

Abstracts of communications presented during the

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The 26<sup>th</sup> Symposium of ASESCU and 1<sup>st</sup> Symposium Ibérico de Cunicultura took place last 23 and 24 May, 2001 in AVEIRO (Portugal). The event was organised by the ASESCU (the Spanish branch of the WRSA)-- the Associação Portuguesa de Cunicultura and Associação Portuguesa dos Engenheiros Zootécnicos (APEZ). Some aspects of Production, Pathology, Welfare and Nutrition were revised during the event.

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### PRODUCTION

#### Rabbit breeding in Spain

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Spain produced 136,624 MT of rabbit meat in 1999. It is one of the main producers of this kind of meat in Europe together with Italy (217,000 MT), France (85,520 MT), the ex-Czechoslovakia (42,000 MT) and Germany (34,000 MT).

Statistical data from the Ministerio de Agricultura, Pesca y Alimentación (MAPA) [Ministry of Agriculture, Fish and Food] and from the programs of Gestión Técnica Económica (GTE) [Technical and Economical Arrangement] have estimated that the number of rabbit does in Spain is about 2,557,000 and the number of doe cages is about 2,275,000.

In Spain, rabbit meat production is in the fifth position with 2.8 % of the total meat production, after pork, chicken, beef and lamb production. Consumption of meat is about 64.5 kg *per capita* per year, being 2.17 kg rabbit meat. The consumption is not regular and it is affected by the geographic location, housewife's age, social class, and also by the number of members in the family.

During last few years, Spain has clearly become an exporter country and it has a self-supplying rate of 105 %. The export of rabbit meat in 1999 was of the order of 6,720 MT. Most foreign trade has happened with Portugal (3,768 MT) and France (2,643 MT).

Data from the GTE programs in 1999 shows the evolution of the average size of the farms, which was about 453 doe cages at the end of that year. This supposes an increase of 4 % in the last year and of 35

% in the last five years. The increase in the utilisation of animals from selected lines has supported an improvement in the indexes related with litter size. Total litter size at birth and at weaning has increased to 9.44 and 7.65, respectively. Also, index of conversion has been reduced from 4.10 in 1991 to 3.8 in 1999, due mainly to genetic selection and improvement of the feed quality. Mortality has been kept at acceptable levels, 13.8 % during lactation and 7.8 % during the fattening period, in spite of problems caused by mucoid enteropathy disease.

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#### The French meat rabbit production

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The French meat rabbit production has decreased since the eighties. France is now the third country in Europe with 95,000 tons per year. Purchases fell steadily by 2 to 4 % annually and rabbit meat represents no more than 2% of the fresh meat purchases (1.6 kg/person/year).

The price paid to the farmer was around 11 F during the year 2000. The price rose in comparison to 1999, but it went down regularly since 1984. The decrease is around 40% in terms of 1983's francs.

The profit margin in relation to the feedstuff cost has gone down by more than 30%. At the same time, the profit margin per doe cage has levelled off owing to the improvement of the breeders technical level.

Technical and economical results had improved up to 1997. Epizootic enterocolitis caused a temporary decline in 1998, and results are now similar to those of 1996.

The number of rabbits produced per doe cage has increased owing to the improvement of the prolificacy

and the fertility. This increase has been reduced by the slowdown of the reproductive cycle.

More than half of the farmers groups intend to produce a different rabbit in order to fulfil the consumer requirements. The « Comité Lapin Interprofessionnel pour la Promotion des Produits » was acknowledged as the rabbit national organisation on the 28th of September 1999. All information related to the economy and the promotion of the rabbit meat is available on a Web site : <http://www.lapin.fr>

### Contribution to the study of fattening rabbits raised on floor in the context of a differentiated production

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A low energy feed (Diet A, DE=9.75 MJ/kg) was studied in order to reduce aggressive behaviour in fattening groups raised in pens in comparison with a standard fattening diet (Diet B, DE=10.54 MJ/kg). Both diets were distributed *ad libitum*. The effect of the housing type, 60 animals per pen vs. 6/3 animals per cage, on the growth and the feed efficiency was also measured. Four genetically homogeneous groups of 60 fattening rabbits were bred from 32 to 90 days of age in a factorial design 2x2, crossing the housing mode with the feed type. No roughage or wooden stick was added to the animal environment. In order to be close to the breeding protocol of the differentiated production Label Rouge Aquitaine, the density was reduced from 16 to 8 animals per m<sup>2</sup> at 49 days of age and floor in the pen consisted of 3.75m<sup>2</sup> of wired netting and 3.75m<sup>2</sup> of concrete plot. Phenomenon of aggressiveness could not be repeated in the pens. As a consequence, no skin injury was observed with none of the diets and the effect of the energy level on rabbits behavior could not be investigated. No significant differences of weight was observed at 90 days between the diets. The lower energy content of the diet A was compensated by a 6% higher feed consumption than the diet B. The diet A was supplemented with 100ppm of zinc-bacitracin, which could have also acted as a growth promoter. The animals raised in pens reached an average final weight 5.7% less than the groups raised in cages. The feed efficiency from 32 to 90 days of age was 4.46 in pens, 0.49 points higher than in cage. This difference was observed mainly after 70 days of age, when bucks were supposed to develop sexual behaviour, which could have lead to higher physical activity in the group.

## WELFARE

### Effect of cage size on doe activity: Preliminary results

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We analysed the use of cage space and activities of four New Zealand does in two conventional cages (50 cm width x 60 cm depth x 30 cm height, plus outside nest with 50x25x30 cm) and two alternative cages (50 cm width x 85 cm depth x 40 cm height, nest included). The cages were made of galvanised metal, with 11 mm distance between floor wires. All cages had a rectangular food protector with plastic slats (40x27 cm). Cycles of 24 h or more were filmed by video-camera with an infrared lamp during the adaptation period, mating period, pregnancy control, nest placing and parturition. Here we present data on the adaptation period (24 h pre-mating + 6 h post-mating; "nulliparous does") and nest placing (24 h, 4 days pre-parturition; "pregnancy does"). Animals were filmed for 1min every 5 min. We noted location in the cage and doe activity in the first images of each minute ("first activities") and other activities in the remaining seconds of each minute ("complementary activities").

The use of cage space was significantly different in experimental cages: both nulliparous and pregnant does used the longitudinal position more in conventional cages (45.3% nulliparous and 59.3% pregnant) and the transversal position in alternative cages (46.4% and 42.9%, respectively). This behaviour was probably related to the location of the foot protector, which was often used in both cage types, especially by pregnant does (83.6% of the time in conventional cages and 88.5% in alternative cages). The diagonal position was rare (5.3-22.4%). Doe activities were not very conditioned by cage size, except during rest (nulliparous and pregnant does preferred to rest on four feet or extended on their side in conventional cages but in alternative cages they preferred to rest on their four feet or their belly) and for the frequency of toilet behaviour of the hind region (less frequent in both alternative cages). There were some differences in exploratory behaviour of nulliparous does in conventional cages (68 events) with respect to alternative cages (90 events), perhaps because every doe occupied individual cages similar to the conventional model since the age of two months until the beginning of our experiment.

The nulliparous does rested less than pregnant ones and ate and drank more frequently, performed less

sporadic movements and had increased exploratory behaviour.

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### Evaluation of rabbit welfare in alternative breeding systems

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A doe was introduced on a surface of 13m<sup>2</sup> of turf, put in communication with an artificial housing unit formed by an underground cell connected by a tube with an external cage (8m<sup>2</sup> in total). Both systems were provided with a feeder, drinker and a small rack containing straw to permit the doe to prepare freely its nest.

During the months of November and December, the doe spent 25% of its time on the turf, before parturition, and only 12% after it. The doe spent in the cage from 55% to 74% of its time, before and after the parturition respectively. The result shows that the doe prefers clearly the artificial system and a cage in the open-air should be considered as an environment very fit to animal welfare.

The doe had its first parturition into the artificial nest inside the underground cell but it dug its burrow to get the next one. It changed also its behaviour with reference to the place chosen to deposit its faeces. In the beginning it happened both in the cage and near a tree, but, after parturition, it was only in the cage.

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## PATHOLOGY

### New strategies in rabbit feed: Additives and alternatives to antibiotic use

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In this study the possibilities for the use of alternative additives to antibiotics are reviewed. Six groups were considered: acidificants, vegetable extracts, probiotics, prebiotics, enzymes and mycotoxin binders.

In the acidificants group we could find different organic and inorganic acids and their salts. These are presented to avoid the fungi and bacterial growth in feedstuffs. Another reason for the use of acidificants is to reduce the gastric pH and to improve the vegetable

protein digestibility and minerals. Finally, it has been considered recently that organic acids act against the pathogenic micro-organisms in the digestive tract.

Vegetable extracts group is, nowadays, an unknown group. The positive effects of some of them have been proven in animal production. The best advantage is that they are natural products, with no problem with meat residues. It will be necessary to do more studies so as to know the real possibilities of these compounds.

Probiotics are live microorganisms that could compete in the intestinal tract producing unfavourable conditions for certain pathogenic agents. It's important that these are resistant to pelleting.

Prebiotics are ingredients, which are not hydrolysed, that arrive in intestine where they could be used as substrate for the beneficial flora in a selective way. The most used actually are the fructo-oligo-saccharides.

With the enzymes group, there have been experiences in rabbits with sub-optimal enzymatic activity with  $\alpha$ -amylases for a better starch digestibility.

Finally, the mycotoxin adsorbents have a drag function in the digestive tract, but there are not many studies with rabbits.

The additive use as possible alternative to antibiotic in rabbits has to be studied in future as to know its real possibilities.

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## NUTRITION

### Nutrition around weaning and early weaning

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Management and nutrition around weaning time are clearly related with the digestive physiology development and maturity of young rabbits during fattening, and consequently, with their susceptibility to suffer different digestive disorders during this period. Around weaning, fermentative activity of caecum begins to be developed and some of the enzymatic digestive activities show important changes. However, kits start to eat a diet designed for their mother, making them very liable to suffer digestive disorders. In the present work, recent advances in rabbit nutrition around weaning time and the effect of early weaning on health and performance of kits and does have been reviewed.

From literature results it should be concluded that, early weaning between 21-25 days seems to be a feasible practice that could have interesting

possibilities from a productive point of view: improving the corporal condition of reproductive rabbit does and allowing a specific nutrition of kits around weaning time. In fact, we could infer that a reduction of lactation requirements during the 4<sup>th</sup> week by early weaning or by changes in the doe management should improve the negative situation of does at the end of lactation. However, more information about its effect on the pathology incidences registered during the growing period is needed. Actually, only incidences on the adaptation period (21-32 days) have been reported, but no long-term effect could be clearly deduced. In this respect, the only factor that seems to be related with the predisposition to suffer digestive disorders during fattening is the earlier adaptation to solid food intake. More information about this topic (feeding management systems, weaning diets, weaning age...) is required in the future. Finally, for formulating weaning diets one has to consider that: a) kits do not have a great capacity for carbohydrate digestion, b) the type of protein and fat used could affect their subsequent performance and, c) a high solid food intake should be promoted to improve the maturity of their digestive system.

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#### **Effect of source of starch, heat processing and use of exogenous enzymes in starter diets in rabbits**

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The effect of source of starch, enzyme supplementation and heat processing of starch on digestion efficiency, and growth performance in early-weaned (25-d) rabbits at the starter period (25-39 d) was investigated. Eight diets were factorially arranged to study the effect of the use of wheat or pea as source of starch, enzyme supplementation (0 and 1 g/kg de  $\alpha$ -amylase, xylanase,  $\beta$ -glucanase and poligalacturanase complex) and heat processing vs raw addition of the source of starch. Diets were formulated to meet or exceed essential nutrient requirements of growing rabbits, and were fed ad libitum in the starter period. A feeding trial was conducted to measure the effect of treatments on growth performance in 336 rabbits, which were fed the experimental diets in the starter period and then received a common feed until 60 d of age. Fecal apparent digestibility was determined at 35 d of age in 8 animals per diet. Only the four wheat-based diets were used in a digestion trial to determine ileal starch and crude protein concentration (nine replicates per diet). Wheat-based diets showed higher fecal digestibility of neutral detergent fiber (NDF),

crude protein (CP) and starch than peas-based diets (32.4 vs 29.4%,  $P=0.02$ ; 77.6 vs 75.6%,  $P=0.06$ ; and 99.5 vs 99.25,  $P=0.005$ ; respectively). The addition of enzymes to the diet improved dry matter (DM) and NDF digestibility (68.1 vs 66.9%,  $P=0.05$  and 32.1 vs 29.7%,  $P=0.05$ ). Starch heat processing increased DM, NDF and CP digestibility (68.6 vs 66.3%,  $P<0.001$ ; 33.9 vs 27.9%,  $P<0.001$  and 77.7 vs 75.4%,  $P=0.03$ ; respectively). Moreover, starch heat processing in wheat-based diets reduced ileal starch concentration from 4.33 to 2.28% ( $P=0.006$ ); whereas enzyme supplementation tended to reduce ileal starch concentration from 3.85 to 2.76 % ( $P=0.12$ ). Peas-based diets showed lower ADG in the starter period compared to those based on wheat (35.7 vs 37.2 g,  $P=0.04$ ). Starch heat processing led to a higher feed efficiency in starter (0.574 vs 0.557,  $P=0.03$ ) and in the overall period (0.394 vs 0.387,  $P=0.05$ ). Enzymes supplementation showed a tendency ( $P=0.08$ ) to decrease the mortality both in the starter and fattening period, being reduced from 8.0 and 13.8 to 3.6 and 7.8, respectively. The results indicate that digestive capability of early-weaned rabbits is limited and it could be interesting to use enzyme supplementation and/or heat processing together with an appropriate source of carbohydrates such as wheat in starter diet.

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#### **Effect of type of vegetable protein on growth and mortality of early-weaned rabbits**

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The objective of this work was to evaluate the effect of different sources of protein on growth performance in early-weaned (25-d) rabbits during the starter period (25-39 d). The rabbits were fed on four different diets formulated to contain 200 g crude protein per kg, from soybean meal (S48), soybean concentrate (S61), sunflower meal (SF36) and a mixture of soybean meal and potato protein (SP77). Diets were formulated to meet or exceed essential nutrient requirements of growing rabbits, and were fed ad libitum in the starter period. A feeding trial was conducted to measure effect of treatments on growth performance in 236 rabbits, which were fed the experimental diets in the starter period and later received a common feed until 60 d of age. The protein source affected ( $P=0.007$ ) the feed efficiency in the first week after weaning (25-32 d). The animals fed with the S61 and SF36 diets showed a higher feed efficiency than those fed with S48 and SP77 diets (0.642 vs 0.596,  $P<0.05$ , respectively). A tendency to increase the mortality in the period from

25 to 39 d of age with the SP77 diet was observed compared to the rest of the diets; 34.1 vs 20.0 % ( $P = 0.12$ ). In the global period (25-60 d), this tendency was reconfirmed – the mortality being higher in animals fed the SP77 diet compared to those fed the other treatments (44.4 vs 25.0%,  $P < 0.05$ ). In conclusion, these results suggest that sunflower meal could be a preferential source of vegetable protein in starter diets.

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#### Nutritional value of different fractions of wheat in rabbits

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The nutritional value of a sample of soft wheat and four of its bran fractions was determined in growing rabbits using the substitution method. A digestibility trial was performed using 66 rabbits of New Zealand x Californian type of 1951g average weight with 53 to 67 d of age at the beginning of the digestibility period. The rabbits were fed with the 6 experimental diets that consisted on a basal diet, with 19% FAD, and 5 more diets where 30% of the basal was substituted by wheat and its different fractions: coarse bran, fine bran, wheat middlings and wheat shorts. The chemical parameters that differed more among the different feedstuffs were fiber, fat and ashes, while the crude protein stayed relatively constant. The energy value was negatively correlated with the protein linked to ADF ( $r = -0.95$ ) and with the ADF ( $r = -0.87$ ). Thus, the DE of wheat shorts was similar to that of wheat (3820 kcal/kg DM), coarse bran and wheat middlings showed an intermediate value (3200 kcal/kg MS) and fine bran a considerably lower value (2832 kcal/kg MS). The crude protein digestibility was not significantly different among feeds, although it showed slightly lower values for the wheat middlings and shorts (72.6%) than for wheat or its first brans (83%). The digestibility of ADF was higher than that of NDF (67 vs 41%) for the three types of intermediate brans (coarse, fine and middling) which seems to indicate a greater cellulose than hemicellulose digestibility.

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#### The use of lucerne-based diet on young rabbit does

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A high fibre diet (F) was compared with a control diet (C) using 45 crossbred does of 70 days of age. Young does in F group received F diet ad libitum until first parturition, while does in C group received C diet ad libitum until 3 kg live weight and then they were restricted to 150 g per day until parturition. During lactation both groups had free access to C diet until weaning.

Does of F group showed higher feed intake but lower daily weight gain during growth period, reaching first insemination 6-7 days later than those in C group.

However, does receiving F diet until partum showed a significantly higher feed intake ( $p < 0.001$ ) of C diet throughout lactation, that resulting in a higher milk yield ( $p < 0.001$ ) and a great litter weight at weaning ( $p < 0.001$ ) than does given C diet before partum.

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#### Effect of high energy diets on the performance of primiparous rabbit does

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The influence of high animal fat (F), vegetal fat (O) and starch (S) diets on production traits of 64 primiparous rabbit does was studied during gestation and lactation with standardised litters of ten pups.

Fat addition (F and O diets) significantly increased milk yield ( $p < 0.01$ ) and litter weight at weaning ( $p < 0.05$ ) and decreased the number of kits replaced during lactation ( $p < 0.05$ ), compared with the high starch diet (S diet).

Milk of does given F diet had higher fat ( $p < 0.001$ ) and energy content ( $p < 0.01$ ) than those given O and S diets, instead milk of does given O diet had lower protein content ( $p < 0.05$ ) than F and S groups.

Does, given high starch diet, showed higher live weight gain during lactation ( $p < 0.01$ ) than those given high fat diets.

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**Effect of high energy diets on the body condition of primiparous rabbit does**

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The evolution of body condition of 64 primiparous rabbit does during gestation and lactation with standardised litters of ten kits was studied and compared with three diets: animal fat (F), vegetal fat (O) and starch (S) addition. The body condition of does

was estimated from ultrasound perirenal fat thickness measures.

All diets promoted a rapid increase of perirenal fat in no-productive and gestating does followed by an important decrease in fat deposits during the three days of pre-partum.

During lactation, rabbit does given high fat diets (F and O groups) lost fat deposit and showed a negative fat and energy balances, instead does given high starch diet (S group) increased fat deposit, showing a significantly higher perirenal fat thickness at weaning ( $p < 0.001$ ) than F and O groups.