

ABSTRACTS OF THE REPRODUCTION SECTION PRESENTED DURING THE “8th WORLD RABBIT CONGRESS”

PUEBLA, MEXICO 7-10, 2004.

The 8th World Rabbit Congress was organized in Puebla (Mexico) by the American Branch of WRSA. The proceedings containing the full text of all communications are available at www.dcam.upv.es/\8wrc.

EFFECTS OF INTRAUTERINE CROWDING ON UTERINE AVAILABLE SPACE PER FETUS IN RABBITS

ARGENTE M.J.* , SANTACREU M.A.† ,
CLIMENT A.† , BLASCO A.†

*Universidad Miguel Hernández.
Departamento de Tecnología Agroalimentaria.
División de Producción Animal.
Carretera de Beniel Km 3,2.
03312 ORIHUELA. Spain.

†Universidad Politécnica de Valencia.
Departamento de Ciencia Animal.
P.O. Box 22012. 46071 VALENCIA. Spain.
mj.argente@umh.es

The aim of this study is to examine the effects of uterine crowding on uterine available space per fetus and fetal development at 18 days of gestation in unilaterally ovariectomized and intact does from a divergent selection experiment on uterine capacity. Uterine capacity was estimated as litter size in unilaterally ovariectomized (ULO) does. Records were available from 37 ULO and 26 intact does.

All the does were slaughtered on d 18 of gestation. Ovulation rate per side in ULO does was almost twice as much as intact does (12.41 ova vs. 6.47 ova, $P < 0.001$). ULO does showed a higher intrauterine crowding at implantation than intact does (9.36 implanted embryos/uterine horn vs. 5.31 implanted embryos/uterine horn, $P < 0.001$) and a lower uterine available space by fetus (4.36 cm vs. 4.96 cm, $P < 0.01$). The uterine available space by implantation site showed a negative quadratic regression coefficient with the number of implanted embryos ($P < 0.001$), and a negative linear regression coefficient with the number of dead fetuses ($-0.16 + 0.06$ in ULO does and $-0.19 + 0.10$ in intact does). The uterine available space had a positive quadratic relationships with the length of maternal placenta ($P < 0.001$), and it was linearly associated to the development of fetal placenta and fetus ($P < 0.01$). These results would suggest that each embryo requires a certain minimum space of uterus to attach, survive and develop. The fetal position within the uterus did not affect the proportion of dead embryos. However, the fetuses with placentas receiving less than three blood vessels showed a higher probability of death ($P < 0.01$) than those

receiving more than three blood vessels (35% vs. 4 %). The implantation sites receiving less than three blood vessels had lighter placentas (1.31 g vs. 1.41 g, $P<0.05$) and fetuses (2.03 g vs. 2.12 g, $P<0.05$) that those receiving more than three blood vessels.

Key words: blood vessels, fetal development, placenta, intrauterine crowding, uterine horn.

RESISTANCE OF RABBIT
SPERMATOZOA TO AMBIENT
STRESS AND TO 24-HOUR
REFRIGERATION AT 5°C

BADÚ C. A., FERREIRA W. M., OLIVEIRA C. E. A.,
KAMWA E. B., LANA A. M. Q.

Departamento de Zootecnia. Escola de Veterinária.
Universidade Federal de Minas Gerais.
Caixa Postal 567,
CEP 30161-970 BELO HORIZONTE, Brasil.
baducelia@hotmail.com

The effect of temperature upon seminal characteristics of New Zealand White rabbits was studied, through comparison of the quality of freshly collected semen with that of semen kept 24 hours at 5 °C, considering two different periods (seasons). A saline diluting solution was used, being made up of trizma, glucose, EDTA (ethylene diamine tetra-acetic) and citric acid (pH 6.8 - 7.0). The experimental design was a randomized blocks and the variable studied were motility, strength, spermatozoa concentration and pathologies. During the hot period, values of motility and strength were lower (71.9% and 3.0 vs. 85.6% and 3.4) as compared to cool period. The occurrence of spermatozoa pathologies increased in the hot period (33.9% vs. 25.4%), especially, the presence of protoplasmic droplets (16.2% vs. 11.3%). Results were similar between freshly collected semen and refrigerated one, except

the higher ($P<0.05$) occurrence rate of protoplasmic droplets in fresh semen (15.0% vs. 11.4%).

Key words: New Zealand White, semen, quality, temperature, pathology.

CHARACTERISATION OF LOCAL
RABBIT PERFORMANCES IN ALGERIA:
ENVIRONMENTAL VARIATION OF
LITTER SIZE AND WEIGHTS

BELHADI S.

Dép. d'Agronomie, Faculté des Sciences
Biologiques et Agronomiques,
Université Mouloud Mammeri, B.P 17,
15000 TIZI-OUZOU, Algérie.

An analysis of non genetic factors having influence (rabbit doe weight at positive mating, year-season, physiological state and born alive) on litter size and mortalities from birth to 70 days of age and on litter weights at weaning and at 70d (LW30, LW70) was carried out. Seventy-two does of a local population were controlled during 14 months in a commercial unit. Results showed no significant effect of does body weight on litter size and mortalities from birth to 70 d. The general trend of yearseason effect was favourable for both litter size and weights during preweaning period with a positive effect of spring kindlings on litter sizes from birth to weaning in relation to autumn of the same year (2.12, 1.0 and 1.83 young more respectively for total born, born alive and litter size at 30 d). Again, a high effect of winter and autumn on mean weight at weaning (646.7 g, 611.7 g) was observed. Except stillbirth with low value in winter, mortalities were not affected by this factor. In winter also, we had the heaviest young during post weaning period with no differences. Primiparous no lactating does

gave the best values of litter sizes (9.12, 7.8, 6.9 and 6.3 young from birth to 70 d). However, the highest mortalities were from these later, primiparous lactating and multiparous no lactating females respectively at birth, during lactation and after weaning (14.7, 12.8 and 24.2%). The increase of number of born alive mainly diminished mean weights at weaning and also, but less, mean weight at 70 d and not significantly post weaning daily gain.

Keys words: local population of rabbit, litter traits, non genetic effects.

EFFECTS OF RESTRICTED FEEDING
DURING REARING, COMBINED WITH A
DELAYED FIRST INSEMINATION, ON
REPRODUCTIVE ACTIVITY
OF RABBIT DOES

BONANNO A., MAZZA F., DI GRIGOLI A.,
ALICATA M.L.

Dipartimento S.En.Fi.Mi.Zo., sezione di
Produzioni Animali, Università
degli Studi di Palermo, Facoltà di Agraria,
Viale delle Scienze, 90128 PALERMO, Italy.

abonanno@unipa.it

The experiment was performed to verify the effects of restricted feeding during rearing, combined with a 3-week delay in first artificial insemination (AI), on body development and reproductive traits of young rabbit does, with the aim of improving their productivity and life-span. At 11 weeks of age, 82 New Zealand White (NZW) females were divided into two groups and assigned to different treatments: *ad libitum* feeding and first AI at 16.5 weeks of age (AL-16.5); feed restriction to 75% until 10 days before first AI, performed at 19.5 weeks of age (R-19.5). Five days after AI, 10 females *per* treatment were slaughtered to determine body composition and count of

corpora lutea (CL) and embryos. The career of the 62 does was checked for 160 days, during which a 42-day reproduction rhythm was followed. From 11 weeks to first AI, the R-19.5 had lower growth rate than AL-16.5 (23.1 vs 35.4 g/d; $P < 0.0001$) but showed higher body weight at AI (3571 vs 3427 g; $P = 0.002$). All of the slaughtered females had CL, but the embryo recovery was higher in the R-19.5 than in AL-16.5 (75.6 vs 57.6%; $P = 0.34$). The empty body of R-19.5 was higher in both water (+104 g; $P = 0.005$) and protein (+39 g; $P = 0.13$), and lower in fat (-31 g; $P = 0.30$). At the first AI, the treatment did not affect the kindling rate, but the litter size at birth was higher by 0.7 kits in the R-19.5. After 160 days, although the culled rate of R-19.5 was lower by only 6.4% than the AL-16.5 (48.4 vs 54.8%), the final value was attained more slowly, so that the average duration of activity of R-19.5 tended to be higher (121 vs 105; $P = 0.14$). During the 160-day period, the R-19.5 showed a tendency towards higher productivity in terms of number (+2.7; $P = 0.16$) and weight (+1.8 kg; $P = 0.14$) of weaned rabbits. When lactating, an improvement in kindling rate was observed in R-19.5 (83.0 vs 69.5%; $P = 0.15$). The body weight of lactating R-19.5 was constantly greater from AI to litter weaning (day 31). The restricted feeding, applied from the age of 11 weeks, meant obtaining young rabbit does that, inseminated 3 weeks later, weighed more, without any increase in body fat deposition. The better body development of females favoured an improvement in reproductive efficiency at first AI, productivity during the subsequent activity, and a tendency towards a longer life-span.

Key words: rabbit does, rearing, restricted feeding, reproduction, productivity.

EFFECTS OF SHORT- AND LONG-TERM
FASTING ON THE OVARIAN AXIS AND
REPRODUCTIVE PERFORMANCE OF
RABBITS DOES

BRECCHIA G.^{*}, BONANNO A.[†], GALEATI G.[‡],
DALL'AGLIO C.[§], Di GRIGOLIA A.[†],
PARRILLO F.[§], BOITI C.^{*}

^{*}Dipartimento di Scienze Biopatologiche
veterinarie, Sezione di Fisiologia,
Università di Perugia, 06126 PERUGIA, Italy.

cristiano.boiti@unipg.it

[†]Dipartimento S.EN.FI.MI.ZO.,
Sezione di Produzioni Animali,
Università di Palermo, 90128 PALERMO, Italy.

[‡]Dipartimento DIMORFIPA,
Sezione di Fisiologia veterinaria, Università di Bologna,
OZZANO EMILIA (Bologna) Italy.

[§]Dipartimento di Scienze Biopatologiche
veterinarie, Sezione di Anatomia,
Università di Perugia, 06126 PERUGIA, Italy.

To assess the impact of acute nutritional challenges on reproductive performance, 116 rabbit does were randomly assigned to either "control" or two "fasting" groups. In the control group, the does were fed ad libitum (AL) while in the treated groups the animals were fasted for 24 (STF) or 48 h (LTF) before artificial insemination (AI). In both treated groups, the rabbits were re-fed 2 hours before AI, which was performed at day 11 *post partum* (*pp*) in STF does and at day 32 or 55 *pp* in LTF does following GnRH injection to induce ovulation. In a parallel experiment, blood samples were collected from 10 rabbits/groups by catheterization of the central ear vein at 15 min intervals for 4 h prior and after GnRH, then at hourly intervals for other 4 h, and again 24 and 48 h later to measure LH, estradiol-17 β and leptin. The expression of estradiol-17 β receptors (ER) was evaluated by immunohisto-

chemistry in the hypothalamus and anterior pituitary obtained from both control and treated rabbits after 24 and 48 h of fasting. The 24-h long fasting reduced receptivity (55.8 vs. 70.9%), fertility rate (42.8 vs. 59.2%) especially in does with parity =4 (50 vs. 80%; $P=0.05$), and kits born alive (6.6 vs. 7.7). Also the does fasted for 48 h, showed lower fertility (31.2 vs. 52.6%) and litter size at birth (8.7 vs. 9.6) than controls. Following GnRH injection, the LH peak was higher in AL and STF than in LTF does (Mean \pm SEM, 39.3 \pm 17.04 vs. 31.3 \pm 3.39 and 12.2 \pm 1.23 ng/ml, respectively). Estradiol-17 β showed higher pulse frequency and amplitude in AL than in STF and LTF does. Toward the end of fasting, mean plasma leptin concentrations were lower ($P<0.01$) in both STF and LTF does than in control rabbits (0.82 \pm 0.19, 1.20 \pm 0.1, and 2.32 \pm 0.33 ng/ml, respectively), but then gradually increased in both treated groups following re-alimentation. Compared to controls or STF does, ER-like immunoreactivity decreased in the ventromedial nucleus of LTF rabbits, but increased in the medial preoptic area. ER expression was greatly reduced in the anterior pituitary of LTF does.

Key words: Acute fasting, rabbit, LH, leptin, estradiol-17 β , estrogen receptor.

SEMEN PRODUCTION IN TWO RABBIT
LINES DIVERGENTLY SELECTED FOR 63-
D BODY WEIGHT

BRUN J.M., THEAU-CLEMENT M., LARZUL C.,
FALIERES J., SALEIL G.

INRA. Station d'Amélioration
génétique des Animaux. BP 27.
31326 CASTANET-TOLOSAN CEDEX. France.

brun@germinal.toulouse.inra.fr

Semen production was analysed in two rabbit lines (low, L and high, H) derived by 5

generations of divergent selection for 63-d body weight from a commercial heavy breed. A total of 31 bucks were collected during 18 weeks, once a week, by 2 solicitations at a 15 min interval (giving the 1st and 2nd rank ejaculate). Performances were recorded only one week out of two, resulting in 9 collection series. Sexual activity did not differ between lines. A total of 256 and 226 ejaculates were observed in the L and H lines, respectively. The percent of efficient ejaculates (= fit for insemination) was markedly higher in the L line (66.5% vs. 44.2% in the H line) due to lower potential elimination for presence of urine, or insufficient volume or insufficient mass motility. Considering only the main effect of the lines, the line influenced mass motility, the volume and the concentration of the ejaculates, as well as 4 parameters from a computer assisted sperm motility analysis (path velocity, VAP, track linearity, LIN, track speed, VCL and beat cross frequency, BCF). Mass motility and the volume of the ejaculates were higher in the L line while the semen concentration was higher in the H line. Overall, the total number of sperms and the number of motile sperms per ejaculate were similar in both lines. The interaction between line and rank of the ejaculate on concentration, percent of motile sperms per ejaculate and LIN was a very interesting feature of the results. For example, in the L line, both ejaculates had the same concentration, while in the H line, the 1st ejaculate was more concentrated than the second one. This pattern was maintained all along the experiment. The L line had higher values of VAP, LIN and VCL but lower value of BCF. The efficient number of sperms by ejaculate, a synthetic criteria taking into account the number of motile sperms per ejaculate and the ability of the ejaculate for insemination was significantly higher in the L line: 229 vs 170 x10⁶ sperms per ejaculate in the H line.

Key words: rabbit, semen, growth, correlated response.

EFFECT OF DIETARY α -LINOLENIC ACID ON THE SEMEN CHARACTERISTICS OF RABBIT BUCKS

CASTELLINI C., DAL BOSCO A., CARDINALI R.

Dipartimento di Scienze Zootecniche,
06123, PERUGIA, Italy.

The aim of the study was to investigate the effect of dietary 18:3 n₃ fatty acid on the reproductive performance and oxidative status of young rabbit bucks. Twenty New Zealand White rabbit bucks (7 -10 months of age) were assigned to two different diets: Control and LNA (supplemented with 5% extruded flaxseed and supranutritional level of vitamin E - 200 mg kg⁻¹). The reproductive performance and oxidative status were evaluated. The diet affected many seminal traits and the bucks of control group showed the lowest values of live cells and Eosine Exclusion Test +, VCL, ALH and spermatozoa responsive to Hypoosmotic Swelling Test. In conclusion this study shows that it is possible to improve the quality of rabbit spermatozoa through dietary supplementation of α -linolenic acid and the reduction of oxidative stability does not affect the reaction of spermatozoa to exogenous stimuli.

Key words: rabbit spermatozoa; oxidative status; n-3 fatty acids.

THE EFFECT OF THE DIETARY
ELECTROLYTE BALANCE ON THE
PLASMA ENERGY, PROTEIN, MINERAL
VARIABLES AND ENDOCRINE PROFILE
OF PLURIPAROUS RABBIT DOES

CHIERICATO G. M.^{*}, RIZZI C.^{*}, BRECCHIA G.[†]

^{*}Dipartimento di Scienze Zootecniche.
Università degli Studi di Padova. Agripolis.
35020 LEGNARO (PADOVA). Italia.

gianmaria.chiericato@unipd.it

[†]Dipartimento di Scienze Biopatologiche
Veterinarie. Università di Perugia.
06126 PERUGIA. Italia.

In this research, the effect of the electrolyte balance (dEB, dEB=Na+K-Cl) on the plasma energy, protein, enzyme, mineral profile and on the endocrine response of rabbit does was studied. The animals, belonging to the Grimaud genotype, were at the third reproductive cycle. The rabbits were allocated to reproductive cages and divided into two groups to be fed two diets with different electrolyte balances (dEB1=27 meq/100g and dEB2=35 meq/100g). The diets were similar in ingredients, protein (CP=19.81% DM) and energy content (DE=2945 kcal/kg DM), whereas they had different sodium content (dEB1=0.21% DM and dEB2=0.38% DM). The animals were fed the two diets from first mating (20 weeks of age) until the litter weaning of the third reproductive cycle. From the mating of the third cycle the environmental temperature averaged 15°C and the relative humidity was about 79%. At about 39 weeks of age, five days after parturition, a blood sampling was performed on the does. Results pointed out that the two dEB levels did not significantly affect the body weight and feed intake of rabbit does. No significant dEB effect was observed on the main variables of plasma metabolic (glucose, triglycerides, cholesterol, total proteins, albumin and

globulines), enzyme (aspartate-aminotransferase, alanine-aminotransferase, γ -glutamyl-transpeptidase), and mineral (Ca, P, K, Na, Cl) profile. The plasma concentration of 17 β -oestradiol was similar between the two groups. Cortisol plasma level slightly increased in dEB2 rabbits. Also the triiodothyronine (T3) and thyroxine (T4) were unaffected by the dietary dEB level as well as the free fractions (FT3 and FT4). The results point out that a prolonged administration of a diet with an electrolyte balance of 35 meq/100 g does not affect the metabolic and mineral profile nor the oestradiol plasma level but tendentially increases the thyroid hormones of pluripare lactating rabbit does when they are in neutral thermal conditions.

Key words: rabbit, does, electrolyte balance, blood.

QUALITY AND FERTILITY OF
PRESERVED RABBIT SEMEN AT 15° C, IN
GELATIN SUPPLEMENTED EXTENDER

ECHEGARAY-TORRES J. L.^{*}, OLVERA-CARMONA. J. A.[†],
SALCEDO-BACA R.^{*}, MENDOZA-ÁLVAREZ B.[†]

^{*}Departamento de Preparatoria Agrícola,
Universidad Autónoma Chapingo, Carretera
Mex-Tex. Km. 38.5, CP 56230, TEXCOCO, México.

[†]Departamento de Zootecnia, Universidad
Autónoma Chapingo, Carretera
Mex.-Tex. Km. 38.5, CP 56230, TEXCOCO, México.

echegart@correo.chapingo.mx

The objective of the present study was to evaluate New Zealand rabbit semen viability and fertility diluted and preserved at 15°C in gelatin supplemented extender. The trial was conducted at the Unidad de investigación Aplicada en Producción Cunicola, Departamento de Preparatoria Agrícola, Universidad Autónoma Chapingo,

Mexico, during January-March, 2004. From 10 one year old bucks, semen was collected with artificial vagina 3 days a week, 2 times each day. Collected semen was kept at 35°C in order to be evaluated for volume, color, mass motility viability and normal morphology. Twenty minutes, as maximum, after collection, the evaluated semen was diluted to generate doses with 20 million cells in 0.5 ml volume. Extender had sodium citrate, glucose, and gelatin. Once semen was diluted, temperature was lowered 0.33°C / min up to 18°C. Before the semen got gel consistency it was packed in 0.5 ml straws. They were seal with polyvinyl alcohol, then the straws were storage in a thermos having glacial acetic acid at 15°C. Every 24 h after storage semen was evaluated in motility, normal and live spermatozoa. Once the maximum time of viability keeping was known, then the fertilizing ability of preserved semen was evaluated by artificially inseminating lactating does on day 11 post partum after a bio-stimulus consisting on 48h doe-litter separation. Previously to the statistical analysis arcsin transformation was applied to viability and normality and then the general linear model from SAS (V8) was applied to the variables. Fertility was analyzed through proc FREQ and tested by Chi square. Preservation period affected ($P<0.05$) semen characteristics: motility, viability and normal morphology were reduced as period of preservation increased particularly for motility after 72 h of semen preservation. Preserved semen for 24, 48, and 72 had not significant differences on fertility (84, 73 and 70 %, respectively). Maximum period of semen preservation at 15 °C in gelatin supplemented extender, without affecting seminal characteristics was 72 h. As far as 72 h preservation period, semen fecundity is not affected.

Key words: rabbit, semen preservation, fertility, gelatin, extender.

EFFECT OF NURSING METHODS ON PRODUCTIVITY IN LACTATING RABBITS

EIBEN Cs.*, KUSTOS K.†, GÓDOR-SURMANN K.*,
KOTÁNY SZ.*, THEAU-CLÉMENT M.‡, SZENDRŐ ZS.§

*Institute for Small Animal Research,
H-2101 GÖDÖLLŐ, P.O. Box 417, Hungary.

†Szent Istvan University,
H-2103, GÖDÖLLŐ PÁTER K. u. 1, Hungary

‡INRA Toulouse, SAGA, B.P. 27,
31236 CASTANET TOLOSAN, France.

§University of Kaposvár, H-7401 KAPOSVÁR,
P.O. Box 16, Hungary.

eiben@katki.hu

This work studied the effects of different nursing methods applied before and after insemination (AI) on productivity of does. 173 Pannon White and New Zealand White rabbits were divided into four groups, according to parity, litter size and genotype. Control group (C) nursed freely from day 1 to 35 of lactation. In W2+3 group, freenursing does were separated by wire-mesh insertion from their litters on day 9 (from 9:00) and can nurse controlled (8:45 to 9:00) on day 10, 11, 12 and 13. AI was done within 15 min after controlled nursing on day 11 *post partum*. The does returned to the constant free nursing from 8:45 on day 14. The same timing of nursing and AI was adopted in N2+3 group but with carrying the nest-box each day into another room. In N2 group, the daily removal of the nest-box occurred on day 9 and 10, and immediately after AI on day 11, the does had free access to the nest again. With 42-day reproduction cycle, 485 AI's were performed. After recording the number of born alive, an intra-group egalisation to 8 pups per litter was done. Fertility improved ($P=0.001$) in W2+3 (59.3%), N2+3 (60.0%) and N2 (50.4%) groups compared to C group (33.3%). The

number of born alive was higher ($P=0.024$) in N2+3 group (8.88), than in N2 (7.84) and C groups (7.24), while it was intermediate in W2+3 group (8.26). Controlled suckling increased ($P=0.019$) the 35 days' weaning weight (908 vs. 945, 942, 937 g in C, W2+3, N2+3, N2, respectively) with no impact ($P=0.155$) on litter size (7.06, 6.69, 7.03, 6.83, respectively). The highest increase in productivity (weight of weaned and slaughter rabbits in group) was found in N2+3 group (by 73-86%), however, it also improved by 54-76% in W2+3 and by 44-51% in N2 groups compared to free nursing (C).

Key words: rabbit, nursing method, reproduction, growth.

RELATIONSHIP AMONG FEEDING
LEVEL, CHANGE OF CAGE AND
FASTING WITH VULVA COLOR AND
SEXUAL RECEPTIVITY IN NEW
ZEALAND WHITE AND CALIFORNIAN
NULLIPAROUS DOES

GÓMEZ R. B.* , BECERRIL P. C. M.* , TORRES H. G.* ,
PRO M.A.* , RODRÍGUEZ DE LARA R.†

*Programa de Ganadería. Colegio de Postgraduados
Carr. Fed. México -Texcoco km 36.5
56230 MONTECILLO, TEXCOCO, México.

†Depto. de Zootecnia. Universidad Autónoma
Chapingo. Carr. Fed. México -Texcoco km 38.5
56230 CHAPINGO, TEXCOCO, México.

color@colpos.mx

Data from 43 New Zealand White (NZB) and 46 Californian (CAL) nulliparous does, which included 142 records, were used to evaluate the relationship among feeding level (high vs. low), change of cage (yes vs. not), fasting (yes vs. not) and breed (NZB vs. CAL), with vulva color and sexual receptivity. Data analyses were performed

using mixed models methodology. At the first mating, in the high feeding level 57 % of pink vulvas ($P<0.001$) and 12 % of red vulvas were observed. Does that fasted 24 hs before mating showed 51 % of pale vulvas ($P<0.001$). The interaction change of cage x breed affected doe's sexual receptivity. CAL does improved their receptivity when changed of cage ($P<0.001$). Also the interaction breed x feeding level x fasting affected ($P<0.003$) sexual receptivity at first mating. The highest percentage of receptivity, 78 %, was observed in NZW does in the high feeding level and no fasting; however, in CAL does this same receptivity was observed in the high feeding level but with fasting. The feeding level controlled through the amount of feed can affect vulva color and sexual receptivity in nulliparous does. Also, the change of cage 24 hs before mating can improve their receptivity.

Key words: reproduction, environment, management.

ULTRASONOGRAPHY STUDY OF
RABBITS PREGNANCY

GUTIERREZ H. E., ZAMORA F. M. M.

Centro de Enseñanza Agropecuaria, Facultad
de Estudios Cuautitlán UNAM.

jema81@prodigy.net.mx

mag1956@servidor.unam.mx

ghelisa2000@yahoo.com; ghelisa@hotmail.com

In this assay an ultrasonography study of pregnant uterus was performed in 100 female rabbits of New Zealand, California and Chinchilla breeds, belonging to the Rabbit Production Module at FESC - Facultad de Estudios Superiores Cuautitlán, UNAM, Universidad Nacional Autónoma de México. Fetal development was measured and recorded after the 5th day post

copulation and on 7th, 12th, 15th, 20th 27th and 29th days successively, watching closely the changes appeared in every one of these steps and comparing with the *in vivo* measurements of the slaughtered obtained products of 4 pregnant useless female rabbits in the same pregnancy periods. Observation and measurement of the ultrasonography images led to establish the characteristics of the fetal development of rabbits. The above data let us to determine the gestational age of internal products and demonstrated the ability to make diagnosis as early as 7 days of pregnancy, which is important in rabbit production, because it is possible to know the number of carried embryos and finally to establish standard data in rabbit production to evaluate the gestational age.

Key words: rabbits, pregnancy, ultrasound.

EFFECT OF THE REARING METHOD ON THE PERFORMANCE OF RABBIT DOES (PRELIMINARY RESULTS)

GYÓVAI M.* , SZENDRO ZS.* , MAERTENS L.† ,
BIRÓ-NÉMETH E.* , RADNAI I.* , MATICS ZS.* ,
GERENCSÉR ZS.* , PRINCZ Z.* , HORN P.*

*University of Kaposvár,
7400 KAPOSVÁR, Guba S. str. 40, Hungary.
szendro@mail.atk.u-kaposvar.hu

†Center for Agricultural Research-Ghent,
Department of Animal Nutrition and
Husbandry, MELLE, Belgium

Using a 3×2×2 factorial design, the influence of nutrient supply in intrauterine life, during nursing and after weaning, as well as the effect of age at first artificial insemination (AI), on the performance of does was studied. New-born rabbits were divided into three groups on the basis of their birth weight (low = 35–45 g, medium =

53–58 g and high = 65–70 g). Half of the litters were nursed by one doe and the other half by two does. After weaning at 21 days of age, from day 28 half of the rabbits were fed *ad libitum*, while the other half were reared on a restricted feeding regime corresponding to 80–85% of the *ad libitum* feed intake level. All groups of young does were again divided and inseminated for the first time either at 15.5 or at 18.5 weeks of age. Altogether 2239 litters from 496 does are yet available for the analysis of the results. The birth weight significantly influenced the body weight of does at first AI and at first kindling as well as their average body weight, but had no effect on the kindling rate, litter size, suckling mortality and litter weight at 3 weeks of age. The effect of nursing by two does was significant on the body weight of does even after insemination. Rabbits nursed by two does kindled and reared larger litters. However, the nursing method had no influence on the kindling rate, on litter weight and individual body weight and on kits' mortality during nursing. *Ad libitum* feeding led to a significant increased body weight of does at the first AI but the weight of the restricted-fed group was higher ($P<0.05$) from the first kindling off. In the restricted-fed group, the first kindling took place later and the litter weight and individual kit body weight at 3 weeks of age increased significantly. Age at first AI significantly influenced the body weight of does. Females had higher weight when inseminated at 18.5 weeks of age but from kindling off females inseminated at 15.5 weeks of age had higher body weight. Litter size (total and alive) was significantly higher in females first inseminated at 15.5 weeks of age. However, the kindling rate, the litter size at 3 weeks of age and at weaning, and the litter weight and individual kit body weight were independent of age at first AI. From the combined evaluation of all traits studied, it can be concluded that nursing by two does followed by restricted feeding (80–85% of

ad libitum) up to the time of the first AI exerts a beneficial effect on the subsequent performance of does.

Key words: rabbit does, birth weight, nursing method, feeding regime, age at first AI.

GROWTH PERFORMANCE TRAITS AND THE PHYSIOLOGICAL BACKGROUND OF YOUNG DOE RABBITS AS AFFECTED BY CLIMATIC CONDITIONS AND LIGHTING REGIME, UNDER SUB-TROPICAL CONDITIONS OF EGYPT

MARAI I. F. M.* HAEEB A. A. M[†], GAD A. E. [†]

*Dept. of Animal Production, Faculty of Agriculture, Zagazig University, ZAGAZIG, Egypt.

[†]Dept. of Radiobiological Applications, NRC, Atomic Energy Authority, CAIRO, Inchas, Egypt.

The present work was planned to study the effects of different lighting regimes under both mild and hot conditions on growth performance traits of young New Zealand White (NZW) doe rabbits. The light regimes used were natural daylight and was considered as control, 16 h light and 8 h darkness (long lightness 16L:8D), 12 h light and 12 h darkness (medium lightness) and 8 h light and 16 h darkness (short lightness 8L:16D). The traits studied were live body and daily gain weights, thermoregulatory parameters (respiration rate and temperatures of ear, rectum and skin), feed intake, water consumption, blood metabolites (total proteins and total lipids), kidney function (urea-N and creatinine), liver function (SGPT and SGOT) and endocrine functions (T3 and cortisol hormones). Adaptability for hot climate conditions, was also estimated. The estimated Temperature-humidity index (THI) values were 18.5 during the mild climate and

33.9 in the hot climate period, indicating absence of heat stress in the first period and exposure of rabbits to very severe heat stress in the second one. The period of the year (heat stress) affected adversely many of the studied traits and the effects were significant ($P < 0.001$, 0.01 or 0.05) on daily body weights at 12 and 20 weeks, daily gain weights during 12-16, 16-20 and 12-20 weeks of age, thermoregulatory parameters, feed intake and water consumption, blood plasma metabolites except functions of endocrines. Estimating of the adaptability to the hot conditions, showed that the young doe rabbits are more sensitive to such conditions than the young bucks. Exposure of young doe rabbits to different light regimes adversely affected many of the studied traits and the effects were significant on daily gain weight during 16-20 and 12-20 weeks of age, daily feed intake, blood plasma total proteins and cortisol hormone. The young doe rabbits exposed to long daylight (16L:8D) were deleteriously affected, while those exposed to short daylight (8L:16D) were the least affected, in the studied traits. The differences were significant ($P < 0.05$). No significant interactions were observed, so that only the main effects were reported.

Key words: young NZW doe rabbits, growth performance traits, heat stress, light regimes, thermoregulatory parameters, blood serum components, adaptability to hot conditions.

MODIFICATION OF THE NURSING SYSTEM AS A BIOSTIMULATION METHOD

MATICS Zs.*, SZENDRO Zs.*, THEAU-CLEMENT M.†, BIRÓ-NÉMETH E.*, RADNAI I.*, GYOVAI M.*, OROVA Z.*, EIBEN Cs.‡

*University of Kaposvár,
H-7400 KAPOSVÁR, Guba S. str. 40., Hungary

†INRA Toulouse, SAGA, B.P. 27,
31236 CASTANET TOLOSAN, France

‡nstitute for Small Animal Research,
H-2000 GÖDÖLLO, Isaszegi str., Hungary.
szendro@mail.atk.u-kaposvar.hu

The aim of the experiment was to investigate, whether the modification of the nursing method (from free to controlled) before the insemination improves the reproduction performance. Primi- and multiparous Pannon White rabbit does were divided into three groups. In the C group (n: does=58, AI=144) does were allowed to nurse freely, in the CN2 group (n: does=53, AI=126) two days before the insemination, while in the CN3 group (n: does=64, AI=148) three days before the insemination free nursing was changed to controlled. In the statistical analysis only data obtained from the insemination 11 days after the kindling were taken into account. The colour of the vulva in the experimental groups was unaltered, but it was significantly ($P<0.001$) more turgid. The kindling rate of the C (77.8%), CN2 (78.5%) and CN3 (80.3%) groups was identical, while the total litter size (8.56, 8.73 and 9.26) and the alive litter size (7.81, 8.04 and 9.01) increased significantly ($P<0.05$) in the CN3 group. No differences were found in the mortality between days 0 and 21 (12.5, 12.9 and 13.3%), in the litter weight at 21 days of age (2633, 2576 and 2609g) as well as in the individual body weight (354, 348 and 356g). Based on the above results it can be concluded that

changing the nursing method from free to controlled 3 days before AI is a proper biostimulation method for the improvement of reproduction performance. Compared to the C group, the total litter size/AI increased from 6.66 to 7.84, while the alive litter size/AI from 6.08 to 7.24, meaning an improvement of 18 and 19%, respectively.

Key words: rabbits, nursing method, biostimulation, reproductive traits.

COMPARISON OF SOME REPRODUCTIVE TRAITS OF RABBIT DOES SELECTED FOR HIGH AND LOW BODY FAT CONTENT

MILISITS G.*, LÉVAI A.†

*University of Kaposvár,
H-7400 KAPOSVÁR, Guba S. u. 40, Hungary.

milisits@mail.atk.u-kaposvar.hu

†Hungarian Food Safety Office,
H-1035 BUDAPEST, Miklós tér 1, Hungary.

Andras.Levai@mebih.gov.hu

In this experiment body fat content of Pannon White rabbits was determined at 10 weeks of age using an EM-SCAN SA-3152 type Small Animal Body Composition Analyser (TOBEC method). Based on the fat content estimation the best and worst 16% of the does and the best and worst 8% of the bucks were chosen and mated each other (fatty doe with fatty buck and lean doe with lean buck). During the experiment the following data were recorded: conception rate, number of living born pups, number of dead born pups, litter size at 21 days, litter weight at 21 days and mortality of pups till the 21st day. The examination of changes in the conception rate showed that rabbits selected for high body fat content became pregnant in higher rate than rabbits with low body fat. They reached or exceeded the 75% conception rate three times from

the five inseminations, while rabbit does selected for low body fat could realize this rate only once. In spite of the tendency observed in the conception rate non-fatty does showed better results in the case of litter size at birth. These animals produced litters with 9 or more pups in four cases, while fatty does reached this litter size only once, at their sixth parity. In the case of live born pups also the superiority of non-fatty does was observed till the fifth parity, but the differences between the groups have been changed compared to the total litter size. The reason of this could be found in the changes of dead born pups. Examined the mortality rate of pups during the suckling period (till 21 days of age) it was established that the mortality of the offspring of non-fatty does was higher as that of the offspring of fatty ones except the suckling period after the second kindling. As conclusion of this work it was established, that rabbit does selected for high body fat content mostly have higher conception rate, produce smaller litters at birth, but because of the lower mortality rate of their offspring during the suckling period they have larger and heavier litters at 21 day than the non-fatty ones. To determine the optimal body fat content of rabbit does for a long and effective production more details need.

Key words: rabbit, fat, selection, TOBEC, reproduction.

IN VIVO DEVELOPMENT OF VITRIFIED RABBIT EMBRYOS: EFFECTS ON PRENATAL SURVIVAL. PRELIMINARY RESULTS

MOCE M.L., SANTACREU M.A., CLIMENT A., PEIRÓ R., BLASCO A.

Departamento de Ciencia Animal,
Universidad Politécnica de Valencia,
46071 VALENCIA. Spain.

The aim of this work was to study the distribution of the prenatal mortality in vitrified and fresh embryos. Animals came from an experiment of divergent selection on uterine capacity. The embryos were obtained *post-mortem* from 181 donor does 72 hours after mating. Embryos were kept at room temperature or vitrified before the transference. Vitrified embryos were transferred into a total of 22 does and fresh embryos were transferred into a total of 45 does. The number of embryos transferred per Fallopian tube was standardized to 8, so each recipient doe received 16 embryos. Recipient does were slaughtered on day 28 of gestation. Vitrification procedure did not affect pregnancy rate (85% vs 80% for vitrified and fresh embryos respectively). Number of implanted embryos, live fetuses at d 14, 17 and 28 was similar for vitrified and fresh embryos. Vitrification procedure seems to affect the early fetal survival but not the late fetal survival. Fresh embryos had a higher early fetal survival than vitrified embryos (difference of 1.25 fetuses per uterine horn), but late fetal survival was high and similar in both. The vitrification procedure used in our experiment seems to damage embryos in such a way that the early fetal development is compromised.

Key words: rabbit, embryo, vitrification, prenatal survival, cryopreservation.

EFFECTS OF DIETARY ZINC
SUPPLEMENTATION ON SPERMATIC
CHARACTERISTICS OF RABBIT
BREEDERS

OLIVEIRA C. E. A., BADÚ C. A., FERREIRA W. M.,
KAMWA E. B., LANA, A. M. Q.

Departamento de Zootecnia. Escola de
Veterinária. Universidade Federal de
Minas Gerais. Caixa Postal 567,
CEP 30161-970 BELO HORIZONTE, Brasil.

ceaovet@yahoo.com.br

In order to study the effects of dietary zinc supplementation on spermatic characteristics, 27 New Zealand White rabbits were used, following a completely randomized design with five treatments (Zn levels). Two treatments had had six replicates, while the rest had five. The rabbits were selected immediately after weaning (4 weeks of age) and used in the experiment that extended till 34 weeks of age. The treatments were respectively, 0, 50, 100, 150 and 200 ppm supplemental zinc in the diet. The animal began receiving ZnO in their diets as soon as they were weaned. First semen collection was performed at 28 wks of age, being collected six times weekly per animal. The volume of each ejaculate was registered and an aliquot was separated for further analyses. Due to a possible error in saline formol concentration, it couldn't be possible to estimate spermatozoa concentration through microscopic counting. The alternative used to bypass this problem was to determine the volume of cell mass (volume of spermatozoa) of every ejaculate. The technique consisted in using Wintrobe tubes (graded tubes with subdivisions of 0.01 ml) to centrifuge semen samples, at 4,000 rpm for 20 minutes, and measure the cellular volume each sample. Mean values of total ejaculate didn't differ ($P \leq 0.05$) among treatments. Animal fed 50, 100 and 150 ppm ZnO presented higher

spermatozoa volume as compared to the other groups.

Key words: semen, spermatozoa, cellular mass volume, concentration, nutrition.

EVALUATION OF EFFECTS OF
CRYOPRESERVATION ON RABBIT
SPERMATOZOA MEMBRANES WITH
TRYPAN BLUE-GIEMSA STAINING

POLGÁR, ZS*, VIRÁG, GY.†, BARANYAI, B.‡,
BODÓ, SZ.‡, KOVÁCS, A.4, GÓCZA, E.§

*Szent István University,
2100 GÖDÖLLŐ, Práter Károly u.1., Hungary.

polgarzs@abc.hu

†nstitute for Small Animal Research (ISAR),
2100 GÖDÖLLŐ, Isaszegi út, Pf. 417. Hungary.

‡Agricultural Biotechnology Center,
2100 GÖDÖLLŐ, Szent-Györgyi A. u. 4. Hungary.

§Research Institute for Animal Breeding and
Nutrition, 2053 HERCEGHALOM,
Gesztenyés út 1-3. Hungary

The effects of cryopreservation on membrane of rabbit spermatozoa were studied by Trypan blue-Giemsa staining. Semen samples of 11 White New Zealand bucks (n=31) were evaluated before freezing and after freezing-thawing. The applied cryopreservation method based on two cryoprotectants (DMSO, glycerol). The integrity of the head and tail membrane and the acrosome status were evaluated on smears stained by trypan blue and Giemsa stains. The freezing-thawing process increased the number of dead cells from 18% to 46%. At the same time live cell heads were also observed and significant damage of acrosomal and tail membrane integrity ($P < 0.001$) was detected. The most destroying effect was shown on sperm tail, which was found as the doubled number of

stained tail spermatozoa. The freezingthawing effects were not influenced by collection date but some differences were detected between semen of different bucks in term of tolerance to freezing.

Key words: rabbit semen, cryopreservation, membrane integrity, staining.

PLASMA OESTRADIOL AND PROLACTIN IN SYNCHRONIZED MULTIPAROUS RABBIT DOES

REBOLLAR P. G.* , MILANÉS A. * , ESQUIFINO A. I.† ,
MILLÁN P.‡ , LORENZO P. L.‡

*Departamento de Producción Animal. ETSIA.
Universidad Politécnica de Madrid. Ciudad
Universitaria. 28040 MADRID. Spain.

†Departamento de Bioquímica. Facultad de
Medicina. Universidad Complutense
de Madrid. Ciudad Universitaria.
28040 MADRID. Spain.

‡Departamento de Fisiología Animal.
Facultad de Veterinaria. Universidad
Complutense de Madrid. Ciudad
Universitaria. 28040 MADRID. Spain.

The effect in plasma levels of prolactin and oestradiol when different methods of oestrus synchronization were applied in multiparous lactating does was evaluated. Forty-eight multiparous rabbit does nursing more than eight kits were randomly allocated in four groups. The treatments were as follows: two groups were synchronized on day 2 postpartum, being separated 48 hours from his litter or hormonally treated with 25 UI of PMSG. A third group was separated from his litter on day 3 post-partum during 24 hours and a fourth one was the control group. All does were inseminated on day 4 post-partum with a pool of fresh semen and ovulation was induced with 1 µg of Busereline (i.m.) immediately after

insemination. Blood samples were taken on day 2, 3 and 4 postpartum at 9:00 a.m. Plasma oestradiol was determined by EIA and plasma prolactin by RIA. All does had a plasma oestradiol level similar on day 2 and 3 post-partum (113.24 ± 13.7 and 142.01 ± 13.7 pg/ml, respectively). On day 4 post-partum, does treated with PMSG and separated 24 and 48 hours had a 63.07%, a 73.12% and a 93.47% more mean plasma oestradiol levels than previous values observed on day 3 postpartum ($P < 0.001$). In addition, immediately before artificial insemination rabbit does separated 48 hours had higher plasma oestradiol levels than control does (267.42 ± 27.84 vs. 172.33 ± 26.76 pg/ml; $P < 0.001$). There are not differences in mean plasma prolactin between groups or time of sampling. Similar conception rate was obtained in all groups (83.33 %, 91.67 %, 83.33 % and 66.66 % in does separated 24 or 48 hours, control does and rabbits treated with PMSG respectively). Similar litter size at parturition (9.0 ± 0.9 , 10.4 ± 0.8 , 9.7 ± 0.9 and 8.9 ± 0.9 kits born alive) and at weaning (25d) (8.4 ± 0.5 , 8.4 ± 0.5 , 7.7 ± 0.5 and 7.7 ± 0.6 weaned rabbits) were obtained among groups, but a higher number of born dead kits in does treated with PMSG than other groups was observed (1.12 ± 0.3 vs. 0.1 ± 0.3 , 0.08 ± 0.25 , and 0.1 ± 0.3 young dead rabbits; $P < 0.05$).

Key words: oestrus synchronization, prolactin, oestradiol.

A STUDY ON THE REPRODUCTIVE
PERFORMANCE AND PHYSIOLOGICAL
RESPONSE OF RABBIT BUCKS FED ON
DIETS WITH TWO DIFFERENT
MINERAL CONTENTS

RIZZI C. *, BRECCIA G[†]., CHIERICATO G. M.*

*Dipartimento di Scienze Zootecniche.
Università degli Studi di Padova.
Agripolis. 35020 LEGNARO (Padova). Italia.

chiara.rizzi@unipd.it

[†]Dipartimento di Scienze Biopatologiche
Veterinarie. Università di Perugia.
06126 PERUGIA. Italia.

The reproductive performance and the plasma biochemical profile of rabbit bucks relating to two dietary electrolyte balances (dEB, dEB=Na+K-Cl) were investigated. Two pelleted diets were fed the male rabbits from the first mating (50 weeks of age) until the weaning of the litters of the third reproductive cycle. The diets were similar in composition and were isoproteic (crude protein=19.81% d. m.) and isoenergetic (digestible energy=2945 kcal/kg d. m.); the sodium content was 0.21 and 0.38% d. m. and the electrolyte balance was 27 meq/100g and 35 meq/100 g in the dEB1 and dEB2 diets, respectively. The higher sodium level in the diet was obtained by increasing the mineral content in the supplement of the feed. Matings occurred with natural insemination. The trial started in the summer period under a hot climate but the third cycle presented neutral thermal hygrometric conditions (temperature= 15°C and relative humidity= 79%). The photoperiod was 16L:8D. At the third cycle, at 70 weeks of age, the bucks were submitted to a blood sampling early in the morning. At the third reproductive cycle, the dEB2 diet did not significantly affect the body weight and the feed intake of the rabbits. The two experimental groups presented a similar number of kids born and

born alive and number of kids/mating. Plasma glucose, triglycerides, cholesterol, total proteins, albumin and globulines resulted unaffected by the diets. The plasma enzyme activities (aspartate-aminotransferase, alanine-aminotransferase, γ -glutamyltranspeptidase) and the mineral contents of calcium, phosphorus, potassium, sodium and chloride were similar between the groups. No significant difference was observed for plasma cortisol, even if the higher dEB level induced a tendential decrease in dEB1 group. T3 (triiodothyronine), T4 (thyroxine) and FT3 (free T3) were similar between the groups. FT4 (free T4) slightly increased in the dEB2 rabbits. Results indicate that using daily rations with an electrolyte balance ranging from 27 to 35 meq/100g continuously for three reproductive cycles did not exert any effect on the reproductive performance of the bucks nor on the biochemical profile.

Key words: rabbit, bucks, electrolyte balance, reproductive performance, blood.

BUCK SEMEN CHARACTERISTICS
FROM A MEXICAN POPULATION OF
THE CALIFORNIAN, WHITE NEW
ZEALAND, AND CHINCHILLA BREEDS

SALCEDO-BACA R. *, PICHARDO-REYES M. [†],
ECHAGARAY-TORRES J. L.*

*Departamento de Preparatoria Agrícola,
Universidad Autónoma Chapingo, Carretera
Mex.-Tex. Km. 38.5 TEXCOCO CP 56230 México.

[†] Departamento de Zootecnia, Universidad
Autónoma Chapingo, Carretera
Mex.-Tex. Km. 38.5, TEXCOCO, CP 56230 México.
rames@correo.chapingo.mx

An experiment was conducted in order to find out if there are differences in semen quantity and quality between the most important rabbit breeds in Mexico. The trial

was carried out in the Unidad de Investigación Aplicada en Producción Cunicola at the Universidad Autónoma Chapingo, Mexico. The climatic formula of the place is Cb (wo(w)(i')g, with 571.5 mm of precipitation and average temperature of 15.2 °C. Fifteen males were acquired for each of the Californian (CA), Chinchilla (CH), and New Zealand White (NZ) breeds, from the National Rabbitry Centre at Irapuato, México. Animals with any abnormality or extreme weights were discarded when the experiment started. At that time the nine evaluated bucks by breed were 8 months old and had average live weights of 3.669, 3.663, and 3.986 kg for CA, CH and NZ breeds, respectively. Semen was collected twice a week with two collections per day. An artificial vagina and a doe as dummy were used to collect semen. Semen was evaluated macroscopically (n=578) and microscopically (n=423) for the traits Volume (V), Color (C), Gel Presence (G), Spermatozoa Concentration (CN), Massy Motility (M), Live Spermatozoa Percentage (L), and Normal Spermatozoa Percentage (N). Records were analyzed through the Statistical Analysis System (SAS, 8V, 1999), using the proceedings GLM for all the variables, exception made for G which was analyzed through FREQ proceeding. The arc sin transformation was applied to L, M, and N previously to the analysis. Tukey test was used to compare the means when significant differences were found. The rabbit populations of Californian, Chinchilla, and New Zealand White breeds from the National Rabbit Centre in Mexico showed differences in semen characteristics. The CA breed produced more volume and spermatozoa less motile than the other two breeds. These two parameters are very important in relation to the semen doses that can be produced to be used by artificial insemination. Similar evaluations in different year seasons, buck ages and breed lines are needed.

Key words: rabbit, buck, breeds, semen.

EFFECT OF SHEARING OF RABBIT DOES IN SUMMER ON THEIR PERFORMANCE

SZENDRŐ ZS.* , RASHWAN A. A.† , BIRÓNÉ NÉMETH E.* ,
RADNAI I.* , OROVA Z.*

*University of Kaposvár, Faculty of Animal Science,
7400 KAPOSVÁR, Guba S. str. 40., Hungary

†Zagazig University, Institute of Efficient
Productivity, ZAGAZIG, Egypt .

szendro@mail.atk.u-kaposvar.hu

The aim of the study was to examine the effect of shearing the does' hair before artificial insemination on their performance in summer. Decreasing the effect of heat stress and increasing of receptivity at the time of AI were expected. Primi- and multiparous does were divided into two groups. One half of the animals (n = 80) was sheared (back and both sides of the body) 2 days before the insemination, the other half (non-treated) was the control group (n = 96). Shearing of the does in summer had a positive effect on the daily milk production (227 and 215 g/day, in the sheared and control groups, respectively), and on the litter weight at 35 days of age. Shearing had no effect on litter size but the litter weight was higher by 6, 4 and 9% at 21 (2499 g and 2376 g, NS), at 28 (3525 g and 3386 g, NS) and at 35 days of age (5816 g and 5318 g, $P < 0.05$). Shearing the rabbit does 2 days before AI as a biostimulation method was judged non-effective. The fertility (67.5% and 67.5%), the litter size, total (9.13 and 8.95) and alive (8.57 and 8.26) was the same in the sheared and control groups. It was concluded that the shearing of rabbit does on hot temperature could be an effective method against the heat stress but it is not recommended using it as a biostimulation method.

Key words: rabbits, shearing, biostimulation, milk production.

EFFECT OF PHOTOPERIOD ON THE
REPRODUCTIVE TRAITS
OF RABBIT DOES

SZENDRŐ Zs., GERENCSÉR Zs., GYÓVAI M.,
METZGER SZ., RADNAI I., BIRÓ-NÉMETH E.

University of Kaposvár, Faculty of Animal Science
7400 KAPOSVÁR, Guba S. str. 40. Hungary.

szendro@mail.atk.u-kaposvar.hu

The authors investigated the changes of reproductive traits when, instead of the conventional (16L: 8D, light: dark /16L/) lighting program a new method is used (8L:4D:8L:4D /8+8L/) meaning a double change of the daily light period. Pannon White rabbits at 11 weeks of age were divided into two groups and were housed in two identical rooms, which only differed in the photoperiod. Rabbits were first inseminated at the age of 16.5 weeks (16L: doe number=99, AI number=251; 8+8L: doe number=154, AI number=311); 11 days after kindling does were inseminated again. Controlled nursing was applied, does were only allowed to nurse in the morning, for half an hour (between 8:00 and 8:30). The body weight of the 16L rabbits was slightly higher at the first AI (4049 and 3982 g, NS) and at the first kindling (4264 and 4187 g, $P<0.05$) than that of the 8+8L group. The number of AIs for one kindling was identical in the two groups (1.18 and 1.19). The litter size was slightly higher in the 8+8L group compared to the 16L group (total: 8.50 and 8.76, NS; alive: 8.13 and 8.40, nursed: 8.17 and 8.33, $P<0.05$). Due to the kit mortality being slightly higher in the 8+8L group compared to the 16L (5.9 and 8.7%, NS), the litter size in the two groups at the age of 3 weeks was identical (7.69 and 7.62). No difference was found either in the litter weight (2762 and 2772 g) or individual weight at the age of 3 weeks (362 and 368 g). According to the results the 8L:4D:8L:4D photoperiod does not crucially influence the reproduction of does under controlled

nursing, though the between-group difference changed according the parity order. It is still not elucidated that the production of the two groups would differ in what manner using free nursing. According to preliminary results the litter weight at the age of 3 weeks is higher in the 8+8L group, indicating the higher milk production of these does.

Key words: rabbit does, photoperiod, reproduction.

INFLUENCE OF LIGHTING PROGRAMS
ON THE PRODUCTIVITY OF RABBIT
DOES OF TWO GENETIC TYPES

THEAU-CLEMENT M.*, MERCIER P.†

*INRA. SAGA, BP 27,
31326 CASTANET TOLOSAN CEDEX, France.

theau@germinal.toulouse.inra.fr

†INRA, Domaine Pluridisciplinaire du
Magneraud, B.P. 52, 17700 SURGÈRES, France.

The aim of this experiment was to study the influence of lighting programs on rabbit doe productivity, according to their genetic type and their physiological status at insemination. A total of 223 nulliparous rabbit does (genetic type '0067': 108, genetic type '0557': 115) were placed in rooms under different lighting programs: a continuous 8L:16D (group 8C); a continuous 16L:8D (group 16C) and a discontinuous program: 16L:8D (8L:4D:8L:4D, group 16D). Inseminations (1558) were carried out in eight series (every 42 days). The lighting program did not influence the does' viability and receptivity, nevertheless the '0067' does were more receptive under 16C than the '0557' ones (73.0 % vs 59.7 %). Females under 8C were more fertile than under 16C or 16D (82.7 % vs 75.5 % and 73.8 %, respectively, $P=0.0155$). On the contrary, the

does under 16C or 16D had a significantly higher litter size at birth (total born, born alive, after elimination), at 28 days *post partum* (8.88 and 8.89 vs 8.07 for group 8C respectively, $P=0.0096$) and consequently a higher litter weight. Even though the lighting program did not influence the weights at 28 days *post partum*, the young rabbits from the '0067' mothers were significantly heavier under 16C or 16D. The genetic type did not influence doe viability. The '0067' does were more receptive (69,1 % vs 64.4 %, $P=0.0493$), more prolific at birth and until weaning (9.29 vs 7.94, $P<0.0004$) consequently they had heavier litters at weaning; whereas the '0557' does were more fertile (82.0 % vs 72.7 %, $P=0.0004$). Their global productivity at weaning varied slightly (3383 g vs 3338 g of weaned rabbits/A.I. for '0557' and '0067' does, respectively). The physiological status of the does highly influenced all their reproductive performance as well as growth of the young. In conclusion, for a 42 day reproduction rhythm using insemination and cycled production, the studied lighting programs did not greatly influence global productivity (3388 g, 3452 g and 3235 g of weaned rabbits per insemination for groups 16C, 16D and 8C, respectively). The lighting programs did not interact with the does' genetic type for fertility and prolificacy. Nevertheless, there is a differential sensitivity of photoperiod on litter weight depending on the does' genetic type. A constant 16L:8D is recommended for '0067' rabbit does to increase receptivity and young rabbit growth.

Key words: rabbit, lighting program, genetic effect, physiological status.

FATTY ACID AND TOCOPHEROL COMPOSITION OF SEMEN COMPONENTS IN THE RABBIT

ZANIBONI L.* , GLIOZZI T.†, MALDJIAN A.* ,
LUZI F.‡, CEROLINI S.*

*VSA Department, Università degli Studi,
via Trentacoste 2, 20134 MILANO. Italy.

†IBBA-CNR, via Bassini 15,
20133 MILANO. Italy.

‡Istituto di Zootechnica, Università degli Studi,
via Celoria 10, 20133 MILANO. Italy.

luisa.zaniboni@unimi.it

The aim of this study was to determine and compare the lipid composition and the tocopherol contents in the different components of rabbit semen: spermatozoa, seminal plasma and granules. Semen was collected via an artificial vagina from 16 rabbits. Semen collection was repeated in two subsequent weeks. Two ejaculates were obtained from each male on the same day. Individual ejaculates were pooled in 3 semen samples from 5-6 bucks each. Sperm concentration, viability and motility were measured. Granule concentration was also estimated. Seminal plasma was separated after centrifugation; spermatozoa and granules were separated by Percoll® density gradient centrifugation. Lipid were extracted from semen components and separated by TLC; fatty acid composition of phospholipid was determined by GC on capillary column. The content of tocopherols in semen components was determined by HPLC. Semen quality was good and the mean values recorded were in agreement with standard reproductive performance of bucks. Phospholipid was the most important lipid class found in the different components of rabbit semen. The characteristic fatty acid composition of rabbit spermatozoa has been confirmed: polyunsaturates accounted for the major proportion of fatty acids and were

mainly represented by C22:5n-6 (36%); n-3 polyunsaturates were present in very low proportion, and also the proportion of monounsaturates was low. The fatty acid composition of phospholipid in seminal plasma and granules showed a lower level of unsaturation and a greater proportion of oleic acid in comparison with the gamete composition. Of interest was the presence of consistent proportion of different n- 6 polyunsaturates, from C18:2 to C22:5, in seminal plasma. Two main forms of tocopherols, α and δ , have been found in all components of rabbit semen, and spermatozoa were the preferential site of accumulation.

Key words: rabbit, semen, fatty acids, tocopherols.

BREEDING PERFORMANCE OF LOCAL KABYLIAN RABBITS DOES IN ALGERIA

ZERROUKI N.* , BOLET G.† ,
BERCHICHE M.* , LEBAS F.‡

*University of Tizi Ouzou, Laboratoire de
Physiologie et Nutrition Animales, Algeria.

nacera_zerrouki@yahoo.fr

† INRA, SAGA, BP 27.

31326 CASTANET-TOLOSAN CEDEX, France.

bolet@toulouse.inra.fr

‡Cuniculture, 87a Chemin de Lassère,
31450 CORRON SAC, France.

lebas@cuniculture.info

A total of 287 females of a Kabyle local population of rabbits were studied at the University of Tizi-Ouzou (Algeria) over 6 years. The females were mated at first time at the age of 4.5 months and remated 10-12 days after parturition. The females are characterized (average \pm standard deviation) by a medium to small adult weight (2.81 \pm 0.38

kg) and a rather low prolificacy at birth and weaning (7.2 \pm 2.5 total born of which 6.1 \pm 3.0 born alive and 5.4 \pm 2.3 weaned). Based on the registration of 1377 presentation of does to a male, acceptance of mating and conception rates were 74.3 \pm 3.8% and 73.3 \pm 4.3% respectively. The Algerian hot summer season did not seem to affect parameters of practical importance such as fertility or litter size at weaning. The only significant effect ($P<0.01$) was a reduction of litter weight at weaning (-13%) compared with the average of the 3 other seasons (1070 g vs 2368 g at 28 days). Acceptation and conception rates were not significantly affected by mating number. At first parturition, total number of kits (6.6/litter) was significantly lower when compared to that of multiparous does (7.3 to 7.4), and individual birth weight of first litter's kits was 10% lower than that observed for subsequent litters (51.4 g on average). On the other hand, it must be emphasised that for this sample of the Kabyle population, the kit's individual weight at weaning did not vary significantly with parturition number. Birth to weaning mortality was the lowest for parturition of rank 4 and more (9.8% vs 14.4 to 16.9% for previous ones).

Key words: rabbit, local population, Algeria, reproduction, season.

EVALUATION OF MILK PRODUCTION
OF AN ALGERIAN LOCAL RABBIT
POPULATION RAISED IN THE TIZI-
OUZOU AREA (KABYLIA)

ZERROUKI N.^{*}, LEBAS F.[†]

^{*} University of Tizi Ouzou, Laboratory of
Physiology and Nutrition, BP 17 RP,
TIZI-OUZOU, Algeria.

nacera_zerrouki@yahoo.fr

[†] Cuniculture, 87a Chemin de Lassère,
31450 CORRONNAC, France.

lebas@cuniculture.info

In order to characterise rabbits does of a Kabyle local population raised in Algeria, a study of their milk production was realised in the experimental rabbitry of the Tizi-Ouzou University. Milk production of does was measured every day during the 21 days following 299 parturitions. It was estimated by weighing each litter before and after the single daily suckling (10 - 15 min between the 2 weighing operations). The various calculated parameters were the quantity of milk produced per day, per week and the total quantity produced in 21 days, as well as the

intake of milk by young rabbits. The analysis concerned the effects of the number of successive litters (4 classes: 1 to 4-and-more) and of the average number of young rabbits suckled per litter (7 classes: from 2-3 kits to more-than-8). During the 21 days of controlled lactation, the average litter size was 5.6 ± 2.3 . The rabbit does of the Kabyle local population produced on average 2180 \pm 719 g in 21 days, that is 104g of milk/day. The milk intake of young rabbits increased from 12.6 g/day and /kit during the 1st week, up to 27.2 g/day during the 3rd week of lactation. The number of young per litter influenced in a highly significant way the does' milk production: 62.8 g/d for 2 to 3 young per litter, up to 127-131 g/day for more than 6 young. Nevertheless, milk production available per kit and per day decreased linearly with kit's number in the litter for each of the 3 weeks considered. On the other hand the average milk production expressed as quantity available per kit and per day was not significantly affected by the parturition's number: 20-21 g /kit & /day on average for the 0-21 day period.

Key words: rabbit, Algeria, milk production, local population.