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ABSTRACTS
"GIORNATE DI CONIGLICOLTURA ASIC 2011"
Forlì, Italy, April 8-9th 2011

The fourth edition of the Italian Rabbit Days was held in Forlì (Italy) on April, 8-9th 2011, organized by ASIC (Italian Rabbit Scientific Association) in collaboration with Dipartimento di Scienze degli Alimenti (Università di Bologna), Dipartimento di Scienze Animali (Università di Padova), Fondazione Iniziative Zooprofilattiche e Zootecniche (Brescia), ASPA (Animal Production Scientific Association) and the Forli Fair. The first day included 3 invited lectures: "Feed restriction strategies, implications on physiology, growth and health of the growing rabbit", presented by T. Gidenne, L. Fortun-Lamothe, S. Combes; "Ovulation induction in rabbit does: a review", presented by A. Dal Bosco; "Factors affecting efficacy of intravaginal administration of GnRH analogues for ovulation induction in rabbit does" presented by P.G. Rebollar. In addition, 3 sessions of oral communications on Reproduction and Genetics, Nutrition and Physiology, Welfare, Management, and Pathology were held. During the second day it was presented a round table focused on "Management and use of drugs and vaccines in rabbit production". Finally a Poster Session was through the 2 d. The meeting was attended by more than 100 participants, including researchers and technicians from France, Spain, Hungary, Belgium and Switzerland. A total of 3 invited papers, 14 oral communications and 16 posters were presented during the congress. Following the abstracts of all contributions are reported.

MAIN PAPERS

FEED RESTRICTION STRATEGIES, IMPLICATIONS ON PHYSIOLOGY, GROWTH AND HEALTH OF THE GROWING RABBIT

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This review aims to present the different effects produced by a post-weaning intake limitation strategy on the growing rabbit. If a lower intake level leads to a lower growth, in return an improved feed conversion is obtained, particularly when the rabbits are again fed freely since a compensatory growth occurs. This better feed conversion originates from a better digestion associated to a longer rate of passage, whereas the digestive physiology is slightly modified (morphometry of the intestinal mucosa, fermentation pattern, symbiote). Meat quality and carcass characteristics are not greatly affected by restriction strategy, except a lower dressing out percentage. One of the main interests of limiting post-weaning intake of the rabbit is to reduce the mortality and morbidity rate due to digestive disorders (particularly ERE syndrome). In conclusion, restriction strategies are used by 95% of the French rabbit breeders, because these improve their economic balance. However, this benefit depends of the national market and feed prices, and should be adapted to any specific breeding situation.

OVULATION INDUCTION IN RABBIT DOES: A REVIEW

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This paper reviews the main researches about induction of ovulation in rabbit does. In the last 15 yr the profitability of rabbit farms has increased mainly due to improvements in management and genetic selection but several problems related to

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animal welfare have also occurred. Strategies to optimize these parameters are discussed. A overview on studies that have elucidated the ovulatory mechanisms in rabbit does and the main intramuscular treatments are described. Considering the actual importance of alternative methods to inducing ovulation in rabbit, the main papers which describe intravaginal administration of GnRH analogues for ovulation induction in rabbit does, are reported.

FACTORS AFFECTING EFFICACY OF INTRAVAGINAL ADMINISTRATION OF GnRH ANALOGUES FOR OVULATION INDUCTION IN RABBIT DOES

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The vagina, unlike other mucoses, is very dynamic with respect to its histology and physiology. This leads to the existence of a long list of factors included in the vaginal environment that affect substances absorption deposited there. Recently, it has been obtained normal ovulation rates in rabbit does inseminated which were induced with an intravaginal dose of GnRH analogue. This text provides a review with information about the structure, tissues, secretions, contractions, and innervations of vagina of rabbit which can affect their absorption profile.

SCIENTIFIC COMMUNICATIONS

APPLICATION OF A DIGITAL ARTIFICIAL VAGINA FOR SEMEN COLLECTION IN RABBIT BUCK: PRELIMINARY RESULTS

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Nowadays artificial vagina in rabbitry is widely utilized. The aim of this study was to evaluate the effect of a digital artificial vagina on some quali-quantitative traits on rabbit buck semen. Twenty rabbit bucks were submitted to semen collection twice a week with 2 different artificial vagina: glass vagina (37-40°C) and digital vagina (47°C). For every ejaculate presence/absence of plug gel, volume, sperm concentration, motility, acrosoma status, lysozyme concentration, antioxidant power and total protein were recorded. The libido showed better values with digital vagina and the lowest percentage of plug gel promoting the use of this technique. Sperm concentration was in the range of good health bucks, as confirmed by lysozyme value and antioxidant power. In conclusion it is confirmed that the use of a digital vagina in rabbitry reduces the time to take off sperm samples and does not compromise the quality of ejaculates.

INVESTIGATION OF CANDIDATE GENES FOR THE *DILUTE* COAT COLOUR LOCUS IN RABBIT

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Several coat colour loci remain to be characterized at the DNA level in the rabbit. Among them, the *dilute* locus is determined by a recessive coat colour mutation that dilutes the black to blue (grey) and the yellow to beige interacting with the basic colours influenced by the *Agouti* and *Extension* mutations. We selected 2 candidate genes for this locus (*PMEL* and *MYO5A*) and resequenced several parts of them in 8 rabbits of different coat colour (including rabbit with blue pigmentation) for a total of ~22 kb. Six single nucleotide polymorphisms (SNPs) have been identified (2 n *PMEL* and 4 in *MYO5A*). These SNPs were not completely associated with any coat colour in the sequenced rabbit panel. Other genes should be investigated in order to characterize the *dilute* coat colour locus in rabbit.

EFFECT OF FEEDING PROGRAM BEFORE WEANING ON THE PERFORMANCE OF RABBIT DOES AND THEIR KITS

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The aim of the experiment was to examine the effect of the feeding program between the 21st d

of lactation and weaning on performance of rabbit does and their kits. The does and their kits received a lactation diet until weaning during the whole experiment (BB group; n=60) or a lactation diet until the 21st d of lactation and a post-weaning diet until weaning (BG group; n=59). After weaning, all kits consumed the same diet for growing rabbits. No significant differences were observed between the BB and BG groups for number of inseminations per parturition, body weight of the does at parturition and at 21st d of lactation, litter size, feed conversion ratio and mortality of kits. The feeding program affected the body weight of the does at the 35th d of lactation (4 610 *vs*. 4 530 g in BB and BG group, respectively; *P*=0.016), the litter weight at day 35 (8 160 *vs*. 7 834 g; *P*=0.001) and the does condition at kindling measured by the TOBEC method (*P*=0.024). Body weight of the growing rabbits was higher in the BB group at the ages of 5 and 7 wk (984 *vs*. 937 g, *P*<0.001; 1 651 *vs*. 1 621 g, *P*=0.008, respectively), but the differences were not significant afterwards. It could be concluded that it is advantageous to feed both does and kits with the lactation diet until weaning.

EFFECT OF RE-INSEMINATION INTERVAL AFTER THE FIRST PARTURITION ON THE PERFORMANCE OF RABBIT DOES

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The objective of the study was to examine the effect of the length of period between the first kindling and the next insemination on the performance of rabbit does. Rabbit does (n=311) were randomly sorted to 3 groups and were inseminated 11 (AI-11), 18 (AI-18) or 25 d (AI-25) after the first parturition. Subsequent inseminations occurred 11 d after kindling. The kindling rates (between the second and seventh kindling) of the AI-11, AI-18 and AI-25 groups were 68.0; 74.1 and 76.3 (NS), respectively. No significant differences were found for the does' body weight, litter size (total, born alive, at day 21), suckling mortality, litter and individual weight at day 21. Despite of the small differences that were recorded for these traits, the productivity per 100 inseminations substantial alterations were observed for the total number of kits born (687, 738 and 786), total number of kits born alive (642, 705 and 724), total number of kits at day 21 (642, 705 and 724) and total kit's weight at day 21 (221, 230 and 239 kg) among the AI-11, AI-18 and AI-25 groups. Based on the results after the first kindling it is worth to re-inseminate the does 1-2 wk later for improving their condition and production level.

CT-BASED SELECTION FOR IMPROVING THE CARCASS TRAITS OF GROWING RABBITS

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The objective of the paper was to summarize the main results of selection based on data of computer tomography (CT). Pannon White growing rabbits were selected for L-value (the average of surface *of m. Longissimus dorsi* between the 2nd and 3rd, and 4th and 5th lumbar vertebrae) between 1992 and 2003. Since 2004 the selection criteria is the volume of thigh muscle. The effectiveness of both methods was proven by estimating the genetic trend, using divergent selection and comparing different breeds/lines with Pannon White rabbits. The increased performance (larger amount of meat in the carcass) of the selected animals gives an extra profit for slaughterhouses.

PRELIMINARY RESULTS: EFFECT OF LYCOPENE ADMINISTRATION ON SEMEN QUALITY OF RABBIT

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A total of 18 hybrid strain Martini male rabbits were randomly divided into 3 experimental groups. The animals of the first and the second group drank water with 0.1 (group A) and 0.5 (group B) g/L of lycopene addition (A and B groups, respectively), while water without any supplementation was administered to the rabbits of the control group (C), 8 wk treatment. Semen was collected from 18 bucks (6 animals/group) for 5 consecutive

weeks. Ejaculate volume was determined by graduated test-tube and sperm concentration was calculated by Neubauer chamber. Sperm motility was evaluated subjectively by a phase contrast microscope. FPM was scored 1/4 (low-high). Sperm viability was assessed by nigrosin/eosin (N/E) staining procedure. Data reported showed that the highest level of lycopene (group B) resulted in a significantly greater volume of ejaculate and total number of sperm than in the control group (0.98 *vs*. 0.78 mL, $P<0.05$; 364 *vs*. 227, $P<0.01$), while sperm concentration was not affected. The lycopene addition, however, did not significantly influence progression parameters immediately measured after sampling (t=0 h). These preliminary results underline the positive effects of lycopene supplementation on ejaculate volume and sperm number. Further investigations are needed on the role of this antioxidant which could have interesting applications in field conditions.

EFFECT OF MANNANOLIGOSACCHARIDES ON PERFORMANCE OF GROWING RABBIT

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A total of 256 weaned (34 d) rabbits were equally divided in 4 groups fed the same basal diet supplemented with antibiotics (ANT), mannanoligosaccharides at 1.0 and 1.5 g/kg diet (MOS_1.0 and 1.5) and without supplements (CONT). Up to 67 d, live weight and feed intake were recorded weekly in order to calculate body weight gain (BWG) and feed conversion ratio (FCR). Mortality rate was recorded daily. No differences were recorded among groups for mortality rate. ANT and MOS_1.0 groups had the highest body weight at 67 d ($P<0.05$) due to a high BWG. However, feed intake and FCR resulted significantly lower ($P<0.01$ and $P<0.05$, respectively) for MOS_1.0 than ANT group. MOS are a possible alternative to antibiotics with an interesting effect on FCR reduction.

EFFECT OF SUGAR BEET PULP FIBRE FRACTIONS ON GROWTH PERFORMANCE, FECAL DIGESTIBILITY AND DIGESTIVE PHYSIOLOGY IN RABBITS AROUND WEANING

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The present study investigated the effect of the different fibre components of sugar beet pulp (SBP) on growth performance and some digestive traits. Four semi-synthetic diets were formulated with similar NDF (33% DM) and protein (16% DM) level. Control diet was formulated to contain the lowest level of soluble fibre (3% DM) and SBP diet the highest (9%). The soluble (pectins) and insoluble fractions of SBP were studied in other 2 diets (Pectin and InsSBP diets). A total of 136 weanling rabbits (25 d of age) was housed individually, randomly assigned to 4 experimental groups, and fed *ad libitum* with the experimental diets during 10 d after weaning. The type of diet did not affect growth rate and stomach pH. Animals fed with SBP diet showed higher DM and NDF digestibility (4 and 83%, respectively), gain:feed ratio (13%), cecal and total tract weight (13 and 9%) and ileal viscosity (148%) than rabbits fed the Control diet, but lower cecal pH (9%). Pectin diet increased ileal viscosity and decreased the weight of stomach content with respect to SBP diet. Rabbits fed InsSBP diet showed similar results to SBP diet but lower ileal viscosity and cecal pH than those fed Pectin diet. In conclusion, SBP and their soluble and insoluble fractions are well digested in young rabbits. However the soluble and insoluble fibre of SBP produce different effects in the gastrointestinal tract.

INFLUENCE OF DIETARY PROTEIN ON BLOOD UREA LEVEL, UTERINE pH AND REPRODUCTIVE PERFORMANCE OF LACTATING RABBIT DOES

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The effect of dietary protein level on uterine pH, plasma urea nitrogen concentrations (PUN) and reproduction efficiency was assessed through a trial involving 50 multiparous hybrid rabbit does. At day 27 of pregnancy, the animals were equally divided into 2 experimental groups fed on mixture at different protein levels: 18.5% (CP18.5=25) and

22% (CP22=25) on dry matter. Blood samples (=50) were taken at the same day of AI (12 d *post-partum*) and plasma was assayed for PUN. Measurements of uterine pH (=50) were accomplished at day 12 *post-partum* by inserting a microelectrode through the genital tract. Reproduction efficiency was evaluated by abdominal palpation 12 d after AI to determine the pregnancy rate (PR). CP22 rabbits exhibited significantly higher PUN levels and decreased uterine pH values compared to CP18.5 (35.1 *vs.* 24.9 mg/dL, $P<0.01$; 7.3 *vs.* 6.7 pH units, $P<0.05$), associated with reduced fertility: PR increased when does were fed a diet not exceeding in protein content (79.3 *vs.* 69.8 % for CP18.5 *vs.* CP22; $P<0.01$). The results indicate that high dietary CP may exert an adverse effect on reproduction efficiency by elevating PUN levels and altering the uterine environment in the lactating rabbit doe. Further research is needed to understand whether the reduction in uterine pH is mediated via ammonia, urea or some other factor. The benefits of feeding excess dietary protein to sustain optimum milk production and simultaneous pregnancy in female rabbits should be compared with potential negative effects on fertility before such a program is implemented.

TRIALS OF INTEGRATION BY OZONIZED WATER AND VEGETAL EXTRACTS IN GROWING RABBITS

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In a first trial 2 groups of rabbits (n=182) were fed the same blank diet (CP 18.8%DM, CF 18.7, NDF 37.7) and Control group (C) had fresh water, while O group received ozonized drinking water (O_3 0.5-0.3 ppm) by 5 h/week; a third group (M) received fresh water and a medicated diet. The mortality level was very high (43%) in the C and O groups, while M rabbits had a lower mortality rate (15%). In a second trial (n=140), the use of 4 vegetal products (Tannins, *Allium*, Humic acid, Probiotan) allowed to reduce mortality in rabbits fed C diet (5 *vs*. 11%). However, these products should be also tested in worse sanitary conditions.

EFFECTS OF LOW PROTEIN DIETS FED TO GROWING RABBITS IN VARIED HOUSING AND WATER CONDITIONS

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A factorial 2×2×2 design was used to study the effects of nitrogen levels of the diets (P=normal protein level *vs.* L=Low-protein with 4 Amino-Acids integration), housing system (I=Individual cages *vs*. G=Group by 7 rabbits) and water regimens (L=*ad libitum* 24/24 *vs.* R=Restricted 20/24 h) on a total of 92 growing rabbits raised from 45 to 73 d. Twenty-four animals pre-selected by live NIR Spectroscopy were slaughtered and controlled in carcass by NIRS. Low protein diet did not improved protein utilisation with equality in all other traits. Group raising strongly reduced growth (–15%), feed intake (–6%), feed conversion efficiency (+15%), skin% (–7%), liver% (–18%) with greater incidence of slaughter (+14%) and chilling losses (+37%) and kidneys (+7%), and with strong differentiation of NIRS spectra in carcass (avg. R^2 0.54) but not in live. The water restriction reduced the intake of feed (–5%), increased the meat acidification (pH:–2%), strongly increased adiposity in renal (+110%) and scapular sites (+121%) with evident effects in live NIR scans of ear and loin (0.76) and average on the carcass (0.45).

ACIDIFIED OR INTEGRATED BY PROBIOTAN® DIETS FOR RABBIT DOES

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In the present work a "blend" of medium chain fatty acids (A: K20, 0.5% by Biotrade s.n.c. Mirandola, MO) and an oil-extract vegetal integrator (P: Probiotan®, 1%, oil extracts of stabilised vegetables by *Glycine S., Menta P., Malus P., Centaurium U.,* by Biorama, Rogeno LC) were compared to a medicated (M, by 3-antibiotic prevention active) and to a Control blank (C) diets (CP 16.5, crude fiber 18, NDF 37.5% DM). The M diet was fed to 63 multiparous Bianca Italiana and Macchiata Italiana does, involving 452 living kits, until the subgroups A, P and C were split and fed at -3d from kindling. A significant reduction of the 0-19 d mortality was emerged for all the 3 treated groups (A: 16.3%; P: 17.2%; M: 14.8%) *vs*. the C group (35.6%). Elaboration of the four-mode

mortality by PROC CATMOD of SAS, suited by Cluster Hierarchical Analysis of the probability matrix showed that A and P groups were closer than M group. Performances of the does, analysed by linear models, were unaffected by the integrate received regimens. It was concluded that a protection in the pups liveability was recovered, even at high mortality (35.6%), a second result for Probiotan®, and by first one, for the MCAFAs: some results which should be confirmed in longer trials.

LOW PROTEIN DIET FOR LACTATING DOES AND RELATIONSHIPS BETWEEN CREATININE AND UREA IN URINE

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Decreasing protein level with AA integration (R: 16.94 *vs.* P: 18.69% DM) in the feed of milking does enhanced milk efficiency of nitrogen input by 17% with a 22% reduction in daily urea urine nitrogen (UUN), but the urine volume was unchanged. Creatinine (CREA) level in urine was negatively related to daily urine volume (–0,72) but positively related to urea content (0.78). Favorable equation for predicting the daily UUN emission of lactating does was available: UUN g/d=0.31–0.00504 CREA (mg/dL)+0.00896 urea (mg/dL); R^2=0.87. It would be beneficial to simplify the studies and eventually the field validations regarding nitrogen nutrition of the lactating does.

LOW PROTEIN INTEGRATED BY SYNTHETIC AMINOACIDS DIETS FOR YOUNG RABBITS: GROWTH AND NITROGEN BALANCE TRIALS

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A four-factorial Taguchi design was conceived to estimate effects of addition to zero-basal diet (#1, crude protein 16.7% DM) of 4 AA unilevel; in order the 4 factors were: A: Metionine, B: Lysine C=A*B (Threonine); D=Thryptophan. Nine diets (#1-9) were fed to 18 rabbits in metabolism cages from 40 to 68 d; each week the 9 diets were rotated by rabbits, so 8 records were available for each diet (n=72). Data from growth records enhanced significant positive effects on growth rate (+22%) accounted by Triptophane (added at 50 g/t) also interacting with Metionine (50 g/t). No effect was apparent in urine volume or in apparent digestibility. A second trial compared 9 rabbits fed diet #9 (M) (Mini-nitrogen with added 4 AA) *vs.* 9 rabbits fed by a normal protein diet (C, Control: crude protein 18.8%). The limited protein level (M *vs.* C) did not reduce urine volume and depressed the digestive and metabolic utilisation of the protein, a result which need further investigation.

REDUCING CRUDE PROTEIN AND INCREASING SOLUBLE FIBRE TO STARCH RATIO IN DIETS FOR GROWING RABBITS

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From 29 d of age until slaughter (78 d), 282 rabbits were fed 6 diets formulated in order to evaluate the combined effect of dietary protein level (CP: 13.9 *vs*. 15.4 *vs*. 17.5%) and soluble fibre to starch ratio (0.5 *vs*. 1.1). Health status was good in all groups. When dietary CP decreased, diet DM digestibility, daily growth rate and caecal volatile fatty acid (VFA) concentration significantly decreased. When soluble fibre to starch ratio increased, diet DM and fibre fractions digestibility significantly raised, feed intake decreased and feed conversion improved; at caecum, VFA concentration increased and N-ammonia level diminished. In conclusions, decreasing dietary CP until 13.9% impaired rabbit growth, while replacing starch with soluble fibre had advantages on both performance and caecal fermentations.

MONITORING OF ENVIRONMENTAL PARAMETERS IN FATTENING RABBIT FARMS AND SEASONAL TREND ANALYSIS

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In order to objectively and exhaustively evaluate the influence of different atmospheric conditions on the microclimate and air quality inside rabbit farms, parameters such as temperature, relative humidity, air speed, air flow, total air exchange, noxious gases concentrations, environmental and pathogenic bacteria and fungi counts were monitored during the post-weaning and pre-slaughter phases of 4 fattening cycles that took place in an intensive rabbit farm, over a 12-mo period. The data collected in this study highlight that, as for noxious gases concentrations, winter is the most critical season, as for total dust and total bacterial and fungi counts, autumn together with winter is the most critical season, whereas high counts of pathogenic bacteria, in this case *P. multocida*, were recorded in the pre-slaughter phase in autumn, followed by summer.

QUANTITATIVE STUDY OF AIR CONTAMINATION BY FUNGAL SPORES IN DIFFERENT KINDS OF RABBIT FARMS AND PROPOSAL OF A STANDARDIZED SAMPLING METHOD

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In order to establish the most suitable and reliable sampling method for the assessment of air contamination by spores of environmental and pathogenic fungi inside rabbit farms, 6 farms, equipped with different ventilation systems, characterized by various levels of hygiene and with a history of mycosis, were selected for samples collection. In each farm samples were collected in 4 occasions at different heights and points and, for 1 d, at 4 times. The statistical analysis of the data collected allowed to suggest the following sampling schedule to reliably estimate the average contamination level: 1 sampling point per corridor, at a height of 0-2 m for environmental fungi and 1-2 m for dermatophytes, once in a day.

EFFECT OF HOUSING SYSTEM ON SOME PHYSIOLOGICAL, BEHAVIOURAL AND PRODUCTIVE ASPECTS OF RABBIT DOE

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The aim of the study was to ascertain if a higher space availability (alternative cage system) modifies physiological, behavioural and productive parameters of rabbit does. Sixteen pregnant New Zealand White nulliparous rabbit does were transferred to standard cages (n=8) or to alternative cages (n=8) and physiological, behavioural and productive traits were recorded for 3 consecutive cycles. Behavioural observations showed both in *pre-partum* and *post-partum* periods a higher presence of stereotyped behaviour in standard caged doe. On the contrary in alternatively caged doe, even if blood ROS were higher due to their greater motor activity, a lower haematic value of haptoglobin was reached, thus was accompanied by a lower pre-weaning mortality of kits. In conclusion giving to does a higher space availability could permit to enhance animal welfare and reduce the pre-weaning pups mortality.

GROWTH PERFORMANCE AND SLAUGHTER RESULTS IN RABBITS REARED IN INDIVIDUAL, BICELLULAR AND COLONY CAGES

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From weaning until slaughter (27 to 75 d of age), 384 rabbits were kept into 72 individual cages (72 rabbits), 48 bicellular cages (2 rabbits/cage; 96 rabbits) and 24 colony cages (9 rabbits/cage; 216 rabbits). Rabbits in individual cages showed higher final weight (P=0.10), growth rate (P=0.07) and feed intake (P<0.01) compared to rabbits kept into bicellular and colony cages, but similar conversion index. Dressing percentage and carcass quality were similar apart from muscle to bone ratio of hind leg (P<0.05), higher in rabbits reared in individual cages compared to colony. On *biceps femoris* muscle, the b* index increased (P<0.001) from rabbits of individual to those of bicellular and colony cages. We can conclude that the rabbits in individual cages showed growth performance

somewhat higher compared to those kept in bicellular and colony cages while slaughter results and meat quality did not differ substantially among the 3 housing systems.

MOLECULAR CHARACTERIZATION AND ANTIMICROBIAL RESISTANCE OF *SALMONELLA TYPHIMURIUM* FROM RABBIT FARMS IN SOUTHERN ITALY

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Salmonella enterica infection is quite uncommon in rabbits, but it may raise serious concerns in terms of economic losses and public health impact. Furthermore, the insurgence and diffusion of multidrug resistant strains complicate the management of both human and rabbit infection. In this study four *S. Typhimurium* strains were characterized for antimicrobial susceptibility, resistance genes, class 1 integrons and Pulsed-Field Gel Electrophoresis (PFGE). The results showed the circulation of a group of strain which is indistinguishable from human isolates for PFGE and multidrug resistance patterns. Our data suggest that molecular characterization is an useful tool to promptly recognize *Salmonella* strains which are potentially harmful to rabbits or humans.

RABBIT MYXOMATOSIS: THE ROLE OF THE DIAGNOSTIC LABORATORY FOR THE MANAGING AND CONTROL OF THE DISEASE ON THE FIELD

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Myxomatosis still represents one of the main health problems of farmed, wild and rural rabbits. This is also due to the complexity of its aetiological agent; in fact, only recent studies have partially shown the genomic organization and function of the 171 proteins, which the myxomavirus, a member of the Poxviridae family, genus Leporipoxvirus, expresses during the various stages of infection. These data have direct and positive effects on the improvements of diagnostic methods. In particular, molecular biology and genotyping techniques make possible to quickly get diagnostic results and to precisely differentiate vaccine from wild strains.

ARCANOBACTERIUM PYOGENES AS A CAUSE OF REPRODUCTIVE DISORDERS IN A RABBIT BREEEDING

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Reproductive pathology is conditioned by several factors, which can influence reproductive rhythm in a farm. In rabbits, infertility can be associated with non-infectious and infectious causes. Several pathogens can lead to infertility; among them *Pasteurella multocida* and *Staphylococcus aureus* are the most important. In certain circumstances, *Arcanobacterium pyogenes*, a commensal of mucous membranes, becomes an opportunistic pathogen. In different animal species it can cause suppurative infections involving skin, joints and organs belonging to reproductive and respiratory systems. In this paper we report the isolation of 5 *A. pyogenes* strains recovered from does with infertility problems. They were isolated from three uteri and 2 vaginal swabs. Necropsy revealed lesions only in 3 animals. Results seem to indicate that *A. pyogenes* can cause severe lesions in does, in association with improper management conditions in artificial insemination.

VANCOMYCIN RESISTANCE IN *ENTEROCOCCUS* SPP. STRAINS ISOLATED FROM RABBITS. PRELIMINARY RESULTS

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Enterococcus spp. are part of normal intestinal flora both in humans and animals. Some strains,

multidrug-resistant, can cause serious hospital- and community-acquired infections. One of the most important resistance is the vancomycin resistance. Vancomycin, a glycopeptide antibiotic, represents the last effective drug used to treat such infections in humans. Numerous studies have identified treatment with some glycopeptides as risk factors for acquiring vancomycin resistance both in humans and in animals. Nevertheless some vancomycin resistance strains are able to transfer the codifying resistance genes to other bacterial species. Due to the implications in public health, monitoring of antimicrobial resistance is of the utmost importance to preserve public health. In this study, we investigated the presence of Vancomycin-Resistant Enterococci (VRE) in 139 strains isolated from rabbit faecal samples. Bacterial strains were submitted to examination, using 2 different media (Slanetz Bartley and Slanetz Bartley with 6 mg/L of vancomycin). Vancomycin resistant strains were not found.

DETECTION OF INTERCELLULAR ADHESION GENES AND BIOFILM PRODUCTION IN *STAPHYLOCOCCUS AUREUS* STRAINS ISOLATED FROM RABBIT

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In commercial rabbitries, pathologies due to *Staphylococcus aureus* are considered one of the most important causes of economic losses. The pathogenesis of the *Staphylococcus aureus* infection is related to various factors which promote the adhesion and the colonization to the host surfaces (toxins, extracellular factors and polysaccharidic biofilm). Moreover, the biofilm formation represents a key factor for protection against phagocytosis and antimicrobial agents. It is considered responsible for chronic infections, too. One hundred and four *Staphylococcus aureus* strains isolated from rabbits affected by mastitis were evaluated for slime production by Congo Red agar test (CRA) and by a specific PCR based procedure. Results indicate that 6/104 (6%) strains showed the phenotypic trait, whereas 104/104 (100%) were positive to molecular characterization.

DETECTION OF STAPHYLOCOCCAL ENTEROTOXINS IN *STAPHYLOCOCCUS AUREUS* STRAINS ISOLATED FROM RABBITS MASTITIS

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Staphylococcus aureus is a common cause of infections both in humans and in animals. It can cause various diseases, producing toxins and other extracellular factors. Staphylococcal enterotoxins are the leading cause of gastroenteritis in humans and moreover they are powerful superantigens able to stimulate non-specific T-cell proliferation. This can give several allergic and autoimmune diseases. The aim of this study was to evaluate the presence of Staphylococcal enterotoxins in 98 rabbit mastitis samples. *Staphylococcus aureus* tested strains did not harbour enterotoxins.

RABBIT ENCEPHALITOZOONOSIS: DIAGNOSTIC APPROACH AND CORRELATION AMONG GRADING, IMMUNOHISTOCHEMISTRY AND SEROLOGY

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Encephalitozoonosis is an infection caused by a microsporidium, largely diffused in rabbit farms. This study is focused on the relationship among antibody titers, macro-microscopic kidney lesions and its immunolocalization using a pool of MAbs on 98 kidney samples. Immunohistchemistry may be considered the gold standard for *post-mortem* diagnosis whereas macroscopic scoring is only a screening. The serological test has a lower diagnostic efficacy but is a good screening *in vitam*. However, it has no prognostic value since serological titres are not directly related to the severity of lesions.

RABBIT ENCEPHALITOZOONOSIS IN INDUSTRIAL FARMS IN LOMBARDY: SEROPREVALENCE AND BIOCHEMICAL PARAMETERS

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Encephalitozoonosis is an infection caused by *Encephalitozoon (E.) cuniculi*, largely diffused in industrial rabbit farms in Italy. This study is aimed to evaluate the seroprevalence for *E. cuniculi* in 10 industrial rabbit farms in Lombardy, and to verify the existence of any correlation between serological titres and the values of urea and creatinine, well-known parameters of renal function. Nulliparous (158), primiparous (10) and multiparous (74) does were tested separately: the overall prevalence was 30.63% and it was increasing with age. The values of creatinine and urea were higher in seropositive rabbits. The probability that animals showing values higher than normal are seropositive is almost double (OR 2.87 for creatinine and 1.71 for urea). In conclusion, *E. cuniculi* negatively influences the metabolism and productive performances of does and the urea and creatinine values are promising indicators of the severity of the infection in seropositive animals.

ECONOMICS OF COCCIDIOSIS PREVENTION IN RABBITS: A FIELD STUDY

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Coccidiosis is an important digestive disorder in rabbits but its economic impact is not easy to assess. A correct idea of the cost is necessary to take appropriate management decisions –such as disease prevention– to optimise revenue. The present paper describes a trial that gives insights in the return on investment of coccidiosis prevention. The trial was performed in a commercial farm where no signs of clinical coccidiosis were noted and where no anticoccidial was used in the feed during several years prior to the trial. It involved a group supplemented with an anticoccidial –robenidine– and a non-supplemented group. A zootechnical and parasitological comparison was made. This trial showed significant reduction of the feed conversion rate in robenidine supplemented animals. An economic analysis showed the benefits of anticoccidial supplementation.

LONGITUDINAL STUDY ON THE EXCRETION OF COCCIDIAN IN RABBIT FARMS APPLYING AN ANTICOCCIDIALS 2-PHASE TREATMENT

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A one-year study was carried to evaluate the excretion of coccidia in fattening rabbits from 8 meat farms applying a 2-phase anticoccidial program (diclazuril+robenidine). Parasitological parameters (counts of oocysts and species identification) were measured monthly. Seven out of the 11 known rabbit species were identified. Variable levels of OPG were detected in the farms but in all them, after 8 mo of treatment with diclazuril a lower OPG and a reduced number of *Eimeria* species in rabbit feces were recorded.

THE USE OF MARINATION TO PROVIDE ADDED-VALUE RABBIT MEAT

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A study was conducted to determine the effects of marination use and marination solutions (containing sodium tripolyphosphate, sodium carbonate or sodium bicarbonate) on rabbit meat quality traits. The pH, colour (L*a*b*), drip losses, cooking losses and shear force were measured on a total of 48 *L. lumborum* muscles. Irrespective of the type of solution, marination allowed to reduce cooking loss (18.4 *vs*. 20.0%; $P<0.05$), by increasing its pH, and tenderize loin rabbit meat by about 25% (shear force: 1.37 *vs*. 1.83 kg/g; $P<0.01$). Among marination ingredients, sodium carbonate and bicarbonate showed an higher alkalinisation effect in respect to sodium tripolyphosphate; however colour traits, water holding capacity and shear force of meat were not different among treatments. In conclusion, this study showed that marination can be profitably used in rabbit meat to prepare further processed products and sodium carbonate and bicarbonate can be used as alternative to phosphates.