

**NATIONAL RESEARCH-
DEVELOPMENT INSTITUTE
FOR ANIMAL BIOLOGY AND
NUTRITION**



**12th International Symposium of
Animal Biology and Nutrition**

Book of Abstracts

**Balotești, Romania
November 14, 2014**

NATIONAL RESEARCH DEVELOPMENT INSTITUTE FOR ANIMAL BIOLOGY AND NUTRITION – INCDBNA - BALOTESTI: PAST, PRESENT AND PROSPECTS

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The presentation makes a brief history of the National Research Development Institute for Animal Biology and Nutrition-Balotesti followed by a general presentation (objectives, structure, research directions, etc.). It underlines the main outcomes of the institutional reform that was self-assumed by the institute at the end of the 90s and the breakthrough towards integration into the European Research Area (quality of RD activity, international projects, publication in high quality journals, contribution to research programming, etc.).

It also highlights some of the main results obtained by the institute along the years: from the development of the Romanian feeding system to the solutions offered to the farmers to counteract the side-effects of the ban of feeds of animal origin or to increase the competitiveness and compliance with EU standards.

Keywords: IBNA Balotesti, achievements, research directions, prospects

PRESENTATION OF EUROPEAN PROJECTS

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The presentation is an overview of some European projects in which the National Research Development Institute for Animal Biology and Nutrition-Balotesti was involved: FP7 “Solid”; Eureka “Vegg4Egg”; FP7 “Foodseg”; Erasmus+ “LiveNutrition”; Cost “PigGut”; Cost “DairyCare”; Danube Strategy “DannuInteg”.

Keywords: IBNA Balotesti, European projects, overview

A UNITED KINGDOM MICROBIOLOGICAL SURVEY OF PRE-PACKED READY-TO-EAT SLICED MEATS AT RETAIL IN SMALL TO MEDIUM SIZED ENTERPRISES

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A Health Protection Agency (UK) study of human listeriosis in England (2001-2007) found that the study cases (particularly the elderly who are a high risk group) were more likely to purchase foods from smaller convenience stores than the general population. Therefore this Food Standards Agency funded survey, FSA project FS241042, had the primary objective of determining the prevalence and levels of bacterial contamination in ready-to-eat (RTE) cooked and cured sliced meats at retail sale in small to medium sized enterprises (SMEs). A previous FSA survey of retail cold sliced meats with particular reference to *L. monocytogenes* was based on market share (B18024) and therefore the majority of samples were collected from the large retailers. Further, that survey did not sample fermented and cured meat products, but these were included in this survey.

In total, 1,049 samples of pre-packed ready to eat sliced meats purchased in SME's in the UK were examined for *Listeria* spp. using detection and enumeration methods based on BS EN ISO 11290-1:1997 and BS EN ISO 11290-2:1998 respectively. Samples were also examined to determine numbers of the hygiene indicator organisms *Escherichia coli* (BS EN ISO 16649-2:2001) and *Enterobacteriaceae* (BS EN ISO 21528-2:2004) as well as for a range of physical characteristics including salt content, water activity (a_w) and pH. The surface temperature of the packs of meat at the time of sampling was measured and recorded, as were a range of other details including price, 'use-by' date and storage instructions.

Overall, *Listeria monocytogenes* was detected in 3.8% of samples and *Listeria* spp. were detected in 7.0% of samples. *Enterobacteriaceae* were enumerated from 36.2% of samples and the mean log count (\log_{10} cfu/g) was 2.96 ± 1.47 . *E. coli* were enumerated from five samples (0.48%). The mean temperature of the samples was 6.80°C, with 71.3% of samples above the industry guideline of 5°C and 32.7% being stored above 8°C. The mean pH of the samples was 6.09, and the mean a_w was 0.98. The mean remaining shelf life was 13.8 days, and 75.1% of samples had 14 days or less of shelf life remaining.

Samples came from 96 EU processors and chemical analyses indicated conditions appropriate for the growth of *Listeria* species. *Listeria* were isolated from the products of 27% of the producers sampled. Product from 23 processors showed a mean *Listeria* prevalence of 25%, indicating significant hygienic shortcomings in the production processes. Therefore a minority of processors appear to be manufacturing pre-packed ready to eat sliced meats of unacceptable quality, based on Guidelines issued by the Health Protection Agency in 2009.

The survey found that most of the meat products were stored at temperatures above the industry guidelines, and this, combined with the relatively high prevalence of *Listeria monocytogenes*, in comparison with the previous FSA survey, could put consumers in vulnerable groups at risk. There

is a need to inform and train retail SME staff about appropriate maintenance and control of refrigerated display cabinets. The manufacturers producing unacceptable RTE meats will require investigation with appropriate corrective actions being taken.

Keywords: bacterial contamination, ready-to-eat sliced meats, human listeriosis

OCHRATOXIN A AND IMMUNITY - IMPLICATIONS FOR HEALTH

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Ochratoxins are fungal secondary metabolites produced during storage by fungus of the genera *Aspergillus*, mainly in tropical and warmer regions and by *Penicillium verrucosum*, in temperate and colder areas. Although toxic and carcinogenic effects of OTA are known, there have been very few, sometimes contrasting, reports on the mechanisms underlying its immunotoxicity. However, experimental studies indicated that OTA modulated the immune response even at levels below the toxicity threshold. In the present study, we have analysed the effect of OTA on the cell viability, synthesis of some inflammatory (TNF-alpha, IL-1 beta and IL-8) and anti-inflammatory (IL-10) cytokines and on the expression of some mitogen-activated protein kinases involved in the cell growth, differentiation and apoptosis: extracellular signal – regulated kinases (ERK1 and 2), c-Jun amino-terminal kinases (JNK 1, 2 and 3) and p38 MAPK.

For this purpose, porcine epithelial cells (IPEC-1 and LLC-pK) were treated or not with 1µg/mL OTA for 3, 6 and 24h at 37°C. Cell viability was determined using an MTT test and cytokine synthesis was determined in the supernatant of the cell culture by ELISA using commercial kits. Gene expression was assessed through real time PCR assay. The relative product levels were quantified using the 2^{-ΔΔ CT} method. OTA induce a significant (P<0.05) decrease of the cell viability in both cell lines, the mycotoxin cytotoxic effect being more pronounced for IPEC cell line. Cytokine synthesis, as investigated in the cell supernatant, after 3h, 6h and 24h of exposure, revealed that OTA induced a significant decrease (P<0.05) of inflammatory cytokine synthesis after 24h exposure to 1 µg/mL OTA. No effect was observed for the IL-10 synthesis. High OTA concentrations (10-100µg/mL) induced a decrease of the ERK1, 2 and p38-MAPK expression, as MAPKs/the kinase involved in cell proliferation and in apoptosis and inflammation.

Taken together these results suggest that OTA affect cell immunity through mechanisms involving MAPKs pathways.

Keywords: ochratoxin A, IPEC-1, LLC-pK, cell immunity, MAPKs pathways

GENOMIC SELECTION IN DAIRY CATTLE

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In a pilot study 200 Holstein cows in Lithuania were selected for dairy genomic profiling (Igenity SNP panel) - productive life, fertility, dairy form, somatic cell count, milk, fat, fat %, protein, protein %. Markers for coat color, cheese important proteins – Kappa Casein, Beta Casein, Beta Lactoglobulin, and heritable diseases – BLAD, DUMPS and CVM were tested.

Genotyping was performed by Igenity SNP panel. 19.5 % of tested cows had B allele of Kappa casein. 12 % of cows had BB genotype of Beta Lactoglobulin, 26.5 % AB genotype of Beta Lactoglobulin. No cows with DUMPS have been found, but 1 carrier of BLAD allele and 2 carriers of CVM were detected which gives us indication of having carriers of genetic diseases in cow population causing calf death. 15 to 11 % of tested cows had high genomic values in different traits rating in Igenity dairy cattle reference group.

Genomic profiles have been rated by Igenity software giving different value for traits: 25 % for milk kg, 15 % for milk fat, 15% milk protein, 15% somatic cell count, 15 % for longevity, 15% dairy form. Economic effects have been calculated for rated genomic values for each cow.

Keywords: cattle, genomic profiling, Igenity

NATURAL SOURCES OF B-CAROTENE AND LYCOPENE IN LAYING HENS' NUTRITION

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Eggs morphological characteristics under influence of natural products *VITATON* (biomass of microscopic fungi *Blakeslea trispora* with 7.2% β -carotene) and *TOMATO OIL* (with 1.5% β -carotene, lycopene 0.5%, 1.7% phytofluene), produced by *LYCORED Ltd*, Israel was made. Special attention was paid to the egg yolk color. An experiment was conducted with 100 laying hens at the age of 38 weeks from hybrid combination *LOHMAN BROWN*, randomly distributed in five groups – control and four experimental groups. All birds received 100g/day of one and the same compound feed for laying hens.

The ration was formulated to contain 19.33 % crude protein, 4.81% crude fibre, 2.71% crude fat and metabolizable energy 2584 kcal/kg. The hens from Ist and IInd experimental groups received in daily dose 0.07% and 0.035% respectively *VITATON* and those from IIIrd and IVth groups – 0.2% and

0.1% respectively *TOMATO OIL* with the diet for a period of 30 days. The indices yolk color (Roche), form index, Haugh unit, the weights (egg, egg shell, yolk and albumen), shell thickness, content of Ca and P were controlled once weekly on 30 eggs from each group.

The egg yolk pigmentation obtained in experimental groups was more intensive by 1.37, 0.85, 5.80, 5.13 units (the Roche's scale) for Ist, IInd, IIIrd and IVth treated groups respectively to the control group. The differences on this parameter were significant (P<0.001 for Ist, IIIrd and IVth groups and P<0.01 for IInd group). Egg shell weight in all treated groups was significantly higher (P<0.001) in comparison to control group. There are significantly increase of egg weight (P<0.001 for Ist, IInd and IVth experimental groups), albumen and yolk weight (P<0.05; P<0.01; P<0.001 for Ist, IInd, IVth experimental groups respectively) relative to the control group. *VITATON* and *TOMATO OIL* have no effects on the form index, Haugh unit, egg shell thickness and content of Ca and P.

Keywords; β -carotene, lycopene, laying hens, nutrition, yolk color, egg morphological characteristic

VIRULENCE CHARACTERISTICS OF *CAMPYLOBACTER JEJUNI* ISOLATES FROM THE WEST PART OF ROMANIA

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Campylobacter enteritis has emerged as one of the most common forms of human diarrheal illness. In this study we have investigated the virulence potential of five new *C. jejuni* chicken isolates (RO14, RO19, RO24, RO29 and RO37) originated from private households in the rural regions of Banat and Transylvania in Romania. Following isolation and in vitro virulence assay, on HCT-8 cells, our results show that all the *C. jejuni* chicken isolates overcome the virulence abilities of the highly virulent strain *C. jejuni* 81-176. Motility, an important virulence factor was significantly improved in all the new chicken isolates. The ability to survive to the antimicrobial activity of the human serum, to resist to the violent attack of bile acids and to survive in the presence of synthetic antibiotics was increased in all the chicken isolates. However, these were statistically significant only for isolates RO29 and RO37. In conclusion our study shows, based on invasiveness and motility, and also on the data provided by the serum and bile resistance experiments that all the new chicken isolates are able to infect human cells, in vitro, and could potentially represent a health hazard for humans.

Keywords: *Campylobacter* enteritis, health hazard, *C. jejuni*, chicken isolates

HORMONE FREE-BASED AI PROTOCOLS FOR INDUCING AND SYNCHRONISING OVULATIONS IN OUT OF BREEDING SEASON AT CARPATHIAN GOAT

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The main objectives of the study was to master the use of the 'male effect' combined with light treatment as a means to induce synchronous ovulation in dairy goats for optimal efficiency of artificial insemination during and out of the natural reproduction season. Experiment started at Middle February in 2 farms, on 50 goat Carpathian breed /farm. All the goats were submitted to photoperiod conditions with 90 LD and 60 SD (using melatonin implants). To obtain the male effect the goats were isolated from males at the beginning of SD treatment. The males were introduced after 60 days of SD treatment (day 0) with aprons and starting day 5 with the aprons markers. The oestrus detection was performed twice a day from D5 in order to determine the moment in which 50% of goats are marked. Half of marked goats were inseminated 12h after positive detection and the rest were inseminated 24h later. 45 days after insemination of goats, all goats were examined by ultrasonographies for pregnancy diagnosis. Occurrence of oestrus at goats was 64% (32/50) for each farms. Pregnancy rate for goats inseminated at 12 h was 80 % (21/30) and for 24 h lot was 89.28 % (25/28). Mean of prolificacy was 150% (69/46), 147.61% for 12h lot and 152% for 24 h lot, respectively.

Keywords: male effect, photoperiod, oestrus, artificial insemination

ENVIRONMENTAL IMPACT IN USING POULTRY MANURE AS ORGANIC FERTILIZER

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This paper presents the environmental risk factors and the possible negative impacts on the environment from intensive farming of laying hens in storage conditions and valorization of poultry manure as natural fertilizer. The experiments and the analytical determinations were performed in the second phase of the project with the acronym VITAOU within PN II INNOVATION program, experimenting the first set of four innovative nutritional solutions for laying hens. The environmental risk factors are the existing pollutants in poultry manure: nitrogen and phosphorus

compounds, heavy metals and pathogens. The obtained results show that the concentration of these elements in poultry manure is well below the limits imposed by environmental legislation. Therefore the poultry manure may become polluter only when failure to comply the good agricultural practices of fertilization. Comparing the concentration values of the four nutritional solutions with the concentration values obtained for the reference recipe was carried out a ranking of the nutritional solutions in terms of environmental impact in order to choose the best two nutritional solutions based on quality/cost/environmental impact performance.

Keywords: pollution, risk factors, environmental impact, concentration, heavy metals, limit values

THE EFFECTS OF ZEARALENONE ON INFLAMMATORY RESPONSES IN SWINE LIVER AND SPLEEN – A COMPARATIVE STUDY

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Zearalenone (ZEA) is an estrogenic mycotoxin produced by *Fusarium graminearum* and by other *Fusarium* species. ZEA is commonly found as contaminant of stored grain and has chronic estrogenic effects on mammals, being a risk factor from both public health and agricultural perspectives. Also, ZEA and its derivatives may have divergent effects on important parameters of swine innate immunity. For ZEA and other *Fusarium* contaminants the tolerance limits are regulated by the European Commission only by recommendation CE/576/2006, which means that new experimental evidences (in-depth investigation at the cellular level) are required.

Starting from these evidences, a feeding trial was conducted to evaluate the effect of a ZEA-contaminated diet on performance and inflammatory responses in young pigs. Corn contaminated with ZEA (250 ppb) was included in the diet, and given to 5 weaned piglets for a period of 18 days. A group of 5 piglets which received uncontaminated diet was used as control group.

The aim of the present study was to evaluate the effects of ZEA on several inflammatory-related markers in liver and spleen tissue isolated from weaning pigs taking into account the important roles of these organs in the animal physiology: liver as the centre of general metabolism and spleen as one of the most important organs of the immune system. Effects of ZEA on gene expression and protein level of metalloproteinases (MMP2 and MMP9), their inhibitors (TIMPs), pro- and anti-inflammatory cytokines was measured by using Real-Time PCR and proteomic techniques (gelatin-zymography and ELISA).

Our results showed that a concentration of 250 ppb ZEA decreased MMPs (MMP- and MMP-9) gene expression, correlated with an increase in TIMPs (TIMP-1 and TIMP-2) mRNA both in liver

and spleen samples. ZEA contaminated diet induced at spleen level an increase of several pro-inflammatory cytokines gene expression (TNF α : 2.34; IL-8: 2.05; IL-6: 1.34 and IL-1 β : 2.40 fold change, respectively), with no effect on IFN γ , IL-4 and IL-10 mRNA. By contrast, at hepatic level, ZEA diet induced a dramatically reduction of pro-inflammatory cytokines gene expression (TNF α : 0.16; IL-8: 0.36; IL-6: 0.09; IL-1 β : 0.15 and IFN γ : 0.11 fold change, respectively) in the liver of experimentally intoxicated animals. The cytokine protein levels and MMPs secretion and activity, both in liver and spleen tissues of animals fed ZEA diet had pattern similarly with mRNA described above.

In conclusion, our study shows that ZEA altered several parameters of the inflammatory response both in liver and spleen. The mechanism of action of ZEA seems to be organ-specific, with activation of inflammatory processes in spleen as important centre of immune responses, or reduction of these processes in liver, associated with immunosuppression. Supplementary in-depth studies must be performed in order to determine immunotoxic effects of ZEA at cellular and molecular level.

Keywords: pigs, zearalenone, inflammatory response, liver, spleen

THE USE BLOOD GROUPS WITH INDIVIDUAL SELECTION OF CATTLE

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In this article presents the results of studies on the use of alleles AEB- locus of blood groups in individual selection of cattle in the herd STE "Maximovca". For individual fastening have been selected for 2 bull-producer - Academic 767 and Kiperush 79/395360, which are improvers on complex traits categories A₂B₂.

The productivity of their mothers was 9331 kg of milk fat content of 4.90% and 10915 kg of milk with 4.42 percent of fat, respectively.

Do bull Academician 767 allele EAB locus – B₂O₁/G₂Y₂E'₁Q', of the bull Kiperush 79 – G₂Y₂ E'₁Q'/G ". Heifers (the mother of the future bulls) belonged to the lines Rozeyf Siteyshn 2,671,510, Montvik Chifteyn 95679, Pawni Farm Arlinda Chif 1,427,381, of which 47% - marked allele B₂O₁, 20.0% - allele G₂Y₂E'₁Q' and 35.4% of the animals are marked by other alleles. The genetic distance between the lines, which include dockable bulls and heifers a large, order to avoid in the future inbreeding.

Keywords: genetic markers, selection, alleles, sire, cows, heifer

USE OF THE “DYNAMIC EFFECT” OF FLUSHING TO INCREASE THE FERTILITY RATE OF EWES FROM PLEVEN BLACKHEAD BREED

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The aim of the present study was to determine the effect of 2 week extensive feeding, so called “dynamic flushing effect”, on the fertility rate of ewes. The experiment has been carried out with 164 Pleven Blackhead ewes from one flock, divided into two groups. Both groups were equalized by age, body weight, body condition score (BCS) (5 point scale) and fecundity from the previous lambing. The BCS and live weight of all ewes was assessed and recorded twice, at the beginning of the experiment and two weeks later, after the end of flushing.

The first group of 82 ewes with average BCS 2.93 and mean live body weight of 58.8 at the beginning of the experiment, served as a control. The second group of 82 ewes with average BCS 2.94 and mean live body weight of 59.5 was put on an extensive feeding. Ewes from both groups received 300 g barley per day while the experimental group received an additional 500 g pea for two weeks. The experiment was conducted in the beginning of the natural breeding season of ewes. The artificial insemination started at 08.08.2013.

At the second measurement of BCS and live body weight, it was observed a slight increase of these two parameters (BCS-3.11; live weight-60.8) of ewes from the experimental group, while at the control group practically there were no any significant changes (BCS-2.91; live weight-58.5). The increase of BCS and live weight could be associated with the applied extensive feeding for two weeks. It was found that the ewes from the experimental group had significantly higher biological fecundity (number of born live and dead lambs per 100 lambing ewes) (132.9 vs. 116.2) and industrial fecundity (number of born live lambs per 100 ewes in the flock, in this case in the group) (117.1 vs. 102.4) than the control group.

The effect of flushing is an increase in the number of lambs with 16.7 and 14.7% respectively. It was concluded that extensive feeding for two weeks at the beginning of a breeding period of the ewes with BCS approximately 2.9 could improve the fertility rate of ewes.

Keywords: flushing, dynamic effect, fertility rate, body condition score, ewes

PRELIMINARY RESEARCH ON THE USE OF WINERY BY-PRODUCTS IN LAYER DIETS HIGH IN UNSATURATED FATTY ACIDS

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The consumers are increasingly interested to use in their daily diet foods (of vegetal or animal origin) rich in polyunsaturated fatty acids, omega 3 acids particularly, because of their beneficial effects on human health (coronary diseases, asthma, diabetes, mental health, depression included). The enrichment of animal products in polyunsaturated fatty acids can be done nutritionally, using feedstuffs with high concentrations in omega 3 acids in animal diets. As the proportion of dietary polyunsaturated fatty acids increases, their oxidation also intensifies, which is why the diet needs feed additives with antioxidant properties. The antioxidants inhibit oxidation by their reaction with the free radicals that form at the beginning of the oxidation processes, thus blocking the formation of fatty acids radicals and terminating the reaction chain. The current trend is to replace the synthetic antioxidants butylated hydroxyanisole (BHT), tertiary butyl hydroquinone (TBHQ) and dodecyl, propyl and octyl galate, vitamin E and ascorbic acid, with natural antioxidants such as plants and plant extracts (oregano, rosemary, savory etc.), or with winery by-products which, due to their large amounts of polyphenols, are a rich source of bioactive compounds with antioxidant, anticancer, antimicrobial and anti-inflammatory properties. The purpose of our investigation was to determine the effect of the dietary grape seeds cakes, a winery by-product, included in layer diets high in polyunsaturated fatty acids, on layer performance. The 4-week trial used Leghorn layers, aged 52 weeks, assigned to 2 groups (C and E), with 26 layers per group. Unlike the diet for group C, the diet for group E included 2% grape seeds cakes. The birds had free access to the food and water. Both the grape seeds cakes and the two diets were assayed for their content of main nutrients (protein, fat, fibre), of fatty acids and antioxidant capacity. The following parameters were monitored throughout the experimental period: average daily feed intake (g/bird/day), feed conversion ratio (g feed/g egg mass), laying percentage and average egg weight.

Keywords: winery by-products, laying hens, diets, unsaturated fatty acids

COMPARATIVE STUDY *IN VIVO* AND CARCASS MEASUREMENTS FOR EVALUATION OF MEAT PRODUCTION ON TELEORMAN BLACKHEAD LAMBS

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In this study we compare ultrasound with carcass measurements in order to make a better evaluation of lambs' carcass quality and to keep the best individuals on reproduction. The experimental measurement were carried out on Teleorman Blackhead lambs at birth (5.10 kg BW) and after 2.5 months (22.84 kg BW). Ultrasound measurements were done in two points on *Longissimus Dorsi* muscle highly correlated with a very good meat production. Four ultrasound parameters were measured: subcutaneous fat thickness (2.21 and 2.03 mm), muscle depth (20.8 and 19.54 mm), eye muscle area (8.93 and 8.71 cm²) and eye muscle perimeter (121.97 and 121.57 cm). Lambs were slaughtered and the following carcass parameters were determined: commercial yield (51.66 %), slaughter yield (45.32 %) and meat bone ratio (2.07:1) as well as meat commercial cuts: leg, loin, rack represented 33.3 %, 7.63 % and 13.43 % respectively from the carcass weight. Correlations were calculated between ultrasound parameters and carcass measurements. Our results showed strong correlations between carcass weight and fat thickness (0.78) and carcass weight and muscle depth (0.75) in the first measurement point (P1). Medium correlations were found in the second point for same parameters (P2) (0.57, 0.43). Also strong correlations were found between carcass weight and eye muscle area in P1 and P2 (0.88, 0.83) and between carcass weight and the perimeter of eye muscle area in P1 (0.87). Leg weight measured at slaughter was highly correlated with eye muscle area (0.90, 0.88) and eye muscle perimeter (0.85, 0.73) measured by ultrasound. Taking into consideration the good correlations between the two methods used in this study we consider that the evaluation of carcass quality by ultrasound method could be a good way of carcass appreciation which not need the slaughter of the animals. We found very strong correlations with a proportion of 44.85 % from a total of 136 trait couples, favourable for meat selection. Therefore the evaluation of meat quality by carcass measurements might be replaced by ultrasound method which is more efficient and is frequently used on sheep for a better carcass evaluation in meat selection.

Keywords: ultrasound, *Longissimus Dorsi*, carcass quality

ASSESSMENT OF GRAPE POMACE ENRICHED FEED FOR WEANED PIGLETS

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Little evidence is available on the antioxidant potential of grape pomace (GP) when added in piglet diets. The aim of the present study was to evaluate two diets (D1 and D2) containing 3% GP with seed (TN1/GPS+) or without (TP2/GPS-). 18 crossbreed starter piglets, were divided into 3 experimental groups (6 piglets/group) and assigned to one of the 3 treatments: control (normal diet for weaned pig-C); diet with integral GP (diet 1-D1); diet with GP without seeds (diet 2-D2) for 42 days. At the end of this period, blood samples were collected from all three groups and kept at -80°C for further analysis. Muscle samples from the 3 experimental groups were collected, kept at -80°C and transformed into powder with liquid nitrogen prior the analysis. The absorption and bioavailability of the polyphenols from the GP were assessed by the total polyphenols content of GPS+, GPS-, blood plasma and *Longissimus dorsi* muscle measured through the Folin Ciocalteu method. The highest level of total polyphenols was registered in the plasma of piglets fed D1 diet (5.00±0.35 mg GAE/l) and ten times less was measured for the D2 (0.50±0.23 mg GAE/l) and control group (0.61±0.37 mg GAE/l). Interestingly, when the polyphenols were assessed in muscle the group fed with the D2 diet gave the best results, statistically significant when compared with D1 (total polyphenol content being: 131.42±5.84 mg GAE/l for C group, 118.48±4.23 mg GAE/l for D1 and 144.46±3.96 mg GAE/l for D2, respectively). Dietary supplementation with 3% GPs influenced the general health status of piglets by increasing the levels of glucose, calcium and magnesium in plasma. GP diets modulated also the humoral immune response. GPS- induced the increasing of the synthesis of nonspecific immunoglobulin M and G (IgM, IgG) with key role in the generation of the first and long lasting immunity, while GPS+ had a contrary effect.

These results indicate that including the rich in polyphenols grape pomace with or without seeds, in piglets diet improves the antioxidant status of the body with implications in piglets' health and welfare.

Keywords: weaned piglets, diets, grape pomace, antioxidant status

Acknowledgements: This work was supported by a grant of the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-II-RU-TE-2012-3-0048.

FEEDING PARTICULARITIES OF SOME ROMANIAN WINERY AND OIL EXTRACTION BY-PRODUCTS

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Fourteen winery and oil extraction by-products sampled from the Romanian feed market were studied in order to assess their feeding particularities induced by the local processing conditions and specifics of the raw materials. Chemical composition (Weende), ruminal degradability (in situ method) and in vitro organic matter digestibility were assessed, as well as their influence on the feeding values.

A low, but variable nitrogen rumen degradability was observed for grape marc (from 32 to 42%), whereas grape seed meal was much more degradable (67%). Degradability of protein meals (camelina seeds meal, pumpkin seeds meal, poppy seeds meal, wheat germs meal, linseed meal) was strongly influenced by the raw materials (it varied from 56 to 91%) and had direct influence on their feeding values.

Similar tendencies were observed for in vitro organic digestibility of the studied by-products; these noticeably influenced the feeding values to the point that it raises the need for tailored feeding strategies when using these by-products in ruminants' diets.

Keywords: ruminants, degradability, digestibility, by-products, feeding value

Acknowledgements: the research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/ 2007-2013) under the grant agreement n° FP7-266367 as part of the project SOLID (Sustainable Organic and Low Input Dairying).

TECHNICAL-ECONOMIC AND AGRO-ENVIRONMENT MODELS OF GOATS RAISING HOLDINGS

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The paper presents the estimates of technical-economic and agro-environment indicators for the two modules of goats raising holdings, respectively of 50 heads capacity, with an average milk production of 350 l / head for individual households and of 500 heads, with an average milk production of 500 l / head, for commercial societies. For the module of 50 heads, the rate of

return is 29.6%, with a profit of 163 lei / head and a production of manure that can fertilize 2.1 ha. For the head module of 500 heads, with a superior average production, the rate of return is 51.2%, with a profit of 332.6 lei / head and a production of manure that can fertilize 20.6 ha. The development fund of holdings can modernize technological processes of farm, by acquiring modern equipment (for feeding, watering, manure removal, mechanical milking); also, the investments can be made to increase the environmental performance. The results of the technical-economic and agro-environment indicators experience show that goats farms must build real prospect of economic growth by reducing the consumption of energy, raw materials per unit of effect, preserving the environment, favouring a high degree of profitability and market competitiveness.

Keywords: indicators, goats, holdings, agro-environment.

ORGANIC TRACE ELEMENTS (CU, FE, MN, ZN) IN LAYING HEN DIETS – BENEFITS CONCERNING THEIR INCLUSION

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Nowadays, trace elements are supplemented in animal feed in much higher quantities, far above the physiological requirements due to their low availability of inorganic compounds. Therefore, the large amount of trace minerals excreted has a serious impact on the environment. Organic trace minerals are sources of trace minerals where the metal has been bonded to an organic molecule. Studies were conducted using lower amounts of organic trace minerals that registered similar or better effects compared to identical or higher amounts of inorganic trace minerals inclusion into diets. As a result, a reduction of trace minerals excretion is produced which influences positively the environment.

Positive effects were noticed on the average egg weight, breaking strength, eggshell percentage but, as some authors observed, with no effects on feed intake, feed conversion, specific egg weight, Haugh unit. It was implied that the advantages of chelates over inorganic supplements will not necessarily be evident in all circumstances. The different results obtained within the experiments on organic trace minerals could be related to specific chelation technology used, the great variety of chelates market, therefore the degree of bioavailability, stability and metabolization of the final products can be rather variable. One of the arguments against chelates utilization was the higher price per unit of metal element compared to the same inorganic metal.

Keywords: chelate, laying hen, bioavailability, trace elements

INTERRELATION OF CR (III) AND OTHER TRACE MINERALS METABOLISM IN GROWING PIGS

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Trivalent chromium is essential to normal carbohydrate, lipid and protein metabolism. Published research has shown the beneficial effects of chromium supplementation on carcass traits of pigs. The objective of this study was to evaluate the existing interrelations between Cr (III) and trace minerals (Cu, Fe, Mn, Zn) in growing pigs fed with chromium picolinate supplemented diets.

A 6-week study was conducted on 8 castrated Topigs male pigs with an initial bodyweight of 17.16 ± 0.62 kg and 49.93 ± 2.3 kg (C) and 48.75 ± 5.3 kg (E) final weight, assigned to 2 groups (C, E) and housed in individual metabolic cages. The pigs were fed on corn-soybean meal-based diets (18.75% CP; 3063 kcal/kg ME). The diet of E group was supplemented with 200 ppm CrPic. Samples of ingesta, faeces and urine were collected in 3 balance periods of 5 days each. The levels of Cu, Fe, Mn and Zn were measured by FAAS in the samples of ingesta, faeces, urine and meat.

Chromium supplements decreased, but not significantly ($P > 0.05$) trace minerals apparent absorption coefficients (31.7% (C) and 30.0% (E) for Cu; 56.6% (C) and 53.7% (E) for Fe; 35.2% (C) and 32.8% (E) for Mn; 47.0% (C) and 42.1% (E) for Zn). Tenderloin, loin, ham, shoulder, belly and scruff were characterised from trace elements (Cu, Fe, Mn, Zn) point of view. Significant increased concentrations were obtained for Zn in: loin (4.38 ± 0.29 ppm (C) and 5.19 ± 0.29 ppm (E)), shoulder (8.21 ± 0.41 ppm (C) and 9.74 ± 0.40 ppm (E)), belly (3.78 ± 0.54 ppm (C) and 5.04 ± 0.82 ppm (E)) and scruff (4.89 ± 0.29 ppm (C) and 6.09 ± 0.84 ppm (E)). The deposits of Cu, Fe, Mn and Zn in the main organs (liver, spleen and kidney) were also evaluated and significant increased concentrations ($P \leq 0.05$) of Zn in the liver samples of E group (18.40 ± 0.14 ppm (C) and 20.02 ± 0.56 ppm (E)) were noticed.

The synergy of Cr and Zn was highlighted in this study by the results obtained in determinations on anatomical parts.

Keywords: trivalent chromium, pigs, trace minerals, metabolism

COPPER AND ZINC STATUS OF BLOOD SERUM AND WOOL OF AKKARAMAN SHEEP IN GRAZING SEASON RELATED TO PASTURE MINERAL CONTENT IN ANKARA PROVINCE

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This study was carried out in 6 districts of Ankara province. The aim of this study is to determine Cu, Zn status of blood serum and those of wool in Akkaraman sheep grazing on natural pastures and the same trace mineral content of soil and pastures in different seasons for two years. A further aim was to gain information about trace mineral insufficiency of Akkaraman sheep which are fed only pastures without any supplementation and to advice sheep breeders about supplementation of insufficient mineral in the region.

In this study sera copper (Cu) concentration was above critical level however was near to sub clinic deficiency level as sera zinc (Zn) was under normal level, near to deficiency. Sera Cu content differs between 0.50 ± 0.034 mg/L and 0.79 ± 0.027 mg/L as above critical level but near to subclinical insufficient level. Sera Cu content both between districts and also in the same districts between different seasons (except two districts) were statically different ($p < 0.05$). Sera Zn content in the districts, according to seasons were ranged between 0.41 ± 0.013 mg/L and 0.83 ± 0.015 mg/L, average was between 0.52 ± 0.012 mg/L and 0.69 ± 0.010 mg/L. Sera Zn content both between districts and also in the same districts between different seasons were statically different ($p < 0.05$).

Wool Cu content, in district of Haymana in spring and summer was under the critical level, as respectively 4.26 ± 0.169 µg/g and 4.14 ± 0.320 µg/g. In the other districts wool Cu content was above the critical level. Wool Cu content was highest in Polatlı district as 59 ± 0.157 µg/g and was lowest in Haymana district as 4.59 ± 0.140 µg/g. Wool Zn content in different season was ranged between $26,37 \pm 0,713$ µg/g and $36,95 \pm 0,900$ µg/g. Wool Zn was also under the level of findings of research done with Akkaraman in literature. This is also consistent with sera Zn close to critical level.

Pasture Cu levels were found to be declined and under critical level in summer and autumn. Pasture Zn content was found under minimum level. Soil Cu levels in all districts were above the critical level and sufficient. Soil Zn levels in all districts were under sufficient level.

As interpreting sera, wool, pasture and soil analysis in Ankara region Beypazarı, Elmadağ, Kalecik, Kızılcahamam, Haymana and Polatlı districts, normal and healthy growth of sheep without economic loss in their production, we concluded that grazing sheep should be supplemented with Cu in some seasons and with Zn throughout the year.

Keywords: trace mineral content, sheep, serum, wool, soil, pasture

EVALUATION OF THE QUALITY AND PRODUCTIVITY OF MAIZE GROWN WITH WORM COMPOST

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The article reflects the influence of worm compost on the assessment of the degree of contamination of maize with smut (*Sorosporium reilianum* f. Zeae) and its productivity over the course of three years of use of the fertilizer. In the first year of using worms compost, it was found that on the plots where worms compost was used, 1.51% of plants were contaminated with smut, whereas on the control plot (with natural background) – 3.86% of plants grown on the batch were contaminated. So, it was found that on the plots with natural background (control plots), the degree of contamination of the plants with the smut was 2.50 times higher than on plots where worms compost was used. The results of an analysis of data from the second and third years of the worms compost use showed that maize plants have been contaminated with smut only on the natural background plots. As a result of observations, it was found that the degree of contamination of the maize with smut has negatively impacted on the productivity of maize. Analysing the results, it was found that the harvest of the corncobs in the first, second and third year of the experiment, on plots treated with worms compost was respectively 29.07%, 35.09% and 32.03% higher than the harvest of the control plot. Therefore, as a result of research carried out during the three years, it was found that worms compost embedded in soil reduced the degree of contamination of maize with smut (*Sorosporium reilianum* f. Zeae) and increased the harvest by the unit of area.

Keywords: worm compost, maize, smut, contamination, productivity

STUDY OF HAEMATOLOGICAL PARAMETERS ACCORDING AGE, SEASON AND PHYSIOLOGICAL STATUS IN CATTLE

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The aim of this study was comparison of haematological parameters according age, season and physiological status in cattle. RBC mass, WBC mass, haemoglobin concentrations (HB), PCV, MCV, MCHC, MCH, platelet mass, percent and concentration of lymphocyte, neutrophil, eosinophil and monocyte were determined with routine methods. Except for platelet concentration, monocyte percent and count, the other haematological parameters were significantly differ between various physiological status and ages of cattle. MCH in spring was higher than autumn and in summer was

higher than spring. MCHC in summer was significantly higher than other seasons. Platelet concentration in autumn was higher than spring but its difference was not significant with other seasons. WBC was lower in summer than spring and autumn. It is concluded that haematological parameters of cattle can be affected with age, physiological status significantly differ between seasons.

Keywords: cattle, hematologic parameter, age, season, physiological status

INFLUENCE OF VARIOUS PROPORTIONS OF SORGHUM INCLUDED IN THE COMPOUND FEEDS FOR FATTENING STEERS ON ANIMAL HEALTH STATE AND ON THE FATTY ACIDS PROFILE OF *LONGISSIMUS DORSI* MUSCLE

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A trial using 21 Romanian Black Spotted fattening steers was conducted in order to determine the effects of new feed sources (sorghum grains). The animals were assigned uniformly to 3 groups of 7 steers each, which received different treatments: the control group (C) received a compound feed without sorghum grains, the experimental group E1 received 15% sorghum grains in the compound feed, while the experimental group E2 received 25% sorghum grains in the compound feed. The laboratory assays of the blood mineral, energetic, plasma and enzyme profiles substantiated the hypothesis that the feeding, physiological and pathological state of the animals can be evaluated from the biochemical parameters of the blood. The laboratory analyses conducted on samples of *Longissimus dorsi* muscle collected from the three experimental groups, showed changes in the structure of the fatty acids composing the muscle lipids. Thus, the proportion of saturated fatty acids (SFA) decreased in favour of the unsaturated fatty acids (UFA), from 46.10% SFA (C) to 44.43% in group E2, which was treated with 25% sorghum grains through the compound feed, while the proportion of unsaturated fatty acids increased from 53.00% UFA in the control group, to 54.19% UFA in group E2.

Keywords: steers, diets, biochemical parameters, fatty acids

INFLUENCE OF NUTRITION ON FERTILITY TRAITS OF GOATS

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During two year period in herds of private breeders it has been investigated the influence of diet on fertility traits of domestic Balkan goat breeds that are brought up in the area of the North West part of the mountain Sarplanina. Studies were performed on the Balkan goat herds (four herds) from private farmers.

Winter feeding of goats has been consisted of concentrate and meadow hay. Bulky food was given in small quantities (about 300 grams) three times a day and concentrate in the morning and evening. As for the schedule of administration of certain nutrients, all breeders were first giving concentrates and forages (hay), both in the morning and evening feeding. Generally speaking, intake goat herds during the winter period did not significantly differ in both diet and amount of added food, except for goats in the herd 4 (and partly in herd 2) that received a larger amount to concentrate and forage crop, and hence favourable share of nutrients (especially proteins) in a meal. All goat breeders have applied a semi-intensive system of education (sheds-pasture system).

As part of establishing reproductive performance of domestic Balkan goat during the season of kidding, accurate daily records were taken of the date of kidding, kidding type (only children, twins) and gender of kids (male and female), based on which analyses were made for the level of kidding or fertility of goats (the number of live born kids per mother).

The statistical processing of the results pertinent to the fertility trait was performed on a personal computer, using the LSMLMW program (Harvey, 1990).

Kidding of examined population of goats started in January and ended in late May. The highest intensity of kidding was realized during February and March in both, single kids and in twins, which collectively comprise 75% (singles) and 86.88% (twins) of the total percentage of kidding goats in the investigated period. The fertility of the population of goats for a two-year test period was 124.4%, and ranged between 118.69% (in the third) and 132.16% (fourth herd).

Better nutrition of goats during high pregnancy and in the first period of lactation, by both, concentrate and bulky food, which was derived from the sown meadows, had a positive effect on fertility trait in goats in the fourth herd.

Keywords: goat, nutrition, fertility trait, herd

STUDY CONCERNING THE NUTRITIONAL POTENTIAL OF SOME FOOD INDUSTRY BY-PRODUCTS INCLUDED IN LAYING HENS DIETS

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The food industry by-product can be used in animal feeding on condition they have feeding value. Poppy, nuts and wheat germs meals are among the by-products recently proposed for inclusion in laying hens feeding. These food industry by-products were characterized in view of their prospective utilization as feed additives.

Each product was submitted to a complex physical and chemical investigation, and their metabolisable energy was calculated on the basis of the results. All three by-products have a high protein contents, thus high values of metabolisable energy (29.13% CP; 10.60 MJ ME – nut meal; 26.24% CP; 10.31 MJ ME – poppy meal; 28.58% CP; 12.52 MJ ME – wheat germs meal). The nuts meal is a good source of fat (15.15% EE), of which 70.79% are polyunsaturated fatty acids (PUFA). Of the PUFA detected in the fat of nuts meal, 10.08% are ω :3 fatty acids and 60.71% are ω :6 fatty acids. Two of the investigated by-products have significant concentrations of trace elements (28.52 ppm Cu and 118.22 ppm Fe – poppy meal; 162.02 ppm Mn and 155.61 ppm Zn – wheat germs meal).

These analytical results prompt the design and run of experimental trials evaluating the use of poppy, nuts and wheat germs meals in laying hens diet, which will optimise the egg quality to price ratio.

Keywords: by-products, poppy, nuts, wheat germs, feeding value, laying hens

POSSIBLE USE OF ARTIFICIAL NEURAL NETWORKS FOR EVALUATION OF CARCASS QUALITY

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Artificial neural networks (ANNs) have been developed that have the capacity to analyse and sort large inputs of data. Because the function of the neural network was patterned after the human brain, it has the capacity to learn, remember, and forget. This is advantageous because the system can constantly update its own efficiency for prediction of the desired output. The possibilities of accurate predicting cattle slaughter value based on live animal evaluation have been investigated

since many years in all over the world. The studies were dealing with the application of various methods, from among the most important are: ultrasound and X-ray methods, digital image analysis, optical probes and magnetic resonance imaging. However, due to high costs, all these methods, besides the ultrasound one, are not recommended for breeding and production practice. Recent research activities have shown that they have been used for mastitis prediction, milk, fat and protein yield prediction, estimation of somatic cell count and fat and protein content in milk, evaluation of a physiological status of cows (oestrus, calving and health status) and analysis of in vitro embryo development. Neural network models were also developed for predicting and determination of an objective measurement of slaughter value in beef cattle using pre-slaughter information. Therefore, in this reviewed study, the possible use of ANNs for carcass evaluation is discussed.

Keywords: modelling, forecasting, artificial neural networks, animal production, carcass

EFFECTS OF DIETARY GRAPE SEED CAKE ON GROWTH PERFORMANCES AND MEAT QUALITY IN PIGS

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Grape seed cake (GSC) is usually treated as waste and discarded. In fact it can be a valuable by-product with possible benefits for pig industry and grapes seed oil producers due to its nutritional composition and availability.

The aim of this study was to evaluate the effects of replacing 3% corn and 2% protein sources with 5% GSC from pig diets on performances and meat quality. The trial was conducted on 24 finishing TOPIGS pigs [(Landrace×Large White) × (Duroc×Pietrain)], 75.63±1.41 average body weight, assigned to 2 randomized groups (control, C and experimental, GSC) during 24 days. The fatty acid (FA) composition of GSC, compound feed diets and muscular tissue was assessed by Gas Chromatography while the polyphenols content of GSC and blood tissue by UltraViolet-Visible Spectrophotometry.

Our results indicate that GSC are rich in polyunsaturated fatty acids (65.00%, PUFA), especially linoleic acid (62.26%) and contain important amounts of alpha-linolenic acid (2.32%). Also in the GSC the plasma spectrum show us a maximum absorption of polyphenols at $\lambda = 271$ nm while in blood samples maximum absorbance was at $\lambda_{max} = 278$ nm. No difference in bioproductive performances was observed among pigs in the GSC group comparing to C group. Feeding GSC led

to increases by 5.22% linoleic acid and by 12.00% linolenic acid in the muscular tissue (*Longissimus dorsi*). Therefore, PUFA combined with the polyphenols converts this by-product into an alternative feeding source for pigs with possible nutritional benefits for the consumers.

Keywords: grape seed cake, meat quality, fatty acids, polyphenols, pigs

Acknowledgement: this research was financially supported through Project ADER 721 - Scientific and technical support addressed to ensure high standards of animal welfare, based on Article 40 of Regulation (EC) no. 1698/2005.

METHODOLOGY FOR ACCOUNTING THE MATERIAL AND ENERGY FLOWS

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The material flow cost accounting (MFCA) is a management tool that can help organizations to better understand the potential environmental and financial consequences of their practices using the materials and energy.

The proposed methodology promotes greater transparency in materials and energy use practices by developing a materials flow model that monitors and quantifies the materials flows and stocks within an organization in physical units and associated costs.

The information produced are opportunities for managers to simultaneously generate financial benefits and reduce the environmental impacts by changing these practices.

Applying this methodology can locate the "black holes" where occur losses in production processes and identify these losses by physical values and associated costs. Once environmental costs are quantified, it becomes possible an accurate assessment of the required resources to improve a particular process or activity proved as responsible for the most important environmental impact.

The amount of negative flow costs allows the management to act for getting the reductions of the cost production through product redesign, upgrading processes or materials substitution;

Keywords: methodology, management, environment, materials and energy flow, costs, assessment

CONTROL MEASURES OF ZOOZOSES AT THE FARM LEVEL AND FOOD SAFETY

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Health of the animals intended for human consumption, unconditionally is connected with the production of healthy food, because the consumers demand food of high quality. Risk of zoonoses can appear in farms, food plants and distribution chains. Production and sustainability of healthy livestock needs good breeding practice, which includes selection and veterinary control. Key primary factor is feed and water without pathogens, pest control and optimal environment, with stress effect reduced to minimum. Those are all very important prerequisites for good use of animals. Significance of some zoonoses varies from region to region, with the respect to the influence to health status of humans and animals. Because of this, the programs of control also vary. Focus of the program is application of veterinary and zoo technical measures: risk assessment, inspections of farms and clinical examination of animals, monitoring and data analysis. Some infections are not mortal for animals (for example *E. coli* O157), but they can cause severe disease in humans, while other infections like brucellosis, salmonellosis and leptospirosis are threat to human and animal health.

It is necessary for the animals to originate from the herds with known health status. Also monitoring of the animals and products through the whole food chain is important. Improper application of antimicrobial drugs can cause generation of multiresistant microorganisms which can be a problem for public health. Separation of animals depending on age, colostrum feeding, isolation of sick animals and proper disinfection can prevent the spreading of disease and contribute to the maintenance of health status within the herd. Appropriate measures of ecto and endo parasitic control will prevent the appearance of runts in animals and their receptivity for other diseases. The policy of drug usage in animals has to be scientifically approved, documented in details and regularly monitored. Standard bio safe practice which is necessary for the maintenance of the production unit integrity, is implemented by introduction of sanitary rules, including application of disinfectants on key spots, wearing of protective clothes and shoes, sanitation control of feed and water supplies and pest control.

Increased amount of slurry, which is inevitable on farms, and especially the removal of it, is an issue for public health. From the point of view of public health, farms with high number of animals and farms with intensive breeding, need special attention. This is especially the case in pig and poultry breeding, where the prevalence with infectious agents, such as salmonella and campylobacter, are particularly found, while level of clinically ill animals is relatively low.

Multidisciplinary approach to the control of zoonoses will have optimal results and existing approaches have to be flexible to be able to incorporate progress in breeding of animals resistant to diseases, new vaccines, new dietary approaches and innovative education ways of farmers as primary producers of food.

Keywords: herd health, zoonosis control, epidemiology, food safety.

STUDY CONCERNING THE ULTRASOUND MEASUREMENTS OF *LONGISSIMUS DORSI* MUSCLE AND SUBCUTANEOUS FAT THICKNESS IN ROMANIAN LOCAL BREEDS LAMBS

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Romania is among the European countries with the highest sheep populations, having thus the possibility to export large amounts of sheep meat. In order to produce sheep carcasses which are competitive on the European market, the sheep farmers from Romania must increase the meat proportion of the carcass and to decrease the bone and fat proportions. The purpose of the investigation was to evaluate by ultrasound measurements the properties of *Longissimus Dorsi* (LD) muscle (depth, area and perimeter) and the subcutaneous fat thickness on live animals, using lambs from the local breeds Teleorman Blackhead (TBH) and Tsigai (T). The studies were performed on 25 male (33.22 kg average body weight) and 48 female (30.05 kg average body weight) weaned TBH lambs, aged 100 days and, and on 28 male (21.30 kg average body weight) and 20 female (18.62 kg average body weight) Tsigai lambs, aged 77 days. The ultrasound measurements were performed with an Echo blaster 64 with LV 7.5 65/64 probe (TELEMED ultrasound medical systems). The ultrasound images were recorded and analysed with Echo Wave II software, version 1.32/2009. The first measuring point was located at 5 cm from the spine at the 12th rib, and the second measuring point was between the 3rd and 4th lumbar vertebrae. The average values for TBH lambs were 2.41 mm for the subcutaneous fat thickness (SF), 21.88 mm for LD muscle depth (MD), 8.93 square cm. for LD muscle area (MA) and 124.22 mm for LD muscle perimeter; the corresponding values for the Tsigai lambs were 1.87 mm, 21.81 mm, 8.95 square cm. and 123 mm, respectively. These results show that there are no significant differences ($P>0.05$) between the measurements performed at the two measuring points. Comparing the results from the two breeds shows that Tsigai lambs have very close values for LD muscle depth, area and perimeter with TBH lambs, while the subcutaneous fat thickness is lower, although the lambs are 23 days younger and have about 12 kg less body weight. The same method will be applied on fattening lambs, which produce larger carcasses, as demanded by the west European market. The measurements were also analysed separately, by sex. Significant differences ($P<0.05$) were determined only for muscle depth at the first measuring point and for the subcutaneous fat thickness at the second measuring point in TBH lambs. No significant differences between sexes were determined in the Tsigai lambs. The phenotypical correlations between body weight and the ultrasound measurements were significant, the highest coefficients being for those with muscle depth and area. The studies will continue and the results will be used for the selection of lambs for meat production.

Keywords: lambs, ultrasound measurements, *Longissimus dorsi* muscle, subcutaneous fat

INFLUENCE OF DIETARY PROTEIN LEVELS AND PROTEIN-OLEAGINOUS SOURCES ON CARCASS PARAMETERS AND FATTY ACID COMPOSITION OF BROILER MEAT

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The study was conducted to evaluate the influence of different dietary protein levels and protein-oleaginous sources on carcass parameters and fatty acid composition of meat in broilers at 42 d. One-day-old unsexed Cobb 500 broilers (n=1200) were randomly assigned in 6 groups with 4 replicates per treatment. Broilers were fed 6 different isocaloric diets in a 3 x 2 factorial design with 3 levels of protein [medium protein (M), high protein (HP) and low protein (LP)] and 2 protein-oleaginous sources [camelina cake (CC) and canola meal (CM)]. The proportion of CC and CM in broilers diets was similar. Gas chromatography method was used to determine the fatty acid composition. Carcass yield and the percentage of broilers liver were not affected ($P>0.05$) by the dietary treatments. Breast and leg yield was decreased ($P<0.04$) in LP diets, influenced by the dietary protein level, in both protein-oleaginous sources. The HP diet produced carcasses that contained lower levels of abdominal fat than the LP diet ($P<0.0001$), in both protein-oleaginous sources. There was no significant effect ($P>0.05$) of dietary protein level or protein-oleaginous sources on the chemical composition of broiler meat (breast and leg) which demonstrated that LP diets allow for similar transformation of protein and energy intake into tissue synthesis and accretion. However, the quality of the breast and leg meat, in terms of fatty acids profile was influenced positively by the use of CC as protein-oleaginous source. The content of n-3 polyunsaturated fatty acids (PUFA), especially α -linolenic was significantly higher ($P<0.0001$), in both type of muscle, in CC diet compared to CM diet. The use of CC decreased significantly ($P<0.0001$) n-6:n-3 PUFA ratio, in both type of muscle, which reached values recommended for a good health state, compared to CM. In conclusion, LP diets can assure similar quality performance that HP or M diets and CC can improve the n-3 PUFA content of broilers meat.

Keywords: protein levels; protein-oleaginous sources; carcass parameters; fatty acid composition; broiler

Acknowledgments: This research was financial supported by Project ADER 721 - Scientific and technical support addressed to ensure high standards of animal welfare, based on Article 40 of Regulation (EC) no. 1698/2005.

EFFECTS OF THE OILY SEEDS SUPPLEMENTED DIETS ON THE PROTEIN QUALITY OF SOME LAYING HENS PRODUCTS (EGG AND BREAST)

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The effect of oily seed supplementation on protein quality of eggs and breast from laying hens was investigated in a 35 days trial using 114 laying hens, divided into 3 groups (C, E1, E2) and housed in metabolic cages (2 hens/cage). The hens were fed on a corn-soybean meal based diet (16.35% crude protein, 2710 kcal/kg feed metabolizable energy). Feeding was ad libitum. The experimental diets enriched in PUFA were supplemented with 5% linseed and 2 % camelina seed (E1), and 2% linseed, 2 % camelina seed and 1 % fenugreek seed (E2). At the end of the experiment, 5 hens/group were slaughtered and breast samples were collected. In the last week of the experiment, 18 eggs/group were collected in a randomized manner, and amino acids were determined from albumen and yolk samples.

The amino acid analysis was performed according to EU Regulation no. 152/2009. The albumen analysis revealed a significant decreased ($P \leq 0.05$) of the sulfur amino acid concentrations. Methionine decreased from 3.483 g/100g DM (C) to 3.297 g/100g DM (E1) and 2.504 g/100g DM (E2). Cystine also decreased from 1.974 g/100g DM (C) to 1.499 g/100g DM (E1) and 1.474 g/100g DM (E2). The essential amino acids isoleucine and phenylalanine registered significant reductions ($P \leq 0,05$) in E1 and E2 groups compared with C group. Lysine was however, not affected by the treatments. The yolk analysis results shown significant decreased concentrations ($P \leq 0,05$) for serine and glycine in E1 and E2 compared with C.

From the analysis of the breast samples we observed a significant increased ($P \leq 0.05$) in the case of some essential amino acids for human: phenylalanine increased from 2.743 g/100g DM (C) to 3.282 g/100g DM (E1) and 3.299 g/100g DM (E2); threonine increased from 3.736 g/100g DM (C) to 4.179 g/100g DM (E1) and 4.284 g/100g DM (E2). Lysine, methionine and cystine were not affected by the treatments. In conclusion, more research is needed to elucidate the biochemical mechanisms involved in the amino acids utilization and deposition into the eggs and breast of the laying hens.

Keywords: amino acid, animal products, oily seeds, laying hens

HAEMATOLOGICAL PARAMETERS OF RAINBOW TROUT

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The objective of the present study was to assess the effects of pesticides on haematological parameters of rainbow trout (*Oncorhynchus mykiss*), after exposure. The physiological and chemical properties of fish blood are very sensitive to environmental changes.

Rainbow trout reared in fresh water were exposed to pesticides at 24 h intervals, for 3 weeks in tanks containing water under natural light conditions with a constant flow. Approximately 2 cc venous blood was drawn from each subject for the determination of haematological parameters, using heparin as an anticoagulant. Haematological parameters were investigated weekly.

The findings of this study showed that pesticides had some effect on the haematological parameters of rainbow trout. It was determined that the use of the pesticides caused a slight increase in red blood cell (RBC) numbers and a decrease in haemoglobin (Hb), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), packed cell volume (PCV), mean corpuscular volume (MCV) and white blood cell (WBC) levels. Significant decreases ($P < 0.05$) in Hb content and in MCH were observed during exposure to the pesticide. No significant differences were observed in the levels of RBC, MCHC, PCV, MCV and WBC ($P > 0.05$).

Keywords: trout, hematologic parameter, pesticide

TESTING AND EVALUATION OF THE MATHEMATICAL MODELS USED IN FARM ANIMAL NUTRITION

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Testing and evaluation of a mathematical model is a continuous process that can start from the beginning of the project modelling. A different approach to it, and not only, can be inefficient. This paper examines the dynamic models, Deterministic type or semi-Newtonian, Newtonian and empirical models based on biological hypotheses. A useful description of this subject is given by Penning de Vries, who stresses the lack of agreement on terminology and the need for clear definitions when these issues are discussed. Some modellers dilate the validation and verification, although we believe that the terms assessment and testing are more appropriate scope.

Keywords: mathematical models, farm animal nutrition, testing, evaluation

COMPARATIVE STUDIES ON IN VITRO AND IN VIVO CRYOPRESERVATION PERFORMANCES OF RAM SEMEN BY APPLYING COMBINED PRESERVING AND AI TECHNOLOGIES

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In earlier stages, our experiments have demonstrated that the dilution medium supplemented with various antioxidants common in certain concentrations, can improve the quality of frozen-thawed ram semen. Our results have shown that antioxidants such as cysteine (5 mM) and vitamin E (1.0 mM) had effects on the studied sperm-cell cytological parameters: motility, structural and functional integrity of the plasma membrane and the fertility performance obtained after artificial insemination of Palas Merino ewes. The research has demonstrated that the addition of cysteine and vitamin E in the dilution / cooling phases leads to significant increases ($p < 0.05$) of sperm motility and viability of frozen semen. In low concentrations (1%), and the presence of antioxidants (cysteine), glycerol has no negative effects on quality parameters (viability, motility) during freezing. The conclusion is that dilution with the addition of 1.0 mMvitamina E (Trolox) or 10 mM L-cysteine leads to an increase in sheep semen quality parameters kept frozen. The best thawed -frozen sperm from two Palas Merino meat line rams was tested “*in vivo*” by artificial insemination of Merino sheep, in several farms in the south-east of Romania (Dobrogea county). The frozen sperm was artificially inseminated in normal breeding season (September 2013) and in extra-season (March 2014). In breeding season the sheep were inseminated in natural oestrus, by introducing thawed sperm deep intracervically. In extra-season, semen was deposited deep intracervically with vaginal speculum and using syringe insemination. The results obtained after artificial insemination of sheep in normal season (n=310 ewes) and extra-season (n=195 ewes) with the frozen semen diluted in Tris medium with added antioxidants are very good. Fertility obtained after AI with semen diluted in Tris + cysteine medium was 75.80% in normal season and 61.56% in extra-season. Prolificacy was achieved 135.5% and 131.83%, respectively. Fertility and prolificacy indices were higher in normal season than in extra-season, namely by 23% and 2.7%. The scientific literature cites the influence of cysteine on the increase of the cryobiological indexes of frozen ram semen, but research on the direct *in vivo* testing data of sperm with antioxidants are non-existent

Our results display an important advantage of artificial insemination program for sheep such as: increasing genetic progress especially in the economic characteristics, amount of milk, protein and their quality, a small number of bucks in the top of the pyramid of improvement can have a number of daughters while deficient progeny testing, ensuring a high intensity of selection.

Keywords: sheep, ram sperm, cryopreservation, AI

RESULTS REGARDING THE USE OF PROSTAGLANDIN-BASED AI PROTOCOLS IN THE BREEDING SEASON AT CARPATHIAN GOAT

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The objective of this study was to establish a protocol based on prostaglandin associated with male effect during breeding season at local goat breed into 4 farms from Romania on 25 goats/farm. Goats were treated with prostaglandin and male effect (n=5). The experiment started at Middle September-beginning of October. For male effect the goats were isolated from males 60 days before the start of the experiment. Goat lots were prepared 30 days before the start of the experiment. Also for the both lots of goats for each farm examined, pseudopregnancy was detected 19 days before the start of the experiment. Artificial insemination of goats was done with refrigerated semen with progressive motility and viability more than 75%. For all the goats were tested the following parameters: percent of oestrus detection, percent of returning of goats in oestrus, percent of positive diagnostic of pregnancy and percent of negative and uncertain diagnostic of pregnancy. For all the farms, mean of oestrus occurrence was 78±2.58%, the percent of returning in oestrus of goats was 22±2.58. Fertility after artificial insemination of goats was 69%.

Keywords: male effect, prostaglandin, oestrus, artificial insemination

THE USE OF PROSTAGLANDIN-BASED AI PROTOCOLS FOR INDUCING AND SYNCHRONISING OVULATIONS IN OUT OF THE BREEDING SEASON AT CARPATHIAN GOAT

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The objective of this study was to validate the prostaglandin-based protocols using the male effect for inducing and synchronising ovulations out of the breeding season along with photoperiodic treatment. The studies were conducted at 2 farms of private breeders of goats from Romania on

25 Carpathian goats at each farm. The experiment started with the male effect applied at goats (Day 0 – on 18 July 2013) and the injection of PG (Reglandin, cloprostenol 0.75µg/goat) realised in day 17. After 70 hours from PG injection, the goats were artificial inseminated with refrigerated semen. After goat's insemination (day 20), the bucks were removed from lot of goat treated with prostaglandin. For the experimental lot of goats treated with prostaglandin and male effect, occurrence of oestrus was 92% (23/25) on farm 1 and 80% (20/25) on farm 2 and fertility was 68% (17/25) for each farm.

Keywords: male effect, prostaglandin, out of breeding season, artificial insemination

FLOW CYTOMETRY METHOD APPLIED IN DETERMINING OF CRYOPRESERVED BUCK SEMEN QUALITY

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Sperm cryopreservation involves several steps such as cooling, freezing and thawing and each of these steps can cause sperm damage to the plasma membrane, which impairs normal sperm structure and function, reduces motility and the fertilizing ability of spermatozoa. Advanced techniques are needed in order to establish exactly the percentage of viable sperm cells. This study aimed to determine the optimal thawing procedure of cryopreserved buck sperm, in order to establish the proper thawing rate that can assure the highest percentage of viable spermatozoa. The thawing variants tested were: thawing at 90° C for 2 seconds, thawing at 75° C for 5 seconds, thawing at 75° C for 10 seconds, thawing at 50° C for 30 seconds, and thawing at 39° C for 120 seconds. The quality of cryopreserved sperm sample was evaluated by flow cytometry. Were analysed the mitochondrial function with Rhodamine (R123) and the viability by double staining with 2 fluorochromes: SYBR-14, which stains the spermatozoa with intact membranes and the propidium iodide (PI), which stains cells with damaged membranes. The results of this research showed that the viability and mitochondrial function are significantly increased when the fine straws were thawed at 39° C and 50° C as compared with other thawing temperatures.

Keywords: Palas Merino rams, flow cytometry, mitochondrial function, motility, viability

THE ACCOUNTING OF MATERIAL FLOWS AND ENERGY TOOL FOR IMPROVING THE ENVIRONMENTAL PERFORMANCE OF ORGANIZATIONS

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The Material Flow Cost Accounting (MFCA) is a management tool that can help the organizations from any industry to better understand which are the environmental and financial potential consequences of their practices using materials and energy.

Applying such methodology, that aims and quantifies the flows and stocks of materials within organization in physical units to which are associated the related costs, can give to managers the information needed to generate simultaneously the reduction of the environmental impacts and financial benefits.

This poster presents the methodology of continuous improvement of environmental performance and the results of its application in an organization, providing cleaning products, with implemented environmental management system.

Keywords: methodology, environmental management, environmental performance, management of materials and energy flows, information dissemination

EVALUATION OF ENVIRONMENTAL PERFORMANCE FOR ORGANIZATIONS IN THE FOOD INDUSTRY ACCORDING TO EMAS III

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Evaluation of environmental performance is used by the top management to make informed decisions about the efficiency and effectiveness of operation environmental management system and to prioritize the environmental line from one stage to another. Selection and use in environmental analysis the relevant indicators for organization is always the key of success for a fast and effective management reviews.

This paper aims to provide a guide for reporting environmental performance for organizations in the food industry, specifically in the brewing and beverage industries, easy to use by the top management in the periodic performed analyses.

The guide is composed by tables with sets of general indicators / generic and specific: energy efficiency, efficient use of raw materials and materials, use of water resources, minimizing waste, minimizing emissions (discharges to air, water and soil), maintaining biodiversity.

Sets of indicators proposed, of a general/generic nature, relevant to the food industry are understandable thereby facilitating assessment of environmental performance in any organization. From these indicators of general / generic nature can be derived specific indicators for various industries to enable organizations to improve the identification and reporting their environmental performance to all stakeholders.

Keywords: guide, indicators, food industry, management, environment

STUDY OF THE EFFECTS OF EXPOSURE TO DIFFERENT LEVELS OF ENERGY GENERATED BY A HE-NE LASER BEAM ON THE QUALITY OF THE CRYOPRESERVED AND THAWED RAM SEMEN

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The purpose of the investigation was to see whether two levels of laser irradiation energy (3.96 and 6.12 J/cm²) can improve the qualitative characteristics of the ram sperm following the process of cryopreservation-thawing. The straws with semen were thawed on a water bath at 39°C for 120 seconds. After thawing, the semen was divided in three samples: a control sample and two samples which were thereafter irradiated with two levels of energy (3.96 and 6.12 J/cm²). The mitochondrial activity, cell viability (by flow cytometry), the motility and functional integrity of the plasma membrane (HOST test) were verified. The action of the He-Ne laser beam on the thawed ram semen improved its motility (45.6 ± 2.45 vs 43.2 ± 2.18), viability (52.3 ± 2.86 vs 50.1 ± 2.74), mitochondrial function (45.12 ± 2 vs 40.52 ± 1.47) functional integrity of the membrane (46.52 ± 2.07 vs 42.97 ± 1.62) for the 6.12 J/cm² level of energy, unlike the 3.96 J/cm² level of energy where lower qualitative parameters of the semen were recorded compared to the control sample. The use of flow cytometry techniques leads to much more accurate results due to the higher number of analysed cells.

Keywords: ram semen, cryopreservation, thawing, He-Ne laser, sperm quality

EFFECT OF GRADED LEVELS OF TOASTED FLAMBOYANT (*DELONIX REGIA*) SEED MEAL ON THE PERFORMANCE OF WEANER RABBITS (*ORYCTOLAGUS CUNICULUS*)

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The study which lasted for 35 days investigated the effect of graded levels of toasted *Delonix regia* seed meal (DRSM) on the growth performance, blood parameters and nutrient digestibility of weaner rabbits. The diets were compounded to be isonitrogenous (20.02 – 20.59% crude protein) and isocaloric (2722.36 – 2798.25kcal/kg, ME) and the DRSM was included at 0, 5, 10, 15 and 20% in diets T₁, T₂, T₃, T₄ and T₅, respectively. A total of 45 crossbred weaned rabbits weighing averagely 271.56±4.23g/rabbit were randomly allocated to the 5 dietary treatments in a Completely Randomized Design. Each treatment was replicated thrice with 3 rabbits per replicate. All the rabbits were fed known quantity of feeds while drinking water was supplied *ad-libitum*. Growth parameters, blood constituents and nutrient digestibility were evaluated and the results obtained showed that there was no significant variation (P>0.05) in the final body weight (650.00 vs. 725.00 vs. 750.00 vs. 725.00 and 650.00 g/rabbit), feed conversion ratio (10.57 vs. 12.34 vs. 8.69 vs. 8.11 and 10.20), protein efficiency ratio (6.99 vs. 6.62 vs. 7.44 vs. 6.87 and 7.47) and daily body weight gain (7.14 vs. 6.43 vs. 8.93 vs. 8.83 and 7.50g/rabbit). Similarly, coefficient of nutrient digestibility and blood constituents: packed cell volume (29.00 vs. 35.50 vs. 34.00 vs. 32.00 and 35.50 x10³μl), white blood cells (5.40 vs. 4.10 vs. 6.00 vs. 5.60 and 5.90 x10⁶μl), red blood cells (4.10 vs. 4.90 vs. 4.90 vs. 4.10 and 4.90 x10⁶μl) and haemoglobin (8.80 vs. 10.70 vs. 10.30 vs. 9.80 and 10.60 g/dl) evaluated were not significantly affected (P>0.05) by the inclusion of DRSM in the diets. Therefore, rabbit farmers can include up to 20% of toasted DRSM in the diets of rabbit without impairing the growth and health status of the animal.

Keywords: Blood constituents, *Delonix regia* seed meal, growth parameters, nutrient digestibility and weaner rabbits,