



## ANIMAL AND VETERINARY SCIENCE RESEARCH CENTRE

2010  
ANNUAL REPORT





**FCT**

Fundação para a Ciência e a Tecnologia  
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Animal and Veterinary Research Centre (CECAV)  
Universidade de Trás-os-Montes e Alto Douro  
Quinta de Prados, Apartado 1013  
5001-801 Vila Real  
PORTUGAL

<http://www.cecav.utad.pt/>



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## Executive Summary

The research Centre in Animal and Veterinary Sciences was reorganized in 2010 and a new directive board was elected in June. Although some modifications were introduced, the mission of the Centre remained the same and research emphasis was directed to the achievement of high levels of efficiency in livestock production without compromising animal health and welfare, product quality and safety and the surrounding environment. Nevertheless, CECAV's research groups were modified in order to cope with a new management that focused its efforts on interdisciplinary approaches between the different research projects.

This was also an important year due to the evaluation conducted by the Scientific Advising Committee (SAC). This process occurred during October of 2010 and the final report was sent to the directive board by December. In this way the main recommendations of the committee will be implemented during next year.

The reinforcement of the critical mass of CECAV was also a priority and new integrated members and collaborators were incorporated in the research groups. Contributing to this issue, 5 PhD and 43 Master Thesis were completed by students whose research activities were supported by CECAV.

Taking advantage of the FCT and the Portuguese Agency for Public Awareness of Science grants the Centre recruited graduation students and students from secondary schools, involving them in global research experience.

Another important landmark was the involvement of CECAV in the PhD degree in Animal Science of the University of Trás-os-Montes e Alto Douro, being the research Centre that supported the accreditation by the National Agency for the Evaluation and Accreditation of University Degrees.

A focused approach to industry was also established as one of the Centre's main priorities. Following the 2009 main strategy targeting the need to increase research, contracts with private companies were encouraged in order to amplify CECAV's financial support and to allow the transfer of knowledge with a direct socio-economical relevance.

In a near future, our all-time purpose must still be devoted to develop strong, multidisciplinary teams, directing their efforts to an integrated and collaborative research. CECAV intends to reinforce its efforts into promotion of collaborative research with other national and international Research Centres. This strategy will also be strengthened by the progressive increase in the percentage of students (PhDs and MSc) coming from other national or international institutions.



## The Animal and Veterinary Science Research Centre

The Animal and Veterinary Research Centre (CECAV) currently integrates 41 PhD members from the Departments of Animal Production, Veterinary Sciences and Chemistry of the University of Trás-os-Montes and Alto Douro (UTAD). In addition, it also integrates, as Collaborators, 35 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 four Vice-Directors, and a Scientific Council (SC) including all integrated research members. The SC elects the DB for a three year period. The criteria required to be an integrated member of CECAV is based on its scientific productivity in the former three years.

For the year of 2010, the Scientific Advisory Committee (SAC) incorporated 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.

CECAV is organized in three research groups according to the recommendation of the FCT Evaluation Panel for this Unit in December of 2008, which were positively recognized by the Scientific Advisory Committee in October of 2010:

- (1) Clinical sciences and pathology
- (2) Food quality, safety and public health
- (3) Animal production

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



## Clinical Sciences and Pathology Group

Adelina Gama, Ana Celeste Martins Bessa, Anabela Alves, Aura Colaço, David Ferreira, Felisbina Queiroga, Fernanda Travassos, Francisco Peixoto, Isabel Gaivão, Isabel Pires, José Manuel Almeida, Justina Prada Oliveira, Maria dos Anjos Pires, Maria de Lurdes Pinto, Paula Oliveira, Rita Payan Carreira, Romeu Videira

Ana Laura Saraiva, Ana Margarida Calado, Paula Rodrigues, Carlos Venâncio, Regina Rodrigues Arantes, Carmen Nóbrega, Fernanda Ferreira, Maria João Pires, Bruno Colaço

The research group integrates multidisciplinary researchers that cooperate to pursuit proposed goals on developmental biology, mechanisms of inflammation and carcinogenesis.

### **Objectives**

The main goal of this group is to achieve an integrated multidisciplinary research focused on the study of cell development, namely its mechanisms from the molecular level to the ultra structure and structure of the living organism. In order to perform this purpose the research group is focused in three main issues:

a) Developmental biology studies and its correlation with inflammation and carcinogenesis from the molecular level to the living organism. For this, different approaches are in use, which include the investigation of molecular and cellular mechanisms underlying different clinical processes. The study of these mechanisms is expected to increase knowledge on the physiological processes and may allow the identification of new risk factors in inflammation and oncology, or may clarify the role of new mediators useful for the development of new therapies.

b) Studies on the antioxidant and oxidative stress effects and possible protective implications on amelioration of different conditions. The group also dedicates attention to the biological activities of new synthesized compounds, considering biomedical and toxicological implications.

c) The wild animals' health and pathology is one of emergent studies of this group. This is important due to the new emergent zoonotic diseases affecting wildlife and because we should not talk in "human health" or "animal health" but there should be "one global health" concern.

### **Main achievements**

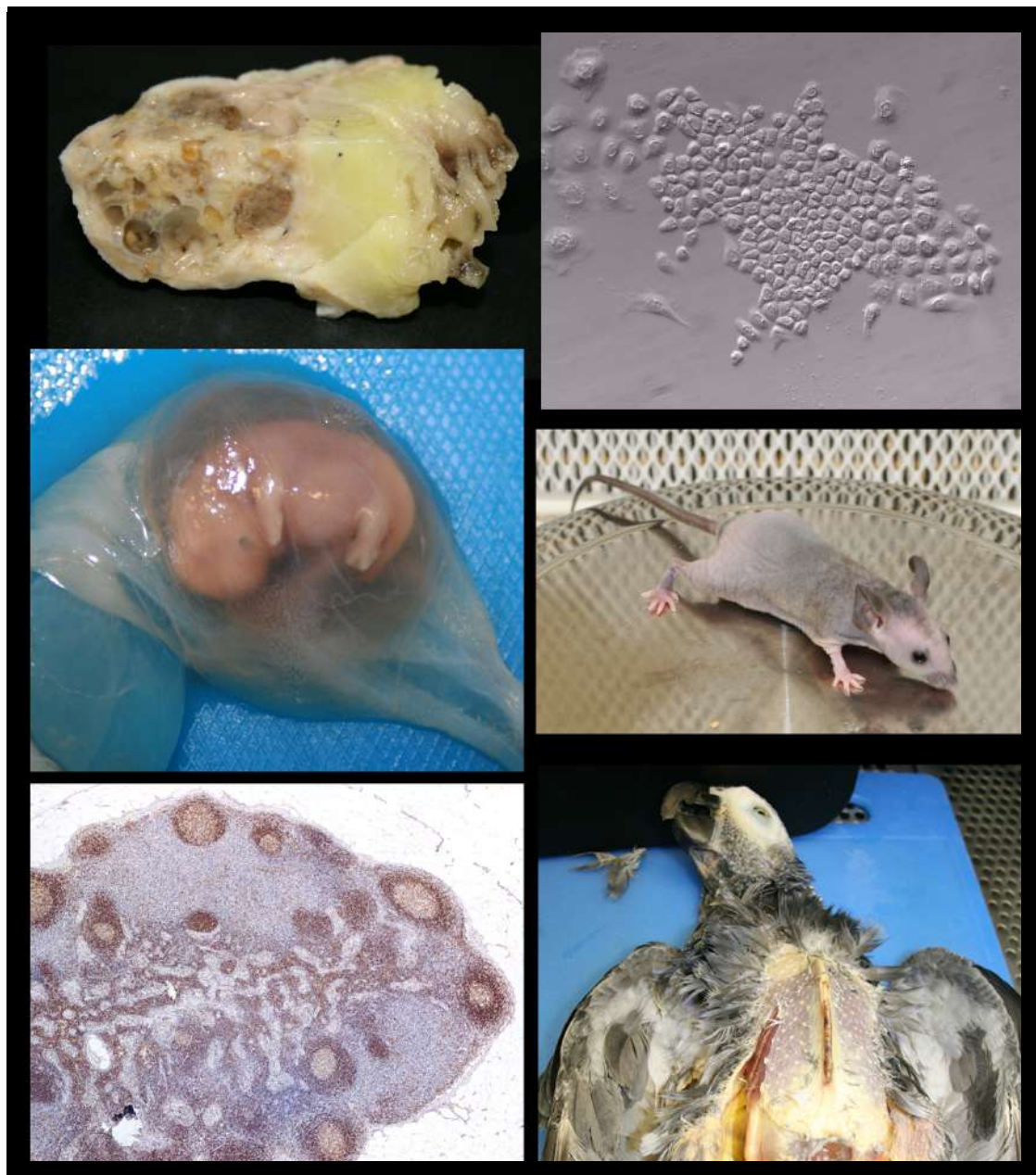
The main scientific research achievements reached in this year included:

a) Identification of molecular markers of particular canine and feline diseases, such as neoplasia and hyperplasia, which may be useful as biomarker or prognostic factor in clinical situations and allow to strengthen the knowledge on some animal tumors.

b) Evaluation of molecular factors related to clinic-pathological parameters, aggressiveness and animal survival in canine mammary tumors. In particular, it was demonstrated that the expression of intercellular adhesion molecules were reduced in canine mammary malignant tumors in comparison to the benign ones, particularly in those that present lymph node metastasis. This issue was further supported with identification of molecular phenotypes in canine and feline mammary carcinomas with important clinical implications.

c) Studies were conducted on the importance of the immune response regulation in neoplastic and non-neoplastic hypertrophic processes and the extension of inflammation in these clinical situations and its relation to systemic indicators for the presence of the diseased was assessed.

d) Evaluation of the molecular factors involved in canine endometrial cycle and its association with success of fetus implantation for the species was on focus, and first reports are being published.



e) In the toxicology area, studies were performed on biopathology of chemical induced cancer of bladder and liver, as therapeutic approaches to cancer. The use of specific chemical carcinogens can be used to induce the development of bladder and liver tumors in mice and rat. These tumors, chemically induced in laboratory animals, are similar to those observed in dogs, cats and man and can contribute to a better understanding of mechanisms involved in cancer development and to evaluate the antineoplastic effect of several drugs.

f) The neurotoxicological effects of some opioid molecules and the anticarcinogenic potential of natural products acting on mitochondria oxidative stress.

g) It was established the effect of several natural products in blood glucose levels as well as their impact on mitochondrial bioenergetics, using a non-obese spontaneous animal model of type 2 diabetes mellitus.

## Publications

### Papers in SCI Journals

GAMA, A.; ALVES, A.; SCHMITT, F. (2010), "Expression and prognostic significance of CK19 in canine malignant mammary tumours." *Vet J* 184(1): 45-51.

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MOTA, M.P.; PEIXOTO, F.M.; SOARES, J.F.; FIGUEIREDO, P.A.; LEITAO, J.C.; GAIVÃO, I.; DUARTE, J.A. (2010), "Influence of aerobic fitness on age-related lymphocyte DNA damage in humans: relationship with mitochondria respiratory chain and hydrogen peroxide production." *Age* 32(3): 337-346.

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SÁNCHEZ, J.; GONZALO-ORDEN, J.M.; GINJA, M.; OLIVEIRA, P.A.; REYES, L.E.; SERANTES, A.E.; ORDEN, M.A. (2010). "Imaging diagnosis-Medullary tibial infarction in a horse." *Vet Radiol Ultrasound* 51(2):159-161.

SHAPOSHNIKOV, A.; HENRIKSSON, S.; MEIER, S.; GAIVÃO, I.; HUSKISSON, N.H.; SMART, A.; BRUNBORG, G.; NILSSON, M.; COLLINS, A.R. (2010). "Twelve-gel slide format optimised for comet assay and fluorescent in situ hybridisation." *Toxicol Lett* 195(1): 31-34.

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## Food Quality/Safety and Public Health Group

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

Cristina Saraiva, Carla Sofia Gomes, Alexandre Fradeira Gonçalves, Radhouani Hajer

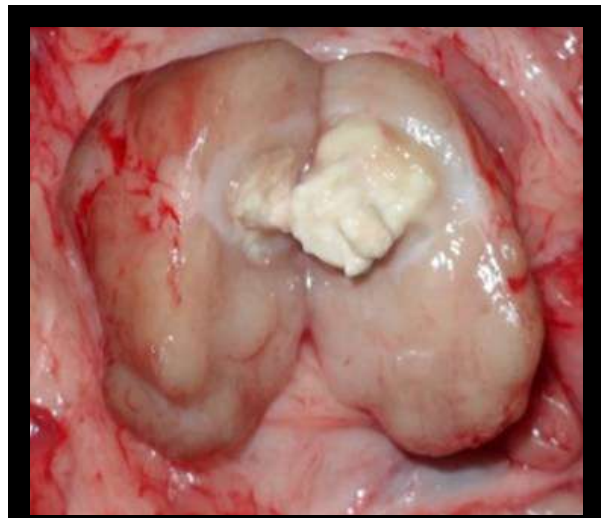
The research group is focused in two main areas, directed for both the food safety and quality and the public health. These two areas became a priority and a necessity to the consumers, manufacturers and regulators.

### Objectives

In a World in change, public expectations for health protection drive the activity of the research group, which includes three main research interrelated subjects: Epidemiological evaluation and diagnosis of zoonosis; Foodborne pathogens, Specific spoilage organisms and Probiotics; Antibiotic resistance and virulence factors.

These include studies on characterization of antimicrobial peptides produced by different microorganisms and its application in human, veterinary medicine and in food conservation, as well as research on antibiotic resistance and molecular characterization of virulence factors in microbiota from different ecological niches. Under these research subjects, important microbiological hazards (*Salmonella* sp., *Campylobacter* spp., *E. coli*, *Listeria* spp., *Aeromonas* spp.) involved in foodborne outbreaks, are also analyzed.

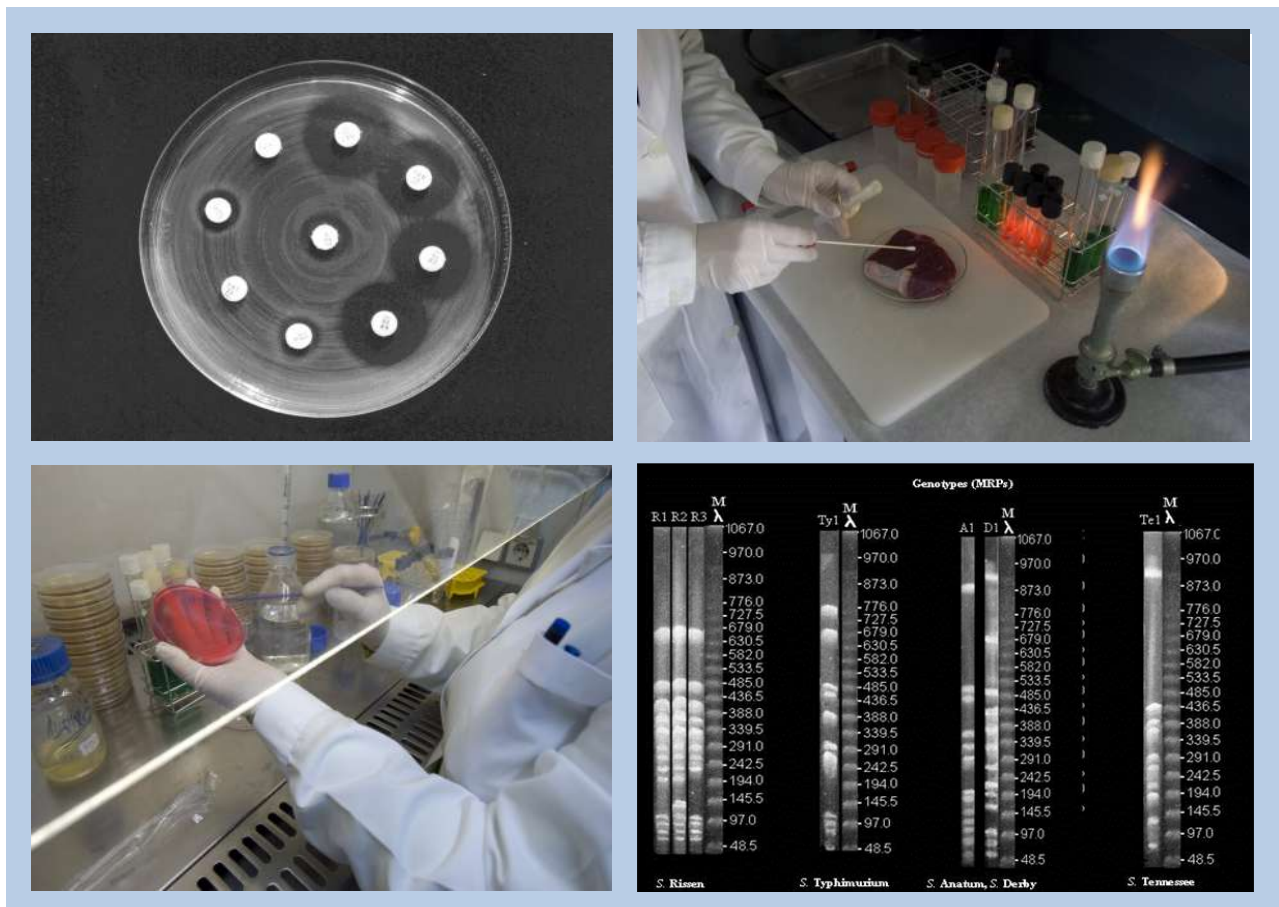
The group also develops new approaches to analyze and interpret more complex and emerging microbial pathogen using molecular, serotyping and phylogenetic analysis. Additionally, research is developed in order to improve knowledge on prevalence, definition of contamination sources, risk to public health and strategies to improve food safety and quality, such as packaging, temperature, and improvement of traditional methods for meat products (fermentation, drying, spices and herbs, wine...). Concerned to the epidemiological evaluation and diagnosis of zoonosis, the research studies are mainly focused 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.



In the food safety, quality and preservation area, research is mainly developed in order to evaluate hygienic, technological and sensorial traits in meat namely autochthonous breeds (Maronesa cattle), meat products and other food of animal origin. In this subject are included studies on meat quality (tenderness and the proteolytic processes); 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 and pathogenic microbiota.

### Main achievements

The main achievements of the Food Quality/Safety and Public Health (FQSPH) group derived from the scientific activity developed under an important multidisciplinary collaboration between UTAD, national and international Centres/Institutes. The main part of research was developed on Antibiotic resistance and virulence factors in important pathogens from animals, food, humans and different ecological niches, under a genomics and proteomics approach. Were also developed different approaches/designs for both microbial and population-based studies on meat and meat products and for evaluate emerging pathogens (*Campylobacter* spp., *Salmonella* sp., *Aeromonas* spp.) from different food production chains. Concerned to the epidemiological evaluation on micobacterioses, the research studies were mainly focused on *M. bovis* and MAC complex to analyze and interpret more accurate microbial methods and to evaluate prevalence rates in pork and large game samples.



## Publications

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# Animal Production Group

António Mario Domingues Silvestre, Arnaldo A. Dias da Silva, Cristina V. de Miranda Guedes, Jorge Antonio Colaço, Jorge Manuel T. de Azevedo, José Luís Teixeira de Abreu M. Mourão, 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, Divanildo Outor Monteiro, José Carlos Almeida, Maria José Gomes, Paulo Russo Almeida, Filipe Silva, Mário Cotovio, John Cone, Koldo Osoro

Changes in animal production systems are a growing concern in the European framework. The rising demand for livestock products, that is expected to grow immensely in the beginning of this century, must be analyzed in the light of the possible changes on the available resources. The main objective of the group is to produce and disseminate applied research in the area of sustainable animal production systems, with impact in specific agro-ecosystems and associated biodiversity.

## Objectives

In this way, our research activity will be developed in the following subjects:

1. Development of sustainable livestock production systems in less favorable areas, assessing animal performance, valorization of low input feed, grazing behavior of domestic species. Regarding this subject, special attention has been given to the development of strategies that promote the sustainable use of less-favored areas, driven by production and environmental goals. Knowledge on the grazing behavior of the domestic herbivore species that utilize these vegetation communities is determinant. For this purpose, several epicuticular wax compounds have been evaluated as diet composition markers. Furthermore, the influence of gastro intestinal parasitism and its influence on the performance of domestic cattle, goats and sheep are also being investigated.



The use of low-input feeds in animal nutrition has been recurrent and it is an integrating part of the mankind's evolution and of the different mechanisms of the animal domestication. Nevertheless, there are nutritional restrictions that limit its utilization associated to adverse effects in animal performances, mostly due to the reduction of nutrients availability and, in high concentrations, negative effects on ingestion. Alternative biological treatments are being developed using white-rot fungi, aiming to utilize its enzyme complexes to promote changes within cell wall structure and to enhance detoxification mechanisms. These studies are being conducted using mainly fibrous feedstuffs that are normally considered residuals from the agro-food industry aiming to enhance its utilization in animal nutrition.

## 2. Evaluation of natural compounds as an alternative to conventional feed additives.

Antimicrobial resistance is supposed to be related to antibiotics in animal feeding in general. Thus, the search for alternative substances that are economically feasible to control microorganism growth has an important role in the animal production. Scientists of Animal production group are investigating natural alternatives to conventional chemotherapeutic agents. More specifically, the use of probiotics, oligosaccharides and plant products that may enhance growth performance and immune function in chicken, rabbit and pigs are being studied.

In addition, studies on the development of efficient strategies to improve composition and enhance health-related effects of meat and other animal products by modifying their lipid content and composition and improving their oxidative stability will also be conducted. Methods for modifying the composition of animals' meat in order to improve its quality will include the incorporation of vegetable materials with high content of antioxidants in animals' feeds.

### Main achievements

The main scientific research achievements were the following:

- 1.Characterization of carcass composition of male and female Serrana goat kids slaughtered at different live weights.
- 2.Validation of very long chain fatty acids as fecal markers for studying grazing behavior of herbivore domestic species.
- 3.Lactation curve description of local beef breeds.
- 4.To demonstrate that the supplementation of dairy cow diets with *Saccaromyces cerevisiae* had a positive effect on forage digestibility and that this effect was negatively related with forage quality.
- 5.Application of RTU methodologies to predict carcass and body composition of fish, poultry and rabbits; use of RTU and image analysis to evaluate morphometric characteristics and body condition of horses and dairy cows..
- 6.Evaluation of white-rot fungi as biological treatment to detoxify and increase the nutritive value of low input feeds.
- 7.The use of organic forms of selenium in layer hens feeding increase egg content in selenium.
- 8.Adult Wildlife rabbits can be reared in captivity with acceptable reproductive performances.



## Publications

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