

ABSTRACTS
from the 8th International Conference
on Risk Factors of Food Chain,
Kraków, Poland, September 17, 2008

01: Angelovičová, M. - Bulla, J. - Liptaiová, D. - Močár, K.
- Štofán, D. - Ladyková, M. - Angelovič, M.:

**ORIGAMI AETHEROLEUM IN THE
PRODUCTION OF CHICKEN MEAT**

[Slovak University of Agriculture, Nitra, Slovak Republic]

Safety of chicken meat must fulfil standard specific and hygienic requests avoiding a risk for humans. A population of poultry in Slovakia has been rising and total poultry quantity is now 13 038 300 fowls. The basis for specific hygiene meat control is information on food chain aspects: blight status and health status of animals, health status with a protection period more than 0, occurrence of diseases, which can affect meat quality, occurrence of diseases, which can affect meat safety. Safe chicken meat does not contain prohibited substances, prohibited medicals, unauthorized substances, and unauthorized medicals. Safe chicken meat may contain maximal acceptable residual amounts of various substances and medicals. In relation to plants, it is known that they are source of biological active substances. Essential oils of selected plants are important due to its antimicrobial and antifungal effects. Selected essential oils against intestinal pathogens are considered as potential components for feed antibiotics. There are methods for preparation of essential oils, determination of chemical composition of essential oils, biologically active substances and antimicrobial effects. The data on the mechanism of their effects on animal organism are insufficient. In this study the role of feed antibiotics in nutrition of broilers was determined. We carried out a feeding experiment with broilers (Cobb 500) fed various feed mixtures – starter, grower and finisher. The experiment involved control group, in which feed antibiotic was supplied to starter feed mixture, and experimental group, where *Origami aetherooleum* (0.05%) was added to starter, grower and finisher feed mixtures. Chemical analysis measured the content of carvacrol in *Origami aetherooleum* at 65%. Feeding period was 36 days. Average body weight at the end of experiment was 2193.72 g in broilers fed with feed mixtures with *Origami aetherooleum*, which was comparable with broilers in control group. The content of selected aminoacids in breast muscles was similar in control and in experimental groups. The effect of various feed additives insignificantly altered aminoacid content. Support: VEGA 1/4420/07.

02: Amarakoon, R. - Buňka, F. - Macků, I. - Kráčmar, S.:

**METHODS TO ELIMINATE
ANTI-NUTRITIONAL FACTORS IN LEGUMES**

[Tomáš Baťa University, Zlín, Czech Republic]

Legumes are a valuable source of all kinds of nutrients. Despite their high nutritional value, legumes contain several anti-nutritional compounds as trypsin and chymotrypsin inhibitors, lectins, tannins, phytic acids and amylase inhibitors. In order to improve the nutritional value and to provide effective utilization of legumes to a maximal level, it is essential to

neutralize activity of anti-nutritional factors. In this regard it was shown that these anti-nutritional factors can be eliminated by different processing methods. Most of anti-nutritional compounds, such as trypsin and chymotrypsin inhibitors, lectins, tannins, phytic acids and amylase inhibitors, are heat-labile. Legumes must be processed before consumption. There are variations in the elimination of anti-nutrients depending on the method of processing. Combination of soaking in water and cooking, heating, steaming under an atmospheric pressure, extrusion cooking are the common processing methods for legumes. Combined soaking and boiling is an effective method of reducing most of anti-nutritional factors. A significant reduction of most of anti-nutritional factors in legumes takes place upon cooking at temperature ranges from 50–100°C for 30 min–2 hours. Steaming process at desired pressure (34.5 and 103.5 kPa) causes smaller losses in total phenolic compounds. Though polyphenols were traditionally considered as anti-nutrients, this view has changed in the last few years with the discovery of the role of polyphenols as anti-oxidants and anti-mutagens. Therefore, steaming retains more anti-oxidants than the boiling processes. Extrusion cooking at temperature ranges from 100 to 148°C is the best way to remove anti-nutritional factors in legumes, for processing in commercial scale, permitting consumption without any health risk factors for human and also for animal feed.

03: Arpášová, H. - Massányi, P. - Capcarová, M.
- Kolesárová, A. - Kalafová, A.:

**EFFECT OF EXPERIMENTAL ADMINISTRATION
OF NICKEL ON SELECTED QUALITATIVE
PARAMETERS OF LAYING HEN EGGS**

[Slovak University of Agriculture, Nitra, Slovak Republic]

In this experiment the effect of nickel (NiCl_2) administration in drinking water on the egg weight and egg albumen quality was studied. Twenty Isa Brown laying hens of 53 weeks of age were divided into four groups (each $n=5$). Experimental groups of hens were given to drink with water supplemented with NiCl_2 at different concentrations (20 mg/L; 200 mg/L and 2000 mg/L). In all groups laying hens received drinking water ad libitum. The experiment lasted 30 days. The results indicate that the most of qualitative parameters during the experiment were significantly negatively affected by NiCl_2 supplementation. Egg production showed decreasing tendency in all experimental groups (83.87; 62.58; 32.90 and 14.19%, respectively). Egg weight was significantly decreased mainly in groups with highest nickel concentration. Also significantly lower values of albumen weight and albumen content were found in experimental groups in comparison with the control group. Lower values of albumen index and Haugh Units were detected in the experimental group with 2000 mg/L NiCl_2 ; however the difference was not statistically significant. Support: APVV 0299–06, VEGA 1/0696/08.

04: Barteczko, J. - Lasek, O.:

EFFECTS OF LEVEL AND ORIGIN OF PROTEIN ON MEAT QUALITY IN BROILER CHICKEN

[University of Agriculture, Kraków, Poland]

The quality of broiler chicken meat depends on genetic factors (genetic line, sex), age at slaughter and environmental conditions, especially feeding. The components of concentrate mixtures **do not provide the appropriate concentration of energy** for fast-growing broilers. The use of full-fat oilseed meal, ground maize or fat supplemented forage helps to solve this problem. However, the use of full-fat oilseed meals can adversely affect the quality traits of broiler meat. The aim of this study was to determine the effects of different protein level and origin (plant, animal) and vegetable oil as well as an addition of vegetable oil to wheat-based mixtures on sensory quality of broiler chicken meat, particularly texture, smell, tenderness, juiciness, flavor intensity, pH and colour. Besides chemical composition like: dry matter, crude protein, crude fat and ash a content of cholesterol in muscles, liver and blood was measured. Furthermore body mass gain, food intake, feed conversion ratio, as well as blood parameters (total lipids, total cholesterol, LDL, HDL, triglycerides) were recorded. The research was carried out on ninety-six broiler chickens of Ross 308 line at the age of 14–49 days. Broilers were divided into 8 groups of 12 fowls each and fed ad libitum a diet with 19% and 23% protein contents and also 2% and 4% of oil added. The results of the study show that mixtures supplemented with plant and animal proteins positively influenced body mass gain in comparison to mixtures with plant protein only. The higher protein content (23%) diet increased the total cholesterol content in the muscle, liver and blood in comparison to the lower protein content diet (19%). Soybean oil added in an amount of 2% or 4% increased feed intake as well as improved sensory quality of breast muscle particularly smell, flavor intensity and tenderness.

05: Bobko, M. - Lagin, L. - Angelovičová, M. - Bobková, A.:

THE INFLUENCE OF FEED SUPPLEMENTS ON SENSORY QUALITY OF POULTRY MEAT

[Slovak University of Agriculture, Nitra, Slovak Republic]

In the study the influence of feed supplement addition into complete feeding mixtures on the final sensory quality of the poultry meat was investigated. On the basis of knowledge about the changes in nutrition, including the removal of meat–bone flour and also prohibiting of feed antibiotics using since 2006, the feed experiment on COBB broilers up to the 36th day of feeding was conducted. The animals were divided into 4 groups (one control and three experimental ones). In control group the antibiotic preparation avilamycine was added into the feeding mixture. In 1st experimental group the premix with *Origami aetheroleum* (0.05%) was added, in 2nd experimental group the addition of probiotic preparation based on *Enterococcus faecium* (0.1%) and in 3rd experimental group with *Origami aetheroleum* (0.05%) + probiotic preparation based on *Enterococcus faecium* (0.1%). Broilers of all three groups were fed a feeding mixtures HYD–01 (starter diet) from 1st to 18th day of feeding, HYD–02 (growth) from 19th to 31st day of feeding and HYD–03 (final) from 32nd to 36th day of feeding. Sensory evaluation of the poultry meat was done by 5 members committee, where the method of individual evaluation

according to 5-points scale scoring system was used. From the sensory standpoint the following parameters were observed: aroma, taste, juiciness and texture of meat. Maximal value was assessed by control group with the addition of avilamycine by complete sensory evaluation, where an average for the breast muscle was 15.02, and an average for thigh muscle was 15.50 scores. Minimal average value was in the first experimental group with the addition of *Origami aetheroleum* (0.05%), where an average for breast muscle was 13.85 and for thigh - 14.00 scores, what presented high statistically significant difference ($P < 0.01$). In the 2nd experimental group with the addition of probiotic preparation on the basis of *Enterococcus faecium* (0.1%) an average for the breast muscle was 15.00 and for thigh muscle - 15.08 scores. By the combination of probiotic addition on the basis of *Enterococcus faecium* (0.1%) and *Origami aetheroleum* (0.05%) an average for the breast muscle was 15.00 and for thigh muscle - 14.98 scores. Obtained results show possible substitution of antibiotic preparation of avilamycine by the probiotic preparation with *Enterococcus faecium* (0.1%) and by the combination of probiotic preparation with *Enterococcus faecium* (0.1%) and *Origami aetheroleum* (0.05%), which had no any influence on final sensory quality of the poultry meat. Using *Origami aetheroleum* (0.05%) we observed an aggravation of total sensory value of poultry meat. Support: VEGA 1/0509/08

06: Bojňanská, T. - Frančáková, H. - Vollmannová, A.:

THE CONTENT OF SELECTED ELEMENTS IN BREAD AND PASTA PRODUCTS WITH THE ADDITION OF OAT AND LENTIL

[Slovak University of Agriculture, Nitra, Slovak Republic]

The results obtained in this study show that the bread and pastry products with addition of oat and lentil increase their nutritional value. Bread and pasta to which an amount of 10%, 20%, 30%, 40% and 50% was added, were prepared and subsequently analyzed for the presence of Fe, Mn, Zn, Cu, Co, Ni, Cr, Pb and Cd. The input of raw materials, e.g. wheat flour T 512 and homogenized oat and lentil, used in bakery tests, was also analyzed. The prepared products were evaluated from the point of view of their technological and nutritional value. Actual legislature of Slovak Republic lists the maximum limits of Cu, Ni, Cr, Pb and Cd (from the elements evaluated within the test) allowed to be contained in foodstuffs. Concerning copper, neither the products nor the input base material exceeded allowed limit (10 mg/kg), but lentil showed values close to the limit. Similar results were recorded for nickel, and the source of relatively high amount of nickel was oat. The measured chrome content was substantially under the limit in all samples. Similar situation was observed for lead: none of the samples exceeded the maximum limit (1.0 mg/kg). Based on obtained results it was confirmed that the most problematic element in our soils and subsequently in the foodstuffs is cadmium. Excessive values (< 0.1 mg/kg) were detected in all samples, i.e. in the input of raw materials (flour, lentil, and oat) as well as in the finished products (bread, pastries): the values varied from 0.107 mg/kg (flour, lentil) to 0.400 mg/kg (pastries with 50 % addition of oat). Based on the data obtained we can assume that other sources of contamination exist, e.g. yeast, eggs or other basic materials used for bread and pastry production.

07: Bošiak, M. - Golian, J. - Židek, R. - Šiška, B. - Žiak, J.:

QUANTIFICATION OF SOYA-PROTEIN IN SAMPLES OF PCR-ANALYZED WHEAT FLOUR CONTAMINATED BY SOYA POWDER WITH THE USING OF ELISA TEST

[Slovak University of Agriculture, Nitra, Slovak Republic]

Soya is important food stuff because it is widely used in food industry and is also present in a number of food products. Consumption of soya-containing products does not present a risk for majority of consumers; however it could be dangerous for food-allergic people. Symptoms of a food allergy could vary from mild hives to severe gastro-intestinal and respiratory symptoms. The most dangerous symptom of a food allergy is the anaphylactic shock that may result in the death of allergic consumer. For people allergic to soya, especially consumption of those products that contain a hidden soya is very dangerous. The objective of this assay was to design a quantitative range for quantification of soya-protein in food products containing soya. In the first part of this assay we performed a PCR analysis of prepared wheat flour samples contaminated by soya powder with the determination of soya DNA amount (ng/L) in each sample. Subsequently, soya occurred in the same samples was quantified (mg/kg) using ELISA method. Quantitative range for PCR was established on the basis of continual proportion relationship between decreasing amount of soya (mg/kg) in samples analyzed by ELISA along with decreasing of color intensity of obtained bands and decreasing content of soya DNA in the same samples.

08: Bystrická, J. - Musilová, J. - Tóth, T.:

THE POSSIBILITIES OF CADMIUM UPTAKE LOWERING BY SEEDS OF LEGUMINES WITH THE APPLICATION OF Zn^{2+} INTO THE SOIL

[Slovak University of Agriculture, Nitra, Slovak Republic]

Environmental contamination by heavy metals is a persisting problem. Cadmium is toxic, carcinogenic element naturally occurring in soil at the concentration of about 1 mg/kg. High concentrations of cadmium increase its uptake by plants and lower the yields. One of the ways how to overcome the phytotoxicity of cadmium could be the antagonistic system of cadmium with cations Zn^{2+} , Ni^{2+} a Mn^{2+} . The system Cd^{2+} and Zn^{2+} was created and added into the soil. We observed the ability of Zn^{2+} cation to eliminate the negative influence of cadmium on plant nutrition and to decrease cadmium in the dry matter. In pot experiments the tested crops were: Faba bean (*Faba vulgaris L.subsp. equine*) and Soya bean (*Glycine max*). It was observed that the response of plants on the presence of zinc is individual and depends on the dose and mutual combination of cadmium and added Zn^{2+} cations. The dose of 10 mg Cd/kg on soil influences the formation of upper biomass of tested crops as following: the weight of the upper biomass declined compared to control; the Cd content in the dry matter was increased. The concentration of Zn^{2+} had positive influence on the formation of the upper biomass compared to the sole application of Cd and there was the decline of Cd content in the dry matter of tested leguminous plants.

09: Chryan, A. - Marko-Worłowska, M. - Łaciak, T.:

THE INFLUENCE OF THE HEAVY METALS POLLUTING THE SOIL ON THE PEDOFAUNA

[Pedagogical University, Kraków, Poland]

The high density of metals in the soil, due to its toxic influence on the microflora, plants as well as on the pedofauna, can negatively affect the functioning of the soil subsystem. In order to evaluate the toxicity of metals to mesofauna of the soil 3 areas were chosen, where the diversity, the number and the content of Pb, Cd, Ni, Zn, Fe and Cu in the soil were detected. The humidity, temperature and pH of the soil were also analyzed. The chosen areas were situated in 3 different city parks in Kraków: area I – Park in Mogiła around 300 m distant from the traffic lane; area II – Planty (the green zone) at Gertrudy street near the busy street; area III – Bednarski Park in Podgórze around 200 m distant from the main road. Results show that important differences in the pH and temperature of the soil were not detected, the highest content of Cd was detected in the III area, where the lowest density of the mesofauna was observed, the highest density of the mesofauna was detected in the I area, where the smallest number of Pb as well as Cd, Ni, Cu and Zn was observed, the cadmium is toxic to the mesofauna, Ni and Zn have similar effects on the mesofauna as Cd – it is confirmed by the results obtained on the II area.

10: Domagała-Świątkiewicz, I. - Sady, W. - Smoleń S.:
EFFECT OF NITROGEN FERTILIZATION ON Cd, Cr, Cu, Fe, Mn, Ni, Sr AND Zn AVAILABILITY IN COMMERCIALY GROWN WHITE CABBAGE (*BRASSICA OLERACEA VAR. CAPITATA ALBA*)

[University of Agriculture, Kraków, Poland]

Plant uptake of metals from the soil is an important pathway for their entry to the human food chain. The bioavailability and the potential toxicity of metals in the environment depend on their speciation in the soil and the soil solution. A pH of the soils is often the most important chemical property governing metal availability. In intensive agricultural systems over-application of lime may have detrimental effects on factors affecting crop yield, particularly nutrient availability. The field experiment was carried out in 2005–2007 with ‘Galaxy’ F_1 white cabbage on a silty clay soil containing 0.91–1.02% organic carbon and soil acidity pH_{H_2O} 7.18–8.21. The plots were located at a private farm in Zagorzyce (50°23’ and 20°04’). Farms of this area specialize in cabbage production in continuous or highly frequent cropping. In short-term crop rotation systems liming is commonly used as a control measure for club root (*Plasmodiophora brassicae*) potential damage. The effect of ammonium sulphate and RSM (solution of ammonium nitrate + urea), the method of application (placement and broadcast technique) on Cd, Cr, Cu, Fe, Mn, Ni, Sr and Zn concentrations in edible parts of cabbage were surveyed. In present work all metal concentrations in cabbage were below the lower range of the content reported for cabbage grown in non-contaminated areas. The low content of micro/trace elements was related to soil parent material with generally low total and extractable levels of metals. The low concentration of microelements in cabbage may indicate deficiencies that would affect crop yields or human nutrition. Consistently higher concentrations of Cd, Cu, Fe, Mn and Ni were measured in cabbage grown on the site with lower pH, compared to concentrations in plants sampled at other soil sites with higher pH. The results obtained would suggest that in commercial cabbage production on over-limed soils using nitrogen ammonium fertilizers may improve Mn, Fe and Zn uptake by plants.

11: Drábeková, J. - Jančová, A. - Brodzianska, M.
- Massányi, P. - Lukáč, N. - Rumanová, L.:

**MORPHOMETRICAL ANALYSIS
OF GENDER-SPECIFIC DIFFERENCES
IN KIDNEY OF *CLETHRIONOMYS GLAREOLUS*
IN ENVIRONMENTAL RISK AREA**

[Slovak Agricultural University, Nitra, Slovak Republic;
Constantine the Philosopher University, Nitra, Slovak Republic]

This work presents histological analysis of the kidney tissue. We have evaluated microscopically kidney structures of bank voles (*Clethrionomys glareolus*, Schreber 1780). Samples for histological preparations were taken from adult individuals, which were sexual active and in a very good physical condition. They come from ecosystems which are situated close to thermal power station Novaky. For quantitative analysis morphometrical image analyzer software (Micro Image ver. 4.0) was used according to micromorphological criteria. The relative volume of glomerulum, tubules (nucleus, lumen and cytoplasm) and interstitium; diameter of renal corpuscle, glomeruli, Bowman's capsule, tubules; height of tubular epithelium; surface and perimeter of tubules, as well as surface and perimeter of the lumen in tubules were evaluated. Quantitative analysis of experimental data has detected differences between male and female. There were significant ($P < 0.05$) differences in the diameter of Bowman's capsule, the diameter, surface and perimeter of tubules, relative volume of nuclei of epithelial cells in the proximal tubule and nucleocytoplasmic ratio. We have determined significantly larger values in males compared to females.

12: Džugan, M.:
**THE EFFECT OF CADMIUM ON
N-ACETYL- β -D-HEXOSAMINIDASE
ACTIVITY IN CHICK FETUSES ORGANS**

[University of Rzeszow, Rzeszów, Poland]

Cadmium is a highly toxic cumulative trace metal characterized by a long half-life period in mammal organisms. The effect of cadmium on laboratory animals may include renal tubular damage, placental and testicular necrosis, as well as functional liver damage. Due to specific metabolism birds are sensitive indicators of environment pollution. However, relatively little is known about toxic effects of cadmium on sensitive birds' embryos. The paper presents preliminary investigation of N-acetyl- β -D-hexosaminidase activity, which acts as an indicator of cadmium-induced organ damage. The influence of cadmium on the enzyme activity in chicken fetuses organs, including kidneys, liver, heart and intestine, was studied. Fertile chicken eggs underwent the exposure to different cadmium ion concentrations ranging from 0.5 to 5 ng per egg. The injection of cadmium ions into air cell of eggs was performed both before incubation and on day 4 of incubation. Enzyme activity was determined spectrophotometrically in organs' homogenates of day 19 chicken embryos with the use of p-nitrophenyl-N-acetyl- β -D-glucosaminide as a substrate. It has been proved that cadmium injections change the enzyme activity in comparison to the control group, especially if a dose of metal is high. No any effects of cadmium ions (1–10 μ M) on the enzyme activity in vitro were observed. Despite low cadmium doses applied in the experiment, certain changes in chicken N-acetyl- β -D-hexosaminidase activity, caused by cadmium ions,

were noticed. Owing to this fact, the use of this enzyme as a marker of cadmium exposure needs further studies.

13: Fatrcová-Šramková K. - Chlebo P. - Dudriková E.:
**RISK IN NUTRITION HABITS
OF SLOVAK POPULATION**

[Slovak University of Agriculture, Nitra, Slovak Republic;
University of Veterinary Medicine, Košice, Slovak Republic]

Rational diet is very necessary to fully support human health and essential in preventing nutrition associated civilization diseases. The aim of the study was to identify and analyze differences between females and males in anthropometrics, food habits, preferences and eating attitude. Data were obtained from a cross-sectional survey of 1 400 adults (700 males and 700 females) from different regions of Slovakia. The study found that 38.14% of females and 30.0% of males had a normal weight, whilst in 21.86% of males and 15.72% of females ($p < 0.01$) a light obesity prevailed. Participants reported their usual weekly consumption (number of serves) of foods of vegetable and animal origin. The study found that 62.29% of females were met the weekly consumption of dairy products three times and more ($p < 0.001$). Males (59.14%) preferred consumption of pork meat and beef at least once a week (87.14%). Basing on the results of this study, it appears that a significant proportion of the Slovakian adults fall short of current, national dietary and physical activity recommendations for adults. Support: KEGA 3/5082/07; GA of SUA 724/02380.

14: Fatrcová-Šramková K. - Kolesárová A.
- Nôžková J. - Babinská, K.:
**NUTRITION HABITS AND ANTHROPOMETRIC
PARAMETERS OF SLOVAK CHILDREN**

[Slovak University of Agriculture, Nitra, Slovak Republic;
Comenius University, Bratislava, Slovak Republic]

The aim of the study was to analyse dietary patterns of 204 schoolchildren (110 girls and 94 boys), aged 9 to 14 years, from Slovak city Nitra (average age 11.40 ± 1.62 years). A regular consumption of breakfast was determined in 67.29% of younger schoolchildren and in 45.36% of older children ($P < 0.05$). The most frequently eaten meat by those children is poultry; just small share of younger and older children (14.95% and 16.49%) have consumed fish almost every week. Milk has been daily drunk by 60.75% and 64.95% of children in amount of 0.31 ± 0.18 and 0.40 ± 0.31 L. Markedly negative finding is fairly deficient (less than once a week) consumption of fruit (in 5.61% and 10.31% of children), vegetable (in 14.02% and 21.65% of children) and legumes (less than twice a month in 27.10% and 36.08% of children respectively). In this study, intake of particular foodstuffs added with bio foodstuffs among families is also analyzed. Support: KEGA 3/5082/07; GA of SUA 724/02380; project „Healthy city Nitra“.

15: Fatrcová-Šramková, K. - Nôžková, J. - Kačániová, M.
- Máriássyová, M. - Kropková, Z.:

**MICROBIAL PROPERTIES, NUTRITIONAL
COMPOSITION AND ANTIOXIDANT ACTIVITY
OF *BRASSICA NAPUS* SUBSP. *NAPUS* L. BEE
POLLEN USED IN HUMAN NUTRITION**

[Slovak University of Agriculture, Nitra, Slovak Republic;
Food Research Institute, Modra, Slovak Republic]

The aim of this work was to characterize properties of *Brassica napus* subsp. *napus* L. bee pollen sample, which can be potentially used in human nutrition. Mean number of mesophilic aerobic sporulating microorganisms ranged from 3.78 to 4.56 log CFU/g, number of mesophilic anaerobes sporulating microorganisms was in range 2.54–4.63 log CFU/g, number of coliforms bacteria - 0.00–3.74 log CFU/g and cell number of *Escherichia coli* in range 0.00–3.71 log CFU/g. Mean number of microscopic fungi ranged from 2.48 to 4.20 log CFU/g. The antioxidant activity of bee pollen ranged from 1.25 to 1.93 I/I₀ (in case of freeze-dried and frozen bee pollen, respectively). The highest total flavonoid content (128.33 mg/kg) was detected in frozen pollen. Sum of proteins (average 251.13±33.06 g/kg) decreased in the order as following: freeze-dried > dried > frozen bee pollen. The freeze-dried form of pollen was characterized by the highest value of calcium concentration (2040 mg/kg). Zinc was presented at the amount of 36.97±4.15 mg/kg. The most of zinc was contained in freeze-dried pollen. Support: APVT-20-026704.

**16: Fazekašová, D. - Torma, S. - Mochnacká, M.:
QUALITY OF PRODUCTION IN ECOLOGICAL
AND CONVENTIONAL AGRICULTURE**

[University of Prešov, Prešov, Slovak Republic;
Soil Science and Conservation Research
Institute, Bratislava, Slovak Republic]

Two models of enterprises served as a subject of the research the results of which are presented in given paper. The enterprises are located in marginal areas of Slovakia and they use an ecological system of soil management. Nutritious and hygienic indicators and the content of heavy metals were analyzed in selected agricultural producers using common methods. Basing on obtained results it is possible to conclude, that the observed ecological producers had higher nutritious values. However, from the hygienic point of view, the content of nitrates was higher in selected ecological producers. The higher content of heavy metals in meadow hay was influenced by the position, where we found over-limit values of risk elements (Cr, Ni). The mobilisation of these elements and consecutively increased contamination of the production were significantly affected by the soil reaction, which was in range of pH value between 4.41 and 4.78 during analysed period.

17: Formicki, G. - Stawarz, R. - Jančová, A. - Martiniaková, M. - Massányi, P. - Lukáč, N. - Toman, R. - Goc, Z.:

**THE INFLUENCE OF UV RADIATION
ON CADMIUM UPTAKE IN SELECTED
SPECIES OF AQUATIC ANIMALS**

[Pedagogical University, Krakow, Poland; Constantin the Philosopher University, Nitra, Slovak Republic; Slovak University of Agriculture, Nitra, Slovak Republic]

The influence of direct exposure to UV radiation on cadmium uptake in common frog tadpoles (*Rana temporaria*) and indirect influence of UV on cadmium uptake in freshwater mussels in the presence of humic acid was studied. Direct exposure of tadpoles kept at cadmium ion concentration of 1 mg/L resulted in significant increase of cadmium uptake. On the other hand, tadpoles exposed to UV radiation removed cadmium more efficiently than non-irradiated larvae. Cu, Na,

and K were positively correlated with Cd content, while Mg was negatively correlated with Cd. Animals exposed to combined stressors had lower Mg, Fe, Ca, Na, Zn contents, lower Na/K ratio and higher Cu and K contents than animals exposed exclusively to cadmium. In mussels grown at Cd concentration of 1 mg/L the presence of humic acid concentration of 29 mg/L increased cadmium uptake. UV exposure of the mixture of Cd and humic acid resulted in further increase in cadmium uptake. Increased cadmium uptake was followed by decreases in contents of Zn, Ca, Fe and increase in the Cu content in mussel organs. Analysis of water revealed that in UV-exposed mixtures more cadmium was bound to particulate matter. Nevertheless, voltammetrical analysis shown that in UV exposed mixtures more cadmium was present in ionic form. We suggest that UV radiation increases the number of negatively charged sites on particulate matter of humic substances. This site binds Cd²⁺ by electrostatic interactions, which are relatively weak. On the gills' surface in the favourable redox conditions cadmium cations are desorbed and taken up by the mussels. Our studies indicate that UV radiation present in the environment influences cadmium uptake directly by its influence on the body surface in some animal species or indirectly by modifications in water chemistry. [ORAL PRESENTATION]

**18: Frączek, K. - Grzyb, J. - Barabasz, W. - Górný, R. L.:
RESEARCH ON BACTERIAL AEROSOL
OCCURRING IN SANATORIUM CENTRES
OF BOCHNIA AND SZCZAWNICA**

[University of Agriculture, Cracow, Poland;
Institute of Occupational Medicine and
Environmental Health, Sosnowiec, Poland]

The real progress of underground therapeutics called dates from half of XXth century. The therapy is based on a few hour patient stay in atmosphere of the underground space. It seems that physical properties of the chamber environment are of special importance, especially stable microclimate and microbiological air cleanness. Underground air reservoirs became to be a simple, effective, low cost and healthy method of therapy for a patient, applicable mainly for the treatment of respiratory system damaged by anthropogenic pollution of air on the surface. That is why the main aim of the research was to estimate characteristics of the bacterial aerosol occurring in [underground] chambers of the Bochnia Salt Mine Sanatorium and in sanatorium space of the Szczawnica Sanatorium Company, complying fraction distribution depending on particle aerodynamic diameter: above 7.0 µm, 7.0–4.7 µm, 4.7–3.3 µm, 3.3–2.1 µm, 2.1–1.1 µm, and 1.1–0.65 µm. Microbiological tests of air were run in winter and spring 2008 in two [underground] therapeutic chambers of the Bochnia Salt Mine Sanatorium and in sanatorium space of the „Szczawnica Sanatorium” Company. Measurements were taken with a 6-stage Graseby–Andersen impactor from respiratory level [human nostril–mouth level] in state of „primary sterility” – that is before personel and patient introduction into chambers or sanatorium space, as well as during turns and execution of therapeutic operations. The analysis displayed significant difference for occurring bacterial aerosol at different measuring points. Basing on obtained results it is to state that the largest concentration of bacterial aerosol occurred at the sport field and

in bedroom part [the Ważyn Chamber] of the Bochnia Salt Mine Sanatorium, in space of balneotherapy and in a hall leading to patient rooms in the Inhalatorium building of the „Szczańska Sanatorium” Company. An evident increase of bacterial aerosol occurrence in chambers or sanatorium space during turns and execution of therapeutic operations was observed, comparing to inter-turn period [absence of patients]. Support: Research project N N 305 2552 33 (2007 – 2009).

**19: Gálik, B. - Bíro, D. - Juráček, M. - Šimko, M. - Michálková, J. - Gyöngyová, E. - Taška, M.:
THE INFLUENCE OF BIOCHEMICAL ADDITIVES
ON CONCENTRATION OF MYCOTOXINS
IN SILAGE OF HIGH MOISTURE CRIMPED CORN**
[Slovak University of Agriculture, Nitra, Slovak Republic]

The aim of this study was to determine the influence of combined biochemical silage additives on the amount of detected mycotoxins in silage of high moisture crimped corn (HMC). We used maize corn with the content of dry matter between 608.9 and 613.3 g. Two variants were examined: untreated control (UC) – without additives and variant A, in which we conserved high moisture crimped corn using biochemical additives containing lactic acid bacteria, active enzymatic complex of cellulases and natrium benzoate at dose of 6.0 L/1000 kg. After six months of fermentation the concentration of detected mycotoxins in the average samples was determined by immuno-enzymatic method using ELISA reader. Before the fermentation process we found all tested mycotoxins in experimental variants except deoxynivalenol (DON). In silages from HMC different concentrations of mycotoxins were detected. In variant A (used combined biochemical additives) we found lower concentrations of tested mycotoxins: zearalenone (29.83 µg/kg), deoxynivalenol (66.67 µg/kg), fumonisins (53.67 µg/kg), T-2 toxin (220.9 µg/kg), aflatoxins (2.13 µg/kg), and ochratoxin (1.133 µg/kg). All concentrations of tested mycotoxins were under the limit levels. In the experiment we found no significant positive influence of application of biochemical additives. Support: Scientific Grant Agency VEGA Project 1/0610/08.

**20: Gambuś, H. - Gambuś, F. - Pastuszka, D. - Wrona, P. - Ziobro, R. - Sabat, R. - Mickowska, B. - Nowotna, A. - Sikora, M. - Achremowicz, B.:
SUPPLEMENTATION OF GLUTEN-FREE
CONFECTIONERY PRODUCTS**
[University of Agriculture, Kraków, Poland]

Gluten-free cookies, produced according to the modified recipes published by Fenster (2004), were used as standards for comparison with gluten-free products, which were supplemented with flaxseed, amaranth and buckwheat. These gluten-free raw materials were expected to increase nutritional values of confectionery products. Cookies were analyzed in terms of organoleptic quality and shelf-life, evaluated by their texture and lipid composition, and then compared with control samples. All supplemented gluten-free products received high consumer scores, exceeding in some cases those of control samples. Enrichment of gluten-free confectionery products with flaxseed, amaranth and buckwheat flours had no negative influence on shelf life, which in all cases was longer than 4 months.

21: Gambuś, H. - Gambuś, F. - Wrona, P. - Pastuszka, D. - Ziobro, R. - Kopeć, A. - Nowotna, A. - Sikora, M. - Achremowicz, B.:

**EFFECT OF GLUTEN-FREE BREAD SUPPLEMENTED
WITH FLAXSEED AND AMARANTH FLOUR
ON SELECTED BIOCHEMICAL INDICES IN
RATS** University of Agriculture, Kraków, Poland]

Utilization of nutrients present in amaranth flour and flaxseed, used as supplements of gluten-free rolls was examined on rats. Chemical composition of amaranth flour, flaxseed and enriched rolls were compared. In the nutritional study Wistar rats were fed with diets consisting solely of air-dried gluten-free rolls and water. The animals were divided into 3 groups of 6 rats per each group. Group I was fed with control (not supplemented) rolls, group II– amaranth enriched buns, and group III– products with the addition of flaxseed. The experiment was run for 30 days. On the end of the experiment, the blood and organs were removed from anesthetized rats. Lipid profile and content of some elements were measured in blood serum, while other tissues were checked for the content of Ca, P, Mg, Fe, Na, K, Cu, Zn and Mn. It was shown, that the supplementation of gluten-free rolls with amaranth flour resulted in better biological value of proteins. Both supplements, especially amaranth flour, positively influenced lipid profile of serum. Beneficial changes in concentrations of Ca and P were observed in bones of rodents. No effect of Fe and Mg on the serum levels was found.

**22: Golian, J. - Toman, R. - Šiška, B. - Bošiák, M.:
CONTENT OF CADMIUM AND LEAD IN SELECTED
FOOD OF ANIMAL ORIGIN**
[Slovak University of Agriculture, Nitra, Slovak Republic]

Heavy metals are natural components of the environment. In recent years, industrial and agricultural development has been responsible for the diffusion of these substances into the environment. These elements are accumulated in soils and edible plants, and when animals are fed with these plants, they accumulated high levels of toxic metals in their organism. We analyzed 140 samples of milk products (55 samples of yogurts, 48 samples of cheeses, 37 samples of curds) and 218 samples of meat products (74 samples of pork meat, 61 samples of meat tins, 83 samples of sausages). All samples were taken from Slovak market during year 2006. The measurements of chosen metals were performed on an atomic absorption spectrophotometer Varian AA-175. Analyses were performed in the accredited laboratory. Average amount of cadmium in milk products was 0.00196 mg/kg in cheeses, 0.00254 mg/kg in yogurts and 0.00349 mg/kg in curds. Variability of cadmium amount in milk products was in range 48.67–76.24%. Average amount of lead in milk products was 0.0548 mg/kg in cheeses, 0.0594 mg/kg in yogurts and 0.0652 mg/kg in curds. Variability of lead amount was in range 71.82–89.51%. Average amount of cadmium in meat products was 0.0105 mg/kg in pork meat, 0.0081 mg/kg in sausages and 0.00585 mg/kg in meat tins. Variability of cadmium amount was in range 61.76–103.23%. Average amount of lead was 0.0792 mg/kg in pork meat, 0.1046 mg/kg in sausages and 0.04551 mg/kg in meat tins. Variability of lead amount was in range 75.18–93.74%.

23: Górká, P. - Kowalski, Z. M. - Pietrzak, P.

- Kotunia, A. - Zabielski, R.:

THE EFFECT OF SODIUM BUTYRATE FEED ADDITIVE IN MILK REPLACER OR/AND STARTER MIXTURE ON HEALTH STATUS OF NEONATAL CALVES

[Agriculture University, Kraków, Poland; Warsaw University of Life Sciences, Warsaw, Poland; Polish Academy of Science, Jabłonna, Poland]

High mortality and poor health status of neonatal calves are still problems of high economical relevance. In particular, high susceptibility of newborn calves to diarrhoeas is a cause of economical loss. The prohibition of usage of antibiotic growth promoters in animal production eliminated important tool in preventing such diseases in neonatal calves. It forced to look for more "natural" ways of preventing animal infections. Accelerating of the development of gastrointestinal tract may be one of the methods for decreasing susceptibility of calves to diarrhoeas. Butyric acid is a well known regulator of gastrointestinal tract development. Antimicrobial properties of butyric acid are also known. The aim of this study was to investigate the effect of sodium butyrate feed additive (NaB) to milk replacer or/and starter mixture on growth parameters and health status of neonatal calves in first 26 days of life. Addition of NaB to milk replacer and starter mixture had no effect on daily growth rate, however, its addition to milk replacer reduced negative effect of weight loss marked in calves received control milk replacer in first 12 days of age ($P=0.07$). Additionally, calves fed with NaB milk replacer showed a tendency towards higher growth rate in a whole trial period ($P=0.09$). On the other hand, the addition of NaB to starter mixture positively affected starter mixture intake between 19 and 26 days of life ($P=0.02$). Supplementation of NaB to milk replacer reduced scouring days in first 12 days of age ($P=0.08$). Moreover, its addition to starter mixture reduced scouring days between 13 and 19 days of age ($P=0.06$) and in a whole trial period ($P=0.02$). There were no effects of NaB on electrolyte and antibiotic therapies used, however, the calves received NaB both in milk replacer and starter mixture required no electrolyte therapy during whole trial period. Additionally, NaB positively affected body condition of neonatal calves ($P=0.07$). Support: Grant No. 1164/P01/2006/31, Ministry for Research and Higher Education, Poland). [ORAL PRESENTATION]

24: Grzyb, J. - Frączek, K.:

OCCURRENCE OF FUNGAL AEROSOL IN OVERGROUND AND UNDERGROUND HEALTH RESORTS

[University of Agriculture, Cracow, Poland]

For many years sanatorium therapeutics has been very popular in Poland as well as abroad. Detailed pulmonological research showed the appropriateness of such treatment in respiratory diseases. According to this, specific environment conditions, which occur in the underground subterranean therapy chambers and rooms of overground sanatoriums become more and more important. Main aim of the research was to define and divide the particles of biological aerosol into fractions (depending on their aerodynamical diameters): over 7.0 μm , 7.0–4.7 μm , 4.7–3.3 μm , 3.3–2.1 μm , 2.1–1.1 μm and 1.1–0.65 μm , which occur in the underground subterranean therapy

chambers in Salt Mine in Bochnia and overground sanatorium chambers in "Health Resort Szczawnica". The microbiological analysis of the air was carried out during the winter and spring of 2008 in 2 underground sanatorium chambers in Bochnia and in sanatorium chambers in Szczawnica. The measures were carried out by means of the six-step Graseby–Anderson impactor from the human's respiratory zone (oral and nasal cavity position) in the state of so-called "original sterility", which is before introducing sick people and the personnel into and during the period of visitors stay. The analysis showed significant differences between amounts of fungal aerosol in different places of chambers. It has been ascertained that the biological aerosol in subterranean therapy chambers occurred at definitely higher concentrations during the treatment activity, than during the period of the break between the turns. The highest concentrations of fungi in Salt Mine in Bochnia ascertained in Koldras' Chamber and gymnasium in Wazyn Chamber; in Szczawnica the highest concentration was in well-room of mineral water. Support: Project N N305 2552 33.

25: Gumul, D. - Ziobro, R. - Rożnowski, J. - Achremowicz, B.:

POLYPHENOLS AND ANTIOXIDANT ACTIVITY OF POLISH POTATOES

[University of Agriculture, Kraków, Poland]

The study was performed in order to analyze phenolic compounds and antioxidant activity of 5 Polish potato cultivars. Material consisted of 5 potato cultivars: Satzerna, Hermes, Raja, Rosolinol and Courage. Total polyphenol content (TPC) was assessed by spectrophotometric method using an F-C reagent. Flavonols and flavons were determined. Moreover, antioxidative activity was measured by 2 independent methods: FRAP and ABTS radical for all analyzed potato cultivars. The highest total content of polyphenols was found for Saturna cultivar and the lowest for Rosalinol. Other cultivars contained similar levels of these compounds. The amounts of flavonols and flavonoids were not proportional to total content of polyphenols in analyzed potato cultivars. Antioxidative activity determined by two independent methods was proportional to total polyphenol content in plant material. The highest antioxidant activity was displayed by Saturna, which was also the cultivar richest in polyphenols. In summary, among all analyzed potato cultivars, Saturna was characterised by the highest total content of polyphenols and antioxidant activity, while Rosolinol displayed the lowest values of these parameters.

26: Gumułka, M. - Rabsztyn, A. - Borowiec, F. - Niedziółka, J.:

FATTY ACID PROFILE AND CHEMICAL COMPOSITION OF MEAT AND ABDOMINAL FAT IN TWO BREEDS OF GEESE

[University of Agriculture, Kraków, Poland]

The meat products obtained from geese are characterized by special quality features as compared to broiler chickens. However, it is well known that water fowl during fattening accumulates a lot of fat, especially under the skin. The fatty acid composition of diets is considered to be an important factor from the human health standpoint. The purpose of the research was to estimate the chemical composition and fatty acid profile of breast meat lipids and of abdominal fat in two genetic groups of broiler geese. The experiment was conducted on Zatorska

geese maintained as a preserved flock and commercial White Koluda geese crosses selected for body weight and growth rate for several generations. **Fattening of geese was carried out up to 10 weeks of age according to the standard fattening technology.** For chemical analysis samples were taken from *m. pectoralis superficialis* and abdominal fat from 16 carcasses (8 males and 8 females). Chemical composition was determined according to AOAC (2001) and gas chromatography (Varian 3400 CX GC with FID detector) was used for fatty acid profile. **Significance of differences between means was tested by the Tukey's test.** In chemical composition of breast meat about 21% of crude protein was shown. Moreover, **the statistically significant effect of the genotype on chemical composition of muscles and abdominal fat was observed.** In both strains of geese saturated (SFA) and monounsaturated fatty acids (MUFA) were the predominant components, both in muscles and abdominal fat lipids, whereas the concentration of polyunsaturated fatty acids (PUFA) was relatively lower. The major SFA was palmitic, while the major MUFA was oleic acid and the major PUFA was linoleic acid. It was found that geese genotype induced differences in some of fatty acids and total SFA and MUFA, but not in PUFA concentration in muscle lipids and abdominal fat of geese.

27: Haščík, P. - Nováková, I. - Kačániová, M. - Fikselová, M. - Pavličová, S.:

MICROBIOLOGICAL QUALITY OF THE ANAS PLATYRHYNCHOS AND THE FULICA ATRA MEAT
[Slovak University of Agriculture, Nitra, Slovak Republic]

The aim of our experiment was to monitor the microbiological quality of *Anas platyrhynchos* and *Fulica atra* meat after the slaughtering and seven days of maturing process. Total count of microorganisms in the Glucose Tryptone Yeast agar, at 30°C and 48 hour, number of coliforms bacteria in Violet Red Bile agar, at 37°C and 24 hour and number of mesophilic anaerobic sporulating microorganisms in the Nutrient agar, at 25°C and 72 hour were estimated. The evaluation of microorganisms was done according to *Codex Alimentarius*. We noticed that the count of coliform bacteria was negative after slaughter in both experimental groups. The count of mesophilic anaerobic sporulating bacteria in the meat of the wild ducks ranged from 1.78–2.12 log CFU/g and in the meat of the fulicas was found from 4.98 to 5.95 log CFU/g. The difference was highly significantly different ($P < 0.001$). The total count of microorganisms in the meat of the wild ducks was zero, but in the meat of the fulicas ranged from 5.18 to 6.25 log CFU/g. The statistical differences between the meat samples from the wild ducks and the fulicas were significant ($P < 0.001$). The counts of coliforms in the mature meat of wild ducks varied from 1.12–1.73 log CFU/g. The differences between the meat samples from the wild ducks and the fulicas were not statistically significant ($P > 0.05$). The count of mesophilic anaerobic sporulating microorganisms in the wild duck mature meat samples varied from 1.95 to 2.24 log CFU/g and in the mature meat of the fulicas ranged from 5.00 to 6.00 log CFU/g. The significant differences between the meat samples of the wild ducks and the fulicas were determined ($P < 0.001$). The total count of microorganisms in the mature meat samples of the wild ducks ranged from 1.18 to 2.24 log CFU/g, i.e. at average 1.99 log CFU/g. Higher values were detected in the mature meat samples of the fulicas. The values

varied from 5.24 to 6.30 log CFU/g, i.e. at average 5.69 log CFU/g. The comparison of meat samples of both experimental animals showed high significant differences ($P < 0.001$).

28: Hijová E. - Chmelárová A. - Bomba A.:
COLON CANCER, LIFE STYLE AND NUTRITION
[Pavol Jozef Šafárik University, Košice, Slovak Republic]

Colon cancer is one of the most common forms of malignant tumours in human, and its incidence is increasing. This experimental work was designed to investigate the efficacy of prebiotic–inulin enriched with oligofructose BeneoSynergy 1 (ORAFIT, Belgium), *Hippocastani extractum siccum* (HES), as nutritional plant supplement (Calendula, SR) and *Lini oleum virginale* (Dr. Kulich Pharma, CZ), as a source of omega–3 fatty acids on the activity of bacterial enzymes and concentration of bile acids in rats with induced colon cancer by N,N–dimethylhydrazine (DMH, Merck, DE). In addition to chemically induced colon cancer, as one of risk factor for development of colon cancer and other civilizing diseases, we detected high intake of dietary fat. Male and female Wistar albino rats, six months old were divided into 8 experimental groups. Two groups (without DMH) were divided into two subgroups: control group with conventional diet and the group with high fat diet (HF). Next six subgroups were with DMH: control group with conventional diet + DMH, the group with HF diet + DMH, the group with HF diet + prebiotic + HES + DMH, the group with HF diet + prebiotic + DMH, the group with HES + DMH and the group with HF diet + Linen oil + DMH. Two weeks after beginning the diets, the rats were treated with DMH (20 mg/kg s.c. two times at week interval); dietary treatments were continued for the entire experiment. In the end of experimental period 8-week rats were anaesthetized (Ketamin 100 mg/kg + Xylazin 15 mg/kg b.w., i.p.) and blood samples were taken from the heart by puncture and used for determination of bile acid concentration with commercial kit (Trinity Biotech, Ireland). Freshly collected faecal samples were examined for enzymatic activity of bacterial enzymes using an API–ZYM kit (Biomérieux, France). Bacterial enzymes are known to produce mutagens, carcinogens, and various tumour promoters. Elevated activity of bacterial faecal enzymes increased risk of colon cancer. Prebiotic, *Hippocastanu extractum siccum*, and *Lini oleum virginale* showed a chemopreventive and anticarcinogenic effects against dimethylhydrazine–induced colon cancer by lowering the activities of bacterial enzymes. High fat diet is an important risk factor for the emergence of colorectal cancers, presumably because of their associated impact on the synthesis and secretion of bile acids. Changes in bile acid concentration were obviously depended on supplementary substances in the diet. Support: Project AV 4/0028/07

29: Javoreková, S. - Maková, J. - Tančinová, D.:
INFLUENCE OF PESTICIDES ON MICROBIAL ACTIVITY IN SELECTED SOIL TYPES OF SLOVAKIA
[Slovak University of Agriculture, Nitra, Slovak Republic]

The aim of our work was to determine influence of pesticides on the soil respiration and the amount of microorganisms (bacteria and their spores utilizing organic and inorganic nitrogen, actinomycetes, myxobacteria, *Azotobacter chroococcum*, microscopic fungi) in three soil types (Haplic

Chernozems, Haplic Luvisols, Cambisols). Cumulative values of basal CO₂ production for 21 days ranged from 595.62 mg/kg to 1045.79 mg/kg of dry soil in tested samples of Haplic Chernozems, from 424.6 mg/kg to 540.28 mg/kg of dry soil in tested samples of Haplic Luvisols and from 1789.84 mg/kg to 2103.81 mg/kg of dry soil in tested samples of Cambisols. Potential CO₂ production was higher (statistically significant, $p < 0.01$) in all treatments (with addition of glucose, PVAL, herbicide and fungicide), than basal ones. Stimulating effect of glucose addition was more prominent in Haplic Luvisols, than in Haplic Chernozems and Cambisols. Pesticide addition did not significantly decrease the amount of bacterial vegetative forms in Haplic Chernozems and Cambisols soil types, the bacterial spores only in the Cambisols soil type, but the amount of microscopic fungi only in the Haplic Chernozems soil type. Support: Slovak grant agency KEGA Grant No. 3/6228/08; VEGA Grant No. 1/3459/06 and No. 1/3453/06.

**30: Jevinová, P. - Pipová, M. - Mártonová, M. - Nagy, J. - Máté, D.:
THE STAPHYLOCOCCI RESISTANT TO TETRACYCLIN, ERYTHROMYCIN AND AMPICILLIN ISOLATED FROM GAME AND MECHANICALLY DEBONED POULTRY MEAT**

[University of Veterinary Medicine, Košice, Slovak Republic]

Seventy-seven strains of staphylococci were isolated from 8 samples of pheasant meat (*Phasianus colchicus*), from 8 samples of hares (*Lepus europaeus*) and from 15 samples of mechanically deboned poultry meat. These staphylococcal isolates (18 coagulase-negative staphylococci isolated from hares, 9 coagulase-negative and 18 coagulase-positive staphylococci from pheasant meat, 17 coagulase-negative and 15 coagulase-positive staphylococci isolated from mechanically deboned poultry meat) have been tested for their sensitivity to three antibiotics using disc-diffusion method and dilution method. The highest susceptibility of the staphylococcal strains isolated from hares was observed to tetracycline (66%) and highest resistance of these strains was observed to erythromycin (56–61%). In the staphylococcal strains, isolated from samples of pheasant meat highest susceptibility was shown to ampicillin (81%) and the highest resistance to erythromycin (26%). The strains isolated from samples of mechanically deboned poultry meat demonstrated the highest susceptibility to tetracycline (78%) and the highest resistance to ampicillin (53–59%). Resistance to one or more antibiotics (multiresistance) has been confirmed in staphylococcal isolates, which were obtained from hare meat, in 4 isolates from the meat of pheasant and in 7 isolates from mechanically deboned poultry meat. The total evaluation of the results shows, that 39% of coagulase-positive staphylococci, isolated from usher food matrices, were resistant to ampicillin, 35% to erythromycin and 26% to tetracycline. The results of the susceptibility to chosen antibiotics in coagulase-negative staphylococci, isolated from usher food matrices, were different. Dilution method confirmed, that 42% of these isolates were resistant to erythromycin, 39% to ampicillin and 19% to tetracycline. Disc-diffusion method also confirmed resistance of KN staphylococci to erythromycin (44%), to ampicillin (36%) and to tetracycline (20%). In conclusion we can say, that the increase in the resistance to certain antibiotics in KP and KN

staphylococci is alarming. Therefore, prevention of extension of the resistance can be achieved by careful use of antibiotics, breaking the chain of gene transmission because of preventive measures in hygiene of environment and monitoring of the resistance to antibiotics.

**31: Jomová, K. - Morovič, M. - Sirotkin, A.:
EFFECT OF LEAD TREATMENT ON CHANGES IN PROTEIN SYNTHESIS IN ROOT TIPS OF LUPINUS LUTEUS L.**

[Constantine the Philosopher University, Nitra, Slovak Republic; SARC, Research Institute of Animal Production, Nitra, Slovak Republic]

Plants are often stressed by various biotic and abiotic environmental factors which can cause different damages in the cell structure. Depending on type of the stressor, plants have developed special defending mechanisms often based on changes in molecular level of the plant cell. The main role in this defending system is presented by stress proteins. Therefore, some stress-induced changes in cells can be observed at the protein level. In this study, the effect of lead on growth of the seedlings, as well as protein synthesis changes in root tips were investigated in *Lupinus luteus L.*, var. Juno. Content of lead in root tips was determined as well. The solutions of Pb(NO₃)₂ with different concentrations of lead were applied after germination during the growth of lupine seedlings for 2 days. Effects of lead concentrations (100, 200, 300, 500 mg/dm³) on the seedlings were determined by measuring changes in the root lengths and weights. Significant changes have been observed for all lead treatments with exception of the lowest concentration, where an increase in these parameters (length and weight) has been observed probably due to the presence of the nitrate ions. The amount of lead in root tips, determined by the AAS method, increased proportionally to the lead concentration in the solution in the first three variants. The decrease of lead content in the variant with highest lead concentration in the solution can be a result of irreversible metabolic changes in plant cells, caused by toxic effect of lead. In order to evaluate protein changes the root tips were homogenized in Tris-HCl solution (pH 7.5). Protein concentrations were estimated in the clear supernatant obtained after centrifugation at 15 000 rpm. The relation between increasing concentrations of lead ions and protein synthesis has been studied using 16% (w/v) denaturing polyacrylamide gel electrophoresis. In protein extracts from the seeds growing in presence of lead the enhanced protein signals have been detected in 15–17 kDa area in comparison to control (water) variant. This increased proteosynthesis activity indicates the possible participation of low molecular weight proteins in the cell defence reactions. Increased level of the 70 kDa protein has been found in the root protein extract using SDS-PAGE followed by Western-blotting with mouse monoclonal antibody. Intensity of the signal was increasing proportionally to the lead concentration. In our results, the toxic effect of lead was confirmed by inhibition of seedling growth. Compared with non-treated control (water) variant qualitative protein changes were not observed, but the effect of lead on the protein expression was proved. Increased expression of low-weight proteins, as well as Hsp70 protein indicates their participation in adaptation reaction of cells.

32: Kačániová, M. - Fikselová, M. - Haščík, P.
- Kňazovická, V. - Nôžková, J. - Fatrcová-Šrámková, K.:

**CHANGES IN MICROFLORA OF BEE
POLLEN TREATED WITH UV LIGHT
AND FREEZING DURING STORAGE**

[Slovak University of Agriculture, Nitra, Slovak Republic]

The aim of this work was to observe microbial community of bee pollen of poppy (*Papaver somniferum*), rape (*Brassica napus*) and sunflower (*Helianthus annuus*) treated by freezing, UV light and then stored for 6 weeks. Following microbiological parameters were tested: counts and representation of microscopic fungi, total counts of microorganisms, counts of mesophilic aerobic and anaerobic sporulating microorganisms, count of coliforms bacteria and count of cells of *Escherichia coli*. Counts of microscopic fungi in the pollen treated with UV light ranged from 1.86 log cfu/g in the rape pollen after the 5th week of storage to 3.94 log cfu/g in the sunflower pollen after the 1st week of storage. Counts of mesophilic anaerobic sporulating microorganisms ranged from 2.54 log cfu/g after the 6th week of storage in the poppy pollen to 4.27 log cfu/g in the sunflower pollen after the first week. Mesophilic aerobic sporulating microorganisms varied from 2.43 log cfu/g in poppy pollen after the 6th week of UV light treatment to 3.60 log cfu/g in rape pollen after the first week. Counts of coliforms bacteria ranged from 0 log cfu/g since the 4th week in sunflower pollen and since 4th week in rape pollen to 3.33 log cfu/g in sunflower pollen after the 1st week of UV light treatment. Counts of microscopic fungi in the pollen treated by freezing ranged from 2.13 log cfu/g after the 5th week of storage in the pollen of rape to 4.05 log cfu/g in the pollen of sunflower after the first week. Counts of mesophilic anaerobic sporulating microorganisms varied from 2.13 log cfu/g after the 5th week in the pollen of rape to 4.65 log cfu/g after the first week in the pollen of sunflower. Mesophilic aerobic sporulating microorganisms were found from 2.60 log cfu/g after the 6th week of freezing of poppy pollen to 4.02 log cfu/g after the first week of freezing in the pollen of sunflower. Counts of coliforms bacteria ranged from 0.00 log cfu/g after the 3rd week in the rape pollen to 3.21 log cfu/g after first week of freezing in the poppy pollen. *Alternaria sp.*, *Cladosporium sp.* a *Penicillium sp.* were the most common species among microbiological fungi during whole time of the observation. We can conclude that counts of microorganisms during 6 weeks of storage treated with UV light and freezing decreased in all species of pollen.

33: Kačániová, M. - Nôžková, J. - Fatrcová-Šrámková, K.
- Kropková, Z. - Kubincová, J.:

**ANTIOXIDANT, ANTIMICROBIAL ACTIVITY AND
HEAVY METAL CONTENT IN POLLEN OF *PAPAVER
SOMNIFERUM L.***

[Slovak University of Agriculture, Nitra, Slovak Republic;
Food Research Institute, Modra, Slovak Republic]

Bee collected pollen is considered as valuable special food. The aim of the study was to analyse *Papaver somniferum L.* bee pollen (dried, frozen, freeze-dried). Reduction power of bee pollen compounds was $3592.56 \pm 105.29 \mu\text{g/mL}$. The strongest antibacterial effect was shown by bee pollen ethanolic extract of 90% concentration against *Staphylococcus sp.* and family

Enterobacteriaceae. The strongest antifungal effect was shown by bee pollen ethanolic extract samples at 90% concentration, against *Penicillium citrinum* and *Penicillium crustosum* strains. From the heavy metals, in flower and bee pollen, lead level was 0.64 mg/kg and less than 0.1 mg/kg, respectively. Consecutively, contents of mercury were 0.019 mg/kg for flower pollen and ranged from 0.004 to 0.005 mg/kg for frozen, freeze-dried and dried bee pollen. Cadmium concentration in flower pollen was 0.12 mg/kg, and in bee pollen ranged from 0.22 to 0.26 mg/kg. Support: APVT-20-026704.

34: Kalařová, A. - Kováčik, J. - Chrenek, P. - Lukáč, N.
- Capcarová, M. - Kolesárová, A. - Zaujec, K. - Mojto, J.
- Stawarz, R. - Formicki, G. - Massányi, P.:

**CONCENTRATION OF SELECTED ELEMENTS
IN RABBIT MEAT AND THEIR CORRELATIONS**

[Slovak University of Agriculture, Nitra, Slovak Republic;
Slovak Agricultural Research Centre, Nitra, Slovak Republic;
Pedagogical University, Krakow, Poland]

The impact of trace elements on the environment is still growing. Environmental and human health tasks involve the role and fate of trace elements in soil-water-biota systems. The biogeochemistry of pollutants, toxins, as well micronutrients is of growing attention. Advances in food biochemistry, combined with multidisciplinary research, are critical to understanding the behavior of and managing trace elements in the environment. The aim of this study was to analyze concentrations of selected elements in *musculus longissimus dorsi* (MLD) of rabbits (n=10) using AAS method. The concentration of metals: Ca, P, Mg, Na, K (in g/kg), Fe, Mn, Zn, Cu (in mg/kg) was following: Ca 0.09–0.21; P 1.38–2.42; Mg 0.22–0.27; Na 0.24–0.34; K 3.05–3.74; Fe 1.23–15.84; Mn 0.00–0.74; Zn 9.98–22.42 and Cu 1.50–4.24. Following correlations were found: a strongly positive between Mg and K, highly negative between P and Zn, moderately positive between Ca and Na, P and Mg, P and Mn, P and Cu, Mg and Mn, Na and Mn, K and Mn, Fe and Zn; moderately negative between Ca and Mg, P and Fe, Mg and Fe, Na and Cu, Fe and Cu, Zn and Cu; weakly positive between P and Na, P and K, Mg and Na, Na and K, Mg and Cu, Na and Fe, Na and Zn, K and Zn, K and Cu, Fe and Mn; weakly negative between Ca and P, Ca and K, Mg and Zn, Mn and Zn, Mn and Cu. This study reports about concentrations of selected element in the rabbit MLD muscle, as well as the correlations found between these metals. Obtained data can be used for further analyses in concerns to the impact of environment and possible bioaccumulation of potentially toxic elements and changes of chemical composition of meat. Support: APVV 0299–06, VEGA 1/0696/08

35: Klabanová, P. - Rajmon, R. - Šichtař, J. - Slavík, P.:

**THE EFFECTS OF SOYA AND ZEARALENONE
FEEDING ON THE REPRODUCTIVE
EFFICIENCY OF GILTS**

[Czech University of Life Sciences, Prague, Czech Republic]

Certain compounds used in animal production can act similar to estrogens produced by animal organisms but they come from exogenous environment. The pig is the most sensitive animal to the estrogenic effects of xenoestrogens. In pig fodder soya is the most important source of phytoestrogens,

and cereals are often spotted with estrogenic mycotoxin zearalenone. The objective of this study was to verify the hypothesis that simultaneous exposure of sexually mature gilts to zearalenone (ZEA) and soya phytoestrogens may lead to enhanced estrogenic effects and hence affect the reproductive efficiency of animals. Gilts in the 120 kg weight category were used for this study. The feed mixture contained either soya or fish meal. The soya mixture was fortified with a supplement of 100 mg of genistein. Half of the animals fed individual types of feed mixture received ZEA in a dose corresponding to 1.3 ppm in the feed. The number of pregnant gilts was higher in soya-fed animals than in non soya-fed animals. **The results** that the soya-fed animals became pregnant more often after first insemination were **not statistically significant**. Similar results were found between the ZEA-fed animals and non ZEA-fed animals. The effect of ZEA was on the borderline of statistical significance. The weights of developing fetuses were the highest in the group of gilts fed ZEA and soya, the lowest in the gilts fed only ZEA without soya. The difference between these two experimental groups was statistically significant. The differences in the post-slaughter detected values of weights of ovaries and fetal membranes, numbers of corpora lutea and developing fetuses were statistically insignificant among the individual experimental groups. Although certain differences were observed, it is not possible to unambiguously prove or exclude the interaction of ZEA and soya. Support: NAZV QF3025. [ORAL PRESENTATION]

36: Koréneková, B. - Skalická, M. - Kožárová, I. - Nagy, J. - Máté, D. - Naď, P.:

CADMIUM, LEAD AND NICKEL ACCUMULATION IN LIVER, BREAST AND LEG MUSCLES OF PHASIANUS COLCHICUS

[University of Veterinary Medicine, Košice, Slovak Republic]

Phasianus colchicus is the most popular species of hunting in Slovakia. Game birds are those birds that have traditionally been wild or hunted but have been raised commercially for their meat, for egg production or for release in hunting reserves. **The aim of the study was to determine Cd, Pb and Ni accumulation in tissues (breast and leg muscles) and liver of pheasants.** Seven pheasants were hunted in defined locality in Eastern Slovakia and 6 pheasants were killed. Heavy metals content were determined by atomic absorption spectrometry (AAS) and expressed on a wet weight basis (w. wt.). **The results** were statistically analyzed using Student's t-test (Microsoft Excel 7.0) setting significance levels at $p < 0.05$; $p < 0.01$; $p < 0.001$. The data are presented as means and standard deviations. **The highest mean levels of Cd were noticed in liver (0.037 mg/kg), and Pb (0.849 mg/kg) and Ni (0.548 mg/kg) in breast of shot pheasants.** On the other hand, the killed pheasants had the highest mean concentrations of heavy metals in liver. The analysis of investigated biological materials confirmed higher mean concentrations of Pb and Ni in shot rather than killed pheasants. The minimal differences were observed between mean levels of Cd in shot and killed pheasants. Remarkable increase of Pb and Ni in breast of shot pheasants may be due to used shots. Support: VEGA 1/0403/08.

37: Kováčik, P.:

THE RISKS OF HEAVY METALS ENTRANCE INTO SOIL AND PLANTS AFTER CHEMICALLY AND MECHANICALLY TREATED COAL APPLICATION

[Slovak University of Agriculture, Nitra, Slovak Republic]

The effect of chemically (solid sodium humate) and mechanically (lignofert) treated coal application as a soil remediation substance and NPK (artificial) fertilizers, on the content of heavy metals in root, straw and grain of spring barley and in the soil have been investigated on Haplic Luvisol in the pot trial realized in vegetative cage placed on the territory of Slovak Agricultural University in Nitra (48°18' N, 18°05' E). Obtained results prove that metals are accumulated mostly in the roots of plants and the least in their generative organs. Observed inhibitory effect of sodium humate (SH) on heavy metals in plants has not been proved. Vice versa, in comparison with the control variant, an increase of 9 metals out of 11 monitored has appeared in grains of barley as a result of SH application. A significant decrease has been seen only with Hg. Almost identical influence of humate on accumulation of metals has been noted also in roots. Lignofert treatment on metal accumulation has been compared with SH treatment. A significant positive influence of industrial fertilizers on the increase of metals in generative as well as in vegetative organs of barley has been found. The reason for increased accumulation of metals after application of NPK fertilizers was their acidification effect on soil. SH and lignofert application as soil remediation substances has not brought about a greater risk from the point of view of heavy metals accumulation in spring barley than application of NPK fertilizers. Their usage in order to inhibit heavy metals entrance to the plants seems unreasonable. Metal contents in soil partially increased by chemically and mechanically treated coal application.

38: Kowalski, S. - Łukasiewicz, M.

- Bednarz, S. - Achremowicz, B.:

THE QUALITY OF SELECTED HONEYS FROM THE SOUTH OF POLAND

[University of Agriculture, Cracow, Poland]

Honeydew honeys are very popular in Poland and consumers are highly interested in good quality of this product. Unfortunately high prices of honeys especially honeydew honeys are good opportunity for adulteration of this product leading to lowering quality and functionality of this product. The aim of this work was to describe chemical composition of honeydew honeys from coniferous trees (CH) as well as deciduous trees (DH) and nectar-honeydew honeys (NH). The main emphasis was given on carbohydrate composition of these honeys. High Performance Liquid Chromatography with refractometric detection was used to describe carbohydrate composition of samples. Apart from carbohydrate composition some other physicochemical parameters (pH, free, total and lactones acidity, specific rotation, humidity, electrical conductivity) were used for characterization of honeydew honeys. On the basis of Principal Component Analysis (PCA) we have stated that honeydew honeys produced from deciduous trees can easily differ from other analyzed honeys e.g. CH and NH, because honeydew honeys produced from deciduous trees had the lowest value of specific rotation. Nectar-honeydew honeys can

be distinguished from honeydew honeys from coniferous trees on the basis of dependence of specific rotation from maltose content or specific rotation from total acidity value.

**39: Kožárová, I. - Sýkorová-Goffová Z. - Máté, D.:
DETECTION OF MADURAMYCIN RESIDUES IN THE
TISSUES OF BROILER CHICKEN BY USING THE
PREMI®TEST AND THE STAR IN COMBINATION
WITH THE SOLVENT EXTRACTION PROCEDURE**

[University of Veterinary Medicine, Košice, Slovak Republic]

Monitoring of veterinary drug residues in foods is a critical point in the protection of public health. Primary screening of veterinary drug residues in foods is performed by using the microbiological methods based on inhibiting the growth of a test organism in an agar medium. As not all pharmacologically active substances can be detected by the microbial inhibition tests at or below the levels of maximum residue limits, there is a need to increase the sensitivity of these methods by an alternative residue screening procedure. One of the possible techniques is a solvent extraction procedure. Maduramycin has been observed to be effective against coccidiosis in broiler chickens when it is administered in the feed at a dose of 5 mg/kg of complete feed. A five-day withdrawal period must be observed before the chickens are slaughter for human consumption. In our study, the solvent extraction procedure developed by Stead et al. (2004) was used for the detection of maduramycin residues in the breast muscle, the thigh muscle and gizzards of broiler chickens fed with feed containing Cygro 1% premix with maduramycin at the 5 mg/kg level. The solvent extraction technique was coupled to the Premi®Test and the Screening Test for Antibiotic Residues (STAR). By using the solvent extraction procedure, more positive results were obtained. Maduramycin residues detected in all the examined matrices were considered as negatives at the screening of maduramycin residues by using the existing methodology of the Premi®Test and the STAR. Our results also showed that the thigh muscle and gizzards were still positive on the fifth day of the withdrawal period. Chemically denaturing tissue assisted the release of maduramycin residues from tissues. The solvent extraction technique coupled to the Premi®Test and the STAR represent a significant tool for reliable detection of maduramycin residues in the tissues of broiler chickens at the level of the concern. **Support: VEGA 1/3491/06.**

**40: Kožárová, I. - Sýkorová-Goffová Z. - Máté, D.:
DETECTION OF MADURAMYCIN RESIDUES
IN THE TISSUES OF BROILER CHICKEN BY
USING THE PREMI®TEST AND THE STAR**

[University of Veterinary Medicine, Košice, Slovak Republic]

Maduramycin, amonocarboxylicpolyetherionophoric antibiotic produced by *Actinomadura yumaensis* is authorised as a feed additive for the prevention of coccidiosis in poultry rearing. The recommended level of its use for broiler chicken is 5 mg/kg of complete feed. Although a five-day withdrawal period from medicated feed is required prior to slaughter, there is still a risk that maduramycin residues may remain in animal products derived from poultry and present a potential risk for consumers. The presence of anticoccidial residues in live animals and animal products must be monitored and controlled (EU Council Directive 96/23/EC). Microbial inhibition tests

(MIT) form the basis of screening methods for monitoring the presence of veterinary drug residues in food. Because the MIT do not indicate the sensitivity of respective methods for individual test organisms to anticoccidials, the aim of the present study was to evaluate both the +Premi®Test and the Screening Test for Antibiotic Residues (STAR) for the detection of maduramycin residues in the tissues and blood serum of broiler chicken fed with a commercially-produced feed (BR2) containing 5 mg.kg⁻¹ of maduramycin (Cygro 1% premix) in complete feed from day zero up to the fifth day of the withdrawal period. An inhibition test is useful for the detection of an antibacterial substance, if the detection limit (LOD) of this substance is at or below the maximum residue limit (MRL). For maduramycin, the MRL of 0.4–0.5 mg/kg established for this drug in various countries of the world was taken into consideration. Our results indicated that the highest sensitivity to maduramycin standard showed the test organism *Bacillus stearothermophilus* var. *calidolactis*. *Bacillus stearothermophilus* var. *calidolactis* in both screening methods reliably detected the presence of maduramycin residues at the levels of the safety limit (Premi®Test LOD 0.05 µg/mL, STAR method LOD 0.01 µg/mL). The 5-day withdrawal period established for maduramycin is sufficient to ensure the reduction of maduramycin residues in the tissues and blood serum of broiler chickens to the required safety level. Premi®Test and the STAR with the test organism *Bacillus stearothermophilus* var. *calidolactis* are suitable for detection of maduramycin residues at the levels for concern. **Support: VEGA 1/3491/06.**

**41: Kramářová, D. - Altangerel, B. - Lazárková, Z.
- Rop, O. - Vondruška, M.:**

**DETERMINATION OF HEAVY METALS
AND NUTRITION VALUES IN BROCCOLI**

[Tomáš Baťa University, Zlín, Czech Republic]

Broccoli, belonging to the Brassicaceae family and classified as *Brassica oleracea italica*, is a very powerful nutritional green vegetable, containing plenty of vitamins and minerals such as vitamin A, thiamine, riboflavin, niacin, pyridoxine, vitamin C, vitamin E, vitamin K, folate, pantothenic acid, calcium, copper, iron, magnesium, manganese, phosphorus, potassium, zinc etc. The aim of this study was to determine the content of chosen heavy metals (mercury, lead and cadmium) and some nutritional parameters (β-carotene and vitamin C) in raw broccoli samples obtained from trade network. For the assessment of heavy metals the samples were mineralized with the mixture of sulphuric acid and hydrogen peroxide and the analysis was performed using atomic absorption spectroscopy (analyzers AMA 254 and AVANTA GBC 933A, GBC, Australia). β-carotene and vitamin C were extracted by hexane and acetone and mixture of methanol, phosphoric acid and redistilled water, respectively. Both β-carotene and vitamin C were determined by high-performance liquid chromatography with electrochemical detection (Coulochem III, ESA, USA). The broccoli samples contained 0.094±0.1152 µg/100 g of mercury and 0.0004±0.03981 µg/100 g of lead. No cadmium was detected. It appears from these results that no heavy metals accumulate in this vegetable since all concentrations were below quality standard. The amount of β-carotene in broccoli was 1.703±0.1945 mg/100 g and the content of vitamin C was 57.974±0.535 mg/100 g.

42. Lukáč, N. - Massányi, P. - Kováčik, J. - Trandžík, J. - Naď, P. - Skalická, M. - Koréneková, B. - Toman, R. - Stawarz, R. - Formicki, G. - Kuczkowska, A.:

TRACE ELEMENTS AND SPERMATOZOA QUALITY

[Slovak University of Agriculture, Nitra, Slovak Republic; Breeding Service of Slovak Republic, Nitra, Slovak Republic; University of Veterinary Medicine, Košice, Slovak Republic; Pedagogical University, Cracow, Poland]

Development in industry and agriculture causes an infiltration of various elements in the food chain. This also promotes the uneven distribution of essential elements in the animal body and changes their interactions. Target of this study was to determine the seminal concentrations of selected metals in animal semen and to detect their relations to spermatozoa quality. Semen samples were obtained, digested and analyzed by means of the AAS. For analysis of pathological spermatozoa, samples were stained with Giemsa. The seminal copper concentration was significantly higher in ram and fox than that in bull, boar and stallion. In boar a significantly higher seminal zinc concentration was found in comparison with stallion, bull, ram and fox. Iron concentration in semen is significantly higher in ram, bull and fox than that in boar and stallion. The seminal cadmium concentration was relatively low in all studied species. The seminal lead concentration was the highest in ram, which was much higher than in fox, bull, stallion and boar. The level of seminal nickel was significantly higher in fox and ram in comparison with bull and boar. In bulls high correlations between Fe and Zn ($r=0.72$), Ni and separated flagellum ($r=0.76$); in rams between Cd and Pb ($r=0.98$), Ni and separated flagellum ($r=0.77$); in boars between Cu and Pb ($r=0.52$); in stallions between Fe and Cd ($r=0.78$), Fe and Pb ($r=0.79$), Pb and Ni ($r=0.74$), Cd and Pb ($r=0.97$), Cu and flagellum torso ($r=-0.77$), Zn and total number of pathological spermatozoa ($r=0.86$), Zn and flagellum torso ($r=0.89$), Fe and total number of pathological spermatozoa ($r=0.70$), Fe and flagellum ball ($r=0.91$), Cd and separated flagellum ($r=0.82$), Pb and total number of pathological spermatozoa ($r=0.71$), Pb and separated flagellum ($r=0.85$) and in fox between Cu and Pb ($r=-0.85$), Cu and other forms of pathological spermatozoa ($r=-0.72$), Zn and broken flagellum ($r=-0.69$), Fe and cytoplasmic drop ($r=-0.87$), Cd and separated flagellum ($r=-0.68$) and between Cd and retention of cytoplasmic drop was detected. Support: APVV 0299-06; VEGA 1/2417/05. [ORAL PRESENTATION]

43: Łukasiewicz, M. - Bednarz S.

- Ptaszek, A. - Achremowicz, B.:

ENVIRONMENT FRIENDLY POLYSACCHARIDE MODIFICATION – MICROWAVE ASSISTED OXIDATION OF STARCH

[University of Agriculture, Cracow, Poland]

Microwaves find a lot of different application in both synthetic organic chemistry and food industry and has been already described in hundreds of publications. The conclusions from research are that such kind of energy might have a quite strong influence on both rate and selectivity of the chemical processes. The phenomenon origins in interaction of high frequency irradiation with the matter by means of dielectric and/or conducting mechanism. Starch is one of the most common naturally occurring polymer and thus lie with in the

scope of many research which lead to its industrial and scientific application on different fields of interests: from agricultural/food industry through far beyond its classical perception in modern non-food application. Only a few purposes (approximately 3% of total starch production) have been found for so called 'native' (i.e. raw) starch. Most of the biopolymer is modified by means of various methods i.e. physical, chemical, enzymatic or combined methods. Oxidation is an example of chemical modification of starch and result in conversion of C6 hydroxyl group into the corresponding carboxyl. Such transformation has great consequences by means of change in some physical and chemical properties of such a system. But, like almost in all starch modifications the degradation of macromolecules is also observed during the process. The investigated reaction was conducted applying hydrogen peroxide as the oxidant. H_2O_2 is one of the very promising reagent for oxidation of organic compounds because of completely non toxic waste (water), high oxidation potential, low price and many others features. For the described reaction system the Na_2WO_4 was used as the catalyst (H_2O_2 activator). All the reactions were carried out in multi-mode microwave reactor and compared to those obtained in conventional conditions (by means of online temperature control). The influence of microwave irradiation (or so called microwave effect), on the oxidized starch properties i.e. carboxyl content and molecular mass distribution was investigated. Support: The Polish State Committee Scientific Research Grant No. N31200731/0848.

44: Macků, I. - Lazárková, Z. - Buňka, F.

- Flasarová, R. - Hrabě, J.:

BIOGENIC AMINE CONTENT IN MOULD CHEESE DURING STORAGE

[Tomas Bata University, Zlín, Czech Republic]

Biogenic amines are low molecular weight nitrogenous organic compounds which play many important roles in human physiological functions. However, higher concentrations of biogenic amines can have toxic effect on human health. Biogenic amines are created in food by enzymatic decarboxylation of amino acids. These compounds are mainly included in fermented food products and in food containing high amount of proteins such as cheese, fermented milk, meat, fish, wine and beer. The legislation of the Czech Republic permits 100 mg.kg^{-1} of histamine in fish which is consistent with the European Union. Nevertheless, there are nowadays no other thresholds for the other biogenic amines. Previously, there were also limits for tyramine in various foods such as cheese (200 mg/kg) or red wine (50 mg/kg). The aim of this research was to study the formation of seven biogenic amines (histamine, agmatine, spermine, spermidine, cadaverine, putrescine and tyramine) in three commercial mould cheeses from three different producers from three different Central-European countries during 8-week storage in refrigerator at $6\pm 2^\circ\text{C}$. The analysis of biogenic amines was done three or four weeks before the expiry date and then another five or six weeks after the expiry date of samples. Biogenic amines were extracted by 0.1 mol/dm^3 HCl from the mould cheeses and determined using ion-exchange chromatography with post-column ninhydrin detection. Spermidine, spermine, putrescine and cadaverine were detected in tested mould cheeses. Spermidine

was quantitatively the most important biogenic amine in all the samples. While spermidine was detected immediately after purchase of samples, rest of the detected biogenic amines were detected during storage. The amount of spermidine and putrescine was mostly increased during storage; however, all samples contained toxicologically insignificant concentrations of these nitrogenous compounds and can be considered to be safe for human health.

45: Martiniaková, M. - Omelka, R. - Jančová, A.
- Stawarz, R. - Formicki, G. - Toman, R.:

ACCUMULATION OF SELECTED HEAVY METALS IN THE FEMORA OF SMALL TERRESTRIAL MAMMALS

[Constantine the Philosopher University, Nitra, Slovak Republic; Cracow Pedagogical University, Cracow, Poland; Slovak University of Agriculture, Nitra, Slovak Republic]

The accumulation of lead, cadmium, iron, nickel, copper and zinc in the femora of yellow-necked mouse (*Apodemus flavicollis*) and bank vole (*Clethrionomys glareolus*) living near the site of a coal power station Nováky (Slovakia) were investigated. The content of heavy metals in their bones was assessed by atomic absorption spectrophotometry method. Altogether 20 femora of adult individuals were analysed. Higher concentrations of Cd, Ni, Cu and Zn were detected in the bones of bank vole. Significant differences were observed for the concentrations of Cd, Ni and Zn ($P < 0.05$). On the contrary, higher concentrations of Pb and Fe were found in the femora of yellow necked mouse. However, the differences were not significant. Results indicate that *Clethrionomys glareolus* may be considered as more bone loaded zoomonitor in comparison with *Apodemus flavicollis*.

46. Massányi, P. - Kročková, J. - Kalafová, A.
- Sirotkin, A. V. - Chrenek, P. - Lukáč, N. - Forgács, Z.
- Toman, R. - Capcarová, M. - Kolesárová, A.
- Kováčik, J. - Stawarz, R. - Formicki, G. - Kilian, K.:

THE EFFECT OF NICKEL IN COMBINATION WITH ZINC ON OVARIAN STRUCTURE AND FUNCTION

[Slovak University of Agriculture, Nitra, Slovak Republic; Slovak Agricultural Research Centre, Nitra, Slovak Republic; National Institute of Chemical Safety, Budapest, Hungary; Pedagogical University, Cracow, Poland]

Production of chemicals and burning of fossil fuel is connected with the source of large amounts of toxic waste, especially sulphur oxides, nitric gases and heavy metal emissions, which are toxic for all living organisms. Their danger has been related with movement with in food chain and with their ability to absorb and accumulate. Target of this study was to analyze the effect of *per os* experimentally administered nickel and its combination with zinc on ovarian function in rabbits ($n=25$). Animals were divided into 5 groups – receiving 17.5 and 35 g NiCl_2 per 100 kg of feed mixture and combination of 17.5 or 35 g NiCl_2 + 30 g ZnCl_2 per 100 kg of feed mixture. In control group the relative volume of primary follicles was $2.07 \pm 1.76\%$, growing follicles without antrum formation $0.75 \pm 1.14\%$, growing follicles $4.14 \pm 5.97\%$ and stroma formed $93.03 \pm 5.96\%$. In experimental group with nickel administration slight decrease of the relative volume of growing follicles without antrum formation was found. In the

groups with Ni+Zn combination a decrease of relative volume of primary follicle and growing follicles without antrum formation was detected. No significant differences were found ($p > 0.05$). In 24 hour culture of ovarian granulosa cells from all experimental animals after a single nickel administration decreased level of IGF-I and progesterone was detected, but the differences were not significant. In combination of nickel and zinc the concentration of IGF-I decreased in groups with lower nickel administration. The level of progesterone was very similar in all experimental groups. These results suggest only a weak effect of experimental nickel administration on the rabbit ovarian structure and function. Support: APVV 0299-06, VEGA 1/0696/08.

47. Massányi, P. - Lukáč, N. - Kováčik, J. - Toman, R.
- Stawarz, R. - Cigánková, V. - Ciagło, A.:

HEAVY METALS EFFECTS ON TESTICULAR STRUCTURE IN VIVO

[Slovak University of Agriculture, Nitra, Slovak Republic; Pedagogical University, Cracow, Poland; University of Veterinary Medicine, Košice, Slovak Republic]

Distribution of cadmium, lead, nickel and cobalt as a risk factor of environment, in testis and its effects on the testicular structure in experimental animals were studied. All studied elements were *i. p.* administered in a single dose. Cadmium (CdCl_2) was administrated in mice in group A/Cd (0.25 mg/kg body weight) and group B/Cd (0.5 mg/kg). Rats received lead (PbNO_3) in doses of 50 mg/kg (group A/Pb), 25 mg/kg (group B/Pb) and 12.5 mg/kg (group C/Pb) of body weight. Nickel (NiCl_2) was administrated for mice in doses of 20 mg NiCl_2 per kg of body weight (group A/Ni), 40 mg NiCl_2 per kg b. w. (group B/Ni). Hamsters in group A/Co received cobalt (CoCl_2) in doses of 20 mg/kg, in group B/Co 10 mg/kg and in group C/Co 5 mg/kg CoCl_2 /kg body weight. Animals were killed 48 hours after application of administered elements. After a preparation of histological samples the results were compared with control (Ctrl). Morphometric analysis found any significant differences in relative volume of germinal epithelium (89.08–89.14%) and interstitium (10.86–10.92%) of seminiferous tubules. The diameter of seminiferous epithelium showed insignificant dose-dependent decrease. In all lead-treated groups the relative volume of seminiferous epithelium decreased significantly. Relative volume of interstitium significantly decreased in group C/Pb. The diameter of seminiferous epithelium significantly decreased in group B/Pb and C/Pb in comparison with control. In both experimental groups with nickel a significant ($p < 0.001$) decrease of germinal epithelium in comparison with control group was observed. Morphometric analysis showed that in all cobalt-treated groups the relative volume of seminiferous epithelium significantly decreased. In the relative volume of interstitium a significant increase was found between control group and experimental groups. The qualitative analysis of testicular tissues in all observed animals detected dilatation of blood vessels in interstitium, undulation of basal membrane and several empty spaces occurred in germinal epithelium. Results of this study clearly determine negative effects of heavy metals on the structure as well as on the function of seminiferous epithelium in the place of spermatozoa production. Support: VEGA 1/2417/05, APVV 0299-06. [ORAL PRESENTATION]

48: Maxová, M. - Hubová, M. - Marková, I.
- Žák A. - Kazdová, L.:

FISH OIL IN PREVENTION OF ADVERSE EFFECT OF HIGH SUCROSE DIET IN AN EXPERIMENTAL MODEL OF METABOLIC SYNDROME

[Institute for Clinical and Experimental Medicine, Prague, Czech Republic; Charles University, Prague, Czech Republic]

The metabolic syndrome, which may affect up to 25% of the adult population, is associated with significantly increased risk for cardiovascular mortality and developing type 2 diabetes. In this study the effect of dietary n-3 fatty acids on lipid transport and gluoregulation in an animal model of genetically transmitted hypertriglyceridemia associated with hyperinsulinemia and insulin resistance, in non-obese hereditary hypertriglyceridemic rats (HHTg) was investigated. Adult HHTg males were fed *ad libitum* for 3 weeks a hypertriglyceridemia potentiating carbohydrate rich diet (70% cal. sucrose). In addition, 1 ml/rat/day of either olive oil (controls) or fish oil (Epax 5500 TG, Pronova, Biocare, Norway) was given intragastrically. There were no significant differences in body weight and growth rates during the experiment. Fish oil treatment markedly reduced triglyceridemia in fed (0.78 ± 0.06 vs. 3.35 ± 0.43 mmol/L; $p < 0.01$) and fasted state. Serum FFA levels were also lowered by fish oil treatment (500 ± 24 vs. 608 ± 42 μ mol/L; $p < 0.05$). Post-load blood glucose and serum insulin levels measured during oral glucose tolerance test were markedly lower in fish oil treated rats. Drug administration ameliorated resistance of adipose and muscle tissue to insulin action. While basal incorporation (without insulin) of glucose into adipose tissue lipids was similar in the two groups compared, insulin stimulated incorporation in the fish oil group was higher than in olive oil controls (14.2 ± 2.0 vs. 24.1 ± 3.5 nmol/g/2 hour; $p < 0.02$). Insulin (250 μ U/mL) stimulated incorporation of 14 C-U glucose into diaphragm glycogen increased in fish oil treated rats (1060 ± 84 vs. 697 ± 42 nmol/g/tissue/2 hour; $p < 0.02$). In conclusion, it has been found that fish oil in addition to the pronounced hypotriglyceridemic effect, ameliorates dietary induced glucose intolerance, hyperinsulinemia and tissue resistance to insulin action. These results demonstrate that fish oil can influence a broad spectrum of cardiovascular risk factors involved in the metabolic syndrome. Support: MH CR NR/9387.

49: Musilová, J. - Bystrická, J. - Tomáš, J. - Arvay, J.:
CONTAMINATION OF POTATO TUBERS
(*Solanum tuberosum*) BY NICKEL AND COPPER

[Slovak University of Agriculture, Nitra, Slovak Republic]

The content of toxic microelements is one of the hygienic-toxicological factors of the foodstuffs quality. Lead, mercury, arsenic and cadmium belong to the most important toxic elements. Also, the essential elements (minor ones – Fe, Zn or trace elements – Cr, Cu, Ni, Se) occurring in higher concentrations could have toxic effects. Most of the foodstuffs contain less than 10 mg/kg Cu (potatoes 0.3–0.1 mg/kg), the nickel content in fruit, cereals and foodstuffs of animal origin (except some sea animals) is very low – hundredths to decimals mg/kg (potatoes 0.01–0.26 mg/kg). In this work we focused on the nickel and copper contents determination in potato tubers cultivated in the Stará zem site with the acreage of 62.5 ha, belonging to cadastral area of Imeľ (higher region of Nitra

area, Slovakia). Thirty sampling sites were identified on the basis of 6 seconds raster with GPS on the key site. After the localisation of sampling points the soil samples were taken with pedological probe GeoSampler fy. Fisher from two horizons (A: 0–0.2 m, B: 0.3–0.45 m) by valid methods. The nutrients contents (N, P, K, Ca, Mg), soil pH (active and changeable form), %C_{ox}, % humous and the contents of heavy metals (Ni, Cu in mg/kg) after digestion with aqua regia (Ni: 3.4–22.2; Cu: 3.8–27.6), HNO₃ (c=2 mol/dm³) (Ni: 2.9–7.8; Cu: 3.9–14.6) and NH₄NO₃ (c=1 mol/dm³) (Ni: 0.070–0.195; Cu: 0.025–0.175) were determined in all samples. The samples of plant material were taken similarly as the soil samples, from exact sites processed by GPS. The copper and nickel contents were determined in the samples mineralized by dry weight method AAS on Pye Unicam SP9. The Cu content was in the range of 0.0590–0.1416 mg/kg of fresh mass and the nickel content was 0.0150–0.1223 mg/kg of fresh matter. From the attained results it can be stated that the soils are uncontaminated (neither the limits exceeded nor the critical values for Cu and Ni reached) and the contents of observed heavy metals in potatoes did not exceed the maximum acceptable limits for Cu and Ni defined in Foodstuffs Codex.

50: Okénková, E. - Krejčí, J. - Hrabě, J. - Vicha, R.:
OXIDATIVE CHANGES OF MILK FAT IN DRY MILK STORED UNDER VARIOUS CONDITIONS

[Thomas Bata University, Zlín, Czech Republic]

Oxidative changes of milk fat in whole dry milk during storage under various conditions were examined. Whole dry milk with 26.47% of fat and insolubility index of 1.27 was taken as the sample. Whole dry milk was manufactured by roller drying in YOG s. r. o. Bojkvice, Czech Republic. Whole dry milk was stored in desiccators at a temperature of 37°C in thermo-regulator under various water activities (0.23 and 0.82). Water activity was made up by 100 mL of saturated salt solution. Water activity of 0.23 was made up by saturated solution of potassium acetate and water activity of 0.82 was made up by saturated solution of potassium bromide. The milk powder was stored for 50 days. The sample turned dark brown in colour during storage under water activity of 0.82 thanks to products of Maillard reaction. The oxidative changes were examined as contents of hydroperoxides, TBARS (thiobarbituric reactive substances), peroxide value, neutralization number, contents of conjugated diens and fatty acids composition. The contents of hydroperoxides, TBARS and fatty acids especially unsaturated fatty acids (oleic acid, obtusilic acid or linoleic acid) had decreased during storage. Neutralization number and peroxide value had increased during storage. Significant changes of all tracked factors were found during 50 days of storage under various water activities.

51: Ptaszek, P. - Ptaszek, A. - Łukasiewicz, M.
- Achremowicz, B.:

LINEAR VISCOELASTIC REATARDATION PHENOMENA: AN IMPORTANT AGENT OF INFLUENCE IN SELECTED POLYSACCHARIDE SYSTEMS

[University of Agriculture, Cracow, Poland]

Polysaccharides are main constituents of human food. They are used also as food texturing agents and to grant

food with proper resistance. Polysaccharides, due to their biodegradability and renewability have found wide applications in pharmaceutical, ceramic, and textile industries, and also in biotechnology. Discussed compounds are characterized by very complicated structure, and exhibit many interesting, from practical point of view, rheological phenomena. Complex hydrodynamic behaviour of polysaccharides and their solutions allow to apply them as pilot testing materials in emerging technologies. It seems to be reasonable to undertake experiments dealing with viscoelastic phenomena of water based solutions of polysaccharides. It gives unequivocal opportunity to characterize investigated material in linear area, and also it is the start point to model phenomena connected with non-linear viscoelasticity and thixotropy. Starch is plant storage material, which is composed of two alpha glucans: essentially linear amylose, and branched amylopectin. The linear amylose (chain length of 500 to 6000 glucose units) has a small degree of branching but it is predominantly regarded as a single chain. The chain of amylopectin contains only up to 30 glucose units. The production of guar gum is based on its extraction from the leguminous shrub *Cyamopsis tetragonoloba*. By means of chemical compounds guar is a galactomannan with (1-4)-linked β -D-mannopyranose backbone with branch points from their 6 - positions linked β -D-galactose. Guar gum (GG) was supplied by Regis (Poland). The aim of present study was to determine the viscoelastic properties of the model mixtures of the selected pasted polysaccharides. The initial material was corn starch (SK), mixed with guar gum (GG).

52: Rabsztyn, A. - Klimczak, Z.:

EGG QUALITY OF POLISH INDIGINEOUS PARTRIDGED GREENLEG HENS KEPT UNDER ECOLOGICAL CONDITIONS

[Agricultural University, Cracow, Poland]

The aim of this study was to evaluate some egg quality traits of the Partridge Greenleg hens maintained in small ecological farms. The study was performed on eggs from hens of Z-11 strain (originating from Chorzelów Research Station, Poland) kept in farms in southern Poland. No differences were found in egg weight between the farms but the egg weight was significantly smaller (by 6 to 8 g) than that of commercial Hy-Line layers. Yolk proportion in egg (28.0-31.1%), being the most important egg component for the consumers, was significantly higher than in eggs from commercial layers. Albumen weight and percentage, shell weight and percentage, shell thickness and egg shape index did not differ from the standard ranges. Yolk (42.5-46.7%) and albumen (9.4-12.3%) indices were very high. Yolk colour in LaRoche scale (10-12.2) was more intense than in commercial layers. Smaller content of total cholesterol per 1 g of yolk was observed in the eggs of Partridge Greenlegs as compared to the eggs of commercial layers (14.3-15.8 mg vs. 17.0 mg), the difference being statistically significant in two out of four farms. The results point to very good quality of the eggs from hens maintained in small agricultural holdings. [ORAL PRESENTATION]

53: Roychoudhury, S.¹ - Massányi, P.¹ - Slamečka, J.² - Okab, A.B.³ - Lukáč, N.¹ - Chlebec, I.² - Bulla, J.¹ - Taha, T. A.³ - Salem, M. H.³ - Ayoub, M. A.⁴ - Talukdar, A.⁵:

EFFECT OF GOSSYPOL ON RABBIT SPERMATOZOA MOTILITY IN VITRO

[¹Slovak University of Agriculture, Nitra, Slovak Republic; ²Slovak Agricultural Research Centre, Nitra, Slovak Republic; ³Alexandria University, Alexandria, Egypt; ⁴Suez Canal University, Ismailia, Egypt; ⁵Indian Agricultural Research Institute, New Delhi, India]

Gossypol, a yellow polyphenolic compound isolated from seeds, leaves, stems and roots of cotton plants, is recognized as an antinutritional agent present in feedstuffs such as whole cottonseed, cottonseed oil and cottonseed meals. On the other hand, the rabbit is considered as an excellent model for reproductive toxicological studies and the role of spermatozoa motility in the process of fertilization and the effect of the gossypol on these processes are believed to indicate its effectiveness as a contraceptive. This paper presents the effects of filtered gossypol on rabbit spermatozoa motility parameters *in vitro*. Heterospermic semen sample from adult (12-14 months) male rabbits (n=5) was cultured with filtered gossypol which was added to semen in various concentrations from 10.0 to 0.15626 mg/L (control group - 0; A - 10; B - 5; C - 2.5; D - 1.25; E - 0.625; F - 0.3125; G - 0.15625 mg/ml) in physiological solution. Semen was diluted with experimental solution (1:3). Spermatozoa motility parameters were analyzed by a Computer Assisted Semen Analyzer (CASA - Sperm Vision). All the values were compared at 5% level of statistical significance ($p < 0.05$). Overall motility values in groups with gossypol administration did not differ significantly with values ranging from 82.90±3.98% in group G to 89.31±2.69% in group A compared to 79.02±6.98% in control group. No significant differences were found in the values of progressive motility of spermatozoa (71.84±4.80% in group G to 84.62±3.95% in group A) as compared to control (69.99±9.56%) at time 0. At Time 60 a similar trend was seen for motility as well as progressive motility values except for group B in which progressive motility significantly decreased from 60.81±7.04% to 43.51±4.93%. After 120 minutes of incubation motility was found to decrease significantly in group A (45.03±5.32%), which received the highest gossypol administration while a significant increase was noticed in group F (71.74±1.10%). Also, significant alterations were seen for progressive motility in groups A, E and F at Time 120. In these cases progressive motility significantly decreased from 44.22±5.10% to 25.74±6.45% in group A and to 32.83±4.33% in group E while an increase to 55.10±2.54% was seen for group F. However, no significant differences in motility and progressive motility were recorded at 180 and 360 minutes after incubation.

Detailed evaluation of spermatozoa distance (DAP, DCL, DSL) and velocity (VAP, VCL, VSL) parameters detected a significant increase of all studied parameters in most of the experimental groups with gossypol addition at Time 0. However, at Time 60 and Time 120 these distance and velocity parameters showed a decrease of all studied parameters in most of the experimental groups, which was significant in most cases. These parameters showed no significant differences at 180 and 360 minutes after incubation with gossypol, with an exception of group D in

which a significant increase ($P < 0.05$) of all studied markers of distance and velocity was recorded at Time 180. Straightness, linearity, wobble, amplitude of lateral head displacement and beat cross frequency were not altered in most groups at all time periods except for at Time 0, where an increase in the values was found. At Time 60, a significant decrease of lateral head displacement was detected in group B ($2.76 \pm 0.27\%$) and E ($3.14 \pm 0.18\%$) in comparison to control ($3.80 \pm 0.31\%$). In conclusion, gossypol addition to rabbit sperm incubation media showed significant effects on motility parameters determined by CASA system. Further investigation will be conducted on the mode of action of gossypol on sperm motility and its effectiveness as a male contraceptive agent. Support: APVV 0299-06, VEGA 1/0696/08, VEGA 1/0834/08.

**54: Skalická, M. - Koréneková, B. - Nad' P.:
DISTRIBUTION OF TRACE ELEMENTS IN
LIVER AND MUSCLE OF JAPANESE QUAILS**

[University of Veterinary Medicine, Košice, Slovak Republic]

The purpose of this study was to examine concentrations of trace elements in the selected tissues and organs of Japanese quails (*Coturnix coturnix japonica*). The samples of liver and leg muscle were analyzed for presence of Cd, Cr, Zn and Cu on the atomic absorption spectrophotometer (Unicam Solar 939). The mean values of Cd, Cr, Zn and Cu were obtained from leg muscle (0.016; 0.361; 51.076; 4.822 mg/kg, respectively) and in liver (0.026; 0.277; 50.607; 9.346 mg/kg, respectively). Tissue analysis showed an accumulation of Cd, Cr, Zn and Cu in the liver and muscle of Japanese quails and some significant relationship between liver and muscle metal concentrations. Support: VEGA 1/1336/04 1/0403/08.

55: Slivková, J. - Popelková, M. - Massányi, P. - Stawarz, R. - Formicki, G. - Lukáč, N. - Kováčik, J.:

**CONCENTRATION OF TRACE ELEMENTS IN
HUMAN SEMEN AND THEIR CORRELATIONS**

[Slovak University of Agriculture, Nitra, Slovak Republic; Louis Pasteur Faculty Hospital, Košice, Slovak Republic; Pedagogical University, Cracow, Poland]

Human beings are exposed to several thousand exogenous chemicals used in industrial processes, developmental activities and also through the food chain. The exposure of exogenous chemicals is considered as cause of the increasing incidence of male reproductive system disorders. In this study the concentrations of trace elements such as lead, cadmium, iron, nickel, copper and zinc in the human semen ($n=47$) and correlations of these elements were detected. In human semen using anodic stripping voltammetry (ASV) and atomic absorption spectrophotometry (AAS) these concentrations were found: lead 1.49 ± 0.40 mg/kg, cadmium 0.13 ± 0.15 mg/kg, iron 2.59 ± 0.21 mg/kg, nickel 0.40 ± 0.07 mg/kg, copper 0.28 ± 0.06 mg/kg, and zinc 153.93 ± 67.08 mg/kg. Correlation analysis of trace elements showed following correlations: moderately positive correlations: Ni-Fe; weakly positive correlations: Fe-Pb; Fe-Cd; Ni-Pb; Ni-Cd; Cu-Fe; Cu-Ni; Zn-Cd; Zn-Cu; as well as negative correlations: moderate: Cu-Pb and weak: Cd-Pb; Zn-Pb; Cu-Cd; Zn-Fe; Zn-Ni. Strong positive and strong negative correlations among trace elements were not found. Support: APVV 0299-06; VEGA 1/0696/08.

**56: Surma-Zadora, M. - Ciešlik, E. - Florkiewicz, A.:
ANTIOXIDANT POTENTIAL OF ACAI BERRY
(*Euterpe oleracea* Mart.)**

[University of Agriculture, Cracow, Poland]

Acai berry is natural fruit, which is the richest source of antioxidants. Acai berry contains 33 times more antioxidants than red grapes and red wine. This berry contains various 16 antioxidants: phenolic compounds, bioflavonoids, anthocyanidins and fitosterols among them. Antioxidant potential of acai berry liophilizate is equal to 1026 Oxygen Radical Absorbent Capacity (ORAC) units. Until now, it is the highest level of ORAC which has been found in any natural product (fruit). For example, antioxidant potential of cranberry and wild berry is one of third of ORAC value determined for acai berry and it is equal to cca. 340 units. This value was the highest value until antioxidant potential was determined for acai berries. Moreover, wild berries have antioxidant potential cca. 260 ORAC units, caneberry – 125 ORAC units and carrot root cca. 50 ORAC units. Anthocyanin and fitosterols seem to be especially interesting compounds among all antioxidants present in acai berries. Anthocyanin have anti-inflammatory effect and fitosterols are used to alleviate menopause symptoms and to treat symptoms of enlarged prostate. The berries have also very low glycaemic index. Moreover, Talcott et al. [2006] estimated that acai berry contains from 50 to 75 compounds, which are not present in other fruits and they were not identified yet. Nowadays, a blend called “Mona Vie” is produced from acai berries and it could be bought via Internet in the USA and Canada. This liquid is supplemented by some amount of juice from other fruits like: pear, banana, chokeberries, peach, kiwi, blueberry and extract from skin of red and white grapes. An addition of other fruits improved the product taste as well as its nutritive and health properties. This well-balanced product is called Super Fruit Cocktail, characterised by very high antioxidant potential because of high concentration of antioxidant compounds, mostly anthocyanin and bioflavonoids. [ORAL PRESENTATION]

**57: Szabó, Cs. - Kerti, A. - Kiss, Zs. - Bárdos, L.:
IMPROVEMENT OF EGG YOLK WITH
CAROTENOIDS AND ANTIOXIDANTS**

[Szent István University, Gödöllő, Hungary]

In human life nutrition has become one of the most important environmental factors. Nearly 70% of cardiovascular diseases and cancers may be related to nutrition. In many articles natural antioxidants are recommended to protect against health-endangering materials which get into the human organism with the nutrition as risk factors. Many studies deal with the aspects of human health (e.g. prostate and lung cancer) and less with animal science. In our experiments we analyzed blood parameters from chickens feeding on β -carotene, lycopene, vitamin E and selenium, and the content value of their eggs as well as the physiological effects on mice fed with these eggs. Certain carotenoids (i.e. β -carotene and lycopene), acting as antioxidants, can potentially reduce the toxic effects of reactive oxygen species (ROS). These ROS, and therefore carotenoids, have been implicated in the etiology of diseases such as cancer, cardiovascular and neurodegenerative diseases and aging. Recent studies on the role of carotenoids in gene regulation, apoptosis

and angiogenesis have advanced our knowledge on the possible mechanism by which carotenoids regulate immune function and cancer. According to our measurements ferric reducing ability of plasma (FRAP) values were elevated in the β -carotene treated groups. Carotenoids were analyzed (β -carotene and lycopene) in connection with immune response. These carotenoids can bring about a significant change in the antigen-induced proliferation of lymphocytes. In this experiment the humoral immune response to chicken-IgY protein (with direct ELISA) in plasma and in egg yolk was also measured. The impacts of feeding were detectable compared to the control group. The IgY content of yolk is one of the most important factors of the immunity of newly hatched chicks. The developing embryo absorbs IgY during first 2–3 weeks post hatching period. This serves to protect the birds against infections. According to our experience it can improve the level of antibodies both in the blood and in the egg by supplementing carotenoids in the fodder of layers. These data suggest that products containing carotenoid added to the diet over a short period can increase carotenoid concentration in the organism and the resistance of lymphocytes to oxidative stress. In this experiment, the intake of tomato puree increased plasma and lymphocyte lycopene concentration and therefore reduced lymphocyte DNA damage, which lead to increased activity. The increased ingestion of functional food products containing lycopene has been shown to be associated with decreased risk of chronic diseases including cancer. In another experiment layers were immunized with *Salmonella typhimurium* (STM) strain. The fodder of the hens was supplemented with antioxidants (β -carotene, vitamin E, selenium) to increase the immune response. Mice were fed *per os* with the IgY extracted from their eggs, in which the protective effect of specific IgY was developed. [ORAL PRESENTATION]

58: Šiška, B. - Toman, R. - Golian, J.
- Bošiak, M. - Krajčirová, A.:

DISTRIBUTION OF DIAZINON AND SELENIUM IN VARIOUS TISSUES AFTER SINGLE AND COMMON INTRAPERITONEAL ADMINISTRATION

[Slovak University of Agriculture, Nitra, Slovak Republic]

The aim of this study was to evaluate the distribution of diazinon and selenium in various tissues of laboratory rats after single and common intraperitoneal administration. Rats in the age of 135 days were randomly divided into 4 groups. Each group consisted of 10 males. Animals in the first group were administrated with diazinon 20 mg/kg body weight intraperitoneally. Animals in the second group were administrated with selenium (Na_2SeO_3) 2 mg Se/kg body weight intraperitoneally in physiological solution. Animals in the third group were given a mixture of diazinon 20 mg/kg body weight and selenium 2 mg Se/kg body weight intraperitoneally in physiological solution. The fourth group served as a control group and was administrated only with the physiological solution. 24 hours after the administration of tested substances, animals were sacrificed and samples of livers, kidneys, muscles and fat tissue were taken during the autopsy. The amount of diazinon in tissues was determined using gas chromatography with mass spectrometry. The amount of selenium was determined using atomic absorption spectrometry. Significant increase of selenium in livers, kidneys and muscles after single selenium

administration and also after common administration of both substances was detected. On the other hand, significant decrease of selenium in muscles and fat tissue after single diazinon administration was recorded. Slight accumulation of diazinon in samples of kidneys and muscles and significant increase of diazinon in fat tissue after single diazinon administration and also after common administration of both substances was observed.

59: Šutiaková, I. - Šutiak, V. - Kovalkovičová, N.:
ANALYSIS OF SHEEP LYMPHOCYTE CHROMOSOMAL ABERRATION AFTER CHLORTETRACYCLINE EXPOSURE

[University of Prešov, Prešov, Slovak Republic;

University of Veterinary Medicine, Košice, Slovak Republic]

Tetracyclines are broad spectrum antibiotics that have been successfully used worldwide in human and veterinary medicine and in aquaculture. Many of these substances, due to their chemical unstability, persist in the environment for many years, and they are responsible for several effects on human and animal health through food chain. The chromosome aberrations assay is a well-known cytogenetic technique that has been used to assess DNA damage at the chromosome level from blood lymphocytes. We analyzed chromosome aberrations and mitotic index in peripheral lymphocytes of sheep exposed to chlortetracycline chloride (preparation Aureovit 12 C 80 plv. a. u. v.) after 30 days. The animals (n=12) were fed with 35 dkg of meadow hay and 30 dkg of feed mixture ČOJ-2 per animal per day, with free access to pure tap water. Animals belonging to the experimental group (n=6) received an additional 0.35 g preparation of Aureovit 12 C 80 plv. a.u.v. per kg b.w. per day (i.e. 168 mg of chlortetracycline hydrochloride/kg b.w.).

The frequencies of aberrant cells (ABC) in the experimental and control group of sheep was stated to differ significantly ($P<0.001$). In experimental group, chromatid breaks were the dominant type of chromosomal aberrations. No statistical differences in mitotic index values were found between the groups ($P>0.05$). Increased frequencies of chromosomal aberrations in peripheral lymphocytes of sheep exposed to chlortetracycline in feed suggested a potential hazard which needs attention from the viewpoint of human and animal health. Support: VEGA 1/2408/05 and 1/0545/08.

60: Tančinová, D. - Felšćiová, S. - Dovičičová, M.
- Piovarčiová, Z. - Labuda, R. - Javoreková, S.:

ENDOGENOUS CONTAMINATION OF WHEAT BY SPECIES OF THE GENERA ASPERGILLUS AND PENICILLIUM

[Slovak University of Agriculture, Nitra, Slovak Republic]

The aim of this study was to analyse the endogenous mycobiota of superficially sterilised wheat grains with the focus on *Aspergillus* (including two teleomorphs) and *Penicillium* genera. Slovak wheat samples (*Triticum aestivum* L.) were harvested in the season 2006. The total of 6 wheat samples grown under conditions of the conventional and 12 under the ecological farming system were investigated for presence of microscopical fungi. A total of 17 genera were recovered as members of the endogenous mycobiota on Dichloran Rose Bengal Chloramphenicol agar (DRBC) and Dychloran

Yeast Extract 18% Glycerol agar (DYSG). On DRBC only *Aspergillus* and *Penicillium* species were detected from the ecological agriculture, namely *A. candidus*, *A. flavus*, *A. niger*, *Aspergillus* sp., *Emericella nidulans*, *Eurotium amstelodami*, *E. chevalieri*, *Eurotium* sp., *Penicillium aurantiogriseum*, *P. chrysogenum*, *P. corylophilum*, *P. crustosum*, *P. griseofulvum*, *P. viridicatum* and *Penicillium* sp. On DYSG *Eurotium* species (*E. amstelodami*, *E. chevalieri*, *E. repens*, *E. rubrum*) and *Penicillium* species (*P. aurantiogriseum*, *P. chrysogenum*) were detected both from ecological and conventional agriculture. From the ecological wheat a wider spectrum of fungi on DYSG were isolated in comparison with the conventional agriculture, namely *A. flavus*, *A. ochraceus*, *A. sydowii*, *Emericella nidulans*, *E. amstelodami*, *E. chevalieri*, *E. repens*, *E. rubrum*, *Eurotium* sp., *P. aurantiogriseum*, *P. crustosum*, *P. solitum* and *Penicillium* sp. The isolates of potentially toxigenic species of *Aspergillus*, *Emericella* and *Penicillium* were tested for their ability to produce particular toxic metabolites, i.e. mycotoxins *in vitro* by means of a thin layer chromatography (TLC). All the tested isolates were obtained from the samples of ecological agriculture. Out of 18 isolates screened 11 produced at least one mycotoxin and production was vague in 2 isolates. One isolate (out of one) produced sterigmatocystin, 6 (out of 11) cyclopiazonic acid (production was vague in 2 isolates), and patulin 3 (out of 3). In contrast, none of the potentially aflatoxinogenic isolates (*Aspergillus flavus*) tested in this study produced aflatoxins. Two isolates were tested for production of ochratoxin A - *Aspergillus niger* didn't produce ochratoxin A and in *A. ochraceus* the production was unclear. Support: VEGA 1/3456/06, KEGA 3/2080/07.

61: Toman, R. - Šiška, B. - Massányi, P. - Hluchý, S. - Golian, J. - Slivková, J. - Lukáč, N. - Martiniaková, M. - Stawarz, R. - Formicki, G. - Čupka, P.:
EFFECTS OF DIAZINON ON RAT SPERM MOTILITY EVALUATED WITH COMPUTER ASSISTED SEMEN ANALYZER

[Slovak University of Agriculture, Nitra, Slovak Republic; Constantine the Philosopher University, Nitra, Slovak Republic; Pedagogical University, Cracow, Poland]

Diazinon is an organophosphate insecticide which affects mainly the nervous system. Little is known about its reproductive effects. The aim of this study was to reveal the acute and subchronic effects of diazinon on the rat spermatozoa motility using the computer-assisted semen analyzer (CASA). Adult Wistar male rats were used in the experiment. First group (A) was injected with a single intraperitoneal dose (20 mg/kg b.w.) of diazinon, second group (B) with a daily peroral dose (100 mg/L) of diazinon in drinking water for 90 days, while the third group served as untreated control. The motility parameters of spermatozoa obtained from the cauda epididymis was measured using CASA system 36 hours (group A) and 90 days (group B) after diazinon administration. In the samples motility, progressive motility, DAP (distance average path), DCL (distance curved line), DSL (distance straight line), VAP (velocity average path), VCL (velocity curved line), VSL (velocity straight line), STR (straightness), LIN (linearity), WOB (wobble), ALH (amplitude of lateral head displacement) and BCF (beat cross frequency) were evaluated. The decrease

in motility parameters was observed 36 hours after diazinon administration with significant ($p < 0.05$) decrease in VCL. BCF significantly ($p < 0.001$) increased. In group B, increase in spermatozoa motility parameters was found with significant ($p < 0.05$) differences in LIN and WOB when compared with control. The results suggest that diazinon may affect the rat sperm motility. It seems that the mechanism of diazinon effect on sperm motility differs in an acute and long-term period.

62: Torma, S. - Fazekášová, D.:
WATER PROTECTION AND ITS LEGAL FRAMEWORK IN SLOVAK REPUBLIC

[Soil Science and Conservation Research Institute, Bratislava, Slovak Republic; University of Prešov, Prešov, Slovak Republic]

It is necessary to invest maximal effort for protection of all elements of environment including water for securing of quality living conditions for future generations. Each country creates its own legislative background that tries to regulate the actions, which causes or may cause an uncalled for status in water quality and quantity. Besides it is also necessary to monitor the areas that can influence water quality. Agricultural production belongs to these actions that really can pollute the water sources, especially when the farmers do not respect the specific rules in farming, mainly in the areas in so-called vulnerable zones. Therefore, a set of rules and principles were formulated that have their substance in laws and acts. The scope of these rules is gradually to reach the wanted status in water protection in two ways – in the form of controls and farmers' education.

63: Vaňátková, Z. - Okénková, E. - Buňková, L. - Dráb, V.¹ - Hrabě, J.:
MOLECULAR DIAGNOSTICS OF STREPTOCOCCUS THERMOPHILUS

[Tomáš Baťa University, Zlín, Czech Republic; Dairy Research Institute–Milcom, a.s., Tábor, Czech Republic]

Streptococcus thermophilus is one of the most important lactic acid bacteria in the dairy industry. Despite the wide use of *Streptococcus thermophilus* in the dairy industry, data on the phenotypic and genetic strain variations within the species remains to be limited. Genetic techniques are very useful for molecular discrimination of complex mixtures of starter and probiotic cultures in research laboratories. Detection and identification of various lactic acid bacteria species with rapid methods is often important for quality control of dairy products. This work deals with characterization and differentiation of *Streptococcus thermophilus* strains by PCR, RAPD and SDS-PAGE techniques. Fifteen strains of *Streptococcus thermophilus* from Czech Collection of Dairy Microorganisms (CCDM) and a strain of *Streptococcus thermophilus* from Czech Collection of Microorganisms (CCM) were used. Particular strains were confirmed with primer set THI/THII by PCR method. Consequently, the identity of RAPD and SDS-PAGE techniques were also examined. Primers OPP-7 and RAPD-4 were used for RAPD analysis. It can be claimed that mentioned methods are good means for further identification and characterization of streptococci.

64: Vollmannová, A. - Tomáš, J. - Tóth, T.:
POSSIBILITY OF RISK ELEMENTS INPUT
INTO THE FOOD CHAIN IN OLD ENVIRONMENTAL
LOADED LOCALITIES

[Slovak University of Agriculture, Nitra, Slovak Republic]

The old environmental loaded localities present the potential danger of risk elements input into the human food chain. The old mines, scrap-heaps, landfills, industrial and municipal wastes are important sources of environment contamination. The aim of this work was to evaluate the potential influence of three various sources on the soil hygiene and plant production in their vicinity. The first observed locality was Zahorska lowland in the South west Slovakia. In five municipal landfills Cu, Cd, Ni and Pb contents in soil and agricultural production were determined. The second site was the wider surrounding of previous nickel smeltry in Sered situated in southern Slovakia. Nickel smeltry produced the waste during its activity (1964–1993), which was cumulated in the form of leach scrap in neighbourhood of the factory. The third surveyed locality was the wider surrounding of iron ore mines in Rudnany in central–eastern Slovakia. This enterprise belonged until 1992 to the one of determining sources of the emission contamination of the environment in loaded area of Middle Spis. In the first observed area the determined total Cu, Cd and Ni soil contents were higher than the background values (by 18%, 45% and 54%, respectively). The metal contents in cereal grains were higher (Pb till by 200%, Cd 35%, Cu 1.5%) than limits given by Food Codex (FC) of the Slovak Republic. In soil of the second area observed, the contents of Cd exceeded the background values by 150%, Ni by 40%, Cu by 93% and Co by 22%. Agricultural produce in this area does not pose a risk for human consumption with the exception of Cd in barley grain grown at one locality (Vlckovce), where the determined Cd content was 25% higher than hygienic limit. The soil of the third observed area was evaluated as highly metal contaminated. The soil was contaminated by As and Cu (45% and 15% higher contents than hygienic limits, respectively) and extremely by Hg (in some of localities the determined Hg content exceeded the legislative limit for soil sanitation by 280%). Potatoes are the most risky in this area (Cd exceeding the hygienic limit defined in FC by 40%, Cu by 210%, Pb by 70%, Zn by 43% and Hg by 500%). The determined contents of risky metals in cereals were also high (Hg 200%, Pb 165% and Cd 50% higher than hygienic limits). The results suggest that the residual environmental contamination in old loaded areas can be the potential cause of enhanced heavy metal contents in agricultural plants cultivated near pollution sources. Therefore, it is necessary to permanently control the hygiene and safety of food and agricultural production in these areas.

65: Waclawek, W.:
RADIOACTIVE ISOTOPES IN FOOD
[University of Opole, Opole, Poland]

As a consequence of military nuclear tests and nuclear accidents (the largest one was that in Chernobyl in 1986) a certain amount of radioisotopes was released into the atmosphere, from where it was deposited to the soil. After the Chernobyl disaster large-scale contamination occurred in Europe and some other parts of the northern hemisphere. The main mechanism of radioisotopes deposition was wet deposition, although there was also some dry deposition. The Chernobyl contamination was inhomogeneous in space and time, and was dependent on local weather and other conditions. From the soil, radioisotopes penetrated into food chains and in humans, where it irradiates sensitive tissues. **In Poland radioactive contamination is monitored in accordance with the State Environment Monitoring programme and the European Commission recommendations included in the Recommendation of June 8, 2000.** Pursuant to the Regulation of the Council of Ministers, centres were established to measure radioactive contamination in the environmental material samples as well as in foodstuffs and animal fodder. These centres were divided into basic (48) and specialist (9) centres. Basic centres operate in the Sanitary and Epidemiological Stations. They measure the total beta radiation activity in milk samples (once a month) and in foodstuffs (once a quarter) and determine the content of the γ -radioactive nuclides, including ^{137}Cs and ^{90}Sr , in selected agricultural and food products. Specialist centres carry out more complex radioactivity analyses of the environmental samples, e.g. they determine the content of tritium in water. The above-mentioned institutions also systematically measure gamma radiation background and activity of radioactive isotopes and natural radionuclides in surface soil layers. Such measurements allow monitoring radioactive contamination of the environment and provide information about current distribution of the radioisotopes in Poland. **The data discussed in this work were provided by the Voivodship Sanitary and Epidemiological Station in Opole. Results of measurements were collected during the years 1986–2007. The global beta activity and Cs –137 activity in environmental samples and food samples were determined. Total beta radiation activity in milk, meat, eggs, vegetables and fruits, soils and waters were analyzed. The results show that at present artificial radionuclides content are at the same level as before 1986. Radionuclides activities in food products are many times lower than admissible values permitted in Poland and in the European Union countries.** [ORAL PRESENTATION]