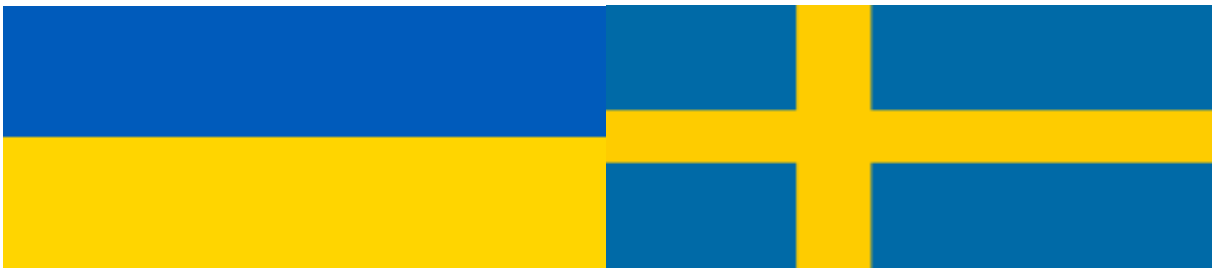

PROCEEDINGS
ANIMAL SCIENCE: «SUSTAINABLE LIVESTOCK PRODUCTION AND ANIMAL WELFARE»

17 – 18 January 2023, Kyiv – Stockholm

PATRON
Ministry of Education and Science of Ukraine

ORGANIZER
National University of Life and Environmental Sciences of Ukraine

SPONSOR
Swedish University of Agricultural Sciences
Swedish Institute
(Svenska Institutet, project number 01877/2021).

PUBLISHER
Faculty of Livestock Raising and Water Bioresources,
National University of Life and Environmental Sciences of Ukraine,
Kyiv, Ukraine

EDITORS
Nataliia Hryshchenko, Associate Professor, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
Galia Zamaratskaia, Associate Professor, Swedish University of Agricultural Sciences, Uppsala, Sweden

The proceedings is printed by the Faculty of Livestock Raising and Water Bioresources and according to the rector's order № 943 entry 13.12.2023., Kyiv.
animal_science_dean@nubip.edu.ua
nubip.edu.ua/structure/tvb
Circulation 100 copies.

Animal science: «Sustainable livestock production and animal welfare» – K.: NUBiP of Ukraine, 2023. – 76 p.

УДК 001.636.083:502.131.1:338.3

ISBN 978-617-8102-90-6

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CONTENTS

Andriy Getya, Mykhailo Matvieiev, Nataliia Hryshchenko[1],Elina Åsbjer, Birgitta Staaf Larsson, Anders Karlsson, Hallvard Wie, Galia Zamaratskaia[2], Oksana Kravchenko, Svitlana Usenko[3], Iveta Kocina, Liene Ansone[4], Vytautas Ribikauskas[5], Irada Khalilova, Ayaz Mammadov, Javid Ojaghi[6], David Richard Arney, Ragnar Leming, Francesca Carnovale[7] **THE ATTITUDES OF UKRAINIAN CONSUMERS TOWARD ANIMAL WELFARE** ([1]Ukraine, [2]Sweden, [3]Ukraine, [4]Latvia, [5]Lithuania, [6]Azerbaijan, [7]Estonia) **8**

Simon Tobias Höxter **VIEWS ON ANIMAL WELFARE IN SWEDEN** (Sweden) **9**

Oksana Yurchenko **IMPACT OF THE WAR ON THE PORK SUPPLY CHAIN IN UKRAINE** (Ukraine) **10**

S. Y. Ruban, O. O. Borsch, V. O. Danshin **DAIRY CATTLE PRODUCTION OF UKRAINE (FEATURES IN MODERN CONDITIONS)** (Ukraine) **11**

Vitalii Nedosekov **ANIMAL WELFARE ASSESSMENT (**Ukraine) **12**

Janak K. Vidanarachchi **TRENDS IN NOVEL FOOD PRODUCTS DEVELOPMENT *(Sri Lanka)*** **13**

Uliana Gottlieb, Gustav Johed, Helena Hansson **ACCOUNTING AND ACCOUNTABILITY FOR FARM ANIMALS: CONCEPTUAL LIMITS AND THE POSSIBILITIES OF CARING** (Sweden) **14**

Irina Bankovska **SENSORY EVALUATION OF BOAR MEAT IN A DIFFERENT WAY OF CASTRATION** (*Ukraine)* **15**

Martin Krøyer Rasmussen **CURRENT SITUATION WITH SURGICAL CASTRATION IN DENMARK** (Denmark) **16**

Kadyrzhan Makangali **MEAT-BASED PRODUCTS FOR ELDERLY** (Kazakhstan) **17**

Galia Zamaratskaia **HISTORY AND PURPOSE OF MEAT CONSUMPTION** (Sweden) **18**

Malgorzata Korzeniowska **PLANT-BASED BIOACTIVE COMPOUNDS IN MEAT INDUSTRY** (Poland*)* **19**

Kurmei Kornelii **BASICS OF SUSTAINABLE PRODUCTION AND WELFARE OF ANIMALS ON AGRO-INDUSTRIAL SHEEP FARM CEO "GEOZEM-MAKARIV"** (Ukraine*)* **20**

Sampels S., Pickova, J., Gatchell, S., Karlsson, A., Yngvesson J., Arvidsson Segerkvist K. **HAPPY CHICKENS – BETTER MEAT (**Sweden) **21**

Hanna Petkun, Vitalii Nedosekov **CRITERIA OF THE PROTOCOL FOR COW WELFARE ASSESSING ON THE FARM IN UKRAINE** (Ukraine) **22**

Yelyzaveta Budakva **RESULTS OF DNA TYPING OF HYBRID PIGS BY RYR1 GENE** (Ukraine) **23**

Martin Knicky **POSSIBILITIES TO IMPROVE SILAGE CONSERVATION FOR ANIMAL FEEDING** (Sweden) **24**

Kostiantyn Makhno **INNOVATIONS IN FEEDING PIGLETS WITH LIQUID MILK PRODUCTS** (Ukraine) **25**

Yurii Pozniakovskyi **COLOSTRUM - THE MOST IMPORTANT FEED FOR CALVES** (Ukraine) **26**

Taras Yakubets, Vasyl Bochkov **INFLUENCE OF MALE RABBITS ON THE PRODUCTIVITY AND REPRODUCTION OF RABBITS DOE OF THE MATERNAL FORM OF THE CROSS** (Ukraine) **27**

Roman Kulibaba, Mykola Sakhatskyi **A2 GENOTYPING: PROMISING DIRECTION IN DAIRY CATTLE GENETICS** (Ukraine) **28**

Matvieiev Mykhailo, Getya Andriy **EFFICIENCY OF APPLICATION OF DIFFERENT INDEX MODELS IN DAIRY CATTLE BREEDING** (Ukraine) **29**

Vitalii Shkarban **MARKET POSSIBILITIES FOR HIGH PROTEIN SUNFLOWER CONCENTRATE IN POULTRY AND SWINE FARMING** (Ukraine) **30**

Khrystyna Kurta, Henrik Jeuthe, Christos Palaiokostas **TOWARDS IMPROVING REPRODUCTIVE TRAITS IN AQUACULTURE SPECIES USING NEXT-GENERATION SEQUENCING** (Sweden) **31**

Ganna Kotovska, Rudyk-Leuskaya Nataliia, Mykhailo Leuskyi, Dmytro Khrystenko **TRADITIONAL AND NONTRADITIONAL BIOMANIPULATION: TWO ALTERNATIVE WAYS TO PREVENT ALGAL BLOOMS AND FISH KILLS IN FRESHWATER BODIES** (Ukraine) **32**

Nataliia Hrishchenko **RELATIONSHIP BETWEEN INDUSTRIAL PRODUCTION AND ANIMAL WELFARE IN UKRAINE** (Ukraine) **33**

Miroslav Rozkot **CASTRATION OF BOARS FROM THE BEGINNING UNTIL THE POSSIBLE END** (Czech Republic) **34**

Gryshchenko Sergii **MANAGEMENT OF THE PIG INDUSTRY IN CONDITIONS OF GLOBAL WARMING** (Ukraine) **35**

Kamila Pokorná, Jaroslav Čítek, Martyna Małopolska, Mirosław Tyra, Hana Süssenbeková, Monika Okrouhlá, Kateřina Zadinová, Roman Stupka **DETERMINATION OF BOAR´S SALIVA ANDROSTENONE AS A METHOD OF EARLY DETECTION OF BOAR TAINT** (Czech Republic) **36**

Ieva Stankevičiūtė, Juratė Kučinskienė, Vytautas Ribikauskas **EVALUATING HORSE MISBEHAVIOUR WHILE FEEDING** (Lithuania) **37**

Vadym M. Kondratyuk, Oleksiy I. Tymoshchuk **IMPLEMENTATION OF THE PRINCIPLES OF ANIMAL WELFARE ON THE EXAMPLE OF THE TURKEY MEAT PRODUCTION FARM «GOOD MEAT»** (Ukraine) **38**

A. M. Shostya, A. S. Siabro **PROOXIDANT-ANTIOXIDANT HOMEOSTASIS IN BLOOD OF GILTS UNDER THE EFFECTS OF COPPER CITRATE** (Ukraine) **39**

R. S. Oliinyk, P.V. Korol, M. S. Doroshenko, S. O. Kostenko **TRANSGENESIS BIOTECHNOLOGICAL PROCEDURES INFLUENCE ON DUCKS EGG PRODUCTIVITY** (Ukraine) **40**

A. M. Shostya, S. O. Usenko, A. M. Tytarenko **WELFARE OF PIGS IS THE BASIS OF QUALITY PRODUCTS** (Ukraine) **41**

S. O. Usenko, T. I. Karunna, O. I. Kravchenko, B. S. Shaferivskyi, S. V. Danilenko **PRODUCTION EFFICIENCY OF COMMODITY EGGS DEPENDING ON THE SELECTION OF THE CROSS** (Ukraine) **42**

S. O. Kostenko, S. O. Usenko, N. P. Svyrydenko, Y. P. Bosa **ASSESSMENT OF THE ATTITUDE OF STUDENTS OF DIFFERENT SPECIALTIES TO THE ISSUES OF ANIMAL WELFARE** (Ukraine) **43**

Asaf M.Omarov, Ali Azghani, Saida Aliyeva, Aysel Hasanzade **MONITORING OF THE RESIDUES OF THE ANTIBIOTICS AND AMR BACTERIA IN CHICKEN MEAT** (USA, Azerbaijan) **44**

Eva Weisbauerová, Pavel Nevrkla, Zdeněk Hadaš, Miroslav Rozkot, Jaroslava Bělková **THE EFFECT OF HOUSING TECHNOLOGY ON REPRODUCTION PARAMETERS OF SOWS** (Czech Republic) **45**

S. Frydrychova, A. Lustykova, J. Seifert, E. Weisbauerova, S. Kucharova, M. Rozkot **EVALUATION OF BOAR INSEMINATION DOSES IN DIFFERENT EXTENDERS SOWS** (Czech Republic) **46**

Gulim Abakanova, Yuriy Balji S. Seifullin **EFFECT OF EXTRUDED BARLEY FEED ON COW MILK QUALITY** (Kazakhstan) **47**

Gulnur Zhuzzhasarova, Zhanat Adilbekov **HELMINTH FAUNA OF FISH IN WATER BODIES OF NORTH AND CENTRAL REGIONS OF KAZAKHSTAN** (Kazakhstan) **48**

K. Poklukar, M. Čandek-Potokar , N. Batorek Lukač, M. Vrecl, G. Fazarinc, M. Škrlep **ADIPOSE TISSUE TRANSCRIPTOME OF KRŠKOPOLJE PIGS REARED IN DIFFERENT PRODUCTION SYSTEMS** (Slovenia) **49**

N. Batorek Lukač [a], M. Škrlep [a], K. Poklukar [a], D. Jerič [b], M. Čandek-Potokar* **TESTING HEAVY PIG PRODUCTION ON SLOVENIAN FARMS** (Slovenia) **50**

Borshch O.V. **FEATURES OF MILKING LOCAL UKRAINIAN COWS AND THEIR CROSSES WITH MONTBÉLIARDE BREED** (Ukraine) **51**

Varpo Vare, Rünno Patune, Ragnar Leming **THE EFFECT OF FEEDING BLACK SOLDIER FLY LARVAE ON WEIGHT GAIN IN GROWING PIGS** (Estonia) **52**

Aiym Tilektes, Akmaral Baspakova **FREQUENCY OF MILK CONSUMPTION AMONG THE ADULT POPULATION OF AKTOBE CITY AND A COMPARATIVE EVALUATION OF THE RESULTS OF LABORATORY STUDIES OF MILK** (Kazakhstan) **53**

Akmaral Mukhamejanova **CLEANING METHOD OF ANIMAL MILK AGAINST POLLUTION BY NITRATES AND NITRITES** (Kazakhstan) **54**

Symbat Utepova, Aruzhan Tolegen, Akmaral Mukhmejanova **ENRICHED OF YOGURT TECHNOLOGY USING ANIMAL-BASED AND PLANT-BASED RAW MATERIALS IN PAVLODAR REGION** (Kazakhstan) **55**

A. Zh. Orazov, A. B. Ayupnabieva **QUALITY SAFETY SYSTEM IN THE DAIRY INDUSTRY STRATEGIES OF ITS IMPROVEMENTS** (Kazakhstan) **56**

Bohdan Kovalenko, Vasyl Kovalenko **HUMANE SLAUGHTER OF FISH AS AN ELEMENT OF ANIMAL WELFARE** (Ukraine) **57**

Nataliia Vdovenko **TOOLS OF INDUSTRY REGULATION IN THE ASPECT OF FISH WELFARE AND ENVIRONMENTAL QUALITY** (Ukraine) **58**

Oleksandr Kuzmenko, Nadiya Vovk **POLYSPERMY OF STURGEON FISH IN THE CONDITIONS OF ARTIFICIAL REPRODUCTION** (Ukraine) **59**

I. V. Goncharenko **THERAPEUTIC PROPERTIES OF KOUMIS AND PROSPECTS OF ITS PRODUCTION IN UKRAINE** (Ukraine) **60**

I. V. Goncharenko, P. V. Korol **NEW REPRODUCTIVE TECHNOLOGY IN RABBIT BREEDING** (Ukraine) **61**

Larisa Caisin, Alla Cara **DYNAMICS OF LIVE WEIGHT OF ADLER SILVER BREED CHICKEN AGAINST THE BACKGROUND OF THE USE OF NON-TRADITIONAL FEED ADDITIVES** (Moldova) **62**

Nataliia Prokopenko, Ivan Voloshyn **PRINCIPLES OF IMPLEMENTATION OF THE PROGRAM OF FORCED MOLTING OF MEAT HENS** (Ukraine) **63**

S. Bazyvolyak, T. Yarar, **POULTRY WELFARE AND ENVIRONMENTAL ASPECTS OF POULTRY PRODUCTION** (Ukraine) **64**

V. Melnyk, O. Mizina **MEAT PRODUCTIVITY OF TURKEYS OF THE "BIG 6" CROSS** (Ukraine) **65**

Vasyl Turynskiy **WAYS OF INCREASING THE ECONOMIC EFFICIENCY OF SHEEP BREEDING MANAGEMENT OF WOOLEN PRODUCTIVITY DIRECTION** (Ukraine) **66**

Nataliia Bogdanova **THE PROTECTIVE PROPERTIES OF THE WOOL FLEECE OF TAURIAN-TYPE EWES** (Ukraine) **67**

Alexandra Granat, Nataliia Bogdanova **THE POSTPARTUM BEHAVIOR OF GOATS** (Ukraine) **68**

Kateryna Makhyboroda **PROSPECTS OF ORGANIC PRODUCTION OF AQUACULTURE PRODUCTS IN UKRAINE** (Ukraine) **69**

Liudmyla Zlamaniuk, Borys Hopka, Vitalii Skotsyk **RAISING FOALS** (Ukraine) **70**

Yuliia Perehuda **SUSTAINABLE DEVELOPMENT OF LIVESTOCK ENTERPRISES IN THE CONTEXT OF DIGITALIZATION OF THE ECONOMY** (Ukraine) **71**

Dmytro Grigoryev **INDUSTRY REGULATION IN MANAGEMENT DECISION-MAKING REGARDING FISH WELFARE AND ENVIRONMENTAL PROTECTION** (Ukraine) **72**

Roman Konovalov **BASIC MEASURES TO REGULATE THE DEVELOPMENT OF FISHERIES AND AQUACULTURE ON THE BASIS OF RESOURCE CONSERVATION AND IMPACT ON THE FISH MARKET** (Ukraine) **73**

Daria Teslia, Nataliia Hrishchenko **IMPORTANCE OF UNDERFLOOR HEATING FOR THE WELL-BEING OF GROWING YOUNG PIGS** (Ukraine) **74**

Nataliia Hrishchenko, Volodymyr Shevchenko **FACTORS OF WELFARE OF PIG PRODUCTION** (Ukraine) **75**

THE ATTITUDES OF UKRAINIAN CONSUMERS TOWARD ANIMAL WELFARE

Andriy Getya, Mykhailo Matvieiev, Nataliia Hryshchenko[1],Elina Åsbjer, Birgitta Staaf Larsson, Anders Karlsson, Hallvard Wie, Galia Zamaratskaia[2], Oksana Kravchenko, Svitlana Usenko[3], Iveta Kocina, Liene Ansone[4], Vytautas Ribikauskas[5], Irada Khalilova, Ayaz Mammadov, Javid Ojaghi[6], David Richard Arney, Ragnar Leming, Francesca Carnovale[7]

[1]National University of Life and Environmental Sciences of Ukraine, [2]Swedish University of Agricultural Sciences, [3]Poltava State Agrarian University of Ukraine, [4]Latvia University of Life Sciences and Technologies, [5]Lithuanian University of Health Sciences Veterinary Academy, [6]Khazar University, Azerbaijan, [7]Estonian University of Life Sciences

getya@ukr.net

The study presents the results of a survey of Ukrainian consumers regarding their attitude toward animal welfare. Totally 147 respondents (including 70% men and 30% women) were interviewed in the period from January to February 2022. Most of the consumers were neither vegetarian nor vegan (99.3%), and 50.7% were related to livestock industry. Rural area was represented by 42.2% of consumers.

We concluded, that a large part of consumers described the animal welfare issue as very important (62.6%) and less than 1% as not at all important. More than 92% of the respondent believe that the welfare of livestock animals in Ukraine should be improved. This improvement can be achieved by adaptation of special legislation to ensure the humane treatment of farm animals (87.7%), or by labelling "animal welfare meat, dairy products and eggs" in the supermarkets (65.1%). At the same time, the consumers were ready to pay more for "animal welfare-labelled" products, but if it will be not more than 10% price increase (68.6%). To understand more about animal welfare, 63.3% of the interviewed consumers would like to have more information. Regarding animal-based food in general, different issues were important for consumers ranging from safety (39.5%) to reasonable price (7.5%).

Keywords: animal welfare, consumer survey, animal-based food

VIEWS ON ANIMAL WELFARE IN SWEDEN

Simon Tobias Höxter

Swedish University of Agricultural Sciences, SE-750 07, Uppsala, Sweden

ssho0001@stud.slu.se

Sweden is considered a country with high animal welfare standards and is one of the six highest-ranking countries in the Animal Protection Index, which ranks 50 countries in total. Swedish animal product companies and lobby organizations, such as the Swedish Farmers Association, often use the perception of Sweden having high animal welfare standards in their communication. The main legislation regarding animal welfare in Sweden is the Animal Welfare Act from 2018 (2018:1192). The Ministry of Enterprise and Regulation has responsibility for the more detailed Animal Welfare Ordinance (2019:66). The Swedish Board of Agriculture in turn is responsible for the even more detailed animal welfare regulations.

Numerous research studies about views on animal welfare of different target groups in Sweden, e.g., farmers and consumers have been conducted. An extensive study is the European Union's quantitative study "Attitudes of Europeans towards Animal Welfare" (European Commission, Directorate-General for Health and Food Safety 2016). In this study, 27 672 EU citizens, including 1028 Swedes, were interviewed, and the most Europeans in the study agreed with statements such as animal welfare being important and that animal protection in the country should be improved. Swedes are more inclined to strongly agree with those statements. Another study has shown that Swedish consumers often linked organic products, products from their own country and higher price with higher quality of animal welfare.

A qualitative study on both conventional and organic pig farmers showed that conventional farmers mainly defined animal welfare as "the physical comfort" of animals, while organic farmers mainly defined it as "natural behaviour". The farmers view on their relationship with pigs varied, different types of personal or professional relationships were mentioned. The described relationship varied with the farm production system, type of pig (e.g., sow or fattening pig) and the education level of the farmer.

In conclusion, there has generally been little research into different views on animal welfare in Sweden. There have been more studies on consumers compared to other groups, e.g., farmers. Given that the current Swedish Animal Welfare legislation is new, it is an optimal time to initiate more research within this area.

Keywords: animal welfare standards; consumers; farmers

IMPACT OF THE WAR ON THE PORK SUPPLY CHAIN IN UKRAINE

Oksana Yurchenko

Association on Ukrainian Pig Producers, post-graduate student at Uman National University of Horticulture, Ukraine

oy@asu-ua.org

The war that started on 24 February, 2022, when russia invaded Ukraine, has significantly influenced the Ukrainian agricultural sector, particularly pork production.

Due to the war total pig population in Ukraine has decreased by approximately 12 %. Among the main reasons: damage and destruction of farms as well as massive displacement of people that used to raise pigs before the war. As a result, the overall volume of pork supplies to the domestic market dropped by more than 120,000 tons of live weight in 2022 (87,000 of slaughter weight), as estimated. Reduction in the supply led to increase of average chilled pork price by 35 % during ten months of war (130,84 UAH/kg as of 23 February 2022 vs 177,81 UAH/kg as of 30 December 2022). This has resulted in more competition between pork and poultry.

The war has a negative impact on the pork foreign-trade balance as well. The blockade of ports has halted pork exports. In 2022, imports of pork amounted 74 tons, which equals 11 % of domestic pork market volume. It not only had a negative impact on domestic price but is considered to a bad trend: pork import volumes are growing from year to year while pork exports are banned due to the African Swine Fever.

Despite business risks arising out of war, loss of qualified farm personnel due to mobilization and displacement, growing pressure of pork imports, drop of pork consumption due to migration of millions of Ukrainians and purchasing power loss coursed by reduction in income and forced unemployment, most producers continue operating steadily in the areas controlled by Ukraine. Approximately 20 % of companies engaged in pig production have plans to expand capacities. The stimulus is 26 % rise in the price of pig live weight compared to pre-war period and lower grain prices on domestic market due to the difficulties of exports by sea.

Keywords: impact of war, pork supply, pig population

DAIRY CATTLE PRODUCTION OF UKRAINE (FEATURES IN MODERN CONDITIONS)

S. Y. Ruban[1], O.O. Borsch, V. O. Danshin[2]

[1]National University of Life and Environmental Sciences of Ukraine
[2]Bila Tserkva National Agrarian University, Ukraine

rubansy@gmail.com

The dairy cattle production in Ukraine is complicated by increase in cost of such components as fertilizers, energy, and feeds. Since the beginning of military operations, the dairy business has been adapting to new challenges.

The increase in production efficiency due to the reduction of dependence on energy (natural gas, fuel) and natural gas derivatives (nitrogen mineral fertilizers) in the conditions of different technologies of animal husbandry and manure processing is considered. It has been proven that in terms of the sum of nitrogen, phosphorus and potassium content in 1 kg of organic fertilizers, the highest indicators were obtained using the technology of housing cows in compost barns than when using manure processing systems in bioreactors-fermenters and open lagoons. The technology of compost barns enables greater replacement of inorganic nitrogen fertilizers. Also, this technology results in lower emissions of N_2O, the main ozone-depleting substance. The use of forced ventilation systems in summer, sealing of side curtains with the use of polycarbonate, and canopies on walking and feeding areas made it possible to extend temperature-neutral period of animals, which improved their health and productivity.

The possibility of selecting animals for feed efficiency based on the amount of milk per 1 kg of dry matter intake (the Netherlands) or “feed saved”, which takes into account amount of feeds used for milk production and maintenance (USA, Canada, Scandinavian countries, etc.) has been proven, as well as the gross efficiency of net protein as difference between input protein with feeds and output with milk. The heritability of these traits is within 13%.

The development of effective systems of milk production requires complex bio-energetic researches and analysis aimed at increasing profitability in production of high-quality milk at a low cost, improving the comfort and well-being of animals, which will affect their health and reproduction level, directions of selection, and technology of production of high-quality organic fertilizers for obtaining sustainable harvests.

Keywords: dairy cattle, health, productivity, military operations.

ANIMAL WELFARE ASSESSMENT

Vitalii Nedosekov

National University of Life and Environmental Sciences of Ukraine

nedosekov_vv@nubip.edu.ua

Animal welfare is the hallmark of a world of quality human nutrition and innovative animal husbandry, and is at the heart of sustainable society. Animal welfare is defined by a combination of three interrelated components: the physical, mental and natural state of individual animals, and, of course, our humane attitude towards meeting their needs. Animal welfare is one of the most important livestock issues in many countries. In the global trend of livestock development, the priority is the analysis of accumulated knowledge and the formation of scientific and practical welfare awareness groups or welfare consulting groups that will form animal welfare policies, carry out legislative harmonization and implementation of the best animal welfare practices.

The purpose of our work was to analyze the EU legislative framework, conduct audits and examinations, participate in various discussions of welfare problems. Based on the research, an animal welfare assessment system was created and welfare audited in 24 farms from 7 countries.

The studies carried out have made it possible to find a compromise between production and the welfare of animals, which is essential to convey to the consumer the importance of their welfare. However, the challenges remain:

A) legislative support should be constant for different groups of animals (different systems of keeping and productivity).

B) information support should be constant, both for manufacturers and consumers of products.

C) ensuring that manufacturers of the animal welfare system of different stakeholders understand.

D) training of state inspectors and private veterinarians from the position of animal welfare.

Keywords: animal welfare, assessment of welfare, criteria's, *challenges and prospects*

TRENDS IN NOVEL FOOD PRODUCTS DEVELOPMENT

J. K. Vidanarachchi

Department of Animal Science, University of Peradeniya, Sri Lanka, 20400

janakvid@pdn.ac.lk

Food industry is experiencing a dynamic process of transformation due to various reasons such as demand for more foods due to continually growing global population, growing concerns of consumers on quality, safety & health aspects of foods, emerging challenges posed by globalization, climate change, increased competitive pressures and diverse consumer demands. In this context, there are many emerging and re-emerging trends in novel food products development. Some of these novel trends are sustainable nutrition via foods, deciphering allergies, minimally processed foods, clean-labelled products & all-natural enriched foods, functional foods in terms of foods for specified health benefits, food products tailored to specified ages & uses, and smart packaging methods. These novel trends are also focused toward circular food systems, precision food manufacturing concepts and climate smart manufacturing technologies. In this context innovative modelling & developing foods, use of non-thermal preservation techniques, bio-preservatives, protective cultures, and use of novel analytical methods such as molecular techniques, food image analysis and biosensors play a significant role. Finally, adopting these novel products must be aimed via research & development, demonstration, niche formation, market formation and diffusion.

Keywords: Emerging trends, Novel foods, Sustainability

ACCOUNTING AND ACCOUNTABILITY FOR FARM ANIMALS: CONCEPTUAL LIMITS AND THE POSSIBILITIES OF CARING

Uliana Gottlieb, Gustav Johed, Helena Hansson

Swedish University of Agricultural Sciences, Department of Economics, Stockholm University and Stockholm School of Economics, Department of Accounting, Sweden

uliana.gottlieb@slu.se

This study explores dairy farmers' accounts of farm animals in a context heavily influenced by the concept of farm animal welfare (FAW). We illustrate how external demands linked to FAW, performance concerns, and proximity to animals shape farmers' formal and cognitive accounts of animals. We explain how different accounts underlie farmers' accountability for animals. Using FAW as an example of a referent concept, we propose that accountability can be limited conceptually by its referent. This limit is not a matter of its (in)ability to account fully for all lived experiences. Rather, it is a matter of what one is or is not accountable for—such as the mortality rate but not culling—as well as assumptions regarding the referent—such as the nature of animal welfare and how it can be assessed and safeguarded. Even when it is conceptually bounded in this way, self-accountability has potential to alter farming practices by reflecting on caring about animals and on what this implies for oneself and the animals.

Keywords: Farm animal welfare, Accounting, Accountability

SENSORY EVALUATION OF BOAR MEAT IN A DIFFERENT WAY OF CASTRATION

Irina Bankovska

Institute of Pig Breeding and Agroindustrial Production NAAS,
Poltava, Ukraine

gloryir2017@gmail.com

Modern requirements of the eco-ethical declaration for the improvement of animal welfare «Universal Declaration of Animal Welfare» change the accents of attention in the direction of the complete rejection of the castration of boars. However, the unpleasant «boar taint» is recognized by consumers as a significant defect in the quality of pork. The aim of this study was to conduct a sensory assessment of boar meat of various methods of castration and different pre-slaughter mass.

Research methodology. Under the conditions of SPE "Globinsky Pig Complex" LLC, 2 groups of boars of the same age were formed - surgical castrates (SC) and immunological castrates (IC). Boars obtained from sows F1 combination of Yorkshire and Landrace breeds (Large White × Landrace) with terminal boars of the "MaxGrow" line of Irish selection. At the end of the fattening, the animals showed different live weights (from 100 to 130 kg).

A group of seven trained tasters evaluated the quality of the smell of meat and subcutaneous fat samples (from the rectus pectoral muscle (m. Rectus thoracis)) prepared by the "broth method". Each taster evaluated 40 samples (20 SC 20 IC) according to the point system. Of the 20 samples, every 5 belonged to 100, 110, 120, and 130 kg subgroups.

The results of the study. In the group of surgical castrati, out of 20 samples, 19 were evaluated as a fresh product high quality. However, sample No. 8 from the carcass of an animal with a live weight of 110 kg was low. Three of the seven tasters identified it as a "palpable boar smell."

Among immunological castrati, it was found that sample No. 36 in a group of animals of 110 kg was distinguished by the «boar taint». The same characteristic and low point score was given to sample No. 55 (live weight of the animal 130 kg). Among the group of heavy pigs, tasters noted three more samples with an unpleasant odor.

Conclusions. The results of the sensory evaluation of pork samples obtained by us are consistent with the conclusions of Dunshea et al.(2001), Fabrega et al. (2010) the fact that for a number of technological and physiological reasons among castrated boars there are 1-3% of animals with an unpleasant smell of muscle tissue that exceeds the level of normal human perception.

The results provide grounds for further research to find out whether double vaccination is sufficient to fully address the issue of the unpleasant smell of meat in immunocastrated boars and how does the growth rate of immunocastrates affects the sensory characteristics of meat.

CURRENT SITUATION WITH SURGICAL CASTRATION IN DENMARK

Associate Professor Martin Krøyer Rasmussen

Department of Food Science, Aarhus University, *Denmark*

Martink.rasmussen@food.au.dk

Quality is one of the single most important parameters for the consumer when buying meat. Among the quality parameters are attributes like aroma and taste. Meat from sexually mature boars can carry an off-flavor and taste, which causes low consumer acceptance. The phenomenon of boar taint is related to the bacterial production and hepatic clearance of skatole, the latter being compromised by sex hormones. Moreover, the production of androstenone in the testis is *per se* also contribution to boar taint. The common method to avoid boar-tainted meat is surgical castration of male piglets to stop the production of sex hormones including androstenone. However, from an ethical and sustainability point of view, surgical castration should be eliminated from pig production. My presentation will give an overview of the mechanism behind the development of boar taint and suggest solutions. Moreover, I will also give a status on the situation in Denmark.

Keywords: pigs, meat quality, boar taint

MEAT-BASED PRODUCTS FOR ELDERLY

Kadyrzhan Makangali

S. Seifullin Kazakh Agrotechnical University, Department of Food Technology and Processing Products, Zhenis Str., 62, Astana, 010000, Kazakhstan

kadyr.makangali@gmail.com

In meat processing, a large part of meat by-products is discarded as waste or used for low-value products. Meat by-products are good sources of protein hydrolysate because they are produced in large quantities and are rich in protein. In order for these by-products to be profitably processed into valuable products by enzymatic hydrolysis, protein hydrolysate was obtained from wool cattle by-products. For effective hydrolysis of meat by-products, pre-heat treatment parameters have been set at 95-98°C for 45-50 minutes. Two enzyme concentrations have been selected for effective hydrolysis of protein substrates: 1%, and 5% by the enzyme BLT 7 and commercial Protease from Bacillus licheniformis (hereinafter PS). Six meat samples were examined in 3 hours, 24 hours, 36 hours, and 48 hours in duplicate. The effectiveness of using 5% BLT 7 as an enzyme preparation, providing for the hydrolysis of protein of cow's trotters, has been substantiated. The optimal hydrolysis time of 24 hours at a temperature of 45°C has been determined. As a result of the conducted studies, a technological scheme for the production of protein hydrolysate from meat by-products has been developed and proposed. Set drying mode, which was the temperature at the input of the dryer 135-140°C and output 85-90°C. Based on the results of studies and for the fuller use of all resources of raw meat, in the production of boiled sausages for the elderly, it is proposed to use protein hydrolysate obtained from cow's trotters.

Keywords: cow's totters; enzyme hydrolysis; meat by-products

HISTORY AND PURPOSE OF MEAT CONSUMPTION

Galia Zamaratskaia

Department of Molecular Sciences, Swedish University of Agricultural Sciences, SE-750 07, Uppsala, Sweden

galia.zamaratskaia@slu.se

Numerous scientific studies aimed to improve our understanding of human diet evolution and the role of meat in our development. Meat consumption in the West started at least 2,500 years ago. The largest evidence of meat eating is butchery marks found on bones. The changes in dietary patterns and the transition from hunting and gathering to agriculture have been extensively reviewed. However, further research is needed to understand when and how our ancestors started eating meat using advanced analytical methods. This knowledge will help to explain the evolutionary context of our modern diets and even diseases associated with these diets.

Meat is a good source of high-quality proteins with a favorable amino acid profile. Meat proteins are considered easily digestible. It also contains high concentrations of essential minerlas including iron, zinc, selenium, copper and manganese. Vitamin B12 can be found only in food of animal origin, but not in vegetable products. The content of these nutrients in meat depends on the production system, muscle type, breed or age at slaughter of the animals. Meat is potentially rich in bioactive peptides with positive health effects including antihypertensive, antioxidant, antithrombotic, antimicrobial, antidiabetic, and anticancer activities. Bioactive peptides can be generated even from low-value meat and offal, which is an attractive strategy to reduce waste in the food industry.

Certainly, it doesn't mean that meat is an irreplaceable part of the modern human diet. In 2015, the International Agency for Research on Cancer, based on data from animal models and epidemiological studies classified the consumption of processed meat as carcinogenic and red meat as probably carcinogenic to humans. The exact mechanism(s) behind these effects are still poorly understood. Nevertheless, meat analogs are increasingly adopted in dietary patterns as a replacement of meat products, especially in Western countries, including Sweden.

Keywords: animal; muscle foods; nutritional value

PLANT-BASED BIOACTIVE COMPOUNDS IN MEAT INDUSTRY

Malgorzata Korzeniowska

Wroclaw University of Environmental and Life Sciences, Department of Functional Food Products Development, Wroclaw, Poland

malgorzata.korzeniowska@upwr.edu.pl

Various plant based materials have been used in meat industry since the beginning of meat processing development. Nowadays, meat technologists are still constantly looking for new sources of non-meat components as a key aspect of continuous innovations and market success. Plant materials are rich in many components with potential pro-health values, a.o. vitamins, minerals, polyphenols, terpenoids, organic acids, specific polyenoic fatty acids, betalains, etc. Moreover, selected plant matrixes obtained during fruit, vegetables and grains processing, as a side streams, including pomaces, press cakes and spent grains, are very valuable in case of fiber content. The application of plants and plant-based materials, like herbs, spices, fruits, vegetables, and unconventional plants, as well as fruit, vegetable, grain and fermentation industries by-products, as a carrier of natural substances creates the possibility for further improvement of nutritive, quality and functional properties of meat products, and as well the products' shelf-life through plant additives high antioxidative, antimicrobial and antiviral potential. The aim of the study was to screen for various plant sources (buckthorn, nettle, *Scutellaria baicalensis* Georgi), including food industry side streams (spent barley, blue maize germ flour, buckwheat and oat brans, cranberry and plum pomace) to create innovative meat products with improved functionality and preserved or enhanced sensory qualities. In the series of experiments meat pates, burgers, nuggets and homogenized sausages were prepared with the addition of plant matrixes (0%-10%) and subjected to physicochemical, textural, sensory and microbiological analyses. It can be concluded that all analyzed plant materials can be successfully applied in meat products as an alternative source of protein, fat, fiber and antioxidants, but with dose restrictions (usually not more than 2%-3% blue corn flour, 5% for buckwheat and 8% for oat brans), due to significant negative effect on the quality of the products, especially on color, texture and taste.

Keywords: plants, fruit and vegetables side streams, meat products

BASICS OF SUSTAINABLE PRODUCTION AND WELFARE OF ANIMALS ON AGRO-INDUSTRIAL SHEEP FARM CEO ”GEOZEM-MAKARIV”

Kurmei Kornelii

National University of Life and Environmental Sciences of Ukraine

kornelio.kyiv@gmail.com

Economic development of the agricultural sector is impossible without sustainable development of economic entities based on the principles of animal welfare. On the example of our agro-industrial sheep farm, I will reveal the advantages and details of the stall keeping of sheep of the «Lacaune» breed of dairy productivity in Ukraine. Firstly, it is profitable for farms specializing in the combined production of meat and dairy products. Stall keeping allows gaining regulated weight and growth of animals, avoiding viral, bacterial and fungal infections, hair clogging, hoofs diseases, provide psychological peace and even eating of feed. And this whole complex of measures guarantees the first stage of the well-being of the animal. Secondly, when building a sheep farm, it is necessary to take into account a lot of measures: the thermal balance of the building, the ergonomics of the fodder-table, the places for animals to drink, the effective ventilation of stalls and air-exchange systems, the correct setting of the roof-peak, temperature and light conditions, microclimate control sensors. This complex is the second stage of sheep’s welfare. Thirdly, the human factor and responsible professionalism play a fundamental role in the organization of animal welfare. Our livestock specialists conduct a clear routine for the care of sheep. The regulation includes the following processes: the formation of a control group of sheep in the herd, constant visual monitoring of animals, special care for impregnate ewes and young lambs, compliance with the time schedule for the distribution of feed and concentrates, organization of sheep watering, farm/sheep cleaning, correct hay layout, availability of high-quality bedding, timely separation of animals and their distribution into subgroups, trimming and hooves treatment, etc.

Combining all these requirements into a unified working system, we can confidently assume that animal welfare only in this way looks perfect. Today, our farm continues to produce high-quality dairy and meat products. And, in practice, the main factor of product quality is the comfortable keeping of animals. Animal welfare provides a high economic effect, allowing to obtain high-quality raw, as a milk and meat, advanced processing into premium food products in a sheep farm conditions. Our company recently received the Export License. And this is a source to start export operations of our food products and to develop our farm with the herd more than 2000 sheep, as a competitive business-entity in the international market.

In the course of our scientific and practical work, we will substantiate the economic efficiency of management based on the principles of animal welfare.

Keywords: sheep, agro-industrial sheep farm, sustainable, welfare.

HAPPY CHICKENS – BETTER MEAT

Sampels, S[1]*., *Pickova, J[1]*. *Gatchell, S[1]*. *Karlsson, A[2]*., *Yngvesson, J[2]* & *Arvidsson Segerkvist, K.[2]*

Swedish University of Agricultural Sciences,
[1]Department of Molecular Sciences, P.O. Box 7015, 75007 Uppsala, Sweden,
[2]Department of Animal Environment and Health,

P.O. Box 234, 53223 Skara, Sweden

Differences in broiler meat quality properties can be caused by many factors, among others physical activity and also the foraging of a varied diet on an outdoor pasture. Access to outdoor pasture is part of an animal friendly rearing system but could also cause more physical activity, which can affect meat quality.

The aim in the current study was therefore to evaluate the effect of rearing broilers indoor in small pens (S) or in big pens with outdoor access (B), on meat quality and fatty acid (FA) composition. We compared two slow growing broiler hybrids (Rowan Ranger [RR] and Hubbard CYJA57 [H]). Meat quality was only influenced by genotype, where RR chickens had higher breast weight, higher Warner-Bratzler shear force and higher pH than H chickens. Differences in lipid composition were found both due to hybrid and to rearing system. Rearing in a big pen resulted in lower concentrations of 16:0 and higher concentrations of both total n-3 and n-6 fatty acids and of individual long chain polyunsaturated FA. The conclusion is that outdoor access does not have negative effects on broiler meat quality regarding the used hybrids.

Keywords: broiler; outdoor access; fatty acids

CRITERIA OF THE PROTOCOL FOR COW WELFARE ASSESSING ON THE FARM IN UKRAINE

Hanna Petkun, Vitalii Nedosekov

National University of Life and Environmental Sciences of Ukraine

hanna-korol@ukr.net

The science of farm animal welfare is relatively new for Ukraine. At the moment, there is no general protocol for assessing the welfare of dairy herds on farms.

We identified 4 "problem areas" before creating the protocol. These parameters require further evaluation:

1. Feeding and access to water.
2. Animal husbandry and environment.
3. Health.
4. Behavior.

Our goal was to create a basic, effective and understandable protocol for assessing the welfare of cows on dairy farms in Ukraine

The protocol included 9 criteria for assessing the quality of feeding and watering cows, namely: measurement of trough width and height, number of places for watering and feeding, cleanliness of feed and water, water temperature and type of waterer. BCS is also included in the assessment of the feeding parameter.

Cows' environment is evaluated using 22 criteria: percentage of cows standing idle and cows lying in walkways, noise and lighting in the cowshed, lighting period, air freshness, presence of cobwebs and condensation, temperature, drafts, softness, cleanliness and dryness of bedding, size stall, number of places, condition of the floor, animal walking, width of paths and passages, presence of a motorized brush, access to pastures.

To assess the health parameter, our protocol includes 15 criteria: examination of lameness, condition of knees, hocks and claws, hair, mastitis, ketosis, abomasal displacement, ease of calving, discharge from the nose and eyes, cleanliness of the animal, skin damage, diarrhea and methods of dehorning cows.

The behavioral parameter is evaluated using 6 criteria: vocalization, level of relationship between human and animal, manifestation of aggressive and stereotyped behavior, presence of positive states and the so-called "relaxed" tail.

Therefore, the protocol will include assessment of parameters of health, environment, feeding and behavior. For a general and comprehensive assessment, this protocol consists of 52 criteria and should become the basis for a successful assessment of the welfare of the dairy herd on the farms of Ukraine.

Keywords: animal welfare, dairy herds, dairy farms

RESULTS OF DNA TYPING OF HYBRID PIGS BY RYR1 GENE

Yelyzaveta Budakva

Institute of Pig Breeding and Agroindustrial Production NAAS, Poltava, Ukraine

budakvayelyzaveta@gmail.com

The study was aimed at detecting polymorphism by the RYR1 (g.1843 C>T) gene among the hybrid pigs (Large White × Landrace) × Maxgro. In total, 50 pigs raised in SPE "Globinsky Pig Complex" LLC, Ukraine, were selected. DNA from bristles (n=20) and epithelial tissue (n=30) was isolated using Chelex-100 ion exchange resin and the "DNA-Sorb B" nucleic acid extraction kit respectively. Genotyping of animals was performed using the PCR (Polymerase chain reaction). For the amplification of specific MC4R gene fragments, the following primers by were used: Forward: 5' – *GTGCTGGATGTCCTGTGTTCCCT*-3 and Reverse: 5' – *CTGGTGACATAGTTGATGAGGTTTG*-3. The components were subjected to PCR amplification in a thermal cycler (TERTSYK, DNA Technology). Gel documentation was done after subjecting the amplicons to electrophoresis on 2% agarose gels. The restriction (RFLP) method was used to detect polymorphisms in the RYR1 (g.1843 C>T) gene, using endonuclease HhaI. Enzymatic digestion was performed in a final volume of 12.1 µL, including 5 µL of the PCR product, 0.1 µL of TaqI endonuclease (Thermo Fisher ScientificTM), and 2.0 µL Buffer 10X, together with nuclease-free water to reach final volume 5.0 µL. Samples were incubated at 37 °C for 1 h 50 min. DNA fragments were separated in 8% polyacrylamide gel in 1xTBE buffer. Restriction products were visualized by dyeing bromide ethidium and viewing on the transilluminator in UV light. The results showed that locus $RYR1^{TT}$=49 and $RYR1^{CC}$=1 were monomorphic. The dominant homozygous allele $RYR1^{TT}$ is inherent in animal meat productivity direction. In SNP RYR1, the T allele (0.941) was higher in the frequency of the C allele (0.059). The frequency of genotypes according to the Hardy-Weinberg law for the TT genotype is 0.94, the CC genotype of 0.06 of the RYR1 gene (g.1843 C>T) prevails. To improve the fattening characteristics of hybrid pigs with the participation of the terminal parent line I recommend in breeding work to form groups of hybrid young pigs according to the following complex genotypes: $RYR1^{TC}$, $RYR1^{TT}$ (HhaI). Therefore, a necessary recommendation is to select an assessment of sows and boars of the Maxgro terminal line homozygous by recessive genotype $RYR1^{CC}$ or heterozygous by the $RYR1^{TC}$ genotype. It was found that hybrid pigs are carriers of the dominant homozygous trait $RYR1^{TT}$. This is a direct statement that the parents of the maternal nucleus are representatives of the pure line, in combination with the boars of the Maxgro line similarly homozygous on the basis of $RYR1^{TT}$ as well as descendants who do not have splitting. The PCR analysis showed the absence of polymorphism of the RYR1 gene in pigs of foreign breeding. Indicators of average heterozygosity indicate a high level of genetic consolidation of the studied herd of hybrid pig.

POSSIBILITIES TO IMPROVE SILAGE CONSERVATION FOR ANIMAL FEEDING

Martin Knicky

RISE Research Institutes of Sweden, Bioeconomy and Health, Agriculture and Food, Uppsala, Sweden

martin.knicky@ri.se

Nowadays, hay and silage making are main conservation methods are used in forage preservation in Sweden. Production of high-quality silage and silage management are essential for animal health and welfare. Grasses in mixture with legumes are dominant forage in Sweden, Two technology of forage ensiling prevail in Sweden, ensiling bales and bunker silos. Two overriding features of any forage which affect fermentation can be distinguished. The first is the nature of the raw material which is determined by the chemical and microbial composition of the crop. The second feature is related to ensiling conditions imposed by the silage-maker, and include processes such as wilting, mechanical treatment of forage and use of additives.

Forages ability to be successfully ensiled differs. The difference is mainly given by concentration of water-soluble carbohydrates (WSC), as main substrat for lactic acid bacteria for formation main conservation product in silages, which is lactic acid. Legumes or old forages contain less WSC which make them more difficult to successfully ensile. The water content in the fresh crop plays an important role in availability of WSC to lactic acid bacteria. However very wet forage can cause undesirable fermentation with high ensiling losses.

Wilting of forage prior to silo packing is very common procedure in gras silage making. Wiling reduces the water content in the forage thereby reduces the risk for silage losses in form of effluent as well as undesirable growth of clostridia during fermentation.

Precision chopping causes a more available substrate from damaged forage cells, resulting in an increased fermentation rate of silages. A more finely-chopped crop is easier to consolidate in the silo thereby reduce undesirable effect of oxygen in silage mass.

The use of additives is common practice to ensure a proper ensiling process. Our studies indicated that a mixture of sodium benzoate, sodium propionate, hexamine and sodium nitrite were very suitable additives to ensure the silage quality and aerobic stability in wide spectrum of crops at different levels of ensilibility.

Keywords: additives; fermentation; bacteria; forage.

INNOVATIONS IN FEEDING PIGLETS WITH LIQUID MILK PRODUCTS

Kostiantyn Makhno

AVA Group, Ukraine

k.makhno@avatlantik.com.ua

These studies provide examples of innovations in liquid feeding of piglets in the farrowing section. In recent years, with the development of the genetic capabilities of sows and the increasing fertility, there has been a need for an additional source of nutrients for piglets. We show how feeding liquid milk products to piglets can improve the preservation and productivity of piglets before weaning and prepare the digestive system of piglets for digestion of dry vegetable feed after weaning. We explain the importance and function of each of the products - milk replacer and liquid milk prestarter. The use of these products for piglets is a solution to increase the productivity of piglets and facilitate the process of weaning from the sow, which was a challenge to the European legislation on the prohibition of the use of feed antibiotics, the restriction of the use of zinc oxide and copper sulfate. These types of products can be fed to piglets using manual feeding, special automatic cup or valve systems.

Keywords: piglets, milk replacers, liquid milk prestarter, digestive system, weaning process.

COLOSTRUM - THE MOST IMPORTANT FEED FOR CALVES

Yurii Pozniakovskyi

AVA Group

yuriy_pozniakovskiy@ukr.net

Colostrum is the first and most important feed in a calf's life. The main task of colostrum is to provide passive immunity, because calves do not receive immunity from the mother through the placenta, and are born without immunoglobulins (antibodies) in the blood, and it takes time for the active immunity of one's own body to form.

Colostrum is a super feed that contains all the necessary substances for the development of the calf – proteins, fats, carbohydrates, macro- and microelements, water and a number of other biological substances. In order for the calf to receive them, it is necessary to properly organize colostrum management.

In order to do this, we can highlight the following control points: quality, quantity, quickness, cleanliness, control of passive immunity transfer.

We should feed to the calf first portion of clean colostrum (10% of body weight) with high quality (>50 g/L IgG) during 1^{-st} hour after birth.

In order to control whether the process of transfer of passive immunity was successful, it is necessary to take blood from calves on the 2-5th day of life and analyze it for the content of total protein (using a refractometer). If the content of total protein is higher than 5.2 g/dL – transfer of passive immunity was successful, if less, immunity transfer failed. The main reasons for the failure of the transfer of passive immunity are non-compliance with the recommendations for colostrum feeding.

Correct colostrum management is the first and most important step in ensuring the health and future productivity of the heifer.

Keywords: colostrum; calves; immunity

INFLUENCE OF MALE RABBITS ON THE PRODUCTIVITY AND REPRODUCTION OF RABBITS DOE OF THE MATERNAL FORM OF THE CROSS

Taras Yakubets, Vasyl Bochkov

National University of Life and Environmental Sciences of Ukraine

tarasyakubets@gmail.com

The main principles of modern rabbit meat production technology are the use of rabbits of specialized breeds, keeping them in automated rooms with a regulated microclimate, and feeding rabbits with full-rational compound feed.

The optimal approach to a breeding program to increase rabbit meat production was to create specialized lines through selection - maternal as well as paternal lines. These lines are combined in a crossbreeding program to obtain a final hybrid that has high growth intensity and low feed costs during the fattening period. At the same time, the issue of working with progenitor forms to obtain highly productive rabbits of the maternal form remains relevant.

The purpose of the research is to establish the influence of the use of males on the indicators of the reproductive capacity of female rabbits of the ancestral form of the cross.

To study the influence of males with different weight indices, three groups of rabbits were formed. Females of group I were mated with rabbits with a weight index ≤ 100 points, female rabbits of group II - with males with a weight index of 100 to 120 points, and female rabbits of group III - with males that had a weight index of ≥120 points.

Research results indicate the presence of certain trends in the use of males with different weight indices. Female rabbits of group III had the highest multifertility - it was 1.04 and 1.22 heads, greater than that of female rabbits of groups II and I, respectively. The highest value of high fecundity was found in female rabbits of the I group. According to this feature, they outnumbered female rabbits of the II group by 0.53 g, and female rabbits of the III group - by 1.84 g.

Female rabbits of the III group, which were covered by males with a high weight index, were characterized by the highest milk yield. Rabbits of the II group had 7.7% less milk than females of the III group, and female rabbits of the I group - 11.3% less. The average weight of the 1st rabbit at the age of 3 weeks was the highest in rabbits obtained from rabbits of the III group. It was 3.43 and 6.88 g smaller in rabbits obtained from females of the I and II groups, respectively. The preservation of rabbits until weaning in rabbits of all groups did not differ significantly and was at a high level - from 94.25 to 95.58%.

The obtained data prove that the use of males with a weight index ≥ 120 units affects the level of productive characteristics of female rabbits, in particular, multifertility and milk yield, which are the main characteristics of rabbits of the maternal line of the maternal form. When working with ancestral cross forms, it is recommended to use males with a high weight index.

Keywords: rabbits, crossbreeding, selection, rabbits doe

A2 GENOTYPING: PROMISING DIRECTION IN DAIRY CATTLE GENETICS

Roman Kulibaba, Mykola Sakhatskyi
National University of Life and Environmental Sciences of Ukraine,
Heroyiv Oborony St., 15, Kyiv, 03041, Ukraine
romankx37@gmail.com

One of the most interesting topics in the area of animal genetics, which is implemented in Ukraine, is beta-casein polymorphism in the populations of different cattle breeds in context of association with producing of organic production in animal husbandry. In this direction, beta-casein, which content compose about 45% of the whole casein fraction in milk, belongs to one of the main interesting objects. There are two most common and genetically determined varieties of beta-casein – A^1 and A^2 form. Beta-casein A^1 is harmful to human body, whereas beta-casein A^2 is not. These forms are differed only by one amino acid residue in the molecule. In the case of beta-casein A^1 there is histidine at position 67, and in A^2 –proline at the same position. Numerous studies have shown that various forms of beta-casein are associated with a number of human pathological states which makes *CSN2* gene a relevant object for the studies in the context of production performance of different dairy cattle breeds. When milk, containing A^1 form of beta-casein, enters the gastrointestinal tract, β-casomorphin is formed causing different digestive disorders and leading to other serious diseases in long-term. This does not happen when using milk that contains A^2 form of beta-casein. It was found that the cause for the replacement of the amino acid in the protein molecule is a point mutation in the beta-casein gene, which appeared many years ago in European cattle breeds (for instance, in the ancestor populations of Holstein cattle breed). These cattle are superior to other breeds by milk productivity parameters, due to which it has become practically "transcontinental" and is used for intensive "Holsteinization" of local livestock in many countries. In the local native cattle breeds in African and Asian countries, which have not yet undergone “Holsteinization”, this mutation has not been identified. All cattle in these countries, as well as goats and buffaloes, have only the A^2 allele of the beta-casein gene. Recently, it was shown that 75% of Holstein cows produce A1 milk. Interest in genotyping cattle from different breeds is also noted in Ukraine.

In the 2022, at Molecular genetic laboratory of the Animal Biology Department, a project “To develop the technology of molecular-genetic support of the selection process for the creation of herds of cows that produce A^2 milk” has started. The general aim of this project is to develop the technology of molecular genetic support of the selection process to create herds of cows producing A^2 milk. Currently, with using of different methods (ACRS-PCR, AS-PCR) for allele differentiation of *CSN2* gene were carry out the investigation of genetic structure of different cattle breeds of Ukrainian selection. Thus, based on the results of this work, the prerequisites for obtaining a new type of dairy products – A2 milk – will be created in Ukraine.

Keywords: polymorphism, beta-casein, cattle, population, allele

EFFICIENCY OF APPLICATION OF DIFFERENT INDEX MODELS IN DAIRY CATTLE BREEDING

Matvieiev Mykhailo, Getya Andriy

National University of Life and Environmental Sciences of Ukraine,

matvieiev_mykhailo@nubip.edu.ua

An important element in the evaluation of breeding measures is the assessment of the potential economic efficiency of the indexes used. In current work, the efficiency of 4 variants of indexes was compared, which were included 3 traits: fat yield, protein yield and days open. The indices differed in the method of calculation and the value of economic weights of selection traits depending on the cost of growing heifers.

Since the majority of farms cull cows based on their milk yield, the economic potential of cows wrongly culled for milk yield during 305 days of lactation but retained according to the results of the index evaluation was taken as a measure of the index efficiency, evaluated as an advantage over the average value of animals culled by both methods. Profit from the sale of cow milk is calculated on the basis of the price of 1 kg of milk with the content of fat (3.4%) and protein (3.0%), according to the prices in the farm during the period of research - 13.2 UAH. The annual culling rate of cows from the herd was 30% That was taken as a benchmark for the calculations.

According to the analysis of the results obtained, with the increase in the cost of growing heifers on the farm, the efficiency of the developed indexes decreased from 8215.92 UAH to 8077.6 UAH per head. At the same time, the number of animals that did not coincide with the results of both assessments increased.

As conclusion, culling cows solely for milk yield, without taking into account the amount of milk protein, fat, and days open do not contribute to the growth of production efficiency. The application of the developed indices allows breeding farms to sell culled animals with relatively high index scores to other farms.

Kaywords: selection indexes, dairy cows, economic evaluation

MARKET POSSIBILITIES FOR HIGH PROTEIN SUNFLOWER CONCENTRATE IN POULTRY AND SWINE FARMING

Vitalii Shkarban

Department of Animal Feeding and Feed Technology named after P.D. Pshenychnoho
National University of Life and Environmental Sciences of Ukraine

e-mail: shkarbanv@gmail.com

The realities of the globalization of markets and the opening of borders on the one hand and the increase in the world's population and, accordingly, the need for food products create new challenges to livestock production. Countries, markets and livestock industries that can implement the most efficient production in accordance with today's realities will be more successful world markets and obtain additional profits compared to competitors. The producer of livestock products is affected by a huge number of factors, which we can divide into external and internal. Among the external factors: the price of feed raw materials and main assets, access and size of the markets (population, legislative base, regulation), logistical opportunities, availability and qualification/cost of labor, access to financing, speed of innovations integration into the practice and others . Internal factors usually focus on working with the operational efficiency of production technology, continuous testing of the most optimal feeding strategies (feed factor) and the ability to quickly analyze and make decisions. Livestock industries of Ukraine have advantages in the feed factor in terms of access to relatively cheap and high-quality raw materials, in particular protein and grain.

From the point of view of feeding, Ukrainian producers should focus as much as possible on receiving/using products with added efficiency/value that are locally produced (cereals, protein, alcohol industry processing by-products and others). After all, we import all synthetic and expensive components of rations mostly from Europe and China, so their price in Ukraine depends on the global situation and the most effective solutions always starts their implementation from Western markets.

The most costly components in the rations of pigs and broilers are protein sources. Three types of protein feeds are using in Ukrainian rations for pigs and broilers: sunflower, soy and rapeseed. Sunflower processing products are a strategic advantage in terms of production economics and animal/poultry feeding. Modern technologies for additional processing of sunflower meal/cake make it possible to obtaine high-protein concentrates with 44-46% of crude protein and 6-8% of crude fiber. High-protein sunflower concentrates can be included in the rations of pigs and poultry in large quantities, and the issue of balancing due to synthetic amino acids and the displacement of soy is economically profitable.

Keywords: feeds, swine and poultry farming, meal, cake, high protein sunflower concentrate.

TOWARDS IMPROVING REPRODUCTIVE TRAITS IN AQUACULTURE SPECIES USING NEXT-GENERATION SEQUENCING

Khrystyna Kurta, Henrik Jeuthe, Christos Palaiokostas

Uppsala University, Sweden

khrystyna.kurta@imbim.uu.se

This study aimed to uncover genetic effects on fertility in farmed fish and evaluate the possibility of its improvement through selective breeding. The main determinants of male reproductive performance, such as sperm concentration, motility, and swimming speed, were analyzed. Computer-assisted semen analysis (CASA) and NucleoCounter were used to assess these parameters. We studied Arctic charr males (n = 469) at the age of 3 years, and 329 males out of these males were genotyped for ~5,000 single nucleotide polymorphisms (SNPs) identified with the next-generation sequencing. Heritability estimated for the sperm traits was moderate with the pedigree (0.21 – 0.32; SE 0.09) and genomic (0.23 – 0.26; SE 0.09) relationship matrices. The accuracy of predicting breeding values for motility and velocity was higher using genomic information (0.26 – 0.29, SE 0.03 – 0.06) compared to the pedigree-based model (0.20 – 0.28, SE 0.04 – 0.07). For sperm concentration, a pedigree model (0.22 SE 0.03) was more efficient than the genomic model (0.14 SE 0.04). A genome-wide association study (GWAS) detected a single SNP on chromosome LG7 significantly associated (P<1e-05) with sperm motility. The SNP is located in a *PTPN11* gene (500 Kb region) that was previously linked with sperm quality traits in livestock species. A weighted single-step genomic best linear unbiased prediction (WssGBLUP) showed the genomic regions explaining > 1% of additive genetic variances for sperm traits throughout 21 chromosomes.

Overall, reproductive traits such as sperm quality have moderate heritability, therefore, can be improved through selection. Furthermore, multiple genomic regions associated with sperm quality traits were revealed in farmed Arctic charr, suggesting that the genetic component significantly controls it. Improving fertility traits using selective breeding and GWAS will ensure an increase in sustainable aquaculture production.

Keywords: reproductive performance; selective breeding; genome-wide association study

TRADITIONAL AND NONTRADITIONAL BIOMANIPULATION: TWO ALTERNATIVE WAYS TO PREVENT ALGAL BLOOMS AND FISH KILLS IN FRESHWATER BODIES

Ganna Kotovska[1], Rudyk-Leuskaya Nataliia[1], Mykhailo Leuskyi[1], Dmytro Khrystenko[2]

[1] – National University of Life and Environmental Sciences of Ukraine
[2] – Institute of Fisheries of National Academy of Agrarian Sciences, Ukraine

gannkot@nubip.edu.ua

Despite the considerable reduction in external nutrient loading, many lakes affected by urban and agricultural activities have remained eutrophic with algal blooms and fish kills. One of many methods for improving the conditions in such lakes is biomanipulation. There are two main approaches for achieving the main aim: traditional and nontraditional.

Traditional biomanipulation refers to the manipulation of the fish community to reduce predation pressure on herbivorous zooplankton, supposedly followed by an increased abundance and size of zooplankton, particularly Daphnia, that leads to higher grazing pressure on phytoplankton and, subsequently, to clear water. This method is common in the EU and North America. Usually, activities are focused on cyprinid removal in combination with piscivore addition.

Nontraditional biomanipulation or biomanipulation with filter-feeding planktivorous fish is an alternative concept that is more effective in the case of the absence of large-bodied zooplankton. This method is commonly used in North-East and Central Asia, tropical regions, and some countries of Western Europe (Ukraine). Filter-feeding fish feed on phytoplankton by engulfing or sucking a volume of water containing prey items into the buccal cavity. This feeding behavior is not visually directed at individual prey and, therefore, filter-feeding fish may capture more than one prey at a time. One may argue that silver & bighead carps are consuming mainly big phytoplankton and zooplankton, however, these species are opportunistic and when concentrations of zooplankton are low, they may feed on phytoplankton and detritus and show good results in some big long-term investigations.

Overall, the two presented approaches do not provide 100% effectiveness. Nevertheless, we might assume that the traditional approach is more effective, but it leads to lower fish productivity. Although nontraditional biomanipulation is less effective from an ecological perspective, it achieves higher fish productivity, has higher economic revenue, and was accepted as the main direction of fish management in Ukraine.

Keywords: traditional biomanipulation, fish, phytoplankton, zooplankton

RELATIONSHIP BETWEEN INDUSTRIAL PRODUCTION AND ANIMAL WELFARE IN UKRAINE

Nataliia Hrishchenko

Department of Technologies in Poultry, Pig and Sheep Breeding
National University of Life and Environmental Sciences of Ukraine

nat.hryshchenko@nubip.edu.ua

Today, a number of transformational changes are taking place in Ukraine at the level of regulation of the production and processing of livestock products. From this point of view, the issue of animal welfare is of great importance because we can obtain a permit for the construction and operation of an industrial facility only after proving compliance with safe conditions for people, animals and the environment.

It is worth noting that current production aspects that are not prohibited by law are allowed in the practice of industrial production. So, given the economic approach to production, manufacturers are interested in the efficiency of using every meter of production space. Optimal economic and technological use of the production space led to the reduction of the stable area for animals and the absence of walking space in both pig, goat and dairy cattle breeding facilities. The market needs force the producer to stimulate the maximum production output of animals. This includes the farrowing of pigs more than 2.4 times a year, the milking period of goats for more than 1000 days, the restriction of motor activity due to the high stocking density, and other aspects that are stressful for the animal.

Thus, scientific community today is actively engaged in changes in the legislative base, which will allow the normal functioning of the animal body and will be acceptable to product manufacturers.

Keywords: animal husbandry, well-being, industrial production

CASTRATION OF BOARS FROM THE BEGINNING UNTIL THE POSSIBLE END

Miroslav Rozkot

Institute of Animal Science, Prague – Uhříněves, Czech Republic

rozkot.miroslav@vuzv.cz

At a time when the peaceful life of people is threatened and in many countries the population is struggling with a lack of food resources, prioritizing the rights of animals over the rights of people is not entirely appropriate. But it happens. In this way, the pressure of activist groups can influence public opinion. Their often incompetent, but at the same time very loudly proclaimed opinions can and, according to experience, often change EU legislation. In the last few years, their goal has become the common practice of castration of piglets without anesthesia. Boar odor in adult boars used for human consumption is an indisputable problem. There can be no doubt about the pain during this procedure without anesthesia. However, even anesthesia is not a guarantee of painless wound healing or stress when putting piglets into artificial sleep. We will leave aside the problems associated with the fact that the piglets temporarily stop taking food during the period important for the development of immunity, that there are complications associated with anesthesia and the associated losses. There is therefore an understandable interest in alternatives. Castration without anesthesia is rejected a priori. Castration with anesthesia is problematic, and all that remains is immunocastration and fattening of whole males. Castration is indeed a method used for a long time. The activists it often tell, there are not mentions in ancient literature enough, contradicting the widespread belief that pig castration has always been used to prevent objectionable odors in meat produced for human consumption, but it is a true? Supported by NAZV QK1910400

Keywords: boar, castration, boar smell

MANAGEMENT OF THE PIG INDUSTRY IN CONDITIONS OF GLOBAL WARMING

Sergii Gryshchenko

Department of Technologies in Poultry, Pig and Sheep Breeding
National University of Life and Environmental Sciences of Ukraine

s_grishchenko@ukr.net

Pig breeding, like any other livestock industry, must take into account not only the economic indicators of production, but also the impact of production technologies on the environment.

Scientists argue that pig farming somehow affects global warming (carbon dioxide, methane, nitric oxide), nutrients in soil and water (nitrates, ammonia, phosphates) and atmospheric acidity (gaseous ammonia, sulfur dioxide, nitric oxide). It is also necessary for the pig industry to control the emission of odors and avoid the release of pathogens that may be in the air in the enterprises.

In terms of global warming, it is believed that farm animals emit about 18% of greenhouse gases worldwide in carbon dioxide equivalent. According to the Kyoto Protocol, the air exhaled by animals on farms is not considered a major source of carbon dioxide. Methane emissions from pig farms around the world are 1.11 million metric tons per year, with cattle emitting nearly 60 times that amount. Additional methane released in manure storage facilities during manure storage is about 70 million metric tons per year. Therefore, the search for alternative conditions for keeping pigs and, subsequently, manure disposal systems is of great scientific and practical importance. Equally important, environmentally oriented pig farms in most cases have a positive effect on the productivity of the pigs themselves.

Keywords: pig breeding, environment, global warming

DETERMINATION OF BOAR´S SALIVA ANDROSTENONE AS A METHOD OF EARLY DETECTION OF BOAR TAINT

Kamila Pokorná [1] & Jaroslav Čítek [1] & Martyna Małopolska [2] & Mirosław Tyra [2] & Hana Süssenbeková [1] & Monika Okrouhlá [1] & Kateřina Zadinová [1] & Roman Stupka [1]

[1] Department of Animal Science; Faculty of Agrobiology, Food and Natural Resources; Czech University of Life Sciences Prague; Kamýcká 129, Prague 6 Suchdol
[2] Department of Pig Breeding; National Research Institute of Animal Production in Krakow; 1 Krakowska Street, 32-083 Balice, Krakow

pokornakamila@af.czu.cz

Improving animal welfare and the possibility of a banning castration open new research areas in the field of discovering non-invasive methods of early boar taint detection. Androstenone, as a boar taint compound, is produced by the submaxillary salivary glands to the saliva of boars. Determination of androstenone in boar´s saliva appears to be a suitable method for the early boar taint detection. The aim of this study was to compare androstenone levels in boar´s saliva and immunocastrates saliva. There were 118 animals (pure-breed Polish Landrace) evaluated. Animals were divided into three groups based on gender (boars, immunocastrates, barrows). The barrows were used as a control group. Animals were slaughtered with an average slaughter weight of 117.17 kg. Saliva samples were collected at the same age of animals during the fattening. Boar taint compounds (5α-androst-16-en-3-one, 5α-androst-16-en-3α-ol, 5α-androst-16-en-3β-ol) in saliva were evaluated using MDGC/MS (multidimensional-gas chromatography/mass-spectrometry). There were confirmed significant differences in *testis* and *epididymis* weight between groups of boars and immunocastrates ($P<0.001$) at the end of fattening. During fattening, there were observed increasing levels of androstenone compounds in boar´s saliva and decreasing levels of androstenone compounds in immunocastrates saliva depending on age. There were confirmed significant differences between groups of boars and immunocastrates in the level of total saliva androstenone at the end of fattening in the average ages 134 days and 144.5 days ($P<0.05$). A zero level of androstenone compounds was observed in immunocastrates saliva at the end of fattening. These results offer new possibilities in the research field finding non-invasive methods of boar taint detection. In case of banning castration, it will be a great benefit to find a simple method for detecting boar taint without affecting the economy. Boar taint detection from boar´s saliva appears to be a suitable non-invasive detection method besides not having negative effects on animal welfare.

Keywords: boar taint, submaxillary salivary gland, androstenone, welfare

EVALUATING HORSE MISBEHAVIOUR WHILE FEEDING

Ieva Stankevičiūtė, Juratė Kučinskienė, Vytautas Ribikauskas

Veterinary Academy, Lithuanian University of Health Sciences, Mickevičiaus 9, 44307 Kaunas, Lithuania

vytautas.ribikauskas@lsmuni.lt

The aim of this study was to find out if there was any abnormal behaviour while feeding horses.

Ethograms of abnormal behaviour during the feeding of horses from two different stud farms have been created and compared. It has been found out whether feeding horses at unusual time affects their behaviour. The study involved 43 horses of different breeds, ages, and genders. Behaviour has been observed, ethograms have been made, and the influence of irregular feeding time on the behaviour of horses has been investigated. The study has shown that the behaviour of horses during feeding differs in the two stud farms. No abnormal behaviour has been recorded in the stud farm Y. In the stud farm X, the following statistically significant ways of behaviour have been recorded: foot digging ($p = 0.003$); kicking ($p = 0.046$); ear pinning ($p = 0.008$); biting ($p = 0.020$); head weaving ($p = 0.008$). It has been found out, that both stud farms meet the recommendations for horse keeping. It has been found out, that irregular feeding time has a major impact on horse behaviour. When horses are fed earlier, horses are less anxious than when fed later than usual. Comparing the occurrence of abnormal behaviour between times feeding 1h earlier and 1h later than usual the following statistically significant ways of behaviour have been observed: foot digging ($p = 0.002$); pawing ($p = 0.020$) and biting ($p = 0.037$).

To prevent abnormal behaviour of horses and improve their welfare, it is necessary to provide training for horse breeders on the importance of regular feeding time and the creation of appropriate diet.

Keywords: horse; abnormal behaviour; feeding regime

IMPLEMENTATION OF THE PRINCIPLES OF ANIMAL WELFARE ON THE EXAMPLE OF THE TURKEY MEAT PRODUCTION FARM "GOOD MEAT"

Vadym M. Kondratyuk, Oleksiy I. Tymoshchuk

National University of Life and Environmental Sciences of Ukraine

The practical implementation of the principles of animal welfare is fully realized on the example of the Ukrainian farm for keeping turkeys "Good Meat". Turkeys are kept on a free range, subject to the condition of opening the wings of the bird and a free passage of at least 6 meters. Such a feature allows the bird to have high motor activity and saturation of the body with oxygen, which is an element of the natural behavior of turkeys. Free walking, the possibility of grazing on a large area of the square provides conditions for communication between individuals of their species.

Thus, the company fully realizes the five freedoms in the global food supply chain: freedom from hunger, thirst and malnutrition; freedom from fear and distress, freedom from physical and thermal and thermal discomfort; freedom from pain, injury and disease; freedom to show normal patterns of behavior.

All the time the turkeys are being raised, they are closely watched by farm workers, which allows for constant monitoring of the health and activity of the turkeys. In this way, it is possible to obtain high-quality products.

Keywords: turkeys, farm, animal welfare

PROOXIDANT-ANTIOXIDANT HOMEOSTASIS IN BLOOD OF GILTS UNDER THE EFFECTS OF COPPER CITRATE

A.M. Shostya, A. S.Siabro
Poltava State Agrarian University, Poltava, Ukraine
siabro.aliona@gmail.com

In gilts the period of formation of sexual cycles is characterized by a significant lability of the hormonal background, which is accompanied by changes in the prooxidant-antioxidant homeostasis (PAH) in the direction of acceleration of lipid peroxidation processes. The purpose of the experiment was to study the state of PAH in blood of repair gilts when fed Copper citrate. In the experiment, according to the principle of analogues, gilts of the Large White breed were used, in which blood sampling was performed after feeding Copper citrate (10% and 20% above the norm) when they reached the 5th, 6th, 7th, 8th, 9th you and the 10-month-old.

The results of the experiment indicate a difference in the intensity of peroxidation processes in blood of gilts during the period of sexual function formation when mineral nutrition is corrected. Feeding different doses of Copper citrate during the first 2 months of the experiment reduced the content of diene conjugates in blood of experimental animals, but further feeding led to an increase in the level of these metabolites at the age of 7, 8 and 9 months. At the same time, the highest content of diene conjugates was found in repair gilts that received the maximum amount of mineral supplements. Against the background of the increased concentration of diene conjugates, an increase in TBC-active compounds in blood of the animals of the experimental groups is noted. Gilts that additionally consumed Copper citrate in an amount 20% higher than the norm, the content of TBK-active at 7 and 8 months of age was significantly higher ($p<0.05–p<0.001$) compared to other groups.

During the analysis of the enzymes of the antioxidant link, the lability of the activity of superoxide dismutase (SOD) and catalase (KT) in blood of gilts during the formation of sexual function under the influence of copper citrate was determined. Thus, in animals that additionally consumed this trace element in amounts of 10% and 20% above the norm, an increase in the level of SOD was noted, the maximum value of which reached at the age of 7 months ($p<0.01–p<0.001$). However, the continued feeding of the mineral supplement leads to a sharp decrease in the activity of SOD, which probably indicates the depletion of the antioxidant defense system. A similar trend was determined after the end of the experiment. The fluctuations in CT activity in blood of gilts were noted before the onset of physiological maturity (6 months). At the age of 7, 8 and 9 months, in animals that consumed copper citrate 10% and 20% above the norm, the CT level had higher indexes compared to the beginning of the experiment, which indicates an increased generation of free radicals (H_2O_2) and the intensification of peroxidation processes.

Therefore, with a change in the physiological state of pubertal gilts, there is the intensification of peroxide oxidation processes, which is evidenced by an increase in the concentration of diene conjugates and TBC-active compounds. These changes occur against the background of changes in the activity of SOD and CT, the level of which is mainly determined by mineral nutrition.

Keywords: gilts, sexual cycle, peroxide oxidation

TRANSGENESIS BIOTECHNOLOGICAL PROCEDURES INFLUENCE ON DUCKS EGG PRODUCTIVITY

[1]Oliinyk R. S, [2]Korol P.V., [1]Doroshenko M.S., [1]Kostenko S.O.
[1]National University of Life and Environmental Sciences of Ukraine
[2] Institute of Animal Breeding and Genetics nd. a. M.V.Zubets NAAS of Ukraine

Modern trends of increasing poultry production and growing demand for the use of birds as models for the disease research, make it necessary to increase the efficiency of biotechnological methods of poultry reproduction and to optimize technological procedures. However, the creation of a transgenic poultry is complicated by the structure of ovum and the unique reproductive system of this class. Such species as ducks represent a less investigated object for transgenic improvements due to potential useful differences from chickens and other types of poultry, which may open new opportunities for the development of livestock biotechnology and medicine.

An actual problem in the researching and improving of biotechnological procedures of transgenesis is their influence on the productive qualities of ducks. The consequences of chimerization and transgenesis and their possible effect on the productivity of the offspring of chimeras, remain insufficiently studied. In this work, 40 ducks divided into 4 experimental groups and about 3000 eggs obtained from the studied animals were analyzed.

Several methods of creating germinative chimeras of ducks are used, described and analyzed. We used methods of microinjection of genetic material, creation of blastodermal chimeras, and transfection of transgenic constructs with sperm. Each of these methods has advantages and disadvantages. The main criteria for evaluating these methods are their reproductive efficiency and impact on the productive qualities of the obtained transgenic animals.

After a detailed analysis of the obtained data and comparing groups of ducks, it is shown that one of the most effective methods of transgenesis is the creating transgenic ducks using DNA transfection of donor duck sperm constructs. This method had high performance indicators in our previous studies aimed at analyzing the advantages and disadvantages of biotechnological methods on the issue and confirmed its relevance in this study. The biotechnological process using direct injection of a transgenic construct does not impair the productive abilities of ducks, but the actual technology of the method has a number of significant drawbacks associated with the risk of infection of embryos, and therefore with the low survival rate of these embryos. The analysis of the use of the method of injection of donor blastodermal cells (DBDC) into the embryos of recipients sterilized with busulfan showed the most pronounced effect on productive qualities, namely on egg production and reproductive nobility of ducks, which may be related to the way of action of busulfan - inhibition of the development of primary germ cells and sterilization of the recipient before the injection of donor blastodermal cells. However, no significant effect on the physical shape of the duck was found.

WELFARE OF PIGS IS THE BASIS OF QUALITY PRODUCTS

A.M. Shosty, S. O. Usenko, A. M. Tytarenko

Poltava State Agrarian University, Poltava, Ukraine

sveta_usenko@ukr.net

Animal welfare is the main component of the production of a high-quality meat product. New animal husbandry technologies with the optimum use of natural environmental resources are therefore needed. It is known that pastures affect pig physiology, especially digestion, blood circulation and breathing, which greatly improved animal growth and development.

The proposed improved technology of summer camp housing of pigs includes a number of stages. In the warm season, 10-14 days before farrowing, sows are transferred to separate, specially prepared houses, where cereal straw on a wooden floor is used as bedding. They are provided with feed and clean drinking water according to nutrition norms. After farrowing, sows are kept fixed, and suckling piglets have a separate territory. From 10-12 days after farrowing, sows are gradually accustomed to walking and grazing on the natural pasture using shaded areas. After weaning at the age of 2 months, piglets are grouped into 30 animals per group, and are kept in the same houses as farrowing. To ensure normal development, piglets can graze 2-3 times a day. During the rearing period, piglets are fed twice a day, reducing to 80% of the nutritional requirement. The rest of the nutrients are replenished by the pasture, and the minerals are fed in the form of a supplement.

To house young animals in the summer season with a temperature range from $+28^0$C to $+32^0$C, an optimal amount of water and baths, which requires 2-fold filling of troughs with water, or an existing open reservoir, are needed. The consumption of green fodder has a positive effect on appetite, consumption of other fodder, digestion and nutrient absorption. The use of a free-range system for rearing young pigs with green fodder consumption helps to increase the fattening qualities and reduce the time of reaching a live weight of 100 kg.

Rearing pigs in the summer camp system also has a positive effect on the meat and fat qualities, taste indexes, the consistency of cooked meat, smell and richness of the broth, and attractiveness for consumers of ecologically safe products.

Keywords: pigs, welfare, product quality

PRODUCTION EFFICIENCY OF COMMODITY EGGS DEPENDING ON THE SELECTION OF THE CROSS

S. O. Usenko , T. I. Karunna , O. I. Kravchenko , B. S. Shaferivskyi , S. V. Danilenko

Poltava State Agrarian University, Poltava, Ukraine

sveta_usenko@ukr.net

Monitoring of indexes of the productivity of cross-country race of Lomann is conducted in the conditions of PJC the «Poltava poultry factory».

The level of productivity of laying hens and the efficiency of using two lines of cross-country Lohmann LSL Light and Lohmann Brown were determined. It was found that Lomann Brown cross-laying hens maintained high viability and good adaptive qualities throughout the egg-laying period, as indicated by the survival rate of 96%. Despite good adaptation to an intensive housing and use system, the Lohmann LSL Light crossbird had a 2% lower survival rate than the Lohmann Brown crossbred hen.

Studies have shown that Lomann LSL Light crosses the egg-laying peak quickly (91.4%) and maintains high productivity until the end of its use. At the end of the productive period, the bird of this cross kept egg production at 69.1%, which exceeds this figure compared to the bird of the cross Lohmann Brown by 3.6%. However, the average weight of eggs obtained from the Lohmann LSL Light cross was lower compared to the average weight of eggs obtained from the Lohmann Brown cross.

It was found that the cost of feed, and consequently the cost of production in the cross Lohmann LSL Light is much lower than in the cross Lohmann Brown. These indicators indicate that the use of laying hens cross Lomann LSL Light in the conditions of PJSC "Poltava Poultry Farm" is more effective compared to the bird cross Lomann Brown.

Keywords: laying hens, egg crosses of chickens, egg productivity of hens

ASSESSMENT OF THE ATTITUDE OF STUDENTS OF DIFFERENT SPECIALTIES TO THE ISSUES OF ANIMAL WELFARE

[1] S. O. Kostenko, [2] S. O. Usenko, [1] N. P. Svyrydenko, [1]Y. P. Bosa

[1]National University of Life and Environmental Sciences of Ukraine
[2]Poltava State Agrarian University, Ukraine
sveta_usenko@ukr.net

Representatives of the world community are increasingly concerned about the welfare of animals. The war in Ukraine has heightened this concern because of the protracted crisis that has led to the suffering of both people and animals.

Scientific interest in the assessment of the attitude of students of agricultural universities to animals is conditioned by further direct influence in the future of these specialists on the welfare of animals and behavior of other people in the context of the policy of individual animal farms, veterinary clinics, public organizations, educational institutions and society as a whole.

In order to determine the relation to the issues of animal welfare an anonymous survey of students of the Faculty of Veterinary Medicine, Faculty of Livestock Raising and Water Bioresources of the National University of Life and Environmental Sciences of Ukraine and Poltava State Agrarian University was conducted.

The level of confidence in the discussion of the components of animal welfare lay on the faculty of the polled students. Yes, the students of the Faculty of Veterinary Medicine and the Faculty of Livestock Raising and Water Bioresources were very confident in animal health, and in productivity - only the students of the Faculty of Livestock Raising and Water Bioresources. In assessing behavior, pain, emotional states students of both faculties consider themselves confident in contrast to ethical-social problems.

Students assessing the importance of each of the proposed parameters for animals, which are growing for food production, have chosen all the suggested items. As for the most important methods currently used to grow each type of animal for food production, according to students, the technology of animal production and processing is not provided with the proper level of well-being.

The main problems of welfare of animal-companions students of the veterinary faculty consider insufficient activity, obesity, tumors, aggressive behavior of the owners and an untimely vaccination. Among the problems of the welfare of agricultural animals, the students mentioned conditions of detention, feeding, and insufficient number of specialists. As a result of the analysis of questionnaires it was found that students of veterinary specialties are more concerned with the welfare of small domestic animals (cats, dogs) than agricultural ones. 91,7% of the surveyed students the technology of animal production and processing is fully in agreement with the importance of studying the course on animal welfare as part of the curriculum on animal breeding. All students believe that animal welfare is an important component of their education and future careers.

MONITORING OF THE RESIDUES OF THE ANTIBIOTICS AND AMR BACTERIA IN CHICKEN MEAT

Asaf M.Omarov[1], Ali Azghani[2], Saida Aliyeva[1], Aysel Hasanzade[3]
[1] The ADA University, Baku, Azerbaijan, aomarov@ada.edu.az, saaliyeva@ada.edu.az
[2] The University of Texas at Tyler, Biology department, Tyler, The USA, aazghani@uttyler.edu
[3] Azerbaijan Poultry Company LLC, Azerbaijan, ayselzade55@gmail.com

Intensive animal production involves giving chickens large quantities of antibiotics to promote growth and prevent infection. The use of antibiotics in food animal production has been implicated as the contributing factor to the emergence of drug resistance in human foodborne pathogens. Certain antibiotics, when given in low, subtherapeutic doses, are known to improve feed conversion efficiency and may promote greater growth. The regular and irresponsible use of antibiotics in modern veterinary practices is associated with the emergence of different multidrug-resistant (MDR) bacteria. These MDR pathogens of animal origin may be disseminated to humans via the wider environment including food products, sewage, and agricultural system. *Salmonella* is an important pathogen highly associated with poultry products such as eggs and chicken meat.

In this study, fresh chicken samples (294) were collected from 19 small and large commercial farms between April – December 2022. The samples were processed in the bacteriology laboratory of the Azerbaijan Poultry Company. Different mediums (TSB, TSA, Mueller-Hinton Agar, and MacConkey Agar) were used for isolation and counting the number of colonies. Premi Test R-Biopharm AG was implemented for the detection of antibiotic and sulfanilamide residues in fresh meat. Difco Salmonella O antiserum Poly A – I and Vi, Anti Salmonella H serum was used as a screening test for detection of *Salmonella spp.* and Anti-coli A O1, O2, O8, O78 – for screening *E.coli*. Cefotaxime 30ug, Imipenem 10ug, Colistin 10ug, Amoxicillin+Clavulanic acid 20ug/10ug, Aztreonam 30ug, Chloramphenicol 30ug, Sulfamethoxazole+Trimethoprim 23.75ug/1.25ug, Ciprofloxacin 5ug, Gentamicin 10ug antibiotic discs were used for phenotypical identification to AMR ability to isolated *Salmonella spp.* and *E.coli*.

The results showed that 286 samples were positive for antibiotic and sulfanilamide residuals in fresh chicken meat. Moreover, antimicrobial resistance patterns were identified in all 294 samples. Totally, 8 bacterial strains (4 *Enterococcus spp.,* 2 *E.coli*, 2 *Salmonella spp*.) were isolated from the meat of the different poultry farms in Azerbaijan.

Total bacterial counts were underestimation and that indicates that all the farms follow ISO standards. The results showed that the same antibiotics were used in different farms because the AMR ability was the same for all the samples. AMR mechanism can be a contagion and a burden on human health.

Keywords: antibiotic, gut flora, residual

THE EFFECT OF HOUSING TECHNOLOGY ON REPRODUCTION PARAMETERS OF SOWS

Weisbauerová Eva[1], Nevrkla Pavel[2], Hadaš Zdeněk[2], Rozkot Miroslav[1], Bělková Jaroslava[1]

[1] Institute of Animal Science Prague, Department of Pig Breeding, Komenského 1239, Kostelec nad Orlicí, Czech Republic
[2] Mendel University in Brno, Faculty of AgriSciences, Department of Animal Breeding, Zemědělská 1, 61300 Brno, Czech Republic

weisbauerova.eva@vuzv.cz

The aim of the work was to evaluate the reproduction parameters of sows housed in two different technologies. The following traits were evaluated: number of total born piglets/litter (pc), number of piglets born alive/litter (pc), number of stillborn piglets/litter (pc), number of stillborn piglets (%), number of weaned piglets/litter (pc), piglet losses to weaning /litter (pc), piglet losses to weaning (%). The sows were of the same genotype. The first 4 litters of sows were monitored. Data were evaluated using the QCExpert statistical program (t-test, ANOVA). Technology A: Sows after insemination were housed in group pens with a capacity of up to 70 animals. The housing was realized on deep bedding, the pens were lined with straw. Feeding was carried out using automatic feeding boxes. Lactating sows were housed in individual farrowing pens. The floor of pens consisted of concrete in combination with a plastic grids. Technology B: Pregnant sows were housed in group pens of 45-50 animals. The housing was litter-free on concrete grids. One week before farrowing, the sows were moved to individual farrowing pens. The floor of the pen was slatted from plastic, the space under the sow was filled with concrete grids. 300 animals were involved in the experiment (150 sows from technology A and 150 sows from technology B). The highest number of total piglets born in the first parity was found in sows housed in technology B (17.91 ± 3.24), as well as the number of live-born piglets (15.40 ± 2.94) and weaned piglets (14.45 ± 1.90). The difference between the technologies was statistically significant ($P<0.01$). Losses of piglets to weaning from live-born piglets were not statistically significantly different for both technologies. The same tendency was also observed in the following parities for reproductive performance traits.

Keywords: sow; piglet; reproduction; housing system

The study was supported by the Ministry of Agriculture of the Czech Republic – project QK23020085.

EVALUATION OF BOAR INSEMINATION DOSES IN DIFFERENT EXTENDERS

Frydrychova S., Lustykova A., Seifert J., Weisbauerova E., Kucharova S., Rozkot M.

Institute of Animal Science, Prague Uhříněves, Czech Republic

frydrychova.sona@vuzv.cz

Artificial insemination (AI) is the most widely used reproductive technology in the porcine industry. The effective use of semen in AI also depends upon the ability of extender to provide a suitable environment for spermatozoa during storage. The preparation of the extender has a considerable influence on the quality of insemination dose, which is one of the factors involved in successful insemination. The objective of this study was to assess progressive sperm motility (PSM) by CASA system, viability and acrosome integrity by flow cytometry in boar insemination doses (ID) prepared in short-term and long-term extenders. Fifty-eight ejaculates from eight fertile AI boars of Přeštice black-pied pig aged 1.5 to 5 years were used in this study. Ejaculates were collected using the gloved-hand technique. The boars were kept in the same housing, feeding and breeding conditions. Native semen was diluted in long-term commercial extenders Androhep (A), Androstar plus (AS+) and short-term extender VIP5 in a semen-dilution ratio of 1+2. ID were stored at 17°C and evaluated after 24h and 48h storage time. The initial quality of native semen was as follows: semen volume 332.46±132.34 ml, PSM 77.88±16.43%, sperm concentration 369.42±159.72×10^3/mm^3 and morphologically abnormal spermatozoa 25.61±17.88%. The values of percentage of PSM, viability and acrosome integrity were decreased with storage time but without significant statistical differences ($p>0.05$) among them. In overall assessment VIP5 was the best of the tested extenders, followed by A and AS+ in terms of PMS (83.01% vs. 81.43% and 76.20%), viability (75.10% vs. 73.88% and 74.39%) and acrosome integrity (61.28% vs. 59.77% and 55.07%). In conclusion, it can be stated that when using objective methods of ID quality assessment, no differences were detected in the diluents for a storage period of up to 48 hours. Supported by MZE-RO0718 and MZE-RO0723.

Keywords: boar ID, flow cytometry, CASA system

EFFECT OF EXTRUDED BARLEY FEED ON COW MILK QUALITY

Gulim Abakanova, Yuriy Balji S. Seifullin

Kazakh AgroTechnical University, Astana, Kazakhstan,

yu.balji@kazatu.edu.kz

Sustainable safe fodder for livestock animals is essential for animal health and welfare. Currently, numerous research groups globally attempt to find efficient and environmentally safe feed components which would allow the complete realization of the genetic potential of the animals as well as reduce the negative impact of negative energy balance on the cow's body. The use of extruded enriched feeds and feed additives in the diet of lactating cows might be an attractive option. Scientific and economic experiments to study efficiency of using extruded forages in feeding dairy cows were carried out in Akmola region in "Milk Product" LLP. In the study, 112 milking cows of Simmental breed were included. Animals were fed 4 kg of extruded barley and rape cake in the same proportion for 20 days. Milk sampling and productivity measurements were performed at the beginning and at the end of the study. The dynamics of average daily milk yield and quality indices of milk were recorded. The daily application of the extruded enriched feed increased the milk productivity by 7.2%, from 20.0±2.35 L, to 21.4±2.06 L per day. The content of fat fraction in milk at the end of the experiment increased by 43.3%, from 2.5±0.37% to 3.6±0.41%. It was noted that the ratio of protein to fat at the beginning of the experiment deviated from the norm, i.e. fat concentration was lower by 16.7% than protein. At the end of the experiment, the fat-to-protein ratio normalized. The number of somatic cells throughout the experiment remained within physiological norms and was 106.6±11.83 thousand in 1 ml at the beginning, and 114.5±26.19 thousand in 1 ml at the end. It was concluded that extruded barley and rape cake in the same proportion might be an attractive feed option to improve milk quality and productivity, but more studies are needed to find an optimal combination.

Keywords: extruded barley feed, milk productivity, milk quality.

HELMINTH FAUNA OF FISH IN WATER BODIES OF NORTH AND CENTRAL REGIONS OF KAZAKHSTAN

Gulnur Zhuzzhasarova, Zhanat Adilbekov

Department of Veterinary Sanitation, S. Seifullin Kazakh Agrotechnical University, Astana,

gulnur900607@gmail.com; zh.adilbekov@kazatu.edu.kz

Information on the parasites of fish is important, especially in the geographic area where fisheries play a key role in the national economy or fishing as a hobby is promoted. Knowledge of the helminth parasites of fish in Kazakhstan is limited. The purpose of the study was to determine the degree of parasitosis infestation of fish in some water bodies of Kazakhstan, located near large settlements. A total of 257 samples of different fish species from North (Akmola region) and Central (Karaganda region) Kazakhstan were examined. The presence of helminth in fish was determined by a full helminthological autopsy. In Akmola region in the lakes of Burabay district in the line of Balykkol lake, the eggs of nematodes *Capillaria spp.* were found with a prevalence of 25% and an intensity of 1 unit; in silver carp from Urumkai lake and in bream of Kopa lake *Eimeria spp*. were found with the prevalence of 8.3%; and 10%, respectively. *Opistorchis spp.* metacercariae with a prevalence of 14.2% were found in bream from Katyrkol Lake. In the Basurman lake, the silver carp was found to have myxinvasia *Goussia carpelli* (coccidia oocysts) and *Ligula intestinalis* with a prevalence of 20% and 10%, respectively. *Opistorchis spp.* metacercariae were found in Uyaly-Shalkar lake. In the Koyandinsky reservoir, perch were infested with metacercariae of *Diplostomum spp*.with a prevalence of 33.3%.

In Karaganda region, pikeperch from Balkhash lake contained oocysts of *Eimeria spp.* and *Camallanu spp.* with a prevalence of 25%; and 29%, respectively. Silver carp of Botha lake was infected with *Diplostomum spp.* with a prevalence of 16.6%. Perch in the same area were infested with oocysts of *Eimeria spp*. Metacercariae of *O. felineus* were found in a tench with a prevalence of 25%, while carp from Shalkar lake were infected by *Ligula intestinalis* and *Philometroides lusiana* with a prevalence of 16.6% and 50%, respectively.

To the best of our knowledge, this is the first study to show the infestation of fish in several Kazakhstan regions with various helminth infections, including those dangerous for human health, and might pose a threat of infestations in humans.

Keywords: fish, parasitosis, helminth infections

ADIPOSE TISSUE TRANSCRIPTOME OF KRŠKOPOLJE PIGS REARED IN DIFFERENT PRODUCTION SYSTEMS

Poklukar K.[a*], *Čandek-Potokar M.*[a], *Batorek Lukač N.*[a], *Vrecl M.*[b], *Fazarinc G.*[b], *Škrlep M.* [a,]

[a] Agricultural Institute of Slovenia, Hacquetova ulica 17, SI-1000 Ljubljana, Slovenia

[b] Institute of Preclinical Sciences, Veterinary Faculty, University of Ljubljana, Gerbičeva ulica 60, SI-1000 Ljubljana, Slovenia

klavdija.poklukar@kis.si

Krškopolje pig is the only autochthonous Slovenian pig breed, well adapted to local feed sources and environmental conditions. They are reared under various conditions, from intensive indoor to extensive outdoor system. Studies have shown that the production system affects their performance, including the dynamics of fat deposition. To better characterize the metabolic processes underlying the changes, we aimed to compare the transcriptome of the backfat of Krškopolje pigs reared in two different production systems using RNA-sequencing. Krškopolje pigs were reared indoors (K-IND; N=24) and outdoors (K-OUT; N=24) and were fed equivalent diets. At 330 days of age, the animals were slaughtered and samples of backfat were collected. After RNA extraction, samples were sequenced using Illumina NovaSeq generating 150 bp paired-end reads. Quality control, mapping to the *Ssrofa*11.1 reference genome and extraction of gene hit counts were performed followed by detection of differentially expressed genes (DESeq2) and determination of functional enrichment (KOBAS-i). In total, the sequencing yielded approximately 66.8M paired-end reads, with more than 92.2% of reads uniquely mapped to *Sscrofa*11.1 genome. Differential expression analysis revealed 798 genes ($log_2FC>1$; P-adj<0.05), of which 494 were overexpressed in group K-IND and 304 in group K-OUT. In group K-IND group, the most interesting upregulated genes were involved in collagen synthesis (COL1A; $log_2FC=4.6$), energy homeostasis (LEPR; $log_2FC=1.9$) or triglyceride metabolism (MOGAT; $log_2FC=2.5$). In K-OUT, several upregulated genes were involved in lipid metabolism (FASN, ME1 and SCD genes with $log_2FC=1.4$, 1.2 and 1.1, respectively). Functional enrichment analysis of the upregulated genes in the K-IND group revealed biological processes, such as negative regulation of angiogenesis (GO:0016525), collagen fibril organization (GO:0030199) and endothelial cell morphogenesis (GO:0001886). Upregulated genes in K-OUT were, enriched in immune response (GO:0006955), among others. The results of the present study provide the first insights into the genetic regulation of Krškopolje pigs kept in different production systems.

Acknowledgement: Financing of Slovenian Agency of Research (grants P4-0133, J4-3094, V4-2201), project GeroNIMO (EU H2020 project, grant agreement no. 101000236), Slovenian Rural Development Program 2014–2020, sub-measure M16.2 (operational groups) project "Raising pigs to produce higher quality products" is acknowledged.

Keywords: Krškopolje pig, indoor and outdoor system, adipose tissue, RNA-sequencing

TESTING HEAVY PIG PRODUCTION ON SLOVENIAN FARMS

N. Batorek Lukač [a], M. Škrlep [a], K. Poklukar [a], D. Jerič [b], M. Čandek-Potokar [a,]*

[a] Agricultural Institute of Slovenia, Hacquetova ulica 17, SI-1000 Ljubljana, Slovenia
[b] Chamber of Agriculture and Forestry of Slovenia, Štefana Kovača 40, 9000 Murska Sobota, Slovenia

nina.batorek@kis.si

To provide the supply of adequate raw material for high-quality meat products, the production of heavy pigs should be introduced on Slovenian farms. A case study was performed on Slovenian farms in which an Italian model for heavy pig production was applied to test Slovenian pig genotypes. Fattening protocol with feed restriction applied after 80 kg body weight (BW) was tested with three crossbreed combinations: pen 1 (n=10; (Slovenian Landrace x Slovenian Large White) x Duroc), pen 2 (n=10; (Slovenian Landrace x Slovenian Large White) x (Duroc x Pietrain)), and pen 3 (n=7; Slovenian Landrace x Slovenian Large White). Experimental diets consisted of maize, barley, wheat, wheat feed flour, soybean, sunflower, and rapeseed meal. The diets contained 9.37 MJ of NE and 17 % 15% and 12% of crude protein for early (30-80 kg BW), middle (80-120 kg BW) and late fattening stage (over 120 kg BW), respectively. Performance, carcass, meat, and fat quality were assessed. In average, the final BW (165±9 kg) was reached earlier than expected (i.e. before 9 months of age), due to higher daily gain (0.80±0.07 kg/day in overall fattening period), resulting in feed conversion ratio of 3.5±0.3 kg feed/kg gain. In the future, for this type of production system, restrictive feeding must be applied more strictly. Carcass leanness (16.3±4 mm average backfat thickness measured at the split line over *Gluteus medius*) was generally satisfactory. The results regarding meat quality demonstrated the importance of a better control pre- and post-slaughter treatment and the differences between crossbreeds in terms of color and intramuscular fat content. The use of crosses with the Duroc breed is particularly interesting because of the favorable content of intramuscular fat.

Acknowledgement: Financing of Slovenian Agency of Research (grants P4-0133, J4-3094, V4-2201), and Slovenian Rural Development Program 2014–2020, sub-measure M16.2 (operational groups) project “Raising pigs to produce higher quality products” is acknowledged.

Keywords: heavy-pig production system; breed; performance

FEATURES OF MILKING LOCAL UKRAINIAN COWS AND THEIR CROSSES WITH MONTBÉLIARDE BREED

Borshch O.V.

Bila Tserkva National Agrarian University, Bila Tserkva, 09100, Ukraine

borshcha@outlook.com

Intensification of dairy farming on the basis industrial technology has changed the requirements for breeds of dairy productivity. Dairy cattle, which are bred to be kept on complexes and farms with intensive industrial milk production technology, should stand out not only high milk yields, good adaptability to machine milking on high-performance units, good health, resistance to diseases, and the desired shape of the udder, which is characterized a set of morphological features.

The purpose of this work was to analyze the development udder indicators in crossbred firstborns (Ukrainian red-spotted and Montbeliarde) are compared with purebred analogues and study the indicators milk output during the milking period.

The research was carried out at "Azorel" (village Mukhivtsi, 48°57′01″N, 28°47′09″E) Nemyriv district of Vinnytsia region on first born Ukrainian red-spotted dairy breed and crossbreeds of the first generation, obtained as a result of crossing of Ukrainian red-spotted dairy from Montbeliarde breed. On the farm, there was two groups of purebred and crossbred analogue cows with the number of 20 heads in each were spoken. In farm, use the same type year-round feeding cows with total mixed rations. The research conducted on first-born cows in the period parturition (2–3 months of lactation). Morphological features of the udder of firstborns was determined for 2–3 months of lactation after calving, for one hour before milking by inspection and measurement. The following dimensions of experimental animals were determined: girth, width, length of udder, length of front and back sections udder, and the distance from the bottom of the udder to the ground.

It was established that local first-borns obtained in results of crossbred Ukrainian red-spotted and Montbeliarde breeds, purebred red-spotted ones prevailed analogues in terms of measurements and udder indices. Purebred Ukrainian red-spotted cows show the values of single and daily milk yield were higher than in locals. Purebred firstborns also had it longer duration of single milking, higher indicators average and maximum intensity of milk secretion day and yield in the first 3 minutes.

THE EFFECT OF FEEDING BLACK SOLDIER FLY LARVAE ON WEIGHT GAIN IN GROWING PIGS

Varpo Vare[1], Rünno Patune[2], Ragnar Leming[1]

[1]Estonian University of Life Sciences, Tartu, Estonia
[2]Veskimäe PM Ltd., Viljandi, Estonia

Since September 2021, insect-derived proteins are allowed to use in EU for pig or poultry feed. Insects may soon become a reliable complement to fishmeal and soy in feed for pigs and poultry. The effect of feeding black soldier fly (Hermetia illucens) larvae on daily weight gain in growing pigs was evaluated in a commercial farm. Growing pigs were fed with either high protein (HP, 17% CP, n=242), low protein (LP, 15% CP, n=248), high protein supplemented with black soldier fly larvae (HP+L, n=64) or low protein supplemented with larvae (LP+L, n=64) diets. Larvae dry matter contained 35% protein and 47% fat. LP feed contained about 20% less soybean meal and 15-20% more rapeseed cake than the HP feed. All diets were supplemented with minerals, vitamins and amino acids.

Animals in HP+L and LP+L groups were fed additionally 25 grams live larvae per pig per day in the first period (28 days) and 50 grams in the second period (33 days) of trial.

In the first period (20 to 40 kg BW) of the trial, the daily weight gain of the pigs fed larvae was lower (721 and 790 grams respectively), but in the second period (40 to 70 kg BW), it was higher (818 and 738 grams respectively) compared to the control (HP and LP) groups.

Based on initial observations, it can be concluded that pigs like to eat live larvae, and it also reduced tail biting behaviour. Therefore, the black soldier fly larvae can be considered as edible enrichment material and locally grown alternative protein source for growing pigs.

The project was financed by Estonian Agricultural Registers and Information Board through MAK 2014-2020 measure 16.2. Support for the development of new products, practices, processes and technologies.

Keywords: insect-derived protein feed; growing pigs; black soldier fly

FREQUENCY OF MILK CONSUMPTION AMONG THE ADULT POPULATION OF AKTOBE CITY AND A COMPARATIVE EVALUATION OF THE RESULTS OF LABORATORY STUDIES OF MILK

Aiym Tilektes, Akmaral Baspakova

West Kazakhstan Marat Ospanov medical university, Kazakhstan

baspakova@zkgmu.kz

Milk is one of the main products of the consumer basket, a source of nutrients, and has specific characteristics due to its chemical and microbiological composition. Assessment of the frequency of milk consumption among the adult population and a comparative assessment of the results of laboratory studies of milk sold in the consumer market of the city of Aktobe.

The research was approved by the Local Ethics Commission of the West Kazakhstan Marat Ospanov Medical University in Aktobe city, Republic of Kazakhstan (No. 8 of 10/15/2021). The research involved 461 adults aged 18 years and above. Statistical data processing was performed using the SPSS Statistical version 25 software package.

Participants had a mean age 30 years (SD ± 6.8), mean height 168 (SD ± 8) cm, and mean weight 63 (SD ± 10) kg. According to the frequency of milk consumption, 369 people consume daily, which accounted for 79%, and 6 (1%) people do not consume milk at all. Total for 2021-2022, 57 samples of pasteurized drinking milk of various fat content were studied, of which 7 samples did not meet the requirements of regulatory documents for physical, chemical and organoleptic quality indicators. In these 7 rejected samples, the mass fraction of protein was underestimated by 20-450%, the mass fraction of dry skimmed milk residue - by 7-12%, density - by 1-2%. For 2 years, the share of products that do not meet the requirements of regulatory documents in terms of quality indicators, identified during laboratory tests, amounted to 3.7%.

It was found that adult residents of Aktobe often consume milk, and women (68%) consumed more milk than men. Based on the results of the control and surveillance activities carried out in 2021-2022, 7 milk samples were rejected.

Keywords: milk, adults, properties of milk, frequency of consumption

CLEANING METHOD OF ANIMAL MILK AGAINST POLLUTION BY NITRATES AND NITRITES

Akmaral Mukhamejanova

Biotechnology Department, Toraighyrov University, Pavlodar, Kazakhstan

akmaral1411@gmail.com

Nowadays environmental pollution by nitrates is an enormous problem over the world. It is known from our previous research that microorganisms in animal body can reduce nitrates to nitrites. It is found, animal xanthine oxidase converts NO_3^- and NO_2^- to physiologically important gas as nitric oxide (NO). NO effectively reacts with L-cysteine or reduced glutathione (GSH) at pH 7,0 and 7,4 to form S-nitrosocysteine (CySNO) or S-nitrosoglutathione (GSNO). Products are exhibited a peak absorbance at around 340 and 540 nm. It is known also that Nicotinamide adenine dinucleotide (NADH) is one of the potential physiological electron donors for xanthine oxidase in absorbance at 340 nm. Therefore, to avoid mutual interference between the optical density of NADH and CysNO at 340 nm, instead of NADH we used hypoxanthine as an electron donor. Ascorbic acid decomposes S-nitrosocysteine, consequently we had used L-cysteine as the protector against the oxidation of the cofactor in the active center of xanthine oxidase localized in milk fat globules.

Our results convincingly show heat treatment of fresh milk in the presence of exogenous molybdenum actually activates XO and the enzyme becomes capable of converting nitrate and nitrite to nitric oxide. It was demonstrated that heat treatment (80^oC, 10 min) of homogeny XO resulted in the release of molybdenum cofactor (Mo-co) from the active center of denatured enzyme molecule. However, NO formation was very low when nitrates were used as a substrate. At the same time, using nitrites as substrate resulted in 10 times higher amount of formed NO (i.e. CySNO) in comparison with nitrate substrates. The levels of CysNO determined by absorbance at 340 and 540 nm were completely different. It is occurs due to the difference in the sensitivity of the absorption at the ultraviolet and visible wavelengths of the spectrophotometer.

Key words: milk, xanthine oxidase, nitrates, nitrites, nitric oxide, S-nitrosocysteine, molybdenum, heat treatment, activation.

ENRICHED OF YOGURT TECHNOLOGY USING ANIMAL-BASED AND PLANT-BASED RAW MATERIALS IN PAVLODAR REGION

Symbat Utepova, Aruzhan Tolegen, Akmaral Mukhmejanova

Biotechnology Department, Toraighyrov University, Pavlodar, Kazakhstan

akmaral1411@gmail.com

Fermented products are the most popular as fermented milk drinks in Kazakhstan. The development of yogurt technologies and the expansion of their range in our region are currently very important. As usual, manufacturers often use local fruits of plants to enrich dairy products. In the South Kazakhstan region, such plants can be rosehip, which widespread in forests and river near area (Irtysh River). There are many types of wild rose in Kazakhstan, one of which is the wild rose of the steppe *(Rosa L.)*. The fruits of these rosehip have a high content of biologically active substances, such as ascorbic acid (from 1000 to 2000 mg/100 g), which are superior to blackberries, citruses.

In this study, we evaluated the effect of local plant raw materials as rosehip on the rheological, physicochemical, and sensory properties of natural yogurt.

A technology for dairy production was developed using fermentation technology. Experimental research of yoghurts was assessed by physicochemical and organoleptic methods. All developed samples meet the standards of technical documentation for this type of food product. The organoleptic characteristics were highly appreciated. Developed technology is an opportunity for many people to enrich to a daily diet.

In conclusion, according to the results of the study, yogurt with rosehip has the properties of enriched products. A probiotic product containing vitamin C is in twice. Scientific impact of this study is by obtaining innovative products using domestic raw materials that not only improve consumer health, but also increase final product shelf life thanks to properties of rosehip as antioxidant.

Keywords: animal-based and plant-based raw materials, milk, rosehip, yogurt, fermentation, enriched technology.

QUALITY SAFETY SYSTEM IN THE DAIRY INDUSTRY STRATEGIES OF ITS IMPROVEMENTS

Orazov A. Zh., Ayupnabieva A. B.

West Kazakhstan Agrarian Technical University named after Zhangir Khan

The HACCP, analysis of risks and critical controlpoints in dairy production, is a system to ensure the safety of raw materials by monitoring all hazardous points during processing and its quality. ISO 22000 is a food safety management system. Ural Dairy Plant LLP is a dairy industry enterprise in Uralsk, which strives for certification according to the ISO 22000 standard, which will open up new opportunities including the international milk and dairy production market. Production and technological laboratories have a crucial role in determining quality indicators for raw milk and feed, as well as animal health. There is a system for developing and implementing an industry - specific HACCP quality management system, so -called steps and implementations in a particular industry. The monitoring procedure should reveal the loss of controllability at the control critical points of the dairy enterprises. Monitoring should provide timely information for correcting of process control to not compromise critical points.

The production of safe raw milk in the work of Ural Dairy Plant LLP is includes all from quality of work to quality of products to quality of life. In the face of competition, the winner is not the one who simply produces excellent products, but the one who can actually confirm their quality and can manage it in accordance with ISO 22000-2006 standard and HACCP food safety management system. Our analysis of the principles of HACCP in dairy production, it was revealed that a mandatory factor for companies, producing raw milk is the introduction of a HACCP system to ensure the protection of their dairy products or (brand) in the market.

The main goal of Ural Dairy Plant LLP is to produce high-quality and safe products that meet consumer demands, with the following principles of operation: improving the effectiveness of the quality management system that meets the requirements of the ISO22000-2006 standard; compliance with the established requirements of the legislation on the quality and safety of the products; introduction of cutting-edge achievements in all areas of enterprise activity; identification of customer requirements and prompt response to any changes; improving the professional level of the personnel and involving them in quality management activities; mutually beneficial relationships with suppliers.

Keywords: quality, safety, ISO 22000, HACCP

HUMANE SLAUGHTER OF FISH AS AN ELEMENT OF ANIMAL WELFARE

Bohdan Kovalenko, Vasyl Kovalenko

National University of Life and Environmental Sciences of Ukraine

kovalenko@it.nubip.edu.ua

An important element of animal welfare, including fish, is humane slaughter.

The slaughter of fish in laboratory conditions is carried out after experiments that have caused damage to the fish that is not compatible with further life, and it should be killed in order to save it from suffering. In fish processing, a humane slaughter is required to obtain high-quality commercial products.

The purpose of the work is to develop a method of humane slaughter of fish using clove oil.

The material for research is clary catfish (Clarias gariepinus). Three groups of fish with an individual body weight of 400 to 900 g were formed: two experimental, 10 specimens in each, and one control (20 specimens). The temperature of the water in the experiment is 26 °C.

Before slaughter, the fish from the experimental groups were anesthetized in an aqueous emulsion of clove oil in two concentration options - 0.05 and 0.1 cm^3/dm^3. The time of entry of each individual into a state of anesthesia was recorded. They made sure that the fish did not stop moving the gill covers. It was taken into account that the mobility of the gill covers is a sign of the presence of cardiac activity and blood circulation, which will contribute to faster convergence of blood during slaughter. After entering a state of anesthesia, the fish were killed by exsanguination after cutting the gills.

No anesthesia was used for fish from the control group. The fish were killed with a hammer blow on the skull in the region of the medulla oblongata, followed by cutting the gills of stunned individuals.

The death of the fish in the experimental groups occurred without the fish regaining consciousness and starting to move. In the control group, most of the fish (15 specimens) after receiving a blow to the head came out of the state of numbness and after cutting the gills moved in convulsions, thereby suffering. 5 more specimens died immediately.

Therefore, the use of clove oil to anesthetize clary catfish before slaughter by exsanguinating the fish has demonstrated humaneness towards animals and convenience and safety for humans in using this method.

Keywords: clove oil; animal welfare; fish

TOOLS OF INDUSTRY REGULATION IN THE ASPECT OF FISH WELFARE AND ENVIRONMENTAL QUALITY

Nataliia Vdovenko

Department of Global Economics, National University of Life and Environmental Sciences of Ukraine, Kyiv

nata0409@gmail.com

The study reveals the basic approaches in technological advances and changes in management practices specifically in new and fairly environmentally friendly aquaculture systems. These systems can contribute to overcoming the challenges that arise as a result of increasing fish welfare needs. The participation of state authorities in solving the raised problem is important in this aspect. This will lead to solving the problem of achieving two closely related goals. Such goals are both ethical and ecologically sound aquaculture. And all this is on the agenda because nowadays quite a lot of compromises between the well-being of the aquaculture facility and the environment are not always achieved.

And here we see that the main choice in favor of the efficiency of fishery production is important. At the same time, the threat lies in the fact that this choice can also be made at the expense of well-being. For example, let's cite the recent decision of the Norwegian government to stop salmon production. This became an obvious compromise between the well-being of the fish and the state of the environment in which it lives. So a triploid salmon or salmon has an additional set of chromosomes, as a result of the creation and implementation of measures for the shock treatment of roe with heat or pressure. This confirms that individuals of fish that have escaped from marine ponds cannot interbreed with wild salmon. Therefore, in the future, they may endanger the wild gene pool. This is a positive point from an environmental point of view. But we have to say that, in particular, salmon triploids have a greater number of cases of exhaustion, as well as a decrease in mass compared to diploids. Therefore, rather low quality of products and a lower degree of survival than diploid fish, which resulted in the adoption of a management decision to stop their production. Thus, when applying the management tool to solve the issue of the welfare of fish grown on farms, it became a priority over the ecological consequences of the escape of salmon individuals that are grown on fish farms. This indicates a fairly clear and clear compromise between fish welfare.

Keywords: measures, management tool, fish farms, quality of products, fish welfare.

POLYSPERMY OF STURGEON FISH IN THE CONDITIONS OF ARTIFICIAL REPRODUCTION

Oleksandr Kuzmenko, Nadiya Vovk

National University of Life and Environmental Sciences of Ukraine, Kyiv

karakurt0777@gmail.com

The decline in the number of members of the family *Acipenseridae*, the failure of biological reproduction rhythms and anthropogenic pollution led to a reduction in the number and deterioration of the quality of producers and their offspring. In artificial reproduction of Sturgeon, knowledge of morphological properties, species differences, development and functions of the shell of their eggs is important for a better understanding of the reproduction process, improving the quality of sexual products, increasing the yield of larvae, increasing the amount of fish planting material, increasing the profitability of production.

In recent years, there has been practically no information on the problems of sturgeon polyspermy and its induction by various factors in the available professional literature. However, this question arouses interest among aquaculture specialists, since due to polyspermy, the efficiency of artificial reproduction of sturgeon fish decreases, negatively affecting the yield of larvae, their quality (usefulness) due to morphological disorders in the structure.

We are tasked with researching the features of polyspermic fertilization and proposing new technological approaches to artificial insemination of sturgeon fish to reduce disruption of crushing at the first stages of embryo development and increase the yield of larvae.

For this, it is necessary to find out the peculiarities of the structure of the caviar shell and the number of micropyles in sturgeon breeders of different species and ages; the influence of abiotic environmental factors (temperature, hydrochemical regime) on the intensity of polyspermy in sturgeons; to investigate the dependence of the manifestation of polyspermic fertilization on the age of the breeders, the ratio of females and males, conditions of their maintenance and feeding; to search for conditions blocking polyspermic fertilization of sturgeon fish eggs; to establish at what stage of incubation (development) the maximum death of atypically divided (polyspermic) embryos occurs.

According to the results of scientific research, new technological approaches of artificial insemination of sturgeon fish will be proposed to reduce crushing disorders at the first stages of embryo development and increase the yield of larvae, which will have a positive effect on the artificial reproduction of sturgeon in aquaculture.

Keywords: polyspermy, sturgeon, reproduction

THERAPEUTIC PROPERTIES OF KOUMIS AND PROSPECTS OF ITS PRODUCTION IN UKRAINE

I. V. Goncharenko

National University of Life and Environmental Sciences of Ukraine

igorgoncharenko2711@gmail.com

According to the WHO info, about 8 million people get ill with tuberculosis every year, 3 million of which die. One of the most efficient ways can be the development of dairy horse breeding. Currently, scientists have numerous data from experimental and clinical studies confirming the therapeutic properties of koumis.

Even though koumis is considered to be a traditional drink of the Central and East Asia population, its production is still spreading in European countries, also in Ukraine. We must not forget that the nomads of the Black Sea region mastered the art of making koumis back in the 5th century BC.

The number of mares of the Novoolexandrian breed dominates in Ukrainian koumis farms. Over the years of observation, SOE Dibrovsky Stud Farm No. 62 kept from 27 to 18 milking mares and 7 stallions of this breed. The highest milk yields (12.9 l - average daily milk yield and 1919 l - per lactation) were observed in mares of the middle age group (7-11 years), but the milk of higher quality was produced by young mares. Over the years (namely, after approximately 11 years), the quantity and quality of milk tend to decrease.

The largest production of milk and koumis at the level of 6.8 tons was in 2010. In recent years, there has been a steady trend towards a decrease in the production of milk and koumis on the farm for the following reasons: a decrease in the number of lactating mares, a relatively low selling price of 1 liter of koumis on the consumer market, insufficient promotion and advertising of the therapeutic properties of koumis for children and older people.

The use of mares of the Novoolexandrian Breed breed for the production of koumis requires further study of the qualitative composition of milk, especially considering the importance of fatty acids for increasing the therapeutic and prophylactic effect of koumis. In Ukraine it is necessary to create its own starter, which would be adapted to the conditions of our state to obtain high-quality koumis..

It is necessary to set up an appropriate scientific center to solve technological issues on the production of standard koumis from high-quality mare's milk, to consider the aspects of production, storage, and transportation of koumis and koumis starter as well; to discuss and research the biological value and medical properties of the product for the recovery of patients; to educate specialists in this field.

Conclusion. It would be good if more agricultural enterprises which produce mare's milk, koumis starter, and koumis were opened. The widespread use of these products in medicine, everyday life, and cosmetology can be very beneficial.

All this shows is the expediency of the formation of the dairy horse breeding industry, production and consumption of koumis in Ukraine.

Keywords: mare's milk, koumis, therapeutic properties, Novoolexandrian Breed.

NEW REPRODUCTIVE TECHNOLOGY IN RABBIT BREEDING

I.V. Goncharenko[1], P.V. Korol[2]

[1]National University of Life and Environmental Sciences of Ukraine
[2]Institute of Animal Breeding and Genetics nd. a. M.V.Zubets of National Academy of Agrarian Science of Ukraine

igorgoncharenko2711@gmail.com

In countries with developed rabbit breeding, artificial insemination of female rabbits has been used more and more recently for reproduction and selection.

The aim of the study was to apply new reproductive technology in rabbit breeding through the implementation of hormonal synchronization of rabbit ovulation and artificial insemination with diluted male sperm.

The synchronization of ovulation and artificial insemination of female rabbits was carried out in "Carpathian Pannon" LLC on 2 groups of Hungarian Pannon breed animals of five months of age. Each group consisted of 45 rabbits, and in the first group used a synthetic analog of prostaglandin "Verfaser", and in the second group - "Sergon - 500". These gonadotropic drugs were injected into rabbits 3 days before insemination, parenterally at a dose of 20 IU per rabbit.

In the studies conducted by us, semen from males was taken on an artificial vagina in the cages in which they were kept. Before this procedure, the back of the abdomen and hind limbs of the male were wiped with a damp cloth. As a "mannequin" for sperm collection, were used female rabbits, not in oestrus.

The ejaculate obtained after the mating was transferred to a test tube with diluent, because without diluent spermatozoa quickly die. Sperm quality was assessed visually and under a microscope.

After hatching, in the absence of the female rabbit, the specialists examined the nest, in which 8 healthy rabbits were left. Dead and unhealthy individuals were removed from the nest. The rabbits were planted at the age of 35 - 40 days. In 10 days after weaning, rabbits were fed full-component feed with coccidiostatics. For 1 kg of growth in the above-mentioned farms, 3.9 - 4.0 kg of feed was consumed. Live weight of newborn rabbits was 58-60 g, nest weight at weaning - 750 - 760 g. Rabbits reached slaughter conditions (2.5 - 3.0 kg) at the age of 2.5 - 3.0 months.

The intensive method of raising rabbits involves insemination of female rabbits on the 10th day after kindling.

Thus, the new reproductive technology in rabbit breeding, which is based on artificial insemination of rabbits and the use of sperm of outstanding male breeders with intensive use of animals, allows to increase the production of rabbit meat by 20-25% and improve the economic performance of farms A significant increase in the number of young rabbits obtained by artificial insemination of rabbit sows allows to accelerate the production of animals with the desired breeding qualities and promotes the development of new lines and breeds of rabbits.

Keywords: rabbits, artificial insemination; reproduction.

DYNAMICS OF LIVE WEIGHT OF ADLER SILVER BREED CHICKEN AGAINST THE BACKGROUND OF THE USE OF NON-TRADITIONAL FEED ADDITIVES

Caisin Larisa[1], Cara Alla[2]

[1]Doctor of Science, Professor of TUM, Chisinau, RM
[2]PhD student, TUM, Comrat, RM, Moldova

The complete feed base is the main problem of animal husbandry, in particular poultry farming. It is very relevant to study the effectiveness of new feed additives that contain a number of biologically active substances.

The aim of the present research was to determine the biological feasibility and effectiveness of feed additives: feather meal and peat concentrate additives and their impact on the dynamics of live weight and egg quality of chicken.

The results of the studies showed that one of the objective indicators of assessing the positive dynamics of live weight of poultry and average daily growth of chickens of experimental groups under the influence of the use of feather and peat concentrates. The live weight of young chickens in the first experimental group at the age of 10 weeks was 58,2 g (0,85%) higher than in the control group, in the second group - 145,2 g (1,26%), with living weight at the age of 5 - weeks being almost the same.

At 20-weeks of age there was also an increase in the live weight of chickens in the experimental groups compared with the control: in the first experimental group the live weight of the Adler Silver chickens increased by 64.7 g (2.86%), and in the second - 164.5 g (7.27%).

The results of the research allowed us to formulate the following conclusions:

-it was found that the safety of young animals in the second experimental group was higher than in the control group and amounted to 96.6%. The best preservation of livestock during the study period was observed in the first experimental group - 98.3%. It should also be noted that the preservation of young animals in the first experimental group receiving fodder concentrate from peat at the level of 1 kg per ton of mixed fodder was higher compared with other groups. The difference was 3.3% compared with the control group and 1.7% compared with the second experimental group;

- it is established that the implementation of ion-exchange properties of natural sorbents included in the feed concentrate from peat contributes to the introduction of easily digestible forms of macro- and microelements into the digestive tract, which are actively included in the metabolism. Along with increasing the digestibility and assimilability The nutrients in the diet are enriched with minerals, which have a multifaceted effect on the body;

- complex definition and volume of the carried out researches in zoo technical plan allow us to recommend to the poultry farms to introduce untraditional types of additives into rations: feed concentrate from peat in a dosage of 1 kg and feed concentrate from feather at the level of 2,0kg per ton of mixed fodder, as they do not have a negative effect, but have higher biological effect on growth energy of experimental young animals and finally improve the safety of birds.

PRINCIPLES OF IMPLEMENTATION OF THE PROGRAM OF FORCED MOLTING OF MEAT HENS

Prokopenko Nataliia, Voloshyn Ivan

National University of Life and Environmental Sciences of Ukraine

ProkopenkoNP@nubip.edu.ua

Increasing the production of animal products to meet the growing demand for food while minimizing the negative impact on the environment is the leading direction of sustainable animal husbandry development. Therefore, optimization of work with parental stock in poultry farming includes a number of measures, including the introduction and implementation of programs of forced molting, which is characterized by high economic expediency.

The introduction of forced molting in parent flocks of meat poultry, which ensures the prolongation of the terms of breeding use of poultry, allows reducing costs for the purchase of breeding material (day-old chicks), for raising and keeping poultry (fuel and energy resources, technological equipment, combined fodder and feed additives, veterinary drugs). The expediency of this technological method is determined by the possibilities of increasing the production of hatching eggs in the necessary technological periods, improving the quality of eggs (indices of weight and shell quality) and, in the future, broiler chickens.

In accordance with existing recommendations, during the forced molting of meat hens in our research, we followed the principles of working with poultry: preliminary assessment of hens and removing of inappropriate individuals, control of mineral nutrition of poultry, severe conformity to technological standards of feeding, drinking, lighting programs in poultry houses, coordination of veterinary treatments of poultry, control of body weight and hens survivability during the period of forced molting, maintaining the feeding program after the period of starvation of poultry. Young roosters were used if they met the requirements for their age (28-30 weeks) and body weight (4.1-4.3 kg).

The implementation of the program of forced molting of meat-cross chickens in the farm made it possible to significantly increase the profitability of the production of hatching eggs by reducing their cost price, significantly reduce resource consumption in the farm, and maintain production connection with broiler chicken enterprises.

Keywords: meat hens; forced molting; productivity

POULTRY WELFARE AND ENVIRONMENTAL ASPECTS OF POULTRY PRODUCTION

S. Bazyvolyak, T. Yarar

National University of Life and Environmental Sciences of Ukraine

bazyvolyak@nubip.edu.ua

The consumption of eggs as a valuable source of protein has always been and is important for the population of our planet. But along with this, the question of the ecological footprint of industrial production and the improvement of poultry welfare remains relevant.

According to experts' estimates, agriculture accounts for up to 20% of all emissions of toxic substances into the environment [1]. The poultry industry is one of the biggest air polluters. Therefore, the issue of improving the welfare of birds and reducing environmental pollution remains relevant.

Constant scientific research and development on the creation of new genetic products or the improvement of existing ones, the intensification of the system of raising and keeping chickens, the rationalization of rations contribute to reducing production costs and making eggs and poultry meat cheaper. Scientific developments in the field of poultry farming also contribute to the reduction of emissions of greenhouse gases and ammonia, and to the improvement of the use of scarce raw materials, energy and water.

A key parameter for the simultaneous improvement of economic and ecological criteria is the change in feed efficiency. In the 1950s, more than 3 kg of feed was used to produce 1 kg of egg mass [2], and currently the ratio of feed to egg has decreased to 2-1.9: 1.

Scientists around the world are searching for an alternative to protein for animal husbandry. Recently, special attention has been paid to insects and marine fauna, as a possible option of stable raw materials for feeding birds.

In favor of the intensive technology of chicken production in the world, it is proposed to switch to farming systems that are considered more humane. The most famous brands based on the respective certified production systems are Free Range, Traditional Free Range, Label Rouge and Organic. Alternative systems of chicken production have received the greatest development in the EU countries. The USA, Canada and Australia are not far behind them [3]. Poultry products produced under alternative systems usually belong to the premium segment market

Therefore, the priority direction of the development of science and technology in the field of poultry farming is the development of the latest environmental protection and humane technologies.

MEAT PRODUCTIVITY OF TURKEYS OF THE "BIG 6" CROSS

V. Melnyk, O. Mizina

National University of Life and Environmental Sciences of Ukraine

melnikvika@nubip.edu.ua

In Ukraine in the period 2016-2020, there is a tendency to increase its production. According to the State Statistics Service of Ukraine (which we received in accordance with our request to this institution), the production of turkey meat in live weight in 2016 was 31.3 thousand tons, and in 2020 it increased to 37.2 thousand tons (by 18.9%). As for the number of turkeys, their number in the factories as of January 1, 2021 amounted to 841.8 thousand heads, which is 8.4% less compared to the previous year, but at the same time the number of adult turkeys (parent stock) decreased by 25.7%, and young turkeys, on the contrary, increased by 3.9%.

Day-old hybrid turkeys are mainly imported to Ukraine from abroad. A small number of farms are currently engaged in turkey meat production. In this regard, there is a need to study the meat productivity of turkeys in domestic production. Therefore, the aim of the work was to investigate the meat productivity of male and female turkeys of the cross "Big-6" of the company "Aviagen Turkeys" in the terms of poultry farming in Ukraine.

The results of the research indicate that the general growth dynamics of both males and females are periods of growth, depression and stability. The growth rate of turkeys in the farm in most periods was higher than the requirements of the standard. The turkeys had a livability higher than the minimum recommendations of the cross supplier by 0.15-3.13%, and the indicators for growing males were lower than the standard by 0.29-1.57%. High efficiency of feed use was established. Feed consumption in males per 1 kg of live weight gain is higher than in females by 1.28-17.11%. In the farm, males are slaughtered at the age of 21 weeks, and females – 15 weeks. At the same time, the indicators of slaughter yield and fillet yield differ depending on the sex. Slaughter yield in males is higher compared to females. In general, turkeys of the Big-6 cross in the conditions of domestic poultry farming had high meat productivity.

Keywords: turkeys; productivity; live weight

WAYS OF INCREASING THE ECONOMIC EFFICIENCY OF SHEEP BREEDING MANAGEMENT OF WOOLEN PRODUCTIVITY DIRECTION

Vasyl Turynskiy

Department of Technology in Poultry, Pig and Sheep Breeding
National University of Life and Environmental Sciences of Ukraine

turinskij@nubip.edu.ua

A practically new approach has been developed and justified expediency of organization of primary processing production of wool based on principle new technological solutions and methods in places of production of raw materials with the participation of the producers themselves in the integration with processors. A new domestic resource-saving technology of primary wool processing has been developed. Its capacity of 200 kg of washed wool per hour provides washing and drying technologies. Appropriate technological maps and in-depth schemes for wool processing (thin, semi-thin, crossbred, coarse, teg) have been developed according to the latest technologies, resulting in competitive products.

Experimentally and in the production conditions, it is proved that from all investigated types of wool (merino, crossbreed, Tsigai, coarse, and teg), it is possible to make knitted fur at domestic enterprises, the quality of which meets all the requirements of DSTU* as well as meets European standards. Comprehensive studies of end products on 20 indicators confirmed that the experimental samples of fur in most respects significantly exceed the requirements of DSTU 2724-94 standard: the weight of raising cover by 2.3 times, the weight of loose fibers – by 4.2 times, pile density – by 1,8 times, tensile load – 1.5 times, abrasion resistance – 15.6 times, per-unit-area electrical resistance – 2.7 times, fire resistance – 4 times. The test results convincingly show that knitted fur made of domestic wool can be recommended in the leather and textile industries, manufacturing outerwear, as a lining for shoes, hats designs, and various cloth finishes.

In-depth processing of wool according to the developed technological solutions is highly efficient and cost-effective (95.3%), and the cost of raw materials (wool) in the end product increased from 3–5% to 31.9%. Since this technology of wool processing into knitted fur requires an optimal fiber length of 30–40 mm, it is possible to successfully process wool of the third length and teg wool (obtained from slaughter lambs in the year of birth) into competitive products, as well as to introduce double shearing of sheep of all breeds, without exception, bred in Ukraine and to receive an additional 18% of wool.

Keywords: wool, primary processing, processing technology, knitted fur, competitive products, economic efficiency.

*DSTU – National standard by SE "UkrNDNC", State Enterprise "Ukrainian Scientific Research and Training Center for Standardization, Certification and Quality Problems".

THE PROTECTIVE PROPERTIES OF THE WOOL FLEECE OF TAURIAN-TYPE EWES

Nataliia Bogdanova

Department of Technology in Poultry, Pig and Sheep Breeding
National University of Life and Environmental Sciences of Ukraine

bogdanova212@nubip.edu.ua

The main disadvantage of wool supplied to processing factories is its increased contamination, reduced strength, felting, and yellowing. Their elimination is possible only with the full feeding of animals and the constant attention of breeders to the quantity and quality of wool products.

The selection of merinos is based on numerical qualitative signs of wool productivity. In most cases, these signs are taken into account during the basic grading of sheep, when the breeding purpose of animals is determined. A significant part of the quality characteristics of wool is evaluated by the laboratory method.

Our research aimed to study the protective properties of the wool fleece of ewes of the Taurian type of the Askanian fine-wool breed, depending on the rank of selection differentiation of sheep. The ewes were divided into ten ranks of selection differentiation. The methodology (*Shtompel, 2002*) was used. The protective properties of the fleece are established based on the content of mineral impurities in the wool.

On average, the constant mass of unwashed wool contains 17.1±0.53% impurities, varying by the animal group from 16.1±0.85 to 19.9±1.72%. With the increases in the rank of selection differentiation of sheep, the content of impurities in the wool slightly increases (r_s=+0.771±0.358). The limits of individual indicators of the content of mineral impurities in the wool range from 5.8 to 31.7%. The difference is 25.9%. According to the gradations of selective differentiation, this difference ranges from 5.3 to 24.6%. According to the selection purpose groups of ewes, the minimum indicators of the content of mineral impurities increase (r_s=+0.657±0.377), the maximum indicators decrease (r_s=–0.829±0.280), the difference between them also decreases (r_s=–0.800±0.300).

The variety of ewes in terms of the content of mineral impurities in the wool is quite large. The coefficient of variation is 35%, with a variation in the ranks of selection differentiation from 13.7 to 38.4%. When increasing the group of the total value of sheep by breeding purpose, the value of the coefficient of variation decreases (r_s=–0.871±0.245).

The selection differential of the first three groups of ewes for this trait ranges from 0.6 to 2.8% (relative – from 3.5 to 14.6%). According to the first three groups of sheep, the absolute selection differential is 1.9%, and the relative one is 11.2%.

Keywords: ewes, protective properties of the wool fleece, mineral impurities, wool.

THE POSTPARTUM BEHAVIOR OF GOATS

Alexandra Granat, Nataliia Bogdanova

Department of Technology in Poultry, Pig and Sheep Breeding
National University of Life and Environmental Sciences of Ukraine

bogdanova212@nubip.edu.ua

Analytical research was conducted on the formation of the female goat-kid relationship and determined the primary behavior of does after they reproduce. The first days and months after birth are the most critical period for both kids and goats. The development of the young and the further reproductive capacity of the does depends on the successful separating. In wild goats, kids stay with their mothers from birth to eleven or twelve months (*Winblad von Walter et al., 2021*). Regarding the formation of behavior and animal welfare, there is an opinion that separating should not take place before six to seven weeks of age (*Bungo et al., 1998*). In industrial dairy goat farming is used the artificial feeding of goat kids.

The pattern of maternal behavior is characterized by considerable variability among mammals. Its ethological characteristics depend not only on the early maturity of the young but also on various behavioral reactions of the species (social behavior) (*Hernández et al., 2012*). The maternal behavior of the goat is activated during birth, partly under the influence of stimulation (irritation) of the cervix. Immediately after calving, the does take care of any kid, but then they begin to recognize and feed only their own (*Poindron et al.*, 2007). At first, does actively lick their newborns. This is the first contact that significantly impacts the establishment of the female goat-kid bond. Goats quickly establish a selective bond with their kid by smell and develop visual and acoustic recognition of the kid. Such signals are formed within 4 hours after birth. Acoustic recognition is formed within 48 hours.

In goats, the maternal connection is established in the first 2 hours, leading to further rejection of other youngsters. Mothers drive all other kids away from the udder, allowing only their own. In some cases, 5 to 10 minutes of contact with the newborn is enough for the bond to form. The signals the kid gives during sucking are necessary to maintain the maternal instinct, but the sucking itself is not of primary importance. The presence of a kid also affects the recovery of the female's postpartum sexual activity.

Therefore, the formation of a bond between a doe and a kid is influenced by physiological factors of the postpartum period and ethological factors, namely contact with newborn kids. Physiological factors include an increase in the content of progesterone, estradiol, oxytocin, and receptor irritation of the cervix during lambing. And to the ethological – licking, sniffing, physical presence of the kid, visual and acoustic recognition of the kid, sucking colostral milk (partially).

Keywords: goats, behavior, maternal connection, kids.

PROSPECTS OF ORGANIC PRODUCTION OF AQUACULTURE PRODUCTS IN UKRAINE

Kateryna Makhyboroda

Department of Global Economics
National University of Life and Environmental Sciences of Ukraine

vdovenko.katya@ukr.net

The study is devoted to the current state and prospects for the development of organic production of aquaculture products.
The types of use of aquatic bioresources in Ukraine, which include industrial fishing and aquaculture, are analyzed.

The main directions of obtaining commercial aquaculture are identified: 1) grazing; 2) rate; 3) industrial. It is proved that proper legal regulation of the use of aquatic bioresources is an important factor in ensuring food security of Ukraine, because it will not only increase the range and production of Ukrainian fish products, meet the needs of domestic fisheries, but also help ensure rational use of aquatic bioresources by users. The analysis of domestic regulations governing the field of organic production of aquaculture products is provided.

The latter establish special conditions for keeping, feeding, and treating aquaculture facilities in organic production. It is noted that aquaculture entities before investing in organic production must invest significant funds in the facility, which is intended for the production of organic aquaculture in order to improve its environmental status and bring it into line with the requirements for organic production. It is proved that today there is a need to solve the problems of legal regulation of organic production of aquaculture products, taking into account world experience.

It is concluded that for the effective development of organic aquaculture in Ukraine it is necessary to overcome a number of barriers, such as significant water pollution, lack of organic feed and lack of international certification of organic aquaculture operators.

Keywords: organic production, aquaculture, aquatic bioresources

RAISING FOALS

Liudmyla Zlamaniuk, Borys Hopka, Vitalii Skotsyk

National University of Life and Environmental Sciences of Ukraine

zlamanuk@nubip.edu.ua

Currently, the world pays special attention to the welfare of animals, their feelings and needs. Foal education is based on these principles. Horses have an excellent memory, are capable of learning, are able to understand and analyze their actions, recognize their owner not only by voice, language, but also by behavior. Horses clearly distinguish the voices of individuals with whom they have to communicate - trainer, rider, jockey, horse breeder, farrier, as well as the voices of those people who treated them cruelly - beat or hurt them, and those who were kind to them, sincere, treated with delicacies, etc. In terms of the sense of smell, a horse is so superior to a person that comparisons are impossible. In an open area, for example, in the middle of the steppe, a horse differentiates smells for several hundred meters, which a person recognizes only a few meters away. Among the recognized specialists in training trotters of the first half of the 20th century. there was a firm belief that the upbringing of foals begins from the time of its stay in the mother's womb. Since the normal course of embryogenesis is the basis of his health, stable psychological development and future education. It should also be remembered that the suckling mare should move freely in the diary, as this gives her the opportunity to constantly communicate with her foal, to a certain extent control the actions and have a very positive effect on the development of his psyche. Therefore, the upbringing of foals, young and adult horses should be carried out only on the basis of respect, patience, kindness, benevolence and understanding with the animal.

Keywords: education, foals, young animals, horses

SUSTAINABLE DEVELOPMENT OF LIVESTOCK ENTERPRISES IN THE CONTEXT OF DIGITALIZATION OF THE ECONOMY

Yuliia Perehuda

Department of Global Economy
National University of Bioresources and Nature Management of Ukraine

julilla.pereguda@gmail.com

Global international community has long been declaring and guided in its activities by concept of sustainable development. At institutional level, dimension of this concept is embodied in the strong-willed political decision of UN Member States to adopt 17 Sustainable Development Goals (SDGs) in 2015. In the context of unprecedented war in Ukraine, most relevant for international community is SDG 16 achievement. A striking specific example here is livestock enterprises' activity. This clearly shows the connection and impact of entities' activities on achievement of SDGs such as 2, 3, 12, 13.

Based on fact that in conditions of martial law in Ukraine, together with SDG 16, issue of ensuring achievement of SDG 2 "Zero hunger" is of great importance, while a huge number of the country's population due to hostile aggression is unable to provide themselves with food.

Core tool for improving efficiency of livestock production in the context of sustainable development is digitalization. Purpose of study is to present key areas of further development of livestock enterprises in the context of SDGs achievement and application of the latest digital tools in activities.

The use of modern information tools contributes to the competitiveness of livestock enterprises and management of biological assets. Best world practice demonstrates that it is advisable to use modern livestock practices. Objective of these is to ensure animal welfare in a controlled form, identify risks associated with animal care. All this should help to increase consumer confidence in livestock products, which in the context of sustainable development is a key goal of livestock enterprises. Such tools include the following: information and communication technologies, precision livestock farming technologies. However, it should be noted that the application of digitalization tools should be preceded by significant work on the preparation of an appropriate institutional environment in the context of public-private partnership.

Keywords: sustainable development, digitalization, livestock enterprises

INDUSTRY REGULATION IN MANAGEMENT DECISION-MAKING REGARDING FISH WELFARE AND ENVIRONMENTAL PROTECTION

Dmytro Grigoryev

Department of Global Economics
National University of Life and Environmental Sciences of Ukraine

globeco@nubip.edu.ua

In the research, we studied and established the fact that solutions to the issues of developing environmentally sustainable practices in aquaculture are quite often implemented without taking into account the impact on the welfare of fish. At the same time, we observe such situations even in new production conditions, or the latest methods of combating fish diseases. As research highlights, scientists tend to focus on either fish welfare or the environment, and rarely both at the same time.

Similarly, fish welfare and environmental protection are often controlled by different government agencies under separate legislation. Therefore, decisions are made on the basis of one problem. Today, it is important to discuss potential strategies to improve the balance between fish welfare and environmental protection.

Effective regulation is needed to study the issues raised. Collaboration between institutions concerned with aquaculture welfare and the environment is needed to facilitate discussion of the interrelated trade-offs between fish welfare and the environment. In particular, even proper fish nutrition is critical to maintaining fish health, and substituting marine-derived nutrients for terrestrial-derived nutrients leads to feed quality problems. For example, aquaculture feeds low in fish oil and high in vegetable oil can adversely affect growth rate, immunity and stress response in some farmed species that require supplemental feeding and lead to poorer welfare outcomes. Therefore, research should be aimed at developing feeds that use the minimum amount of fish caught in the wild, fisheries, without harming the health of farmed fish on the principles of resource conservation, taking into account the needs of the global economic environment.

Keywords: regulation, welfare, fish, economic, environment

BASIC MEASURES TO REGULATE THE DEVELOPMENT OF FISHERIES AND AQUACULTURE ON THE BASIS OF RESOURCE CONSERVATION AND IMPACT ON THE FISH MARKET

Roman Konovalov

Department of Global Economics
National University of Life and Environmental Sciences of Ukraine
globeco@nubip.edu.ua

In this article, we investigated the managerial impact of the consequences of economic activity in fish farming on the environment. At the same time, this problem is urgent and is in the center of attention of industry management bodies. The need for sustainable practices is now being discussed among the public, governments and manufacturers. At the same time, it sometimes creates ways to solve the issue of compromise solutions regarding the welfare of fish on the basis of industry regulation. Currently, it is important to carry out mutual coordination of all links of the production process, including the impact on the environment. At the same time, we can observe a growing recognition of the importance of ensuring the well-being of farmed fish. We fully agree with research scientists that the term fish welfare was very rarely used in aquaculture or fisheries research before the turn of the new century. And as scientists note, over the last decade he was mentioned in more than five thousand scientific publications.

We should point out that additional studies of the behavior of various types of fish provided an indisputable understanding of the need to apply sectoral regulatory measures in fish farming. This is all because as understanding of the basic cognitive abilities of fish grows, so do public expectations of acceptable fish welfare.

Consumers will pay more for products with eco-labels or certificates that attest to good animal husbandry and protection practices, as evidenced by the prices in grocery stores for free-range eggs and tuna caught with harmless fishing gear.

Thus, it is in the interests of fish producers themselves to improve fish welfare, not only because it can increase growth rates, but also because consumer opinion has an impact on the fish market. We have every reason to note that the implementation of aquaculture in an ecological and favorable way for animal welfare will really develop in the future.

Keywords: animal welfare, managerial impact, fish farming, regulatory measures, market.

IMPORTANCE OF UNDERFLOOR HEATING FOR THE WELL-BEING OF GROWING YOUNG PIGS

Daria Teslia, Nataliia Hrishchenko

Department of Technologies in Poultry, Pig and Sheep Breeding,
National University of Life and Environmental Sciences of Ukraine

nphrishchenko@nubip.edu.ua, dashateslia13@gmai.com

Ensuring the optimal temperature regime for raising young pigs is an important factor in reducing stress after the weaning process. The temperature of the environment provides the most important factor in the body of pigs - thermoregulation. Modern technology in pig farming involves the use of underfloor heating. By creating an optimal temperature and minimizing the temperature difference between the animal's body and the place of rest, there is a minimization of temperature stress, which contributes to faster adaptation in the period after weaning. A comparison of the behavior of piglets under a conventional slotted floor and a heated floor showed significant differences, which directly affect the average daily growth.

It was shown that piglets become livelier at a comfortable temperature. When piglets are cold, they huddle, consume less food, and their growth and development are stunted. Additional heat is also needed to prevent moisture build-up at low levels of room ventilation. As the piglets growth, the air temperature decreases, and the need for a warm floor is reduced.

Keywords: rearing of young pigs, microclimate, well-being

FACTORS OF WELFARE OF PIG PRODUCTION

Nataliia Hrishchenko, Volodymyr Shevchenko

Department of Technologies in Poultry, Pig and Sheep Breeding,
National University of Life and Environmental Sciences of Ukraine

nphrishchenko@nubip.edu.ua

Animal welfare is an important parameter that directly affects the productivity of animals, their health, growth and development. Today, animal welfare is at the beginning to be implemented in production in Ukraine. Often, too little attention is paid to animal welfare issues due to increased production costs. There are also farms in which animals are densely herded in tight metal cages where the pigs cannot satisfy their biological needs. Considerable attention should be paid to the natural behavior of animals. Small piglets, especially during early weaning, might show aggression, biting of tails and ears, cannibalism, navel sucking, playing with the tongue, rubbing the nose and snout. Such behavior migh be caused (besides eating disorders) by inability to explore, play, and express active natural behaviour. In this poor external environment (without the possibility of digging, the absence of trunks, branches, grass, space, etc.), weaker animals become objects of play and aggression - biting off tails, earlobes, cannibalism. Using toys, for example, might be an option to distract animals from aggressive behavior and injuries.

Thus, the main prerequisites to ensure the well-being of animals include ensuring a high health status, maintaining mental health, ensuring optimal housing conditions such as temperature, humidity and air cleanliness. Observing the behavior of animals can give an answer as to how happy the animal is in conditions of artificial keeping.

Keywords: welfare of pigs, maintenance, production.

PROCEEDINGS ANIMAL SCIENCE:

«SUSTAINABLE LIVESTOCK PRODUCTION AND ANIMAL WELFARE»

January 17 – 18, 2023, Kyiv – Stockholm

Signed for publication February 14, 2023
Format 84x60 1/16. Conventional printed sheets 4.4
Circulation of 100 copies. #230034

NULES of Ukraine Publishing house
St. Heroiv Oborony, 15, Kyiv, 03041
Phone: 527-81-55