

INTERNATIONAL SYMPOSIUM OF VETERINARY MEDICINE AND FORESTRY

12th days BHAAAS in Bosnia and Herzegovina



AGARICUS BISPORUS AS A FUNCTIONAL DIETARY SUPPLEMENT IN ANIMAL FEED

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ABSTRACT

Agaricus bisporus belongs to the group of functional food supplements for both humans and domestic animals intended for human consumption. Due to the presence of bioactive ingredients such as polysaccharides, lipopolysaccharides, essential amino acids, peptides, glycoproteins, nucleosides, triterpenoids, lectins, fatty acids and their derivatives for these fungi are known anti-inflammatory, antiviral, antibacterial, hepatoprotective, anti-diabetic, hypolipemic, antithrombotic, hypotensive and synbiotic effects. On the model of monogastric animals kept in controlled, intensive production and fed with the *Agaricus bisporus* feed supplement showed: faster growth, lower food conversion, less disease, better survival rate of animals, increased leukocyte count, decreased serum cholesterol and glucose levels, reduced *Escherichia coli* and enterobacteria count in rectal smears as well as increase in the number

of *Lactobacillus* spp. Based on the results obtained to date from the Croatian Science Foundation project “ Innovative functional lamb meat products “ (IP-2016-06-3685) it is evident that the button mushroom added as a feed supplement for polygastric animals also has a positive effect on animal health and productivity as well as meat quality and aroma profile. It can be concluded that *Agaricus bisporus* in animals has a potential effect as growth promoters and scientifically proven applicable value as natural, functional feed supplement that can represent a commercially new and innovative product as functional food for humans. This study has been fully supported by the Croatian Science Foundation under the project “Innovative functional lamb meat products” (HRZZ-IP-06-2016-3685).

Keywords: *Agaricus bisporus*, functional feed supplement, veterinary medicine

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THE IMPACT OF NUTRITIONAL ANIMAL PRODUCTS ON HUMAN HEALTH

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ABSTRACT

The aim of this study was to determine the content of nutrients in products of animal origin (milk) with special reference to the content of bioactive fatty acids that have a positive effect on human health. The food that is most often consumed is characterized by a high fat content with a large amount of saturated and n-6 polyunsaturated fatty acids and a small amount of n-3 polyunsaturated fatty acids. A total of 114 samples of sheep's milk were analyzed in which, determined the content of 24 fatty acids by gas chromatography (GC) in the laboratory As Vitas Norway. The fatty acid content

of the tested sheep 's milk was characterized by a relatively high content of saturated fatty acids in relation to monounsaturated and polyunsaturated fatty acids. The rapidly growing market of functional foods and knowledge about the physiological effects of bioactive fatty acids, present in milk, generates the need to improve knowledge about the effects of dairy products on the human body.

Keywords: Animal products, fatty acids, nutrition, health

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IDENTIFYING THE MAIN MOSQUITO SPECIES IN FEDERATION OF BOSNIA AND HERZEGOVINA

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ABSTRACT

Mosquitoes are considered the most important arthropod vectors in the world. The introduction of exotic mosquito species into new territories is of major concern to public and veterinary health because of their potential role in the transmission of several pathogens. Monitoring changes in mosquito populations, collection and identifying which mosquito species are present in Federation of Bosnia and Herzegovina is the main purpose of this research. Considering that details of population structure of mosquitoes, especially invasive mosquitoes, will allow us to following, and possibly predicting, the geographical and temporal dynamics of vector distribution in our country. This study was conducted in 3 cantons of the Federation of Bosnia and Herzegovina (F&BiH), Sarajevo Canton, Herzegovina-Neretva Canton and Tuzla Canton.

Mosquito were collected two times in June 2019 with 4 New Standard Miniature Light Trap-Model 1012. Adult mosquito traps are left out over-night, collected the following day, and taken to the Veterinary faculty for identification. In the laboratory, mosquitoes are sorted from other trapped insects and morphologically identified to species level using standard taxonomic keys (June and July 2019).

A total of 24 pools of mosquitoes (1-10 mosquitoes per pool) belonging to six species were collected and identified. The results of the research confirmed the presence of 10 mosquito species in the area of the three cantons of the Federation of Bosnia and Herzegovina. Mosquito family Culicidae were confirmed, including species: *Culex pipiens*, *Aedes vexans*, *Aedes albopictus*, *Anopheles maculipennis*, *Anopheles plumbeus*, *Culiseta annulata*, *Cocquillettidia richardii*, *Ochlerotatus caspius*. *Culex pipiens* was the most predominant species in all three cantons. Based on the results, we can conclude that identified species of mosquito have great potential in disease transmission, because of that in the coming period the key thing is to continue and expand monitoring on mosquitoes, larval habitats, and other vector species (sandflies, flies, ticks, etc.), and expand surveillance on vector-borne diseases.

Keywords: surveillance, mosquito, vector, invasive species, FBiH

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SUSCEPTIBILITY AND SPREAD OF SARS-CoV-2 IN ANIMALS

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ABSTRACT

The emergence of a novel coronavirus (SARS-CoV-2) originating from Wuhan, China in 2019 and the growing body of information pertaining to the susceptibility of certain animal species to this virus is raising the question of animals serving as a reservoir of infection and contributing to continued disease. Understanding the host range for SARS-CoV-2 is important in order to control the ongoing pandemic but also been able to protect populations of wild and domestic animals in their native habitat and under human care, respectively. The best-documented evidence for susceptibility of any animal species comes from detecting SARS-CoV-2 under natural conditions. The predictive susceptibility of animals has also been based on computational modelling of their angiotensin-converting enzyme 2 (ACE-2), a key receptor for SARS-CoV-2 spike protein. Cross-species infections can occur when a coronavirus adapts to

a new host in part through the mutation of the spike protein, shown to enhance the binding affinity for ACE-2. Various animal species with demonstrated natural and/or experimental susceptibility to SARS-CoV-2 infection have shown very high to medium susceptibility based on their ACE-2 binding propensity to SARS-CoV-2 spike protein. It is important to keep in mind that susceptibility to SARS-CoV-2 does not only rely on the homology of the ACE-2 receptor but also on the presence of other cellular factors required for viral replication. While SARS-CoV-2 has been shown to be experimentally transmittable from animal to animal in cats, ferrets and hamsters, there is no evidence that such transmission is sustained under natural conditions.

Keywords: COVID-19, SARS-CoV-2, animals, ACE-2, intermedium host

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PERSISTANCE OF LYME BORRELIOSIS

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ABSTRACT

Lyme borreliosis has become an important public health problem and the most prevalent tick-borne disease in the United States. According to the CDC, it is estimated that there are more than 300,000 human cases of Lyme borreliosis annually, which is expecting to rise. *Borrelia burgdorferi*, the etiological agent of Lyme borreliosis is spread by ticks in the genus *Ixodes* and belongs to a guild of pathogens, including *Ehrlichia*, *Babesia*, and tick-borne encephalitis viruses that are maintained within the same vector-reservoir niches. Thus, co-infection with one or more of these agents can occur and may be responsible for “para-Lyme disease” syndromes as these other agents have a wide host range. Untreated human Lyme borreliosis results in disease with a wide range of clinical symptoms and protean manifestation, depending on the stage of infection. Treatment of patients with diagnosed Lyme borreliosis with

antimicrobial agents mainly resolves the objective clinical manifestations. Associated subjective symptoms often may persist for many weeks, or even months. However, a proportion of patients remain ill, and delayed treatment is associated with negative clinical outcomes. A hallmark of Lyme borreliosis is persistent infection, as has been experimentally proven in various animal model, and in reported confirmed spontaneous cases in humans. Studies conducted in our laboratory, have provided evidence of *B. burgdorferi* presence in collagenous tissues, following antimicrobial therapy during chronic infection in animals. We demonstrated that noncultivable spirochetes can persist in a host following antimicrobial treatment for a long time but did not demonstrate their clinical relevance.

Keywords: *Borrelia burgdorferi*, persistence, treatment, diagnosis

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SEROLOGICAL SURVEY ON SWINE BRUCELLOSIS IN BOSNIA AND HERZEGOVINA

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ABSTRACT

The aim of this study was to prove, through a serological investigation, the presence of *Brucella* strains in the domestic swine population in Bosnia and Herzegovina. In the last 20 years brucellosis has been circulating in Bosnia and Herzegovina in domestic animals such as cattle, sheep, goat, dog and humans as well. Infection in pigs is caused by *Brucella suis* biovar 1, 2 or 3, but swine are also susceptible to other *Brucella* strains such as *B. melitensis*, *B. abortus*. The studied population included 1459 pig from two entities Federation BiH (n=453) and Republic of

Srpska (n=1006). Serums were tested using two serological tests for brucellosis: Rose Bengal Test (RBT), and Complement Fixation Test (CFT). A structured questionnaire was used to collect the epidemiological data related to the animals and husbandry practice. Only two serum samples resulted positive to both tests, indicating that swine brucellosis has a very limited spread in BiH domestic swine population.

Keywords: Brucellosis, swine, rose bengal, complement fixation test

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EFFECT OF AGARICUS BISPORUS ON KINETICS OF MEMORY T CELLS FROM LAMB PERIPHERAL BLOOD

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ABSTRACT

In the available literature, the immunostimulatory effect of the button mushroom (*Agaricus bisporus*) dietary supplement mixed in the daily rations has been described in monogastric animals kept in controlled environment and intensive production conditions. Thus, after 42 days of feeding with the *Agaricus bisporus* dietary supplement, an increase in the proportion of T and B lymphocytes was recorded in the peripheral blood of domestic pigs and broilers. The aim of the research was to determine the effect of *Agaricus bisporus* on the kinetics and change in the proportion of memory T cells in lambs. Thirty lambs of the Lika pramenka breed at the age of three months were used in the experiment. The lambs were divided into two groups: control (without addition of *Agaricus bisporus* supplement in daily rations) and experimental (with addition of 1.5% dry *Agaricus bisporus* supplement in daily rations). On days 0 and 42 of the experiment, cytometric analysis of lamb peripheral blood lymphocytes was performed using directly fluorochrome-labeled specific mouse monoclonal antibodies for

memory T cells of sheep (antibody panel: CD45+ CD3+ CD8+ CD4+). Statistical data analysis was performed using the SAS 9.4. software package. On the 42nd day of the experiment, in lambs fed with the addition of 1.5% dry *Agaricus bisporus* supplement in daily rations, a 0.33% higher share of memory T cells was recorded compared to control group lambs. There is a general lack of scientific information about the immunomodulatory effect of *Agaricus bisporus* in ruminants. Therefore, the results obtained in this paper are scientific recommendations for further assessment of T cells kinetics, as well as other subpopulations, during and after feeding with *Agaricus bisporus* dietary supplement. This study has been fully supported by the Croatian Science Foundation under the project "Innovative functional lamb meat products" (HRZZ-IP-06-2016-3685).

Keywords: *Agaricus bisporus*, immunomodulation, lamb, Lika pramenka breed, memory T cells

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SEROPREVALENCE OF COXIELLA BURNETII INFECTION AMONG RUMINANTS IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Q fever is a zoonotic disease that affects people all over the world and is caused by *Coxiella burnetii*, an obligate gram-negative intracellular coccobacillus. Ruminants are a major cause of human infection, as bacteria are shed in various secretions and excreta by subclinical carriers. The disease is leading to significant economic loss due to reproductive disorders such as infertility, stillbirth, abortions and weak offspring. Animals infected with the virus are capable of persistently shedding the organism.

The aim of this study was to determine the presence of *C. burnetii* among sheep and cattle in Bosnia and Herzegovina as well to examine the possible impact of season on Q fever prevalence in these animals.

Blood samples of sheep and cows were collected from different parts of Bosnia and Herzegovina during summer and winter season and examined against antibodies of *C. burnetii* using commercial ELISA.

A total of 469 animals made up of 253 sheep and 216 cattle were sampled from different locations in Bosnia and Herzegovina. Our study showed among examined sheep four animals with a developed immune response during summer season, and 37 positive samples collected during winter season, while two cows tested positive during summer season and 21 during winter season. A higher prevalence of Q fever during winter season (90%) was probably due to increased density of animals inside the barn. Namely, the aggregation of a larger number of animals in stables during the cold period of the year may contribute to the transmission of infection due to inhalation of *C. burnetii*-contaminated dust particles.

The current epidemiological situation of *C. burnetii* in cattle and sheep in Bosnia and Herzegovina is defined in this report. Our results also reflect the pathogen's ubiquity, as it is found in all of the areas investigated.

Key words: Q-fever, seroprevalence, ruminants, Bosnia and Herzegovina

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INCIDENCE OF BRUCELLOSIS IN HERCEG-BOSNIA COUNTY IN THE PERIOD 2013-2018. YEARS

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ABSTRACT

The objectives of this study are to conduct a systematic epidemiological study to determine the seroprevalence of brucellosis in domestic animals in HBŽ in the period 2013-2018. Brucellosis is a contagious animal and human disease caused by bacteria of the genus *Brucella*, and presents a significant health problem. It has a particular impact on public health, animal production and animal health in endemic areas such as the Mediterranean region. In the FBiH, and according to the FBiH Institute of Public Health, brucellosis is the most common disease in the group of zoonoses. During the research period, data from the Veterinary Sector of the Federal Ministry of Agriculture, Water Management and Forestry and

annual bulletins of epidemiological surveillance of infectious diseases of the FBiH Public Health were processed. In the period from 2013 to 2018, a total of 3192 cases of brucellosis in domestic animals were registered in the Federation of Bosnia and Herzegovina, of which 670 cases (21%) in Herceg-Bosnia County (HBŽ). According to the data provided by the Institute of Public Health of the Federation of Bosnia and Herzegovina, in the period from 2013 to 2018, a total of 1029 human cases of brucellosis were registered in the Federation of Bosnia and Herzegovina, of which 7 (0,68%) cases in HBŽ.

Keywords: brucellosis, humans, animals

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BLUE TONGUE DISEASE IN SHEEP IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Over the past 20 years, a variety of blue tongue virus (BTV) strains belonging to different serotypes entered and spread across many parts of Europe on several occasions. In the territory of our country, the disease was first recorded in 2002, then 2016/2017, not only in sheep but also in cattle. The OIE Reference Laboratory for BT identified the BTV-9 genotype as the causal genotype of the epizootic in 2002, and BTV-4 as the causal genotype of the epizootic in 2016/2017. In 2020, a BTV-4 outbreak was confirmed (9th October 2020) with 2 infected animals in a flock of 30 sheep in municipality of Neum on the border with Croatia. Whole blood and serum samples of sheep

were collected in autumn 2020, and commercial cELISA was used for detection of specific antibodies to BTV. For virus isolation purposes inoculation on embryonated chicken eggs and molecular characterization were performed. The presence of specific antibodies for Blue tongue in the test sera was determined by ELISA, while the BTV-4 serotype was determined using molecular methods. The aim of this study was to determine presence of the Blue tongue virus in the sheep population in Bosnia and Herzegovina in the 2020.

Keywords: bluetongue, virus, serotyping, virus isolation

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EXPECTED REPRODUCTIVE PERFORMANCES IN HIGH YIELD DAIRY COWS IN SARAJEVO CANTON

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ABSTRACT

Reproduction success greatly depends of peripartum and early lactation period, because those are most critical phases in productive-reproductive cycle of dairy cows. The study had lasted for 1 year and it included 44 Holstein-Friesian cows. Status of reproductive organs and body condition was assessed by ultrasonography. “ZINPRO” method have been used for assessment of lameness. Cows in experimental group had received hormonal stimulations to enhance ovulation and conception. Lameness of stage 2 and 3 had 95% of cows. Disorders of puerperium had 47,82% (n=11) cows in experimental group and 33,3% (n=7) in control group. After the end of puerperium, uterine horn diameter and wall thickness were approximately 38mm and 8 mm in both groups while ovulation had 69,5% cows in experimental and 81% in control group. Body condition scores were 2 in experimental and 2,5 in control group. Cows in experimental group have

been seen in estrus first time at 72 days and had first artificial insemination at 77 days. Conception after first insemination was 17,39% (n=4) and after second insemination 36,84% (n=7). After the end of study experiment group had 65,21% (n=15) pregnant cows with average 189 days of calving to conception interval. Cows in control group have been seen in estrus first time at 112 days and had first artificial insemination at 148 days. Conception after first insemination was 38,09% (n=8) and after second insemination 15,38% (n=2). After the end of study control group had 71,42% (n=15) pregnant cows with average 202 days of calving to conception interval. The farm where our study have been conducted needs to correct management related to lameness, nutrition and more active control of early lactation period.

Keywords: cow, reproduction, puerperium, ovulation, conception

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ECONOMIC EVALUATION OF EGG PRODUCTION IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Poultry production in Bosnia and Herzegovina is one of the strongest and one of the most advanced branches of agriculture from a technological point of view. Evidence suggests that egg production achieves positive financial results as well as a positive trade balance. It is also evident that strong fluctuations sometimes occur, as a result of ever-present market changes but also natural conditions. During the observed period, 2013-2019 egg production in Bosnia and Herzegovina increases by 2.99%, and the average production is 0.7 billion eggs per year. It remains to see whether this promising sector can stimulate agricultural development. Therefore, this study aims to evaluate the economic viability of egg production, as well as to determine major supply and demand trends in egg production/poultry production in Bosnia and Herzegovina. Primary data for this study were collected through semi-structured interviews with representatives of a poultry company in Bosnia and Herzegovina, while secondary data were collected

through official statistical agencies, reports, etc. Major production-economic indicators were used for four years (2016-2019). Results showed positive financial results during all observed years, while best performances were evident during the 2018 year and lowest performances were evident during 2017 (66.22% lower compared to 2018). The financial result is mainly influenced by changes in output prices, while companies tend to produce their animal feed which significantly reduces production costs. Also, by-products, poultry fertilizer is highly appreciated by agricultural producers and company make a significant amount of money from it. It remains to see whether egg production can continue to achieve positive results, and is it going to be recognized by policymakers as well as agricultural producers as a more important agricultural branch in Bosnia and Herzegovina.

Keywords: egg production, economic evaluation, poultry production, Bosnia and Herzegovina

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CORRELATION OF THE LEVEL OF NUTRITION AND THE FREQUENCY OF HONEY CONSUMPTION AMONG PRIMARY SCHOOL STUDENTS IN THE MUNICIPALITY OF PALE

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ABSTRACT

The nutrition of children and youth is an issue that is being studied around the world. When going to school, children are given their own choice of food consumption. Their diet is no longer completely under the control of their parents, and they eat at least one meal a day or even several snacks without supervision. Honey is one of the last unprocessed natural foods. Honey consumption varies from country to country. In the European Union, which is the main importer and producer of honey, annual consumption per capita varies from medium (0.3-0.4 kg) in Italy, to high (1-1.8 kg) in Germany and Austria. Consumption of honey in BiH is very low and amounts to 150 g per year. There is still no data on the consumption of honey by school-age children. The results of many studies show that honey is not just a food sweetener, but that children who consume honey develop a better memory over time. Honey gives energy to children

because it mainly consists of three types of sugar: sucrose, glucose and fructose. Each of these sugars is used differently by the body - sucrose and glucose are digested quickly and cause an increase in blood sugar, and fructose stays longer in the system and gives children constant energy. In addition to sugar, honey contains vitamins and minerals. Honey helps children heal faster, soothes coughs and protects the liver with frequent use of antipyretic drugs. Therefore, the aim of this paper is to examine the eating habits of primary school children and the degree of consumption of honey and bee products. The results of the research will show the frequency of honey consumption, the type and amount of honey consumed and preparations with honey and the correlation of the degree of nutrition with the eating habits of students.

Keywords: honey, children's nutrition, proper nutrition, nutrition, BMI

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FOOD IRRADIATION REGARDING TO ITS HEALTH CORRECTNESS

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ABSTRACT

Today's population needs are qualitatively and quantitatively high and the very goal of ensuring healthy and safe food itself is a great challenge. The healthy food is a food that satisfies by quality, storage conditions, preparation, and distribution. Because of increasingly present fast way of life and increase in number of sensitive categories of population, like children, older people, and immunodeficient categories of people, the scientists from different scientific fields are trying to find up-to-date, faster, and safer way of pasteurization and sterilization of food for decades. Today, the processes of obtaining healthy food are trying to be based on new technologies that do not change the nutritional value, do not raise the temperature during the pasteurization and sterilization, do not leave harmful residues, and are applied to packaged food, which significantly limits the chances of contamination. During the last decades, food irradiation became one of the most important technologies for improvement

of safeness and extension of shelf time which is a modern way of fighting against the decay of food and foodborne pathogens. The purpose of food irradiation is the same as for freezing, high-temperature and chemical processing, i.e. the removal of microorganisms that cause food spoilage and foodborne diseases by using radioactive elements in a certain dose over a given time. In addition, the trend of increasing food allergies has favored this approach, because the food irradiation contributes to the creation of hypoallergenic products by reducing or completely eliminating allergen reactivity. Also, experiments in some African countries have shown that food irradiation can reduce the loss of basic foodstuffs, which economically approves the process. As it becomes more economical, the number of facilities specializing in food irradiation increases and thus the annual amount of food.

Keywords: food irradiation, food preservation, food safety