

**Abstracts of the communications given during the
“XXVIII SYMPOSIUM DE CUNICULTURA” Alcañiz, 2-4 April 2003. Spain.**

The XXVIII SYMPOSIUM DE CUNICULTURA was organized in Alcañiz (Spain) by the Asociación Española de Cunicultura (ASESCU), the Spanish Branch of the WRSA. The actual aspects of rabbit production were revised in 5 invited papers, 2 roundtables and 21 communications, that are summarized hereafter. The proceeding (volumes or CD) containing the text of all the invited papers and communications, written in Spanish, are available at ASESCU (Castañer, 12- 08360 Canet de Mar- Spain) and in <http://www.asescu.com>.

**COMPARATIVE TEST ON THE USE OF TWO OR THREE-APERTURE
FEEDERS IN STANDARD RABBIT CAGES.**

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The new regulations on comfort that are about to be introduced in the EU and the need to discuss how they will affect rabbit farming mean that we must decide on both the minimum and the optimum requirements for rabbits. Among the measures to be studied is the number of apertures in the feeders to be used in the cages or runs. By ethology, we know that young rabbits follow a circadian cycle, feeding principally at daybreak and sunset, when their consumption is double that of other times. Observing the number of occasions when they approached the feeder and the consumption at each feed, each animal was recorded as consuming 2.5G every every

3.75 minutes at these times of maximum consumption and with feeders of two apertures. For most of the rest of the time, both the number of approaches to feeders and the amount consumed were half or less of these figures. Also, at the times of greatest feeding activity it was observed that with two-aperture feeders there were moments when neither of these was occupied. We have discovered that even more important than the number of apertures to ethology and productivity is the capacity of the feed hopper, which should contain a minimum of 4 kilos. Also important is the width of the apertures, which we suggest should be 9cm, as a smaller size is not suitable for today's farm breeds. To compare differences in results between feeders with two and three apertures, which have been recommended for more than 20 years, a test was carried out at the REOSA Centre at our request. Method, materials and results are included in this report and the conclusions were as expected. To sum up, it can be said that for purposes of fattening, feeders of two apertures are sufficient for cages with a maximum of 8 young rabbits, but the feeders must have apertures 9cm wide and hoppers that ensure a minimum supply of 4 kilos of feed.

BENEFITS OF LACTATION CONTROL AND ITS INTERRUPTION, AS REPRODUCTIVE BIOSTIMULATION, IN INDUSTRIAL RABBIT BREEDING

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In the report, we take for granted that does must be stimulated before artificial insemination or fecundation, with the aim of producing more offspring per year, and to form the rabbits into groups, one of the requirements of the programme. Various types of stimulation by hormones and methods of biostimulation are described, with special emphasis on lactation control, in which interruption of lactation for 48 hours is used as a complementary practice, in order to increase receptivity and fertility to the maximum. Due to the importance given to increasing productivity, which can be over 50% annually (according to tests carried out by different research groups), our

company, after years of testing, has developed a new system for closing nest boxes, which allows the doe to leave the nest at will but does not let her return. This system can be applied selectively, either manually or automatically, to a large number of cages. Various programmes are available. The name of this ergonomically designed model is ERGOMATIC. To sum up, we recommend rabbit breeders to use the biostimulation programme, either alone or in conjunction with PSMG stimulation. The programme consists of control of lactation, which is interrupted 48 hours before insemination. This system is sure to increase productivity in rabbitries and will also bring higher profits to breeders.

THE USE OF ENTERTAINMENT OBJECTS IN RABBIT CAGES. PRELIMINARY EVALUATION.

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The behaviour and the interest (time of use) of some entertainment objects put in the adult reproductive cages have been evaluated in a subjective way. The objects were: a wooden peg on cage floor and a wooden stick hung from the roof cage (males and females), an empty Coke can on the floor (in males' cage) and straw on the cage roof (in females' cage). The females gnawed the stick more than the wooden peg, but the peg may also be entertaining since some does carried it around repeatedly in the nest. All does ate straw immediately after placing, but only some continued eating five minutes later. Many females had straw on the roof at the end of the day. The males did not gnaw the wooden objects (peg or stick) but showed a lot of interest in the Coke cans. As these elements could be dangerous if swallowed, they are only advisable for specific use under strict control.

THE CHEMICAL COMPOSITION OF RABBIT MEAT

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Chemical composition of rabbit meat (proteins, lipids and moisture) has been studied in edible meat of 14 commercial carcasses and in their anatomical components. Percentages of edible meat and of chemical components found are similar to those indicated by the Spanish Ministry of Agriculture (e.m. 78.5 vs 79%, protein 20.89 vs. 20.8, lipids 8.37 vs. 7.6, moisture 69.67 vs 71.6) but very different to those indicated by the Spanish Ministry of Health for edible meat (57.4%) and for chemical components (10.1, 5.2, 84.8). The values of the Spanish Ministry of Health are confusing and cause problems for diet validation. The average lipid percentage in edible rabbit meat is higher than the value usually accepted by breeders.

EFFECT OF TRANSPORT AND LAIRAGE TIME ON THE WELFARE AND MEAT QUALITY OF COMMERCIAL RABBITS (COTRANS). REVIEW OF THE LITERATURE AND PRESENTATION OF A NEW PROJECT

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The first stage of the project will be to describe rabbit transport in Spain with special reference to handling before transport, transport conditions and handling at the abattoir, including aspects that can potentially influence the welfare of the animals and meat quality. This first part (MT1) will be performed via a questionnaire for farmers, hauliers and abattoirs, in order to establish the critical points of the transport process and adjust the design of the second stage of the project (MT2), which will centre on studying the effect of transport time and season on stress response variables

in blood (cortisol, glucose, lactate and CPK) and on meat quality (pH 24h, water holding capacity, colour L*a*b* and texture using Warner-Bratzler and compression). The experimental design in MT2 will include three transport times (short, medium and long up to 8 hours) and two seasons (summer and winter). Each treatment will have three replicates. The third stage will analyze the effect of lairage time in the abattoirs on the same stress parameters as in MT2. We will define two groups, one without lairage and another with the average lairage time for rabbits found after MT1. The lairage and transport times will also be the ones most frequently found in MT1. In the fourth stage, we will develop a Code of Practice for the loading of rabbits, with recommendations that should minimize the effect on animal welfare and meat quality. The final stage of the project, (MT5) we centre on elaborating a systematic method to evaluate and audit (score) the process of loading in commercial transport, towards the establishment of a certification of the ethical quality of the product for consumers. Throughout the project we will define a series of milestones in order to inform professionals in the sector.

PATHOLOGY ASPECTS IN CULLED DOES IN A RABBITRY DURING A PERIOD OF ONE YEAR

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This study evaluates the causes of culling in does with evident pathology in an industrial rabbitry with 750 reproductive females. A total of 308 females with lesions were culled by the farmer himself. The period of observation was comprised between January and December 2002. The culled percentage of sick females was 37%, versus 52% healthy females without any observable problem. During this period 11 % of dead does were registered. Reproductive problems were considered the major cause of culling does. This was due both to infertility, subfertility and behavioural alterations, as well as lesions of the reproductive tract. The main cause of culling

does was mastitis, with pododermatitis and abscesses. This makes it clear that the Staphylococia process is one the most important reasons for culling does, after reproductive problems.

MOLECULAR TYPING OF *Staphylococcus aureus* CAUSING PURULENT LESIONS IN RABBITS

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A study was carried out on the different purulent pathological processes present in fourteen rabbit farms in the area of Valencia. The germ that was most frequently isolated in these lesions was the *Staphylococcus aureus*. Following cultivation and identification, a typing of the gene was carried out, utilising as selection criteria the polymorphism in the length of the coagulasa gene. Four different strains were identified as being involved in the pathology studied (A,B,C,D). It was observed that the same strain is able to provoke different types of lesion. The strain identified as A was the most frequently observed in all investigations and in practically all of the pyogenic lesions.

AUTOVACCINES AGAINST MYCOPLASMAS IN FARM RABBITS

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Respiratory and reproductive pathologies are the most frequent failures in rabbit farms, with serious consequences for health and productivity. In two previous articles,

we demonstrated the evidence for the role of *Mycoplasmas* in these pathologies, and in this paper we evaluate the efficacy of autovaccines for their control. The study was carried out on a farm of 800 females. 428 young rabbits were vaccinated and 3.622 were considered as control. In the vaccinated group, mortality was lower and there was a significant decrease ($P<0,01$) of pulmonary lesions.

SEROLOGICAL RESPONSE TO MYXOMATOSIS VACCINATION BY DIFFERENT INOCULATION SYSTEMS

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In order to assess the efficacy of vaccination systems, five groups of 20 rabbits each were inoculated with a live attenuated heterologous vaccine against myxomatosis (Mixohipra-FSA®). Administration systems differed between groups: subcutaneous injection (group A), intradermic inoculation in one-shot one-impact (group B), one-shot three-impacts (group C), two-shots one-impact (group D) and two shots three-impacts (group E). Clinical signs, general and local, as well as serological response at 28 days post-vaccination were compared. Vaccination did not affect health status of rabbits but it produced nodules at the inoculation site, mainly in groups vaccinated by intradermic route where the presence and size of the nodules were closely related to serological response. Although no differences due to the administration system were found in the serological response ($P>0.05$), subcutaneous injection and two-shot intradermic administration gave the most homogeneous and efficient responses.

COCCIDIOSIS EVOLUTION IN DIFFERENT LIVING CONDITIONS

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The concentration of coccidia oocysts in the faeces of growing rabbits was recorded in different living conditions (standard industrial and open air: pelleted mash with or without of added robenidin). 66 subjects per treatment were controlled. The results show that pharmacological treatment can be eliminated when the conditions, mainly strict hygiene, are in accordance with the rules of open air husbandry. This condition is very favourable to the production of organic meat. An even lower concentration of coccidia can be obtained when robenidin is administered, as in the standard industrial system. During an outbreak of epizootic enterocolitis, a paramount increase of oocysts was observed and the concentration (12,000/g) was considered to be related to enterocolitis and to be a possible influence in mortality.

MUCOID ENTEROPATHY OF THE RABBIT: INCIDENCE ON
RABBITRIES BETWEEN 1996-2002.

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A retrospective study made by a rabbit practitioner was conducted on commercial rabbitries during 1996-2002 in Spain and Portugal. It concerned mucoid enteropathy (sin. epizootic enteropathy of the rabbit) and the epidemiological factors year and season. In that period 578 rabbitries were examined through 2,852 visits. On 519 visits mucoid enteropathy (ME) was the most relevant disorder. During 1996 only 2 visits were made for this reason, so it was excluded from the study. The sequence of visits for ME over the total was as follows: winter (January, February, March): 149/645 (23,1 %); spring: 88/565 (15,6 %); summer: 129/617 (20,9 %) and autumn: 151/

628 (24 %). No statistical differences were found due to variability in the percentage of affected farms. Similarly to other severe pandemics, such as myxomatosis and viral haemorrhagic disease, mucoid enteropathy is a disorder which can affect populations at risk throughout the year.

INFLUENCE OF MATERNAL FACTORS ON THE GROWTH RATE AND HEALTH OF GROWING RABBITS

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A total of 496 litters (4960 young) from 5 cycles of 150 reproductive rabbit does were used to evaluate the influence of mother and other maternal factors (reproductive rhythm, doe nutrition management and number of parturition) on the main performance traits of the growing rabbits. As the parity number increased, a clear increase of the mortality (5 to 29%) was observed during the growing period, although growth rate, food intake and food conversion ratio was also improved. The type of diet used during lactation significantly affected the mortality of growing rabbits, being higher for those coming from a high energy diet (13.6 vs. 18.5%). In fact, there was a positive correlation between the milk yield of does and the mortality of their young during the growing period ($r=+0.10$; $P<0.05$). The mother (doe effect) also significantly affected the growth and health of rabbits during the growing period ($P<0.05$), 22% of females being responsible for the 50% mortality observed during the fattening. Therefore, growth and mortality of growing rabbits seem to be clearly affected by some maternal factors, advisable measures being to avoid the "fatigue" of the farm, the sudden change from milk to solid feeding around weaning, and the chasing of animals, whose litters usually show a greater incidence of pathology.

SEMINAL PARAMETERS FROM THE WILD
RABBIT BUCK IN CAPTIVITY

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This study was performed to evaluate the seminal parameters of 10 young wild rabbit males, aged 6 months. The semen was collected with an artificial vagina once a week, trying to obtain two ejaculates per male with an interval of 20-30 minutes. All the measurements were made by the same expert technician during the whole experiment. The macroscopic parameters analyzed were the color (gray, white and cream), the gel presence or absence (expressed as % of ejaculates showing gel) and the volume in gel absence. The mean semen volume was $0,22 \pm 0,006$ ml and the gel presence was detected in 30% of the ejaculates. The microscopic parameters considered were the concentration (number of espermatozoa/ml) and the motility using an arbitrary scale of 1-4 based on the ratio of sperm cells with progressive movement. The mean concentration was $618 \pm 81,3$ millions esp/ml. Order of collection influenced colour, motility and concentration. Second ejaculates had more cream colour and more motility than first. In addition, the highest concentration was observed in the second ejaculate (827 ± 78.49 vs 450.8 ± 63.32 , millions esp./ml, respectively) and the concentration and colour were significantly correlated ($r: 0.75$; $P < 0.001$). After semen evaluation, pool of semen was made in an inorganic extender to obtain doses of 15-20 millions of spermatozoa. A total of 242 artificial inseminations were made in receptive doe rabbits (130 nulliparous and 112 primiparous lactating or not). Mean fertility and prolificacy obtained were 78% and 4.5 ± 0.35 pups per litter. As only receptive does were inseminated, similar fertility and prolificacy results were obtained in nuliparous and primiparous does and identical results were obtained between lactating and non lactating does. The results obtained during the experimental period are considered similar to those for meat rabbits. Consequently, in future studies, the possibility of transferring more effective non-hormonal synchronization methods for dilution and storage, in order to improve the appeal of using an artificial insemination technique in wild rabbit farms, must be considered.

TELL ME WHICH CROSSES YOU ARE USING AND I'LL TELL YOU
HOW MUCH YOU PRODUCE

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The latest crossbreeding experiments in Spain are reviewed. Reproductive and growth traits are evaluated, using the classical Dickerson' model. Importance of direct genetic effects and individual heterosis effect on reproductive traits are pointed out (larger than 10% in litter size at birth and number born alive), and on also maternal genetic effects, when litter size traits are observed as doe traits. Growth traits act progressively, the direct genetic effects being the main explicative factors, since individual heterosis and maternal genetic effects are not significant. Selection experiments must be continued, in order to improve direct genetic effects of the lines. Also, a clear crossbreeding plan has to be adopted, taking advantage of direct genetic effects of maternal lines and the heterosis effect on reproductive traits using crossbred females, and making the most of complementarity, using sire lines that have undergone a careful selection based on daily gain and food conversion rate.

OPTIMIZATION OF PROTEIN NUTRITION IN RABBITS:
INCIDENCIA DE CAECOTROPHY

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In our laboratory some trials were carried out in order to evaluate caecotrophes

or soft faeces production in growing rabbits using the conventional methodology (neck collar) and/or urinary excretion of purine derivatives as an indirect index. When caecotrophes excretion was estimated by fitting neck collar during ten days, a significant decrease in feed intake was recorded (from 97.56 to 71.83 g DM/d). Besides, variation in soft faeces production were also recorded when a collar was fitted during different periods. Effectively, a negative correlation was observed and soft faeces production decreased from 18 ± 0.81 g/d at 24 h collection period to 8 ± 0.61 g/d at 240 h collection period. Finally, collar fitting and PD excretion were compared as estimation methods, when animals were fed diets with different type and level of carbohydrates. Although the effect of the experimental treatment was similar with both methodologies, PD excretion gave a higher level of nitrogen recycling than the collar fitting method (1.99 vs 0.93 g/day). However, it is difficult to conclude what the true value was, given that a permanent standard does not exist.

EFFECT OF DIETS SUPPLEMENTED WITH CHLORTETRECYCLINE, BACITRACIN OR FUMARIC ACID ON CAECAL ENVIRONMENT IN GROWING RABBITS

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Seventy-two growing rabbits , divided in eight animal groups, were fed nine similar diets based on barley, alfalfa hay, sugar beet pulp and soya bean meal, and supplemented with different doses of chlortetracycline (200, 400 y 800 ppm), bacitracin (25, 50 y 100 ppm) and fumaric acid (500 y 1000 ppm). Caecal pH (6.04) and ammonia concentration (4.34 ± 1.1 mg/100ml) were not modified by the experimental treatment. Caecal contents tended to be higher when animals received chlortetracycline as additive, although empty caecum weight was apparently higher with fumaric acid. Chlortetracycline diets induced a greater bacterial concentration and higher number of amylolytic bacteria against diets supplemented with bacitracine

or fumaric acid. However, cellulolytic bacteria were more numerous in animals fed a diet with fumaric acid, against both antibiotics, but this effect occurred only when the level of inclusion was high. On the other hand, purine -derivative excretion was higher in animals receiving the bacitracin diet, showing that caecotrophes intake/production was more positive in these animals.

EFFECT OF THE DIETARY SUPPLEMENTATION WITH ZINC BACITRACIN AND APRAMICIN ON THE DIGESTIBILITY OF EARLY WEANED RABBITS

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The aim of this work was to evaluate the effect of the dietary supplementation with zinc bacitracin (100ppm) and apramycin (60 ppm) on faecal and ileal apparent digestibility and fermentative traits (relative weight of caecum and its contents, pH, VFA and N-NH₃) in early-weaned rabbits (weaning 25d). A diet was formulated to meet or exceed all the essential nutrient requirements of early weaned rabbits (16,3 % CB, 21.5% of starch and 34,7% NDF, on dry matter) and was or was not supplemented with antibiotics. The supplementation with antibiotics did not affect faecal apparent digestibility (70.5, 72.1, 82.4, 36.8 % for DM, GE, CB y NDF as average, respectively), the relative weight of the caecum and its contents (1.76 y 7.46 % BW as average, respectively), caecal pH (5.43), concentration and molar proportion of VFA (68.5 mmol/l) and N-NH₃ concentration (5.25 mmol/l). However, ileal apparent digestibility of DM and CP was enhanced ($P = 0.06$) with antibiotic supplementation (41.9 vs 37.2% and 65.2 vs 61.5%, for DM and CP, respectively).

FIBRE SUPPLEMENTS AROUND WEANING

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The suitability of some fibre sources (alfalfa hay, beet pulp and straw) in young rabbits, as supplementary feed of very digestible or standard feeds, is explored. Very digestible feed, alone or together with fibre sources, leads to low DM intake and live-weight gain around weaning, joined to high mortality rate in the post-weaning period. When fibre sources were used to supplement a standard feed in weaned rabbits, results varied depending on the fibre source.

IMPACT OF DOE-LITTER SEPARATION ON MILK PRODUCTION,
FEED INTAKE OF DOES AND ON DIGESTIVE PARAMETERS OF
YOUNG RABBITS GROWING

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The objective of this work was to study the effect of a transient doe-litter separation (48 hours at 9 days of lactation) on milk production and the evolution of body weight and digestive traits of the litter from the fasting period to the weaning (35 days old). Milk production and feed intake was daily controlled using 16 multiparous does with more than 7 pups from day 2 to 21 days post-partum. Eight does were temporally separated from their litters (Bio-stimulating group, B) and other eight does had free access to nursing (control group, C). To study the evolution of the body weight of the young rabbits a total of 194 litters (92 and 102, assigned to B and C group respectively) were used. The body weight and the survival were controlled at 9, 11, 21 and 35 days old. A total of 48 young rabbits (24 animals per treatment)

were used to study the persistence of the digestive tract changes observed during starvation. The weight of digestive tract, small intestine morphology and enzyme activity (lactase and sucrase) were controlled at 16 and 21 days of age (12 animals per age and treatment). Total milk production at 21 days of B group was lower ($P=0,044$) than that recorded for C group (4593 ± 150 vs. 5090 ± 161 g). From 12 to 15 days of lactation B does showed a lower milk production with respect C group ($P<0,05$). The fasting period led to a reduction ($P< 0,001$) in the body weight (BW) of the separated pups (203 ± 2.6 vs. 164 ± 2.4 g at 11 days of age). However, no significant differences in the BW were detected at 21 and 35 days of age between groups control and biostimulated (378 ± 7.2 and 869 ± 16.2 vs. 382 ± 6.3 and 858 ± 12.2 g respectively). There were no differences in mortality rate at weaning (20 %, as average). At 16 days of age, a lower relative weight of stomach and its contents and in the protein content of yeyunal mucose ($P< 0.05$), was observed in B litters with respect to the C group. These differences were not detected at 21 days. Sucrase activity was similar in both groups at 16 and 21 days of age and this enzymatic activity shows a significant increase at 21 days ($P<0,05$). No differences were observed on villous height between fasted and control groups at either 16 or 21 days old. In conclusion, the changes observed in the development of litters separated from their mothers 48 hours are transient. A fasting period of 48 hours at 9 days of age does not compromise the subsequent development of the young rabbits.

EFFECT OF DOE PARITY ORDER AND LITTER WEANING AGE ON PERFORMANCE AND BODY ENERGY BALANCE OF RABBIT DOES

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This study aimed to evaluate the effects of doe parity order and litter weaning age on reproductive performance and body energy balance of rabbit does from one kindling to the following. To this aim, 138 lactating does of 3 parity orders (first,

second and third kindling: P1, P2 and P3) were remated 12 days after kindling. Their litters were weaned at 21, 26 and 32 d of age according to a bi-factorial experimental design (3 parity orders by 3 weaning ages). Thirty does at initial kindling and 69 pregnant does at final kindling were slaughtered to determine body tissue and energy balance. When increasing parity order, milk production, feed and digestible energy intake during lactation increased linearly while body energy deficit decreased (from -20.5% of the initial content in P1 does to -9.2% in P3 does). When weaning age was decreased from 32 to 21 d, body energy deficit decreased (-19.4% to -8.0%). Significant interactions between parity order and weaning age were recorded on energy balance and reproductive performance. According to our results, multiparous does showed a lower but still relevant energy deficit than primiparous does. Early weaning permitted a reduction of body energy deficit, especially in lower parity orders.

EFFECT OF LEVEL AND PARTICLE SIZE OF DIETARY FIBRE ON THE PERFORMANCE OF RABBIT DOES

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The aim of this work was to study whether an increase of particle size of alfalfa hay and straw allows a reduction of NDF requirements of rabbit does. Four diets were formulated using a factorial design to study the NDF level (33.6 vs 27.3% NDF on DM basis, with added fat or starch, respectively) and the type of grinding of fibre sources (rough vs normal). In diets with low level of NDF fat was added to trait formulated isoenergetic diets. Faecal apparent digestibility of DM and energy were determined using 32 New Zealand x California multiparous lactating rabbit does around 13 and 19 d post partum weighing 4.3 kg. Milk production and productivity were determined by using 52 and 72 primiparous rabbit does, respectively. Digestible energy intake of animals was similar among diets (804 kcal DE/d) to animals fed fibrous diets with added fat, which showed lower DE content (2815 vs 3010 kcal/kg DM, $P = 0.001$), and tended to increase their feed intake (313 vs 286 g/d, $P = 0.06$).

A reduction of NDF level led to an increase of weight gain of does during lactation (158 vs 307 g, $P = 0.04$) but these animals also tended to reduce their milk production (4869 vs 4450 g, $P = 0.07$), the litter weight at birth (455 vs 427 g, $P = 0.12$) and the number of kits born alive (9.34 vs 8.34, $P = 0.06$). The reduction of NDF level also had a negative effect on litter weight at 21 d and at weaning (25 d) (2666 vs 2229 g and 3182 vs 2806 g, respectively, $P < 0.006$), and on growth rate during the first 21 d of lactation (105 vs 88.3 g/d, $P = 0.0007$). However, feed intake of litters from 21 to 25 d was higher for low fibrous diets (59.8 vs 115 g/d, $P = 0.0001$) and for diets with normal particle size (875 vs 99.7 g/d, $P = 0.04$). No other effects were observed for type of grinding. Mortality of lactating does, litter growth rate between 21 and 25 d and feed efficiency were not affected by treatments and averaged: 11.1%, 129 g/d and 2.51 g/g.
