semen cryopreservation.

c) Improvements in cerebral blood flow and body organ perfusion during anaesthesia

d) Investigation on spontaneous animal tumour models soughing to determine new prognostic factors and new therapeutic targets, especially in skin, genital system and mammary tumors.

e) Experimental carcinogenesis including the study of paraneoplastic syndromes and their association with tumour produced factors

f) A lipidomic approach of the relationship between mitochondria and nucleus in cancer cells and degenerative situations, and the potential involvement of exogenous toxicants.



Group productivity

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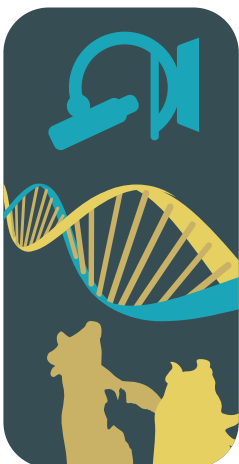
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