

ABSTRACTS OF THE “XXXIV SYMPOSIUM DE CUNICULTURA DE ASESCU”

SEVILLA, SPAIN, 4-5 JUN, 2009

The annual Congress of the Spanish Association of Cuniculture (ASESCU) was held in Sevilla (Andalusia) on 4-5th June of 2009. The 34th edition was devoted to analyse the situation the rabbit sector has reached after being affected by crisis. It was presented a characterization of the rabbit farming sector in Andalusia, an overview on the research on rabbit production in Spain, a broad revision on the sanitary aspects of the intensive rabbit farming in Spain during 1997-2007, a summary of the actions for the promotion of the rabbit meat consumption carried out by the Spanish rabbit interbranch (INTERCUN), and the launching of the new release of the Rabbit National Survey (Encuesta Nacional de Cunicultura 2008). Furthermore, a total of 28 communications were presented in four working sessions: Nutrition, with analysis of the dietary influence on performance, mortality and cecal activity, Reproduction, Genetics and Ethology with references to many different issues, Pathology and Environmental Quality, particularly focusing on mixomatosis and dermatophytosis, and Technico-Economic Management, Consumption and Sector situation, with references to the need to carrying technico-economic management and to rabbit meat perception by the consumers.

MAIN PAPERS

CHARACTERISATION OF THE ANDALUSIAN RABBIT FARMING SECTOR

DIRECCIÓN GENERAL DE LA PRODUCCIÓN AGRÍCOLA Y GANADERA.

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Andalusia occupies the seventh position among Spanish Autonomous Communities in rabbit census, amounting 2% of the national census. In 2009 the Andalusian rabbit industry has a census of 154000 rabbits distributed in 152 farms. In 2007, 19% of the animals were does, 10% were replacement animals, 1% were bucks, and 71% were fattening rabbits. Granada and Málaga were the most important provinces, with 42 and 29 farms, respectively. Fifty two percent of the Andalusian rabbit farms were meat-oriented farms, 29% were intermediaries and markets operators, 12% were game farms, and the other were multiplication farms and farms devoted to raising pet and lab rabbits. Thirty percent of the farms have 20 to 99 doe's cages and 30% have 200 to 399 doe's cages. Only 6% of the farms have more than 799 doe's cages. In Andalusia there are five abattoirs that slaughter rabbits. All the rabbits slaughtered in Andalusia are sold as chilled carcass.

CURRENT SITUATION OF RABBIT RESEARCH IN SPAIN

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This work analyse the actual situation of Rabbit research in Spain. The recent increase of world rabbit meat production was due to the Chinese productive increase, while the European rabbit meat production is even been reduced in the last years (mainly related to the fall in French production). In this sense, the world rabbit research production has increased in the last 10 years (+18%). China would have multiplied by 4 its rabbit research production (mainly in Chinese journals). In Europe, the French meat production fall could be the reason of the reduction in the number of papers published in the last years (-31%), while other countries, as Italy and Spain, would have increased their rabbit research production (70 to 80 %) in this same period. The economic resources obtained by the Spanish research teams situate rabbit science in the fourth position (7% of funds) of the Livestock Sub-programme (National RDI Plan), after swine (28%), sheep (16%), and cattle (13%). There are a lot of Spanish research teams working in different hot areas of rabbit knowledge: breeding, nutrition, reproduction, carcass and meat quality, meat safety, microbiota, pathology and hygiene, welfare and biosecurity in farms. These

data show the good situation of the Spanish rabbit research.

NORM EXTENSION IN THE SPANISH RABBIT INDUSTRY INTERCUN

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Since the official recognition of INTERCUN in 2000, the promotion of rabbit meat consumption has been the main scope of this organization. The promotional activities carried out with funds raised from 20% of the production where enough to promotes consumption and to communicate to the public opinion the qualities and properties of this food; an increase in the consumption of 2% was achieved. In order for improve the promotional activities, a Norm Extension to all the rabbit sector has been put into operation by INTERCUN. A mandatory financial contribution has been established, aimed at promoting rabbit meat consumption, and aimed at developing research and technological innovation on the registration process of specific drugs for the rabbit farming durnig 2008/2011. Moreover, the first promotional campain financed through the Norm Extension will be carried out. The slogan was “Come OK, Come Carne de Conejo”. The campaign hopes to impacts by 32600940 shares of communication across health professionals, media and direct action. In total is expected to be achieved 64000000 impacts in two years, conveying a strong and durable over time effect.

RABBIT FARMING NATIONAL SURVEY 2008

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The Spanish Ministerio de Medio Ambiente y Medio Rural y Marino, in collaboration with the Statistic Services of the Automomous Communities, has carried out a Rabbit Farming National Survey. In Spain there are 222 feed mills, which produced 557823 MT of feed in 2007. There are 84 abattoirs that produced 55351 MT of carcasses in 2007. This survey includes only industrial (those with more than 19 doe's cages), meat-oriented farms. In Spain, these rabbit farms have 2821020 cages, 1336497 of them being doe's cages. There are a total of 6903718 rabbits, 1221495 of them being does and 5326726 fattening rabbits.

PATHOLOGY AND ENVIRONMENTAL QUALITY

SANITARY ASPECTS IN RABBIT PRODUCTION. 1997-2007

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This presentation contains the sanitary perspectives obtained by the author in the course of 11 years of work on rabbit farms. During that period the author did 4307 visits to 812 rabbitries in Spain and 56 in Portugal. It was a work with the aid of expert veterinarians in rabbit production and with the collaboration of other professionals: epidemiologists, pathologists, microbiologists, among others. This conference had like objective to make the information published in UFAW Animal Welfare, Preventive Veterinary Medicine and World Rabbit Science, available to Spanish people. The author included in addition other observations on the reciprocal actions between the housing, the animals, the feeding or the husbandry and the microbism or the health. It also includes a recall of the main axes of the animal production in the European Union: Animal Welfare (that includes the health), Food Safety and Environment, as well as diverse proposals of improvement. Through 2237 urgent visits to 660 farms, with a median of 750 doe rabbits by farm in 2007, it was shown that the mucoid enteropathy (similar to the Epizootic Rabbit Enteropathy) was predominant the pathological process, followed of the enteritis-diarrhea (compatible with intestinal coccidiosis, enterobacteriosis and clostridiosis, among others), myxomatosis, reproductive troubles, respiratory diseases and staphylococcosis, among others. The median culling age per doe in 130 farms was 14.9 months old and 6 kindlings. From data bases of 50,834 culled or euthanized females, the most frequent causes they were the low productivity, followed of the mastitis, badly body condition and sore hocks. In which it concerns to mortality, from another data base, with 366,162 gestations and 16,339 dead, there was a bimodal distribution of mortality: between 10 and 15 d of gestation and, mainly, the 25-33 d. On the matter of the causes of death of does, of 1046 necropsies done in 254 farms, were compatible respiratory processes with the death of the females in 30 % of the cases, enteritis-diarrhea in the 20 % and mucoid enteropathy in the 7 %, among others. Finally, the study on sore hocks put in evidence the utility to permanently install footrest in the cages. The females that no they had it reached 71.5 % of accumulated incidence in fifth lactation, against 15.1 % in which yes they had footrest.

DIAGNOSTIC OF MYXOMATOSIS IN THE ASYMPTOMATIC PERIOD OF THE DISEASE BY PCR

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In this pilot study, we wanted to know if it is possible, by means of molecular diagnostic techniques, PCR, to detect the Myxomatosis (MV) viral antigen in the asymptomatic period of the disease to discover, in the fastest way possible, a farm's level of infection, discount carriers and/or establish an emergency vaccination. To do so, rabbits were subcutaneously inoculated with a reference strain of MV (Lausanne) and placed under biological containment conditions at 64, 72, 96, 117 and 138 h post-inoculation (pi). Samples that are easy to take in the field were collected such as: ocular swabs, anal swabs and swabs from peripheral blood by piercing auricular veins to demonstrate the presence of MV antigens. The results only showed positive antigen in eye swabs collected at 117 and 138 h pi. If we consider that clinical signs of disease are evident at 138 h pi, the techniques used only detected viral antigen 21 h before the clinical signs. That means they would have little diagnostic value for the purpose outlined in this study.

THE USE OF BIOCHEMICAL KINETICS FOR THE DIFFERENTIATION OF STRAINS OF *ESCHERICHIA COLI* ISOLATED FROM RABBIT

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In this work we analyze the discriminatory capacity of the biochemical kinetic technique for the differentiation of *Escherichia coli* strains isolated from digestive disorders of rabbit and its relationship with the presence or absence of *eae* operon, one of the virulence markers of the strains involved in some cases of colibacillosis. This technique is based on the optical density changes produced, every 60 min and during 15 h consecutive, in 30 different biochemical tests. This technique is used by our group for the selection of different strains for its inclusion in complex autobacterins.

ANALYSIS OF THE TRANSFERENCE OF ANTIMICROBIAL RESISTANCE MARKERS IN *ENTEROCOCCUS* SP ISOLATED FROM INTESTINAL SAMPLES OF RABBITS

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In this work we analyzed the *in vitro* gene transfer of antimicrobial resistance markers between strains of *Enterococcus* spp. isolated from intestinal samples of rabbits. A high rate of multi-resistance markers transfer was obtained. This transfer, associated to an efflux pump (*emeA* gene), can explain the reduction of the degree of susceptibility against different antimicrobials observed, but some other antimicrobial resistance mechanisms could be involved.

STUDY OF THE IMMUNOLOGICAL CONDITION OF DOE RABBITS WITH TWO PROTOCOLS OF WEANING (28 AND 42 POSTPARTUM DAYS). PRELIMINARY STUDY

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In this preliminary work the effect on the immune system of two protocols of weaning: 28 and 42 d postpartum was studied. Ten doe rabbits were studied in every group in periods of maximum and minimal productive effort. The doe rabbits with late weaning, unlike the another group, showed a minor proportion of CD4+ T-lymphocytes in the moment of major productive effort.

DERMATOPHYTOSIS PREVALENCE IN RABBITS WITH SUSPECTED LESIONS IN PORTUGAL

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Dermatophyte infection or ringworm is a superficial cutaneous infection with one or more of the fungal species of the keratinophilic genera *Microsporium*, *Trichophyton*, or *Epidermophyton*, and is a zoonosis with a great impact on Public Health. Dermatophytes were identified from meat rabbits samples collected from suspected clinical cases. The overall prevalence of dermatophytes species was 82.7% in the rabbits. Two dermatophytes species were isolated: *Trichophyton mentagrophytes* was the species most commonly isolated from the rabbits (91.9%) and *Microsporium canis* (8.1%) was the second species isolated. High prevalence was detected in rabbits with less than 2 months. No significant differences in dermatophyte isolation were observed with respect to gender, age, hair colour and number of females in the farm.

EVALUATION OF CLINICOMYCOLOGICAL ASPECTS OF DERMATOPHYTOSIS IN ORYCTOLAGUS CUNICULUS

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Trichophyton mentagrophytes is a zoophilic dermatophyte of wild and domestic lagomorphs such as *Oryctolagus cuniculus* and can be transmitted to man and other animals. The aim of this study is to investigate clinical and mycological features of rabbits. An hundred and fifty eight cases of rabbit dermatophytosis caused by *Trichophyton mentagrophytes* were evaluated. All animals showed clinical evidence of skin lesions. Trichophytosis was most frequently diagnosed in female (n=85; 53.8%). Out of 158 rabbits, 100% showed involvement of the head, whereas 154 (97.5%) had involvement of the ears and 108 (68.4%) had involvement of nose. Only one rabbit (1.3%) presented lesions in the back. The most common clinical pattern observed was patched alopecia (79.7%) and in 24 animals a circular lesion (15.2%). The clinical picture included multifocal (74.1%) to diffuse appearance. Considering the veterinary and public health importance of rabbit dermatophytosis, attention was focused on

Trichophyton mentagrophytes due to variations in clinical appearance.

FACTORS ASSOCIATED WITH LABORATORIAL DIAGNOSIS OF DERMATOPHYTOSIS IN RABBITS

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The aim of this study was to investigate the risk factors for dermatophytes isolation in rabbits in the North and Centre of Portugal. The effects on prevalence of several variables such as breed, age, month of sample collection, configuration of the lesions and presence of concomitant infections in the rabbitries were evaluated. This information was then used in a multivariable logistic regression model in order to identify risk factors for dermatophytosis isolation in culture. Univariable analysis was used to screen the variables used in the logistic regression. Variables that showed *P*-values of <0.10 were retained for the multivariable analysis. Five variables were associated with dermatophytosis isolation in univariable analysis. The multivariable logistic regression model identified configuration of lesions (OR=3.15; 95% CI: 1.39–7.15%) and the presence of concomitant infections (OR=2.71; 95% CI: 1.03-7.12%) in the rabbitries as risk factors for isolation of dermatophytosis in culture. Considering the paucity of epidemiological reports in the country our results could make a useful contribution towards the diagnosis and prevention of rabbit dermatophytosis.

ATMOSPHERIC POLLUTION IN RABBIT FARMS: CHARACTERIZATION AND CONTROL

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Environmental implication of rabbit production has been poorly studied. It is necessary to quantify the pollutants produced in this activity in order to assess correctly the possible impacts on the environment, and

if necessary, to establish abatement techniques. In this work we present the characterization of three rabbit farms in terms of gas emissions, particulate matter production and odour production. In general, the levels of pollutants are lower than the recommended threshold values. Furthermore, average emission factors for gases (NH_3 , N_2O and CO_2) have been obtained for fattening rabbits and reproductive does.

NUTRITION

CHARACTERISTICS OF CAECAL ENVIRONMENT OF GROWING RABBITS FED ON DIFFERENT RELATIONS OF DIGESTIBLE/UNDIGESTIBLE FIBRE

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In this study, 24 weaned pups were fed on 4 experimental diets based on two levels of readily digestible fibre (DF; 13 and 18%) or two levels of low digestible fibre (acid detergent fibre, ADF; 26 and 33%). After 19 d of adaptation period, caecotrophes produced during 24 h were collected. Next day, animals were slaughtered to analyze characteristics of their caecal environment. Total caecum weight and caecal content weight increased in diets with a high level of ADF ($P < 0.001$). The excretion of caecotrophes also increased with the level of ADF ($P < 0.05$); however, their percentage of crude protein decreased. Caecal turnover rate was not affected by the diets and showed a mean value of 33.6%. Nor pH neither total concentration of VFA were modified either by the type or level of fiber. Proportions of acetic, propionic and butyric acids were 84, 4.61 and 10.4%, respectively. Ammonia concentration was affected by the interaction between DF and ADF ($P < 0.001$). Biodiversity as calculated by the Shannon Index showed a treatment difference according to the level of DF ($P < 0.05$), being higher in animals fed on diets with 18% of DF.

USING OF OLIVE LEAVE TREATED WITH FUNGI (*GANNODERMA APPLANATUM*) IN DIETS FOR GROWING RABBITS. EFFECT ON GROWTH, CAECAL FERMENTATIVE ACTIVITY AND DIET DIGESTIBILITY

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In an experiment was studied the effect of addition of olive leaf untreated or treated with fungi (*Gannoderma applanatum*) to diets for growing rabbits. Three diets were used, a basal diet (H00) and the basal diet added with 5% of untreated olive leaves (H05) or 5% of olive leaves incubated with fungi (H05H). Were controlled the performances during growing period (52 to 73 d), the digestibility (62 to 66 d) and the caecal fermentation (VFA-73 d). It was observed that the final live weight and weight gain were not affected by treatments. H05H diet increased feed intake when compared with the H00 diet (+10%). The concentration of VFA and their proportion in the caecal contents were not affected by treatments. The organic matter (OM) and crude protein (CP) digestibilities were lower in olive leaves diets than in H00 diet (6% of reduction in the digestibility of OM and the 7% in the CP). It was concluded that the addition of 5% of olive leaf has no adverse effects on performances of rabbits.

EFFECT OF LEVEL AND TYPE OF FIBRE IN THE PRE- SLAUGHTER DIET AND A FASTING PERIOD OF 12 H PREVIOUS TO THE SLAUGHTER ON CARCASS YIELD AND MICROBIOLOGICAL QUALITY OF RABBIT CARCASS

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The aim of this work was to evaluate the effect of level and type of fibre in the pre- slaughter diet and a fasting period of 12 h previous to the slaughter on carcass yield and microbiological quality of rabbit carcass. Seventy two New Zealand White x Californian rabbits were fed with the same commercial feed (35% NDF from alfalfa hay (33%) and sugar beet pulp (10%), 13% starch, 7.4% soluble fibre) during the whole fattening period. During the last 10 d of fattening period (from 56 up to 66 d), one third of the rabbits were fed *ad libitum* with the same previous feed. The rest of animals were feed with an experimental diet formulated to contain a lower NDF level (32% NDF from alfalfa hay (30%) and wheat straw (4%)), 17% starch and 7.1% soluble fibre. The feed was removed 12 h before the slaughtering in the half of rabbits that fed experimental

diet. The remaining animals were fed experimental diet *ad libitum* since their transport to the slaughterhouse. Carcass yield was higher for animals fasted 12 h before the slaughtering (1.5 points; $P=0.002$) than animals fed *ad libitum* since their transport to the slaughterhouse. The increase of dietary fibre content impaired the microbiological quality of rabbit carcass, because they had higher concentration of log cfu/g of total *Aerobic* and *Enterobacteriaceae* ($P<0.001$). A gradual increase with the time post-slaughter was observed in the microorganism content of the carcass. The highest values were reached 11 d after slaughter. The lowest values of log cfu/g of *Clostridium perfringens* of the caecal content ($P<0.001$) were found in animals fed *ad libitum* the highest fibrous diet (35% NDF with 10% of sugar beet pulp) with respect those fed experimental diet (32% NDF, where sugar beet pulp was substituted by barley and wheat straw). These lowest values of *Clostridium perfringens* were related with the lowest mortality of animals during the last ten days of fattening period (2.2% in those fed commercial diet and 11.3% in those fed experimental diet).

EFFECT OF METHIONINE LEVEL ON GROWTH PERFORMANCES AND MORTALITY IN RABBITS WEANED AT 25 DAYS OLD AND AFFECTED BY EPIZOOTIC RABBIT ENTEROPHATY

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A control diet with no synthetic methionine and another three diets with increasing concentrations of DL methionine were formulated, (0.27, 0.34, 0.37 and 0.42%, respectively. Or: Met+Cys: 0.51, 0.59, 0.61, 0.65%, respectively). Four trials were carried out to determine growth performance of rabbits caged single (with or without medication) and in groups, and DM apparent ileal digestibility was determined. Treatments did not affect mortality. When all experiments were analyzed together, diets with 0.34% Met or more increased growth rate and feed efficiency compared to control diet (39.9 vs. 36.1 g/d; $P=0.005$; 0.604 vs. 0.573 g/g; $P<0.001$) for two weeks after weaning (25-28 d) and tended to increase feed intake by 5.8% ($P=0.10$). However, in the whole fattening period growth rate only tended to increase by 3.2% in animals fed with 0.34% Met or more compared to control group ($P=0.11$). Apparent ileal digestibility of DM tended to increase by 21% ($P=0.12$) in rabbits fed 0.34% Met or more compared to control diet. In conclusion, 0.34% is

the minimal requirements of Met (0.59% Met+Cys) in the 25 to 68 d period. As Met requirements decreased with the age, a minimum of 0.27% Met was enough to meet the growth requirements in the 39 to 68 d period. The addition of methionine did not influence mortality.

EFFECT OF WEANING DIET ON LACTATING RABBIT DOES

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In a feeding system with a common weaning diet for female and litter from 17 d of lactation to weaning (28 d), the effects of i) replacing starch by ADF, ii) replacing starch by pectins, and iii) reducing the crude protein (CP) content, on milk yield and body condition of rabbit does were studied with 8 experimental diets over 318 reproductive cycles from 136 females. The replacement of starch by ADF increased the feed intake (+6.7%; $P<0.001$), while replacing starch by pectins or reducing CP reduced it (-8.3 and -6.1%, respectively; $P<0.001$). The three dietary strategies affected negatively the performance of lactating rabbit does, reducing milk yield (-4.8, -8.7 and -7.9%; $P<0.01$) and impairing some traits of the body condition (higher reduction of body weight and/or estimated body energy between 17 and 28 d).

MORTALITY OF FATTENING RABBITS RELATED TO FEEDING AND AGE OF WEANING

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Two experiments were realised in order to study the effect of weaning and feeding on the mortality of kits in a farm affected by heavy epizootic rabbit enteropathy (ERE). In Experiment 1, we combined normal weaning (28 d) and later weaning (42 d) with two different diets, one based on fattening rabbits diet (C) and another (PD48) with a lower starch level and higher digestible and indigestible fibre levels. The later weaning reduced the mortality (39.51 vs. 51.60 to 42 and 28 d at weaning respectively; $P<0.05$), and also the use of diet with more fibre (55.20% vs. 38.09% to diet C and PD48 respectively; $P<0.05$), as long as the combination of both, weaning at 42 d and PD48 diet, showed the best results for this experiment (31.80% mortality; $P<0.05$). In the Experiment 2 changed C diet by other weaning diet (CMED) with the same formulation but with a mix of three antibiotics against enteropathy. In this case, the

mortality values of medicated diet were much lower than others (4% mortality, $P < 0.05$), without influence of age at weaning. With this results, it seems difficult to avoid the use of antibiotics in farms with higher mortalities by ERE.

REPRODUCTION, GENETICS AND ETHOLOGY

EFFECT OF LITTER SIZE (SIX OR TWELVE KITS) ON THE PRODUCTIVE RESULTS OF RABBIT DOES

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A study on the effects of litter size on the performances of rabbit does and kits was performed. Were used one group with 12 non-lactating rabbits (TC0) and 2 groups with 12 primiparous rabbits, one with the litter equalized to 6 kits (TC6) and the other with the litter equalized to 12 kits (TC12). The weight and feed intake were controlled at parturition, 7 and 21 d of lactation and at weaning (35 d). At these dates and at the end of the growing period (67 d) the kits were weighed. During the lactation period the TC0 does had higher weight gain and ingested less feed (213 vs. 559 g/d) than does of TC12 group. The weight of kits at weaning was higher when the litter was smaller (1,161 in TC6 and 921 in TC12) and even at 67 d the weight was higher (2418 vs. 2,284 g), despite the lower weight gain after the weaning (40.5 vs. 44 g/d). Mortality of kits until the weaning was 3 times higher (13.2 vs. 4.2%) in TC12 group. The TC12 does produce more milk at 7 d (251 vs. 175 g) than the females of the TC6 group. In the subsequent reproductive cycle, the TC0 group does fertility was twice of that one observed in females of TC12 group (100 vs. 50%). Since females with litters with 12 kits had worst performances and its kits had lower growth and higher mortality, is not advisable litters with high number of kits.

RABBIT EMBRYO BANK. MANAGEMENT AND GENETIC RESOURCES CONSERVATION

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The purpose of the present work was to show the management of rabbit embryo bank during the last three years. During this period 3,341 embryo from 336 donor females were recovered and vitrified. The vitrified embryos were from five rabbit strains selected at UPV, in addition, 712 embryos from three of these strains were thawed and transfer for re-establish rabbit population group to be able to evaluate the genetic improvement. On the other hand, the export of genetic resources to other country has been realise (a total of 498 vitrified embryos from strain A and R were transferred).

RELATION BETWEEN THE PHYSIOLOGICAL STATE AND THE BODY CONDITION OF THE DOE RABBIT

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The perirenal fat thickness and the live weight of the doe were correlated (0.82). The females don not increase their perirenal fat thickness until the fist parity, no matter the weight of the doe. There were significative differences in perirenal fat thickness between the pregnant females at 11 d of lactation and the females at first parity (4.08 vs. 4.85 mm). The nulliparous females with variations of 0.44 mm in perirenal fat thickness between the mating to the parity had less than 5 rabbits born or more than 10 rabbits born. While the females had 5-10 rabbits at birth did not vary their score condition in this period (-0.05 mm).

EVOLUTION OF MILK YIELD IN RABBIT DOES

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The milk yield shows a quadratic evolution in the time. Litter size affects dairy production, which was practically the double in the females with high litter size (≤ 8 kits) vs. those with small litter size (≥ 5 kits). Also, the maximum of the curve of lactation was higher and it was reached two days before in these females. The growth of the litter is related to the dairy production ($b_1 = 0.42 \pm 0.09$). The growth presents also a quadratic evolution in the time. The maximum growth was reached 3 d before to the peak of dairy production. This reduction in the growth of kits could be due both to kits begin to eat solid feed and variation in the composition of the principal nutrients of the milk of the doe rabbit, and digestive tract is not totally prepared for it.

CHANGES IN ANNUAL PRODUCTIVITY OF A COMMERCIAL FARM DUE TO APPLICATION OF EXTENSIVE REPRODUCTIVE RHYTHMS

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The aim of this work was to study the evolution of the productive results in a commercial farm with 1,800 females from 2005 (AI on 18 d postpartum (pp) and weaning at 40 d of lactation) to 2008 (AI on 25 d pp and weaning at 47 d). A total of 45,025 artificial inseminations (AI) were analysed using fresh semen. Fertility and fecundity were significantly higher in 2008 (88.2% and 81.2%, respectively, $P < 0.001$) than in the rest of the periods studied, matching up with a more extensive and standardized application of reproductive management. Besides, it was obtained more newborn kits alive (7.29; $P < 0.001$) and sold (5.52; $P < 0.01$) per AI in 2008. Season did not affect parameters studied, except kit's mortality, elevated in autumn and lower in spring and summer (25.3%, 19.1% and 21.2%, respectively; $P < 0.01$). One hundred more of kits were sold in 2008 in relation to 2005 ($P < 0.05$) with 100 g more in live body weight at the end of growing period, without having a significant influence in the feed conversion ratio (a mean of 4.19 in the last three years). We can conclude that in accordance to technical and healthy conditions of the commercial farm studied, and after an adaptation period, productive results have been successfully improved.

INFLUENCE OF AGE AND PHYSIOLOGICAL STATUS ON BODY COMPOSITION OF RABBIT DOES IN EXTENSIVE MANAGEMENT SYSTEMS

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The aim of this work was to study live body weight and body composition evolution by means of Bioimpedance in nulliparous and multiparous rabbit does with different number of previous parturitions, inseminated on 25 d post-partum and weaned on 47 d of lactation. Only it was observed significant losses on live body weight, fat depots and energy at parturition, recovering it then,

during their lactation period. Rabbit does with more than 8 parturitions, due to their optimal and continuous productive parameters, had lower live body weight, estimated fat and energy depots but a similar content on protein than younger rabbit does.

THE USE OF ULTRASOUND TO MONITOR BODY FAT RESERVES OF RABBIT DOES IN POSITIVE AND NEGATIVE ENERGY BALANCE

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Twenty New-Zealand×Californian rabbit does (4.3±0.6 kg) were used to evaluate the real time ultrasonography (RTU) technique to predict body fat from *in vivo* scapular fat thickness measurement (SF_{rtu}). The SF_{rtu} and fat depots, except inguinal, were significantly correlated ($r = 0.70$ to 0.85 ; $P < 0.01$). It was established a simple regression for predicting body fat from SF_{rtu} ($R^2 = 0.71$). The SF_{rtu} measurement seems to be a useful for *in vivo* prediction of the body fat of rabbit does.

INFLUENCE OF KITS FOSTERING ON THE VIABILITY AT WEANING IN THE ALTERNATIVE UNDERGROUND CELLS RABBIT KEEPING SYSTEM

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The effect of the cross-fostering after birth to heterogeneous numbers of kits by litter was studied in the alternative rabbit keeping system that bred the Lepriño of Viterbo breed in outdoors underground cells. Fifty four per cent of the litters take part in the equalisation, 45% of them giving kits and the rest receiving kits. The most frequent litter size after equalisation was 8 kits, although many litters were equalised to 7 and between 9 kits, and another remained with litter sizes below 7 kits. There were no differences in the percentage of kits mortality until weaning for every litter size after equalisation, nor in the proportion of litters that weaned all the kits present after the equalisation, in function of the does had given kits, received kits, or remained with the same number of kits born alive. In conclusion, in alternative farms with a low number of does, in which often is not possible to do a precise equalisation of the litters after birth, it is viable

to equalise efficiently the litters of the same or different bands to heterogeneous, but similar, litter sizes when required by the management circumstances.

CAGE REARING AND ETHOLOGICAL REQUIREMENTS OF THE RABBIT

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Welfare of rabbits raised in cages has been tested for different traits. It is demonstrated that rabbits, when they can chose, prefer lying lazily in the cage instead of staying on the turf. Though in separate cages, rabbits are able to maintain a visual social relationship looking at each other more frequently than in other directions. They show also an olfactory relationship that, after an initial phase, does not need to orientate the head in direction of the other subjects, since smell comes anyway through the air. Lastly, it is shown that rabbits don't need higher cages than the industrial (cm 35-40) since they rise their body over the height only very seldom, since they are accustomed to live in the narrow holes of their burrows. With reference to Brambell laws, most of evaluation parameters indicate that cages are suitable to rabbits even better than natural conditions.

TECHNICO-ECONOMIC MANAGEMENT, SECTOR SITUATION AND MEAT CONSUMPTION HABITS

TECHNICAL AND ECONOMIC MANAGEMENT IN SPAIN: UNRESOLVED MATTER

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Technical and economic management in rabbit farms is necessary, especially in crisis times, as it let us know the real situation of the farm, which feature should be changed and how worked the decision we made. Management is widely made by French rabbit or Spanish pig breeders, but it is a practice unusually spread in Spanish rabbit farmers. The main reason could lie in breeders, who do not consider their farms as enterprises, which necessarily implies technical and economic control. The use of management softwares where the own indices can be compared with those

obtained in other farms is still an unresolved matter. The Spanish rabbit database bdcuni, created by the Ministerio de Medio Ambiente y Medio Rural y Marino and the Instituto Valenciano de Investigaciones Agrarias offers this possibility in a confidential and free manner.

EVOLUTION OF INTENSIVE RABBIT FARMING IN THE TRÁS-OS-MONTES REGION IN THE LAST SIX YEARS

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The evolution of rabbit production in the region of Trás-os-Montes (Portugal) was characterized, using inquiries to rabbit farms of the districts of Bragança and Vila Real realized in the years of 2002 and 2008. In this region the number of females increased about 30% (21,105 to 27,420) and there are more 10 farms (44) than in 2002. The productive capacity of Vila Real district is still the most important (67% of installed females). At 2008 all councils of this region have rabbit farms. The council of Montalegre has the largest number of farms (6) and the council of Vila Pouca de Aguiar has the largest number of females (4,240). The average size of rabbit farms increased slightly, from 510 to 520 nests. Artificial insemination is now used in all farms and, consequently, the number of bands was reduced. In past six years the open-air production was reduced and the degree of mechanization increased, with more farms using automatic feed systems and automatic systems to remove wastes. In the region studied, the rabbit production is increased from about 1,936 t to 3,054 t, being the actual production near 131 kg/cage/year.

COMPARISON OF OPINIONS ON THE RABBIT MEAT COMPOSITION AND PROPERTIES BETWEEN TRADITIONAL PURCHASERS AND YOUNG CONSUMERS

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Opinions on the rabbit meat composition and properties from 339 students and 337 traditional purchasers from Seville (Spain), who had ever eaten this meat, were studied. 28.4% of respondents believed that the protein content of the meat is high, with no difference between young consumers and traditional purchasers. 60.7% of subjects said that the fat content is low, 39.6% felt that the cholesterol content is low and 25.7% said that calories

are low, with higher proportion of traditional purchasers than young people having accurate views on the matter. Tenderness and juiciness were considered intermediate by 83.2% and 52.1% of subjects, respectively, with the highest proportion of young consumers against traditional purchasers giving high ratings to both organoleptic properties. The bone content in the rabbit meat was considered high by 47.6% of respondents, with more proportion of young consumers than traditional purchasers holding this opinion. 69.1% of respondents felt that the domestic rabbit meat taste is intermediate, with the highest proportion of young people believing that the taste is strong and traditional purchasers who thought that was weak. 53.6% of subjects claimed that the wild rabbit meat has a strong taste, with the

highest proportion of young consumers believing that the taste is intermediate and traditional buyers believing it is strong. Sex influenced only the opinions of young people on the meat juiciness, being considered high by high proportion of men and low by more proportion of women; also influenced the opinion of the traditional purchasers about calories from meat, which was considered high by higher proportion of men and low by higher proportion of women. It was concluded that there is a certain ignorance of the composition of rabbit meat and that it is perceived differently by young consumers and traditional purchasers.
