

ABSTRACTS OF THE 49TH CUNICULTURE SYMPOSIUM, ASESCU

BURGOS, SPAIN, 28 AND 29 MAY 2025.

The 49th Symposium of the Spanish Association of Cuniculture (ASESCU) was held last May in Burgos (Castilla y León; Spain). The event was organised in collaboration with Union de Pequeños Agricultores y Ganaderos (UPA). During the congress, two main lectures were presented. First, Luis Ángel Quintela, from Universidade de Santiago de Compostela, explained how animals use pheromones to communicate and explored their potential to reduce stress and improve animal breeding in farming. Then, Francisco Xavier Mora, from Universitat Autònoma de Barcelona, talked about re-emerging diseases found in recent years in rabbit farming. The challenges to face with the possible incoming legislation on rabbit housing were discussed by producers, researchers, rabbit meat distributors, housing manufacturers and livestock associations in a round table. Moreover, four simultaneous and interactive round tables were held during a coffee break, with dynamic discussions on processed rabbit meat products, the new legislation about rabbit health, good farming practices and the use of additives in rabbit nutrition. More than a hundred people joined the congress, including technicians, farmers and researchers. In the following pages you can see the contributions on genetics and reproduction, nutrition, housing and welfare, environmental control and pathology.

MAIN PAPERS**WHAT ARE PHEROMONES AND HOW CAN WE USE THEM TO OUR ADVANTAGE?**

QUINTELA L.A.*, YAÑEZ U.*, BARRIONUEVO R.*, ÁLVAREZ J*, ACCIÓN A.*, VILLAMAYOR P.*, SANCHEZ-QUINTEIRO P.†

*Unidad de Reproducción y Obstetricia, Departamento de Patología Animal, Facultad de Veterinaria, Universidade de Santiago de Compostela, Avda. Carballo Calero s/n, 27002 LUGO, Spain. †Unidad de Anatomía, Departamento de Anatomía, Producción Animal y Ciencias Clínicas Veterinarias, Facultad de Veterinaria, Universidade de Santiago de Compostela, Avda. Carballo Calero s/n, 27002 LUGO, Spain.

luisangel.quintela@usc.es

Pheromones play a key role in chemical communication between animals, facilitating essential processes such as danger detection, food location and reproduction. This paper discusses the nature of pheromones, their mechanism of action and their use in various fields such as veterinary medicine and ethology. It reviews the types of pheromones available, their effects on different species and the potential for their use to improve animal welfare and livestock production. The results suggest that pheromone manipulation could optimise animal management, reduce

stress and improve reproduction in domestic species. This work highlights the need for further research into their potential in different biological and production contexts.

EMERGING AND RE-EMERGING DISEASES IN RABBIT FARMING

MORA F.X.

Profesor Asociado UAB Veterinaria. Dept. Ciencia Animal i dels Aliments, UAB, 08193 Cerdanyola del Valles, España.

asvetxm@gmail.com

In recent years, new diseases affecting rabbits have emerged, gradually increasing their presence on rabbit farms. These are not new diseases, but in most cases represent a resurgence of existing diseases with a higher fatality rate. This is often influenced by new local ordinances that restrict the use of antibiotics to therapeutic purposes only, excluding preventive use. Among them, the increase in the frequency of *Enterococcus hirae* and *Salmonella* sp., the appearance of hydatid cysts, enterotoxigenic *Bacteroides fragilis* and a highly multi-resistant strain of *E. coli* found on rabbit farms stand out. These diseases, called emerging due to their relatively recent presence in rabbit farms, are joining the most common associated

pathologies in rabbit farming. They mostly occur in mixed presentations with these diseases.

EFFECT OF THE INCLUSION OF A POSTBIOTIC BASED ON LACTIC ACID BACTERIA ON SPERM PRODUCTION AND SPERM QUALITY IN A LINE OF RABBITS SELECTED TO HOMOGENISE LITTER SIZE

SERRANO-JARA D., ARGENTE M.J., GARCÍA M.L.

Departamento de Tecnología Agroalimentaria, Universidad Miguel Hernández de Elche, Escuela Politécnica Superior de Orihuela, Centro de Investigación e Innovación Agroalimentaria y Agroambiental, CIAGRO-UMH, 03312, ORIHUELA, España.

d.serrano@umh.es

This research evaluated the effect of including a postbiotic based on lactic acid bacteria in the diet on sperm production and motility in the 17th generation of a rabbit line selected to homogenise litter size. Twenty rabbits were used, divided into two groups: Control (standard diet) and Treatment (diet with postbiotic). The total number of samples was 100. Ejaculate volume, feed intake and male weight were measured. Sperm production, concentration and motility were analysed, including motile, progressive, rapidly progressive, medium progressive and non-progressive sperm, using the CASA system (Sperm Class Analyzer 6.6.59, Microptic, Spain). The dose potential was estimated. Bayesian statistics were used to analyse the obtained data. The Treatment group showed a significant increase in ejaculate volume and total sperm production ($P>90\%$). This could enhance the efficiency of artificial insemination by increasing the number of doses produced per ejaculate. The postbiotic did not affect sperm motility. In conclusion, the inclusion of the postbiotic in the diet had a positive impact on reproduction. However, its effect on fertility should be studied in greater depth.

EFFECT OF ADMINISTRATION OF THE FLAVONOID QUERCETIN AND GENETIC LINE ON BODY RESERVE MANAGEMENT, REPRODUCTIVE EFFICIENCY AND PRODUCTIVE PERFORMANCE IN DOES DURING REARING AND AT THE BEGINNING OF THEIR PRODUCTIVE LIFE

JORDÁN-RODRÍGUEZ D.*, VICENTE-CARRILLO A.†, FERNÁNDEZ-GONZÁLEZ J.†, PULIDO-SÁNCHEZ B.‡, BLANCO-ARGIBAY S.M.†, GIMENO MARTOS S.*, LORENZO-GONZÁLEZ P*, GARCÍA REBOLLAR P.‡, GARCÍA-GARCÍA R.M.*, ARIAS-ÁLVAREZ M.†

*Dept. Fisiología, Facultad de Veterinaria, Universidad Complutense de Madrid, 28040, MADRID, España. †Dept. Producción Animal, Facultad de Veterinaria, Universidad Complutense de Madrid, 28040, MADRID, España. ‡Dept. Producción Agraria, E.T.S.I. Agronómica, Alimentaria y de

Biosistemas, Universidad Politécnica de Madrid, 28040, MADRID, España.

djordan@ucm.es

The use of antioxidants such as quercetin (QUR) and its combination with long-lived genetic lines may be of great interest to optimise reproductive function and productive efficiency and prolong the lifespan of breeding rabbits. To assess the effects of this antioxidant and genetics, a study was conducted with rabbits does from the V line, selected for litter size at weaning (V group), and the LP line, selected for longevity and production (LP group), which were fed supplemented diet with QUR (4 g/kg) (V-Q and LP-Q groups) or non-supplemented control diet (V-C and LP-C groups) during rearing (from 15 or 16 weeks in LP and V rabbits, respectively) and the first two pregnancies, following a semi-intensive production rhythm. Feed intake, body weight during the whole experimental period, body composition (BC) at the first artificial insemination (AI) and fertility and prolificacy at the first two AIs were evaluated. The results showed that administration of QUR from rearing did not influence feed intake, body weight or BC of the rabbits at first AI. Although LP does started the study at a lower body weight than V does and had a shorter rearing period, they achieved similar BC values to V rabbit does. Fertility at first AI also tended to be higher in LP-Q does compared to LP-C does. These results suggest that QUR supplementation does not affect feed palatability or influence the productive and reproductive parameters analysed. However, the LP genetic line could show a more efficient management of body reserves at the beginning of their lifespan regardless of QUR supplementation.

EFFECT OF GENETIC SELECTION FOR FEED EFFICIENCY IN MEAT RABBITS ON DIGESTIBILITY, NITROGEN BALANCE AND EXCRETION

CIFUENTES L.*, SÁNCHEZ J.P.†, PASCUAL M.*, PILES M.*, ORENGO J.‡

*Programa de Genética y Mejora Animal, IRTA, 08140, CALDES DE MONTBUI, España. †Departamento de Genética, Universidad de Córdoba, Edif. C5, Campus de Rabanales, 14014 CÓRDOBA, España. ‡Departamento de Producción Animal, Universidad de Murcia, Facultad de Veterinaria - Campus de Espinardo, 30100 MURCIA, España.

leticia.cifuentes@irta.cat

This study compared differences in digestibility coefficients and nitrogen retention among three lines selected for feed efficiency (ADGR, GRP, and RFI) against a control population derived from vitrified embryos. A total of 56 rabbits, selected from two batches and controlled between 49 and 53 d of age, were used. A chemical analysis of feed, faeces, and urine was conducted to assess dry matter digestibility, organic matter digestibility,

energy digestibility and crude protein digestibility (CPD) according to the European reference method. In addition, the nitrogen balance (NB) and nitrogen use efficiency index (NUE) were calculated. Statistical analysis of the variables was performed using a linear model, with line and batch as factors and daily intake as a covariate. No significant differences were found from the control population in any of the digestibility coefficients for the selected lines. However, when these differences were calculated at equal levels of intake, significant differences were observed between the GRP line and the control population in CPD (-3.1%). The NB for the ADGR line was lower than that of the control population both at constant intake (-0.39 g/d) and variable intake (-0.44 g/d). The GRP line also exhibited lower NB than the control (-0.26 g/d), but not at constant intake. The NB for the RFI line did not differ from that of the control population. The GRP line excreted less nitrogen in faeces compared to the control line (-0.13 g/d), while ADGR excreted more nitrogen in urine (0.32 g/d). Overall, only the GRP line excreted less nitrogen than the control (-0.26 g/d). The NUE index was 10% lower in the ADGR line compared to the others. In conclusion, while the lines did not show differences in digestibility, variations in nitrogen metabolism were detected.

DIFFERENTIAL FEEDING IN LACTATING KITS: ENERGY AND PROTEIN LEVELS OF FEED

RAMÓN-MORAGUES A.*, CAMBRA-LÓPEZ M.*, MARTÍNEZ-PAREDES E.*, FRANCH-DASÍ J.*†, RÓDENAS L.*, LÓPEZ M.C.*, PASCUAL J.J.*, MARÍN-GARCÍA P.J.*†

*Instituto de Ciencia y Tecnología Animal, Universitat Politècnica de València, 46022, Valencia, España.
†Departamento de Producción y Sanidad Animal, Salud Pública Veterinaria y Ciencia y Tecnología de los Alimentos (PASAPTA), Facultad de Veterinaria, Universidad Cardenal Herrera-CEU, 46115 Valencia, España.

adramo@upv.es

The objective was to formulate and evaluate specific diets for lactating kits with different levels of digestible energy (DE) and digestible protein (DP). The aim was to promote early feed intake and improve health and productivity. Four diets were formulated combining two levels of DE (low, LE and high, HE) and DP (low, LP and high, HP). These were compared with a control feed for breeding rabbits (C). In total, there were five experimental treatments (C, LELP, HELP, LEHP and HEHP). A total of 120 litters of 60 rabbit does were used in two batches, standardising to 10 rabbits per litter and replenishing casualties in the first 15 d. The experimental diets were administered from day 15 to 38. They were weaned at 31 d, remaining in maternity housing, until they were moved to fattening cages at 39 d (8 rabbits/cage). From this point until 63 d of age, they were fed a commercial feed. During the

experimental period, live weight, average daily gain, feed intake and feed conversion ratio were evaluated at different periods, as well as mortality. The results showed that the HEHP diet improved productive performance between 15 and 38 d. Its effect disappeared when homogenised from the fattening phase onwards. Although higher PD (HP) diets improved growth, they also increased mortality in the same period. Although mortality was low overall, more research is needed to reduce mortality associated with high PD levels by exploring the use of protein sources with higher digestibility.

EFFECT OF THE ADDITION OF PROTECTED SODIUM BUTYRATE ON GROWTH, INTESTINAL MUCOSA AND CAECAL MICROBIOTA IN RABBITS

RAMÓN-MORAGUES A.*, MARÍN-GARCÍA P.J.*†, MARTÍNEZ-PAREDES E.*, FRANCH-DASÍ J.*, RÓDENAS L.*, LÓPEZ M.C.*, LARSEN T.*‡, PASCUAL J.J.*, CAMBRA-LÓPEZ M.*

*Instituto de Ciencia y Tecnología Animal, Universitat Politècnica de València, 46022 Valencia, España.

†Departamento de Producción y Sanidad Animal, Salud Pública Veterinaria y Ciencia y Tecnología de los Alimentos (PASAPTA), Facultad de Veterinaria, Universidad Cardenal Herrera-CEU, 46115 VALENCIA, España. ‡Department of Animal Science, Aarhus University, Blichers Alle 20, 8830 TJELE, Denmark.

adramo@upv.es

The objective was to evaluate the effect of the addition of protected sodium butyrate in the diet of fattening rabbits on growth, function and structure of the intestinal mucosa and modulation of the caecal microbiota. Two experimental feeds (control, CON and control with sodium butyrate (0.96 g butyric acid/kg), BUT) were compared in 552 rabbits from 29 to 63 d of age. Rabbits were housed in group cages (33 replicates/treatment for mortality and sampling) and individual cages (78 replicates/treatment for productive performances). At 45 d of age, the gastrointestinal tract of 16 rabbits/treatment was sampled to measure pH along the tract, measure plasma biomarkers of digestive health, intestinal function and jejunal histomorphology and analyse caecal microbiota composition. The kinetics of butyrate release along the intestine were also evaluated. The addition of butyric acid in the feed of BUT rabbits had no significant impact on productive performance, mortality and incidence of diarrhoea compared to CON. It did not significantly modify the pH of the gastrointestinal tract and the composition of the caecal microbiota. However, its addition significantly improved jejunal villi height and maintained crypt depth compared to CON. In addition, it significantly increased butyric acid concentration in the ileum and reduced D-lactate in blood plasma.

OPTIMISATION OF THE IDEAL PROTEIN PROFILE THROUGH UNTARGETED METABOLOMICS IN RABBITS

MARIN-GARCÍA P.J.*, LLOBAT L.*, CORTÉS-GARCÍA C.*, CAMBRA-LÓPEZ M.†, BLAS E.†, TORBEN L.‡, PASCUAL JJ†, SKOU-HEDEMANN M‡

*Department of Animal Production and Health, Veterinary Public Health and Food Science and Technology (PASAPTA), Institute of Biomedical Sciences, Cardenal Herrera-CEU University, CEU Universities, VALENCIA, Spain. †Institute for Animal Science and Technology, Universitat Politècnica de València, VALENCIA, Spain. ‡Department of Animal and Veterinary Sciences, Aarhus University, TJELE, Denmark.

pablo.maringarcia@uchceu.es

The concept of an ideal protein refers to an amino acid (AA) profile that meets the animal's minimum requirements, optimising growth and reducing environmental impact. However, its application is complex due to the variability of nutritional requirements, making it essential to have precise and rapid tools for their assessment. Metabolomics has brought a revolution, enabling the comprehensive profiling of everyone's metabolome. In this study, we hypothesise that specific biomarkers can help define ideal protein. Plasma samples from rabbits fed experimental diets were analysed, modulating their essential AA levels, following different feeding strategies and under various scenarios. The results showed that variations in AA levels alter the metabolic phenotype more significantly and quickly than other traditional measures. Furthermore, we identified several biomarkers with great potential to further the understanding of the ideal protein concept. This study proposes metabolites as promising candidates —citric acid, among others— for future research as biomarkers.

INFLUENCE OF INSOLUBLE FIBRE LEVEL ON ILEAL DIGESTIBILITY AND FLOW OF DRY MATTER, PROTEIN, STARCH AND DIETARY FIBRE IN GROWING RABBITS

ROMERO C.†, FARIAS-KOVAC C.*, NICODEMUS N.*, GARCÍA J.*

*Dpto. Producción Agraria, ETSI Agronómica, Alimentaria y Biosistemas, Universidad Politécnica de Madrid, MADRID, España. †Facultad de Ciencias y Artes, Universidad Católica Santa Teresa de Jesús de Ávila (UCAV), ÁVILA, España.

javier.garcia@upm.es

In previous studies, we observed that both a deficit and an excess of insoluble fibre in the feed (NDF, neutral-detergent fibre) worsened the health of the rabbits after weaning. In this work, the influence of NDF level on digestibility and ileal flow of feed components was studied. Three papers were selected that studied these variables using treatments with significant variations in NDF. The increase in NDF (from 268 to 438 g NDF/kg dry matter) enhanced

feed intake, reduced ileal digestibility of dry matter and protein (in the latter two from 268 to 490 g NDF/kg DM), and increased ileal flow of both ($P=0.002$). In contrast, the increase in NDF did not change either ileal digestibility of starch (95% on average) or its ileal flow (1 g/d on average). The most important component of ileal flow is dietary fibre (55% on average) and its composition could play a relevant role in digestive health, together with the amount of protein reaching the caecum. In contrast, the ileal flow of starch does not seem to have a large effect in this respect.

PRELIMINARY EVALUATION OF THE EFFECT OF APPEASING PHEROMONES ON THE WELFARE AND PRODUCTIVITY OF BREEDING DOES

RESCONI V.C., PÉREZ Y., BOUZAIDA M.D., ROMERO J.V., LÓPEZ M., CAMPO M.M.

Departamento de Producción Animal y Ciencia de los Alimentos, Universidad de Zaragoza, c/ Miguel Servet 177, 50013, ZARAGOZA, España.

resconi@unizar.es

This study evaluated the effect of synthetic appeasing pheromones (FAS) on the welfare and reproductive parameters of rabbits in natural mating. A crossover experimental design was used with 33 New Zealand breed rabbits, ranging from 0 to over 20 litters, and across two seasons of the year. The results showed that the application of FAS reduced the reactivity during handling for mating: the proportion of more reactive animals was 11.9% in the control group and 5.0% in the treated group. Additionally, an increase in the amount of fur in the nest was observed with the use of the pheromone, reaching 94.1% of litters with medium or high fur, compared to 78.7% in the control group. However, no significant differences were found in receptivity (53.6% without pheromone vs. 55.6% with pheromone), gestation rate (76.4 vs. 75.0%), fertility at birth (68.0 vs. 60.2%), total number of liveborn kits (10.1 vs. 8.8), liveborn kits (9.3 vs. 8.2) and weaned kits (8.5 vs. 7.4). On the other hand, rabbits with more litters showed lower reactivity, lower receptivity, longer cycles and fewer weaned kits. Regarding the effect of seasonality, it was observed that the reproductive cycle (mating 11 d post-partum) was significantly shorter in spring-summer (56.5 d) than in autumn-winter (63.1 d), but its effect was not significant for the other parameters studied. In conclusion, FAS could facilitate management and improve certain aspects of maternal behaviour, such as nest preparation, but did not translate into significant productive improvements in maternity.

BIOMARKERS OF HEAT STRESS IN TWO GENETIC LINES WITH DIFFERENT LONGEVITY

BIADA I.*¹, IBÁÑEZ-ESCRICHE N.*², SERRANO D.†¹, GARCÍA M.L.†¹, ARGENTE M.J.†¹, SANTACREU M.A.*¹

*Institute for Animal Science and Technology, Universitat Politècnica de València, 46022, VALENCIA, España. †Instituto de Investigación e Innovación Agroalimentaria y Agroambiental, Universidad Miguel Hernández de Elche, 03202, ORIHUELA, España.

ibiada@posgrado.upv.es

Heat stress poses a significant challenge to rabbit production, affecting animal resilience and longevity. This study compared ocular temperature, plasma levels of C-reactive protein (CRP), tumour necrosis factor- α (TNF- α) and corticosterone levels between two highly productive maternal lines with different longevity (A and LP) under heat stress and thermoneutral conditions. Comparing differences between the two lines, the results showed that ocular temperature was consistently higher in line A than in line LP (PO=100% probability that the difference is greater or less than 0), suggesting lower heat dissipation efficiency in line A. Concerning inflammatory biomarkers, TNF- α levels were similar between lines (PO=59%), whereas CRP was higher in line A (PO=100%), indicating a higher basal inflammatory state in the standard longevity line A. Corticosterone was higher in line LP, although the quantified difference (0.08 $\mu\text{g/mL}$) was moderate and does not necessarily reflect chronic detrimental stress. Concerning differences between thermal conditions, heat stress increased ocular temperature and corticosterone in both lines, while TNF- α decreased. Interestingly, CRP increased only in line LP under heat stress, although its overall values remained below those of the A line, which showed higher systemic inflammation in both conditions. These findings suggest that the high longevity line LP may have a superior capacity to adapt to environmental stress, with more efficient thermal and inflammatory regulation.

DIFFERENTIAL RESPONSE OF THE GUT MICROBIOME TO HEAT STRESS IN TWO MATERNAL LINES OF RABBITS WITH DIFFERENT LONGEVITY

BIADA I.*¹, IBÁÑEZ-ESCRICHE N.*², GARCÍA M.L.†¹, ARGENTE M.J.†¹, SANTACREU M.A.*¹

*Institute for Animal Science and Technology, Universitat Politècnica de València, 46022, VALENCIA, España. †Departamento de Tecnología Agroalimentaria, Universidad Miguel Hernández de Elche, 03202, ORIHUELA, España.

ibiada@posgrado.upv.es

Heat stress significantly affects livestock productivity and health, particularly in rabbits, due to their physiological vulnerabilities. The objective is to study the relationship between environmental conditions, genetic lines and gut

microbiota. This study investigates the impact of heat stress on the gut microbiome of two maternal rabbit lines: A (standard longevity line) and LP (a robust line founded using longevity criteria). This is carried out by comparing microbial diversity values and testing the classifying ability of microbiota information to predict the genetic lines. Heat stress influenced gut microbiome diversity in both maternal lines, increasing alpha diversity and driving significant beta-diversity shifts ($P < 0.001$). This could be due to intestinal barrier disruption, which may facilitate pathogen proliferation. The high longevity line LP exhibited higher richness under thermal comfort, whereas heat stress equalised these differences between lines, possibly due to increased pathogen proliferation in the low longevity line A. Prediction accuracy and key selected variables distinguishing lines A and LP varied across thermal conditions, with the Area Under the Curve (AUC) exceeding 0.92 under heat stress and 0.87 in thermal comfort. These results reflect distinct gut microbiome regulation between the two lines under heat stress. Notably, potentially stress-associated taxa such as *Erysipelatoclostridium* and *Monoglobus* were more abundant in the less longeval line A. Heat stress significantly influences the gut microbiome of rabbit lines A and LP, inducing notable diversity and compositional changes. These shifts highlight the LP line's greater longevity and expected resilience, in contrast to line A's susceptibility, as reflected in differences in diversity and a higher abundance of potential heat stress-associated taxa in line A.

TRANSITION TO GROUP HOUSING OF DOES IN COMMERCIAL PRODUCTION SYSTEMS

MANUELIAN C.L.*¹, SALAMA A.A.K.*², SUCH X.*³, RUIZ DE LA TORRE J.L.†¹, CASAS C.‡¹, COSTA R.†¹, MORA F.X.*¹

*Dept. Ciencia Animal i dels Aliments, UAB, 08193 Cerdanyola del Vallès, España. †Servei de Granges i de Camps Experimentals. UAB, 08193 Cerdanyola del Vallès, España. ‡Granja Riera, 8480 L'Atmetlla del Vallès, España.

carmen.manuelian@uab.cat

The forthcoming new regulation on rabbit farming is expected to recommend keeping does grouped instead of single-housed. This study compares productivity between single- and group-housed does. Nulliparous does (4.7 ± 0.3 kg) were divided into 3 groups: G1 (8 does individually housed), G4 (4 does/group), and G8 (8 does/group). All does were artificially inseminated (AI) and housed individually for the first 18 d, after which treatments began. G1 were housed in standard individual cages. G4 and G8 were housed in a $1.6 \times 1.5 \times 0.6$ m prototype group housing with individual nests, shared water dispensers and a feeder platform. G1 does' body weight (BW) increased from 1st kindling (4.42 ± 0.15 kg/doe) to

the end of the study (4.91 ± 0.15 kg/does; $P < 0.001$), 1st kindling rate was 63%, prolificity was 10.2 kits/parturition, and 2nd kindling rate was 100%. G4 does BW decreased from 1st kindling (4.71 ± 0.22 kg/does) to the end of the study (4.28 ± 0.22 kg/does; $P = 0.018$), 1st kindling rate was 100%, prolificity was 12.3 kits/parturition, and 2nd kindling rate was 0%. G4 had mild injuries that healed fast with minor alopecia, kindled in separate nests with all kits born alive at the 1st parturition. G8 does' BW increased from 1st kindling (4.41 ± 0.15 kg/does) to the end of the study (4.70 ± 0.15 kg/does; $P < 0.001$), 1st kindling rate was 63% and prolificity was 10.2 kits/parturition, and kindling rate was 12.5%. In G8, fights and injuries started earlier and were more frequent and severe than G4, and 2 does kindled in the same nest. The study ended at 2nd parturition because does in G8 needed to recover from the injuries. Overall, 8 does/group seemed too high as increased aggressions, shared nesting and lower kindling rates were observed. The 4 does/group was promising when grouped once pregnant, but AI in group reduced kindling success.

A STUDY ON HIGHER-WELFARE FARMING SYSTEMS FOR MEAT RABBITS

MURPHY E., MORENO GARCÍA-DONCEL M., BELLEGARDE L., LEGRAND A.

Compassion in World Farming International, Food Business.

maria.moreno@ciwf.org

Rabbits kept for meat production are most commonly housed in small, barren cages. These systems fail to meet basic needs of rabbits (space, comfort, food fibre, gnawing materials, hiding places) and it is impossible for the animals to express behaviours associated with a positive level of animal welfare (play, choice of environment). The potential for animal welfare in cages is limited, and efforts to make improvements have not been effective because the system itself is the limiting factor. A literature review and field trip were conducted to analyse existing non-cage alternatives with the aim of: 1) identifying the non-cage systems that best meet the needs of rabbits; 2) assessing the challenges these systems pose for producers and how they can be mitigated; and 3) identifying the benefits these systems can bring to producers compared to the conventional system. From the literature, a number of non-cage rabbit husbandry systems have been identified, which can be divided into indoor systems (park, pen, pen with litter and pen with winter garden) and outdoor systems (mobile and stationary).

RABBIT MANURE COMPOSTING: EFFECT OF THE APPLIED TECHNOLOGY ON THE PROCESS AND PRODUCT QUALITY

MANRIQUE CÓRDOBA N., SÁNCHEZ-LÓPEZ J.F., ORDEN L., AGULLÓ E., MARTÍNEZ-SABATER E., SÁEZ-TOVAR J.A., GARCÍA-RÁNDEZ A., PÉREZ-MURCIA M.D., BUSTAMANTE M., MORAL R.

Centro de Investigación e Innovación Agroalimentaria y Agroambiental (CIAGRO-UMH), Universidad Miguel Hernández, Carretera de Beniel Km 3,2, ORIHUELA, Alicante 03312, España.

nmanrique@umh.es

Composting is one of the techniques most widely used for organic waste management due to its environmental benefits and its ability to transform wastes into high added-value products. This study investigates the composting of a mixture of manure from intensive rabbit rearing and vine pruning, as well as evaluating its development in two composting systems: open and closed. The open system, known as windrow composting, involves the formation of piles of organic waste in the open air, with mechanised turning to ensure proper oxygenation. It is a cheap and simple method, but it requires large areas of land and, if not managed properly, can produce unpleasant odours and leachates. In contrast, in-vessel composting takes place in reactors that allow precise regulation of key parameters such as temperature, humidity and oxygen levels. This controlled environment increases decomposition efficiency while minimising odours and leachates, making it particularly suitable for urban areas with environmental restrictions. The aim of this study is to compare these two composting methods by assessing the efficiency of the process and the quality of the final composted product. The results of this study have shown the feasibility of both composting systems for rabbit manure management. It is necessary to optimise the design of the compost mixture in order to obtain a compost without any restrictions for agricultural use.

GREENHOUSE GAS EMISSIONS FROM RABBIT MANURE COMPOSTING: ANALYSIS OF CARBON DIOXIDE (CO₂), NITROUS OXIDE (N₂O) AND METHANE (CH₄)

MANRIQUE CÓRDOBA N., SÁNCHEZ-LÓPEZ J.F., ORDEN L., AGULLÓ E., MARTÍNEZ-SABATER E., SÁEZ-TOVAR J.A., GARCÍA-RÁNDEZ A., PÉREZ-MURCIA M.D., BUSTAMANTE M.A., MORAL R.

Centro de Investigación e Innovación Agroalimentaria y Agroambiental (CIAGRO-UMH), Universidad Miguel Hernández, Carretera de Beniel km 3.2, ORIHUELA, Alicante 03312, España.

nmanrique@umh.es

Climate change is one of the greatest environmental challenges and greenhouse gases (GHG) are a major contributor to its aggravation. In this sense, organic waste management through composting allows the recovery of organic waste, but it is also associated with GHG emissions to a greater or lesser extent, depending on the

type of system and the management carried out during the process. The aim of this study was to compare the emissions of GHG (CO₂, N₂O and CH₄) and ammonia (NH₃) during the treatment of rabbit manure in two composting systems: closed (in-vessel composting) and open (windrow composting). The results of this study have shown the variability of the two composting systems in terms of GHG emissions. Future research is needed to evaluate combinations of abatement technologies throughout the organic waste management chain in rabbit production.

NEW SENSORS FOR AMMONIA MONITORING IN RABBIT FARMS

AGEA I.*, SERRANO-JARA D.*, MONFORTE-GÓMEZ B.[†], CORTÉS-BAUTISTA S.[†], ARGENTE M.J.*, CAMPINS-FALCÓ P.[†], GARCÍA M.L.*

*Centro de Investigación e Innovación Agroalimentaria y Agroambiental, CIAGRO-UMH, ORIHUELA, España. [†]Grupo MINTOTA, Departamento de Química Analítica, Facultad de Química, Universidad de Valencia; Dr. Moliner, 50; 46100 BURJASSOT, España.

iagea@umh.es

Monitoring ammonia levels inside rabbit farming facilities is essential both for animal welfare and to assess workers' exposure. The MINTOTA-UV group from the University of Valencia has developed ammonia sensors previously tested in poultry farms. This study aims to determine whether NH₃ControlFarm sensors effectively measure and control the atmosphere in rabbit housing. Sensors were installed in both maternity and fattening units. Ammonia concentrations were measured using the SpectroFree-MINTOTA application and validated in the laboratory through diffuse reflectance spectrophotometry. Results showed that all sensors in both facilities detected ammonia levels below the established safety threshold of 10 ppmv. In conclusion, NH₃ControlFarm sensors have proven effective in monitoring ammonia levels in rabbit housing environments.

EFFICACY OF THE PASSIVE IMMUNITY AGAINST RHD IN RABBIT KITS WHEN BREEDING DOES ARE VACCINATED WITH YURVACR RHD

PEROZO E., FONTSECA M., ACAL L., GASCÓN-TORRENS S., MARCH R., SITJÀ M.

HIPRA, Avinguda de la Selva 135, 17170, AMER, Spain.

sandra.gascon@hipra.com

YURVACR RHD is a recombinant vaccine intended for active immunisation of rabbits from the age of 30 d to reduce rabbit hemorrhagic disease (RHD) mortality caused by the classical RHD virus and variant strains (RHDV2),

including highly virulent strains. The passive immunity against Rabbit Haemorrhagic Disease (RHD) of young rabbits acquired from does vaccinated with YURVACR RHD was evaluated. The study was carried out using the subcutaneous route and administering one single dose to does. Efficacy was evaluated by means of an experimental challenge with RHDV2, performed in the offspring of the vaccinated does, at 30 d of age. The results obtained in this trial fully support the efficacy of the passive immunity in reducing mortality caused by RHDV2 in the offspring of breeding does vaccinated with YURVACR RHD.

GENOMIC ADAPTATION OF *STAPHYLOCOCCUS AUREUS* IN RABBITS: WHAT MAKES RABBIT STRAINS UNIQUE COMPARED TO OTHER ANIMALS?

DÍAZ-MÉNDEZ J.F., MASCARÓS P., MARTÍNEZ-SEIJAS C., ARNAU A., SELVA L., CORPA J.M., VIANA D.

Grupo de investigación "Patología y Sanidad Animal", PASAPTA, Instituto de Ciencias Biomédicas, Facultad de Veterinaria, Universidad Cardenal Herrera-CEU, CEU Universities, c/ Assegadors no 2, 46115 ALFARA DEL PATRIARCA, Valencia, Spain.

jose.diazmendez@uchceu.es

Staphylococcus aureus is a major pathogen in livestock, causing significant economic losses due to infections in ruminants, pigs, poultry and rabbits. In this study, 1,889 *S. aureus* strains isolated from six animal species were bioinformatically analysed. A total of 105 sequence types (STs) were identified, with variable distribution among hosts. ST398 was the most frequent and was detected in cattle, pigs, rabbits and poultry, suggesting a recent epidemiological expansion. Rabbits exhibited the highest genetic diversity, with 34 unique STs, particularly clones ST3764 and ST121, indicating a specific adaptation of *S. aureus* to this host. Antimicrobial resistance genes (AMR) analysis revealed that rabbits and pigs harboured the highest AMR gene burden, with a notable prevalence of sulphonamide and phenicol resistance genes in rabbits. The exclusive presence of the CRISPR-Cas type III-A system in rabbit isolates suggests an adaptation to specific selective pressures, such as phages or plasmids. Additionally, capsule type 8 genes were highly prevalent in rabbits (~87%), potentially contributing to bacterial persistence in this host. These findings highlight the genetic diversity and adaptability of *S. aureus* across different hosts, emphasising the role of rabbits as reservoirs of antimicrobial resistance and virulence genes, with significant implications for animal health and biosecurity.

EXPLORING STRAIN AND ANTIMICROBIAL RESISTANCE DIVERSITY OF *STAPHYLOCOCCUS AUREUS* IN RABBIT FARMS

MASCARÓS P., DÍAZ-MÉNDEZ J.F., MARTÍNEZ-SEIJAS C., ARNAU A., SELVA L., VIANA D., CORPA J.M.

Biomedical Research Institute, PASAPTA-Pathology Group, Facultad de Veterinaria, Universidad Cardenal Herrera-CEU, CEU Universities, C/Tirant lo Blanc 7, Alfara del Patriarca, 46115 VALENCIA, Spain.

patricia.mascarosnunez@uchceu.es

In this study, 125 *Staphylococcus aureus* samples were analysed from rabbits and farm workers in close contact with them. A total of 22 sequence types (STs) were identified, belonging to 11 clonal complexes (CCs). The most frequently detected CCs in rabbits were CC121 and CC96, while in humans, CC96 was the most prevalent, followed by CC121 and CC398. In 17 out of the 37 farms analysed, workers carried strains with the same CCs and STs as the rabbits on the same farms, and in two cases, their average nucleotide identity was 100%. Additionally, all human strains belonging to CC121 carried the *dlb* sequence characteristic of rabbits, suggesting a possible transmission from the animals. The antimicrobial resistance analysis revealed no significant differences in 5 of the 9 antimicrobial groups tested between both populations, indicating a potential transfer of strains or genetic material. Furthermore, a higher proportion of resistant strains within a specific antimicrobial family was associated with greater diversity of resistance genes, which could enhance their persistence, dissemination and transmission among hosts.

CLINICAL CASE OF PROLIFERATIVE ENTEROPATHY DUE TO *LAWSONIA INTRACELLULARIS*. HOW IMPORTANT IS IT IN RABBIT BREEDING?

SANZ C.*, SÁNCHEZ DEL CUETO M.†

*Exopol. Pol. Río Gállego, D-14. 50840, SAN MATEO DE GÁLLEGO, Zaragoza, España. †Cogal Soc. Coop. Gallega. C/ Alceme. 36530, RODEIRO, Pontevedra, España.

csanz@exopol.com

Proliferative enteropathy or ileitis is a digestive disease that is characterised by intestinal mucosa thickening due to epithelial cell proliferation of the intestinal crypts in the final part of the small intestine. The etiological agent is *Lawsonia intracellularis*, an obligate intracellular bacterium. Although swine is the most important host, *L. intracellularis* can affect other species, including rabbits. It has been shown to cause acute typhlitis, histiocytic enteritis, enterocolitis and proliferative enteropathy. In the acute form, there are reports of high mortality due to diarrhoea in neonatal, young and adult rabbits. Otherwise,

rabbits with chronic lesions may present thickening of the small intestine. This paper presents a clinical case where the presence of *L. intracellularis* was confirmed histopathologically and by real-time qPCR in digestive samples from young and adult rabbits that presented atypical haemorrhagic and watery diarrhoea. Proliferative enteritis due to *L. intracellularis* is rarely diagnosed in rabbit farms. This pathogen has great clinical relevance in species such as swine, while few studies have been reported in rabbits. However, in affected farms, it causes significant economic losses due to high mortality and costs of treatment.

FUSOBACTERIUM NECROPHORUM IN RABBIT PRODUCTION, A CLINICAL CASE IN AN INDUSTRIAL RABBIT FARM

MALO M.

Nutega Huesca S.L., Guco S.Coop. Mesenor S.Coop), Grasa J.R. (Nutega Huesca S.L.)

mmalomartinez@yahoo.es

Fusobacterium necrophorum infection in rabbit farming has been described for many years as a complicating factor for other diseases, but this germ is not commonly found on industrial farms. This clinical case specifically concerns an established industrial farm (which inseminates approximately 800 rabbits) affected by *Fusobacterium necrophorum*, and we have not been able to identify any other primary causative agent.

ARTIFICIAL INTELLIGENCE IN RABBIT FARMING: PATHOLOGY PREVENTION IN AN ANTIBIOTIC REDUCTION ENVIRONMENT. A PRACTICAL CASE

CASTELLNÓU J.E.*, CARVALHO A.*, MARCO M.†, FERNÁNDEZ X.M.*

*Veterinario. Servicio Técnico Nutreco Animal Nutrition Iberia. †Veterinario. Rabbit Technical Manager Nutreco Animal Nutrition Iberia.

je.castellnou@nutreco.com

Rabbit farming pathology control in a mandatory antibiotic reduction environment is a must if we want our farms to survive. Adopting artificial intelligence in farm management allows for early detection of pathology onset and helps preventing disease with a precise and minimal use of antibiotics. We have been training our ML model to predict rabbit batch mortality and to yield data on how and when to intervene to avoid it.

FREQUENT MYXOMATOSIS VACCINATION WITH MIXOHIPRAR-H DOES NOT REDUCE THE PRE-EXISTING ANTIBODY RESPONSE

BARATELLI M.*, PRIETO-QUIROGA C.[†], GARCÍA-PARIENTE C.[†], GULLÓN-ÁLVAREZ J.[†], SÁNCHEZ-DEL-CUETO-LOSADA M.[†], RAMÍREZ-OLIVERAS S.*, GASCÓN-TORRENS S.*

*HIPRA, AMER, Girona, Spain. [†]COGAL Sociedad cooperativa Gallega, RODEIRO, Pontevedra, Spain.

sandra.gascon@hipra.com

Myxomatosis is a prevalent disease in European regions such as Spain, necessitating year-round protection for adult rabbits. Although licensed live attenuated vaccines are recommended biannually, there is a common practice of administering vaccines at reduced intervals to maintain herd immunity during high breeder rabbit replacement rates. However, there are concerns about the potential decrease in myxomatosis virus (MYXV) antibodies due to induced tolerance or immunosuppression as a result of frequent vaccinations. The aim of this study, conducted on a rabbit farm in Spain, was to investigate these concerns by comparing antibody responses generated through different revaccination programmes. Replacement breeder rabbits were divided into three groups and revaccinated at varying intervals, with blood samples collected periodically up to 9 mo post-vaccination. Antibody responses against MYXV were assessed using an indirect ELISA, and statistical analyses were performed to compare the results between the groups. The initial vaccination induced an antibody response in all groups. Comparisons of groups revaccinated at shorter intervals with the standard interval group revealed no statistically significant differences. This suggested that frequent revaccination did not decrease the existing antibody response, although no boost was observed. The findings suggest that frequent revaccination could be a strategy to maintain proper immunity on farms facing challenging disease and management situations, preventing the emergence of subpopulations of negative animals. Further research is needed to understand the boosting effects on vaccine protection and other components of the immune system, as the antibody response alone may not be a reliable correlate of protection.

EFFICACY EVALUATION OF YURVACR RHD AGAINST A CURRENT HIGHLY VIRULENT RHDV2 STRAIN

PEROZO E., FONTSECA M., NADAL G., MONTBRAU C., GASCÓN-TORRENS S.*, MARCH R., SITJÀ M.

HIPRA, Avinguda de la Selva 135, 17170, AMER, Spain.

sandra.gascon@hipra.com

YURVACR RHD is a new recombinant vaccine intended for active immunisation of rabbits from the age of 30 d to reduce mortality caused by classical Rabbit Haemorrhagic Disease (RHDV) and the variant (RHDV2). In 2010, a variant of the virus (RHDV2) emerged, spreading worldwide within a short period of time and showing higher prevalence than RHDV isolates in kits and adult rabbits. But one of the most relevant characteristics of this pathogen is that it affects rabbit kits. Recently, an increase in the pathology of current strains was reported. For this reason, the efficacy of a dose of YURVACR RHD was evaluated against a highly virulent currently circulating strain of RHDV2. The study was carried out with the subcutaneous administration of a single dose to 30-day-old rabbits. Efficacy was evaluated by an experimental challenge against a highly virulent RHDV2 strain isolated in The Netherlands in 2022, performed 14 d after vaccination. The results obtained in this trial fully support the efficacy claims of reducing mortality caused by highly virulent strains of RHDV2, demonstrating the efficacy of the vaccine.

SEROLOGICAL EVIDENCE OF EFFECTIVE RHDV VACCINATION BY YURVAC RHD IN 53 DOES, WITH DIFFERENT AGE GROUPS, IN AN INDUSTRIAL RABBITRY

PINTO F.F.*^{†§}, ABRANTES J.*^{§#}, FERREIRA P.G.*^{†||§}, LOPES A.M.*^{†§¶}, PEREIRA L.*[§], MARCOS R.*[§]

*HIPRA, MALVEIRA, Portugal. [†]UMIB - Unit for Multidisciplinary Research in Biomedicine, ICBAS - School of Medicine and Biomedical Sciences, University of Porto, PORTO, Portugal. [‡]CIBIO - Centro de Investigação em Biodiversidade e Recursos Genéticos, InBIO Laboratório Associado, Universidade do Porto, VAIRAO, Portugal. [§]BIOPOLIS Programme in Genomics, Biodiversity and Land Planning, CIBIO, VAIRAO, Portugal. [#]Departamento de Biologia, Faculdade de Ciências, Universidade do Porto, PORTO, Portugal. ^{||}ITR - Laboratory for Integrative and Translational Research in Population Health, University of Porto, PORTO, Portugal. ^{||}RISE - Health Research Network, University of Porto, PORTO, Portugal. [¶]ICBAS - School of Medicine and Biomedical Sciences, University of Porto, PORTO, Portugal.

filipe.pinto@hipra.com

Rabbit Haemorrhagic Disease (RHD) is a highly fatal and contagious viral disease caused by *Lagovirus europaeus*, a member of the *Caliciviridae* family. Since its first detection in China in 1984, the RHD virus (RHDV) has spread globally, leading to high mortality rates in both wild and farmed rabbits. Two pathogenic serotypes, Gl.1 and Gl.2, have been identified, with Gl.2 emerging in 2010 as a highly transmissible variant affecting a broader host range, including young rabbits. Various studies have demonstrated an increase in the virulence

of Gl.2 serotypes, emphasising the need for new vaccination strategies. This study evaluated the immune response of 53 breeding does from different age groups in an intensive rabbit farm in Braga, Portugal, following vaccination with YURVAC RHDR (HIPRA Laboratories). An indirect ELISA assay was performed to determine antibody levels against Gl.1 and Gl.2. The results showed a 100% seroconversion rate, with high IgG titres across all analysed individuals, indicating a strong and sustained humoral immune response. No significant differences in antibody levels were observed between young and adult does, demonstrating that age did not impact vaccine efficacy. These findings confirm the effectiveness of YURVAC RHDR in eliciting robust immunogenic responses against Gl.1 and Gl.2. Vaccination remains the most effective method for RHD control. Future studies to optimise vaccination strategies in commercial rabbit farming should focus on long-term antibody kinetics and interactions between vaccine-induced immunity and non-pathogenic Lagoviruses, as well as the duration of maternal immunity in kits.