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5. Studentski Kongres „Hrana-Ishrana-Zdravlje“ sa međunarodnim učešćem
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Faruk Čaklovića

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sa međunarodnim učešćem**

KNJIGA SAŽETAKA

**5th Students Congress „Food-Nutrition-Health“
with international participation**

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Sarajevo, 2020

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Organizovanjem Petog studentskog kongresa „HRANA-ISHRANA-ZDRAVLJE“ sa međunarodnim učešćem, studenti i nastavnici fakulteta medicinske, biotehničke i humanističke grupacije Univerziteta u Sarajevu, pokazuju svoju želju da održe kontinuitet ove multidisciplinarne konferencije, posebno iz razloga što se ove godine kongres održava u posebnim vanrednim okolnostima, pandemije COVID-19. Unatoč svim preprekama i izazovima koje nove okolnosti postavljaju pred studente i nastavnike Univerziteta u Sarajevu, ali i one sa univerziteta u BiH i regionu, nastavlja se odlučnost da se borimo sa najvećim izazovima ovog vijeka, a to je rastuća nejednakost u pogledu ostvarivanja osnovnih ljudskih prava na adekvatnu prehranu i zdravlje.

Za V Kongres „HRANA-ISHRANA-ZDRAVLJE“ Organizacioni odbor je odabrao 5 tematskih cjelina: 1. Primarna proizvodnja i prerada hrane; 2. Toksikologija i sigurnost hrane; 3. Ishrana tokom životnog ciklusa, 4. Dijetoterapija i 5. Savremena dijagnostika i analitika hrane. Na kongresu će biti predstavljeno 68 studentskih radova, koji su prošli recenziju Naučnog odbora i čije sažetke donosimo u ovoj Knjizi sažetaka. Ocjena i naučna verifikacija iznijetih tvrdnji i rezultata je prepuštena učesnicima Kongresa i široj naučnoj i stručnoj javnosti. Tekstovi rukopisa kratkih sadržaja nisu lektorisani.

U organizaciji i realizaciji V Kongresa uzeli su učešće studenti Poljoprivredno-prehrambenog, Farmaceutskog, Veterinarskog, Pedagoškog, Stomatološkog fakulteta sa klinikama, Fakulteta zdravstvenih studija i Medicinskog fakulteta Univerziteta u Sarajevu, čime su pokazali svoje opredjeljenje da usvajaju nova znanja i vještine i na najbolji način predstave svoje fakultete.

Ovom prilikom se zahvaljujemo i učesnicima svih odobra bez čijeg požrtvovanog rada ne bi bilo moguće realizovati ovaj sada već tradicionalni događaj.

Održavanje Kongresa bez pomoći sponzora bi bilo nemoguće, pa im ovom prilikom izražavamo veliku zahvalnost.

Prof. dr Faruk Čaklovića, predsjednik Organizacionog/Koordinacionog odbora

FOREWORD

By organizing the fifth congress "FOOD-NUTRITION-HEALTH", with international participation, students and their teachers from faculties of medical, biotechnical and humanistic studies of the University of Sarajevo, show their willingness to maintain the continuity of this multidisciplinary conference, especially in these specific aggravating circumstances, the COVID-19 pandemic. Despite, all the obstacles and challenges that are put out in front of the students and professors at University of Sarajevo, and also other universities in BiH and the region, academic community keep on fighting with the greatest challenge of this century, which is growing inequality in exercising fundamental human rights to have adequate nutrition and health.

The Organizing Committee selected five sections for the 5th Congress "FOOD-NUTRITION-HEALTH": 1. Primary production and processing of food; 2. Toxicology and food safety; 3. Nutrition through the life cycle, 4. Dietotherapy and 5. Modern food diagnostics and analysis. Upon the review of the Scientific Committee 68 students' works were approved for presentation and their abstracts are published in this Book of abstracts. Evaluation and scientific verification of the statements and results are left to the participants of Congress and to a scientific and professional public. The English translations of the abstracts are not proofread.

Students of the Faculty of Agriculture and Food Sciences, Faculty of Pharmacy, Veterinary Faculty, Faculty of Educational Sciences, Faculty of Health Sciences, Faculty of Dentistry with Clinics and Faculty of Medicine from the University of Sarajevo took part in the organization and realization of the congress. This confirms the commitment of our students to acquire new knowledge and skills and also to represent their faculties in the best way. We take this opportunity to thank the Scientific, Organizing, Coordination and Technical Committee members for their hard work and efforts to organize this traditional event.

The realization of this Congress would not be possible without the help of the sponsors, to whom we are very grateful.

Prof. dr Faruk Čaklovica, Chairman of the Organizing/Coordinating Committee

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Nenamjerno izlaganje pesticidima: sredstva u upotrebi u domaćinstvima

Mojca BAVCON-KRALJ

Univerzitet u Ljubljani, Fakultet zdravstvenih studija, *Zdravstvena pot 5*, 1000 Ljubljana, Slovenija

Autor za korespondenciju: mojca.kralj@zf.uni-lj.si

Sažetak

Maksimalni nivoi rezidua (MRL, maximal residue limits) nekoliko pesticida koji se trenutno nalaze u upotrebi konstantno se prate i regulišu nacionalnim strategijama i EU direktivama. Bez obzira na to, ljudi su stalno nenamjerno izloženi brojnim biocidima. U prosječnom domaćinstvu, za održavanje čistoće koristi se nekoliko vrsta deterdženata, sredstava za čišćenje, sprejeva i slično. Međutim, koliko god da čistimo ostavljamo rezidue.

Kako bi se dali odgovori na istraživačko pitanje o mogućem nenamjernom izlaganju u domaćinstvima provedena je studija praćenja prisustva rezidua pesticida. Postavljena su dva osnovna cilja istraživanja. Prvi je bio da se procijeni koja je to količina rezidua biocida koja se može očekivati prilikom upotrebe deterdženata, koji sadrže biocide iz grupe fungicida (1,2-benzizotiazol-3(2H)-on) za čišćenje kuhinjskog posuđa, koje je manuelno čišćeno u zavisnosti od dubine i nepravilnosti posuda. Drugi cilj bio je ispitati koliko se efikasno mogu ukloniti pesticidi iz kore citrusa, njihovim pranjem sa *eko-friendly* proizvodima koji se mogu naći u svakoj kuhinji (limunska kiselina, natrij hidrogen karbonat, natrij hlorid, sirćetna kiselina, sirće...) i alkoholom.

Dobiveni rezultati istraživanja ukazuju na to da je moguće upravljati nenamjernim izlaganjem pesticidima uključivanjem jednostavnih metoda, koje se mogu primjenjivati u svakodnevnom životu.

Plenary lecture

Unintentional exposure to pesticides: the household keeping case

Mojca BAVCON-KRALJ

University of Ljubljana, Faculty of Health Sciences, *Zdravstvena pot 5*, 1000 Ljubljana, Slovenia

Corresponding author: mojca.kralj@zf.uni-lj.si

Abstract

The MRL (maximal residue limits) of several pesticides used nowadays is repeatedly monitored and constantly regulated by national strategies and EU directives. Nevertheless, humans are still exposed to several biocides unintentionally. In a common household, people use several detergents, cleaners, sprays etc. to keep their domestic environment clean. However, no matter how clean we are, we leave residues behind.

The study of pesticides' residues was enlarged in the household keeping to answer the research question on unintentional exposure. The objects of the research were two. Firstly, we were interested, how much residues of the biocide we can expect from the detergents, which contained the biocide from the group of fungicides (1,2-benzisothiazol-3(2H)-one) on kitchenware, which was manually cleaned depending on the depth and the roughness of the kitchenware. Secondly, we were interested in how efficiently, we can remove the pesticides from the citrus peel, by washing them with "eco-friendly" cleaners present in every kitchen (citric acid, sodium hydrogen carbonate, sodium chloride, acetic acid, vinegar,...) and alcohol.

The obtained results taught us, that we can manage unintentional exposure to pesticide by including simple handle methods, which could be followed in everyday life.

1. PRIMARNA PROIZVODNJA I PRERADA HRANE
PRIMARY PRODUCTION AND PROCESSING OF FOOD

Meso iz tube

Berina AGANOVIĆ^{1*}

¹Univerzitet u Sarajevu, Veterinarski Fakultet

*Autor za korespondenciju; Berina Aganović, berina.aganovic@student.vfs.unsa.ba

Sažetak

Meso je visoko cijenjena proteinska namirnica koja je veoma ukusna i izaziva dug osjećaj sitosti, a sadrži sve esencijalne amino kiseline, razne vrste masnoća, vitamine i minerale. Danas ljudi konzumiraju sve više mesa, možda čak i više nego što je potrebno. Procjenjuje se da će sa velikim porastom stanovništva kroz sljedećih 30 godina doći i do ogromnog skoka potrebe za mesom. Nama poznat, tradicionalni način proizvodnje mesa je veoma neefikasan, zahtijeva dosta vremena i novca, te postaje ekološki neprihvatljiv. Stočarstvo dovodi dopotrošnje velike količine vode, tla i hrane, kao i emisije oko 15% ukupne količine stakleničkih plinova planete Zemlje. Također, tu postoji i problem etičke prirode, jer milijarde životinja gubi život zbog proizvodnje mesa. Zbog mnogih negativnih efekata mesne industrije, pokušava se pronaći alternativni način proizvodnje mesa. Naučnici su uspjeli stvoriti meso koje nije nastalo klanjem žive životinje, već je nastalo u laboratoriji i dobilo naziv meso iz tube ili kultivirano meso. Princip ovog procesa jeste bezbolna ekstrakcija ćelija iz životinje, potom zasađivanje ćelija na mediju gdje one proliferiraju kao što bi i u samom organizmu. Teoretski, ovaj proces će biti dovoljno efikasan da opskrbi svjetsku populaciju. Cilj ovog rada jeste da se opiše osnova proizvodnje mesa iz tube, njegove prednosti u odnosu na konvencionalnu proizvodnju, kao i izazovi koje će naučnici morati nadvladati da bi se ovakav način proizvodnje komercijalizirao.

Ključne riječi: *potrebe za mesom, alternativni način proizvodnje mesa, ekstrakcija ćelija*

1-0-1

Clean meat

Berina AGANOVIĆ^{1*}

¹University of Sarajevo, Veterinary Faculty

*Corresponding author: BerinaAganović, berina.aganovic@student.vfs.unsa.ba

Abstract

Meat is a highly valued protein food that is very tasty and causes a long feeling of satiety. Today, people consume more meat, even more than necessary. It is estimated that with the large increase in world population there will be a large rise in our meat demands. However, the traditional way of meat production is inefficient; it requires a lot of time and money. Furthermore, it is becoming environmentally unsustainable. Livestock agriculture is responsible for emission of up to 15% of total greenhouse gasses and puts pressure on water, land and food. Another problem is of ethical nature – billions of animals are losing their lives due to meat production. Considering these negative effects, attempts are being made to find an alternative way to produce meat. Scientists have made a new kind of meat named clean meat, which was created in a laboratory instead of slaughtering animals. The production process consists of two main steps: painless cell extraction from an animal followed by isolation of cells in a cultural medium. Theoretically, clean meat production will be efficient enough to meet the global meat demands. Purpose of this paper is to describe the basis of clean meat production, its advantages over conventional production, as well as the challenges that scientist will have to overcome so this type of production could be commercialized.

Keywords: *meat demands, alternative way to produce meat, cell extraction*

Pregled mesa zaklanih svinja na trihinelu

Berina AGANOVIĆ^{1*}, Iram GLADAN¹

¹Univerzitet u Sarajevu, Veterinarski fakultet

*Autor za korespondenciju: Berina Aganović, berina.aganovic@student.vfs.unsa.ba

Sažetak

Trihinelozu je parazitarne bolesti ljudi i životinja, koju uzrokuju nematode iz porodice *Trichinellidae*, rodu *Trichinella* u kojem je poznato 12 genotipova. Iako je moguć prijenos uzročnika bolesti iz mesa drugih karnivora i omnivora, za čovjeka je najvažniji međudomaćin svinja, tj. kontaminirano i nedovoljno termički obrađeno meso domaće svinje. Larve trihinele ingestijom takvog mesa dospijevaju u organizam čovjeka, te prelaze u adultni stadij unutar tankog crijeva. Nakon toga, adulti na svijet donose žive larve koje se limfotokom i krvotokom raznose po raznim dijelovima tijela. Najčešće se zaustavljaju u prečnoprugastoj muskulaturi u kojoj stvaraju čahurice limunastog oblika. U mikroskopskim čahurama larve su položene u obliku slova „S“. Simptomi trihineloze kod ljudi su veoma nespecifični i variraju, te je zbog toga postavljanje dijagnoze i određivanje terapije teško. Prema tome, najbolji lijek je prevencija konzumiranja mesa koje sadrži larvetrihinele. Trihinelozu se uspješno prevenira dokazivanjem ove nematode u mesu domaćih svinja tokom obavezne inspekcije mesa na klaonicama. U većini država Evrope, kao i u BiH, zakonom je strogo naređeno da se svaki svinjski trup nakon klanja pregleda na prisustvo larvetrihinele. Referentna metoda koja se koristi za detekciju larvi se naziva *Metoda umjetne digestije zbirnih uzoraka korištenjem magnetne mješalice*. Pojačani veterinarsko-sanitarni nadzor i obavezni pregled svinjskog mesa u industrijskoj i kućnoj proizvodnji spriječio je velike epidemije i znatno smanjio broj oboljelih.

Ključne riječi: *Trichinella*, inspekcija mesa na klaonicama, referentna metoda detekcije

1-O-2

Meat inspection for *Trichinella* in slaughtered pigs

Berina AGANOVIĆ^{1*}, Iram GLADAN¹

¹University of Sarajevo, Faculty of Veterinary Medicine

*Corresponding author: Berina Aganović, berina.aganovic@student.vfs.unsa.ba

Abstract

Trichinellosis is a parasitic disease of humans and animals caused by nematodes of the *Trichinellidae* family. The genus *Trichinella* includes 12 known genotypes. The most significant genotypes are *Trichinella spiralis*, *T. nativa*, *T. pseudospiralis* and others. Trichinellosis is transmitted by ingestion of contaminated meat. Infestation occurs within the small intestine, from which the larvae spread to various tissues through lymphatic system and bloodstream. Most infested tissues include transverse striated musculature in which they create characteristic cocoons in the shape of a lemon. Humans are mostly infested with *Trichinella* by ingestion of contaminated and undercooked pork. Symptoms of trichinellosis in humans are non-specific and vary, so it is often difficult to provide adequate diagnosis and therapy. Therefore, it is best to prevent the consumption of infested meat. Trichinellosis is successfully prevented by detection of this nematode in infected hosts during mandatory meat inspections at slaughterhouses. In most European countries, including Bosnia and Herzegovina, the law strictly stipulates that every pig carcass must be examined for the presence of *Trichinella* larvae. Reference method used in detection of larvae in meat is called artificial digestion using a magnetic stirrer. Increased veterinary and sanitary control, as well as mandatory inspection of meat in industrial and domestic production, has prevented major epidemics and significantly reduced the number of infested humans.

Keywords: *Trichinella*, meat inspection at slaughter houses, reference inspection methods

Značaj određivanja hektolitarske mase prilikom ocjenjivanja kvaliteta strnih žita

Benjamin CRLJENKOVIĆ^{1*}

¹ Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, BiH

* Autor za korespondenciju: Benjamin Crljenković, crljenkovic.benjamin@gmail.com

Sažetak

Hektolitarska masa zrna žita se definira kao masa 100 litara zrna izražena u kilogramima, što zapravo predstavlja njegovu gustoću, odnosno masu po jedinici volumena. Najčešći je kvalitativni parametar koji se uzima u obzir prilikom prijema zrna žita u skladište ili pogon za preradu. Zbog relativno brzog i jednostavnog mjerenja koje se izvodi za nekoliko minuta, van laboratorije, odavno je ustaljeno kao osnovno, a često i jedino fizičko svojstvo zrna koje se mjeri prilikom preuzimanja zrna.

Brojni radovi dokazuju da se hektolitarska masa može koristiti kao pouzdan indikator ispunjenosti zrna, prinosa brašna, sadržaja proteina u zrnu hljebnih žita te mlinskog i pekarskog kvaliteta brašna. Također, veća vrijednost hektolitarske mase zrna ječma ukazuje na veći prinos pivskog slada, a u korelaciji je i sa ukupnim sadržajem fenola. Hektolitarska masa zrna se može koristiti i kao indikator energetske i nutritivne vrijednosti zrna strnih žita. Osim za potrebe ocjenjivanja kvaliteta merkantilne robe, hektolitarska masa primjenu nalazi i u utvrđivanju kvaliteta zrna koje se koristi kao reproduktivni materijal.

Pregled dostupne literature - istraživačnih, stručnih i naučnih radova kako u našem jezičkom području, tako i u svijetu, dokazuju da je određivanje hektolitarske mase zrna žita iz više razloga opravdan način vrednovanja njegovog tehnološkog kvaliteta, naročito imajući u vidu mogućnost izvođenja mjerenja *in situ*.

Ključne riječi: *hektolitarska masa zrna, strna žita, kvalitet zrna*

1-O-3

The importance of determining the test weight when evaluating the quality of cereal grains

Benjamin CRLJENKOVIĆ^{1*}

¹ University of Sarajevo, Faculty of Agriculture and food sciences, B&H

* Corresponding author: Benjamin Crljenković, crljenkovic.benjamin@gmail.com

Abstract

Test weight of grain is defined as the mass of 100 liters of grain expressed in kilograms, which actually represents its density, i.e. mass per unit of volume. It is the most common qualitative parameter that is taken into account when receiving cereal grain in a warehouse or processing plant. Due to the relatively fast and simple measurement that is performed in a few minutes, even outside the laboratory, it has long been established as the basic, and often the only physical characteristic of grain that is measured when dealing with grain.

Numerous works prove that test weight can be used as a reliable indicator of grain fullness, flour yield, protein content in cereal grains, as well as milling and baking quality. Also, a higher value of test weight in barley indicates a higher malt yield, and it is correlated to the total phenol content of barley. Grain test weight can also be used as an indicator of the energy and nutritional value of cereal grains. Apart from the need of assessing the quality of mercantile goods, test weight is also useful when determining the quality of grain used as reproductive material.

Compilation of available literature - research and scientific papers both in our surrounding and in the rest of the world, prove that determining grain test weight is a justified way of evaluating its technological quality, especially bearing in mind the possibility of performing *in situ* measurements.

Key words: *grain test weight, cereal grain, grain quality*

Antibiotska rezistencija kod farmskih životinja

Adna ČAJDIN^{1*}, Šejma IMAMOVIĆ¹, Berna KRIJEZI¹

¹ Univerzitet u Sarajevu, Veterinarski fakultet, Katedra za higijenu i tehnologiju namirnica, BiH

*Autor za korespondenciju: Adna Čajdin, adna.mo@live.com

Sažetak

Otkriće antibiotika jedno je od najvažnijih postignuća moderne medicine. Korištenje antibiotika znatno je doprinijelo poboljšanju ljudskog zdravlja, produžilo očekivani životni vijek i poboljšalo kvalitetu života. Tokom godina, upotreba antibiotika postajala je sve raširenija, a bakterije su se postepeno prilagođavale takvom okolišu i s vremenom postale rezistentne na sve veći broj antibiotika. Kao posljedicu antibiotske rezistencije (AMR) imamo povećane troškove u zdravstvu zbog posezanja za skupljim lijekovima, produženog bolničkog liječenja i troškova povezanih s pojačanim preventivnim mjerama. Osim toga, veća je stopa smrtnosti uslijed prisustva multirezistentnih bakterija. Prema podacima Svjetske zdravstvene organizacije (SZO), ukupna količina antibiotika primijenjena kod životinja je četiri puta veća nego količina primijenjena kod ljudi. Primjena antibakterijskih lijekova na životinjama koje se koriste kao hrana može rezultirati reziduama tih lijekova u hrani, naročito ako se pri liječenju ne slijedi uputstvo za doziranje lijeka i trajanje terapije. Hrana također može biti izvor antimikrobne rezistencije. Pri tome rizik predstavlja hrana životinjskog porijekla (meso, mlijeko i jaja), naročito ako nije dobro termički obrađena. Stoga, u zemljama Evropske Unije postoje vodiči o primjeni antibiotika u svrhu liječenja životinja gdje se preporučuje racionalna upotreba istih, kao i u opravdanim slučajevima, kada je to zaista neophodno. Svaki pojedinac može doprinijeti borbi protiv AMR koja se prenosi u lancu hrane, na način da se pridržava principima dobre higijenske prakse u svojim kućanstvima. Isto se odnosi na proizvodnju i rukovanje hranom gdje bi sigurnost hrane trebala počivati na načelima HACCP sistema. Edukacija ljudi je jedna od ključnih stavki u podizanju svijesti o AMR iz hrane.

Ključne riječi: *antibiotska rezistencija, farmske životinje, hrana životinjskog porijekla*

1-O-4

Antibiotic resistance in farm animals

Adna ČAJDIN^{1*}, Šejma IMAMOVIĆ¹, Berna KRIJEZI¹

¹ University of Sarajevo, Veterinary faculty, Department of Food Hygiene and Technology, BiH

*Corresponding author: Adna Čajdin, adna.mo@live.com

Abstract

Antibiotic discovery is one of the greatest achievements in modern medicine. Its usage have significantly contributed to the improvement of human health, extended life expectancy and improved the life quality. During years, usage of antibiotics has become more widespread, and the bacteriae have gradually adapted to that environment and eventually became resistant to an increasing number of antibiotics. As a result of antibiotic resistance (AMR), healthcare costs are increased due to resorting to more expensive drugs, prolonged hospital treatment and costs related to enhanced preventive measures. Furthermore, mortality rate is higher when it comes to multiresistant bacteriae. According to World Health Organisation (WHO) data, total antibiotic use in animals is four times higher than the one in humans. Application of antibacterial drugs to animals used for food can result presence of drug residues in food, especially if the instructions for drug dosing and duration of treatment are not being followed. Food can also be the source of antimicrobial resistance. According to that, food of animal origin (meat, milk and eggs), is also the risk for consumers especially if it's not thermally processed. Therefore, there are guidelines for antibiotic use for the treatment of animals in the member countries of European Union, where the use is allowed only when it's necessary. Each individual can contribute fighting against antimicrobial resistance (AMR), that is transmitted in the food chain, by implementing the good hygiene practice in their households. Food safety in food production and handling, should be insured by implementing HACCP principles. Education is the key factor in raising awareness of the AMR from a food.

Key words: *antibiotic resistance, farm animals, food of animal origin*

Pregled mesa kao indikator dobrobiti životinja u uzgoju

Aida GLAVINIĆ^{1*}, Sanja BOŽIĆ¹

¹ Univerzitet u Sarajevu, Veterinarski fakultet

Autor za korespondenciju: Aida Glavinić, aida.glavinic@student.vfs.unsa.ba

Sažetak

U današnje vrijeme kada su gotovo sve informacije zahvaljujući razvoju digitalne tehnologije lako dostupne, sve veći broj konzumenata zanima se i insistira na informacijama o postupanju sa životinjama na farmama. Zbog dostupnih videa i fotografija u kojima se nehumano postupa sa životinjama pojedini ljudi se odlučuju za mijenjanje prehrambenih navika u smislu isključenja mesa iz prehrane, dok postoje i oni koji se ne žele odreći mesa kao namirnice, već zahtijevaju transparentnost procesa proizvodnje. Intenziviranje uzgoja životinja što je neminovnost ukoliko se žele ostvariti visoki prinosi, rezultiralo je porastom prinosa mesa, ali istodobno, stvorilo je i predušlove za narušavanje dobrobiti životinja jer često u uslovima intenzivnog uzgoja životinje nisu primjereno tretirane. Loš postupak sa životinjama tokom intenzivnog uzgoja negativno utiče na njihovo zdravlje, a samim tim i produktivnost što u konačnici dovodi do pada kvaliteta proizvoda, kao i pada profita. Za procjenu dobrobiti i dobrostanja životinja na farmi, tokom transporta i u klaonici, između ostalog, vrši se i pregled trupova nakon klanja. Pregled trupova i pravilna procjena nalaza ima za cilj da prepozna koja karika lanca zakazuje (farma-utovar-transport-istovar-depo). Kvalificiranjem i kvantificiranjem lezija, odnosno oštećenja ili nenormalnih promjena na trupu životinje, može se dobiti uvid u odnos prema životinjama. Navedeni postupci ujedno predstavljaju i osnovu za procjenu potrebe za promjenom odnosa prema životinjama, da bi se na taj način doprinijelo i podizanju kvaliteta njihovog mesa, a samim time i zarade proizvođača.

Ključne riječi: dobrobit životinja, transparentnost procesa proizvodnje, kvalificiranje i kvantificiranje lezija

Meat inspection as an indicator of the welfare of farmed animals

Aida GLAVINIĆ^{1*}, Sanja BOŽIĆ¹

¹ University of Sarajevo, Veterinary faculty

*Corresponding author: Aida Glavinić, aida.glavinic@student.vfs.unsa.ba

Abstract

Nowadays, when almost all information is easily accessible thanks to the development of digital technology, an increasing number of consumers are interested in and insist on information about the treatment of animals on farms. Due to the available videos and photos in which animals are treated inhumanely, some people decide to change their eating habits in terms of excluding meat from their diet, while there are those who do not want to give up meat and so require transparency of the production process. Intensification of animal husbandry, which is inevitable if high yields are to be achieved, has resulted in an increase in meat yield, but at the same time, it has created preconditions for disturbing animal welfare because often animals are not treated appropriately in intensive breeding conditions. Poor treatment of animals during intensive breeding has a negative impact on their health, and thus productivity, which ultimately leads to a decline in product quality and a decline in profits. To assess the welfare of animals on the farm, during transport and in the slaughterhouse, among other things, the carcasses are inspected after slaughter. The inspection of the carcasses and the correct assessment of the findings aims to identify which link of the chain is failing (farm-loading-transport-unloading-depot). By qualifying and quantifying lesions, i.e. damage or abnormal changes in the animal's carcass, one can gain insight into the attitude towards animals. These procedures are also the basis for assessing the need to change attitudes towards animals which would contribute to raising the quality of their meat, and thus the earnings of producers.

Keywords: *animal welfare, transparency of the production process, qualifying and quantifying lesions*

Patvorenje meda

Nikša GNJATIĆ*, Abdullah JUKANOVIĆ, Nedim ČUTURIĆ

Veterinarski fakultet, Univerzitet u Sarajevu

Autor za korespondenciju: Nikša Gnjatić, niksa.gnjatic@student.vfs.unsa.ba

Sažetak

Med je prirodni proizvod sastavljen od različitih šećera, najvećim dijelom od fruktoze i glukoze, zatim vode, ali i niza drugih materija koje proizvodi medonosna pčela (*Apis mellifera*). Organoleptička svojstva meda se međusobno značajno razlikuju što zavisi u prvom redu od botaničkog porijekla nektara, klimatskih uslova, tretmana pčela od strane pčelara te načina skladištenja meda. Zbog visoke nutritivne vrijednosti i ugodnih organoleptičkih svojstava, med zauzima posebno mjesto u brojnim kulturama gdje se od davnina koristi kao hrana i kao lijek. Med i ostali pčelinji proizvodi zbog svoje relativno visoke cijene često su podložni patvorenju. Patvorenje meda je složen problem jer može negativno uticati na prehranu, a time i na zdravlje konzument. Pod pojmom patvorenja meda se u pravilu podrazumijeva dodavanje jeftinih, najčešće okusom slatkih materija u med, poput saharoze, melase i škrobnog sirupa, a sa ciljem povećanja njegovog volumena i ostvarenja veće zarade. Osim toga, na tržištu se pojavljuje i na druge načine patvoren med, što predstavlja problem kako kupcima tako i pčelarima. Danas su u cilju otkrivanja patvorenja meda razvijene brojne metode. Jedan od načina sprečavanja patvorenja je uspostavljanje kontrole i monitoringa cjelokupnog lanca proizvodnje, od ispaše pčela do deklarisanja i označavanja proizvoda. Cilj ovog rada je ukazati na najčešće metode patvorenja meda i dati pregled metoda koje se koriste za utvrđivanje patvorenja.

Ključne riječi: *med, patvorenje*

Honey adulteration

Nikša GNJATIĆ*, Abdullah JUKANOVIĆ, Nedim ČUTURIĆ

Veterinary faculty, University of Sarajevo

*Corresponding author: Nikša Gnjatić, niksa.gnjatic@student.vfs.unsa.ba

Abstract

Honey is a natural product composed of various sugars, mostly fructose and glucose, then water, but also a number of other substances produced by honey bee (*Apis mellifera*). Organoleptic properties of honey differ significantly from each other, which depends primarily on the botanical origin of nectar, climatic conditions, bee treatment (by beekeepers) and the method of honey storage. Because of high nutritional value and pleasant organoleptic properties, honey occupies a special place in many cultures where it was used as food and medicine. Due to their relatively high price, honey and other bee products are often prone to adulteration. Honey adulteration is a very complicated problem because it can negatively affect the diet and health of the consumer. Adulteration of honey usually means the addition of cheap, sweet-tasting substances to honey, such as sucrose, molasses and starch syrup, with the aim of increasing its volume and making higher profits. Furthermore, on the market we have imported honey, which is problem for buyers and honey producers. Today, a number of methods have been developed to detect honey adulteration. One of the ways to prevent honey adulteration is to establish control and monitoring of the entire production chain, from bee grazing to declaring and labeling products. The aim of this work is to point out the most common methods of honey adulteration and to give an overview of the methods used to determine honey adulteration.

Keywords: *honey, adulteration*

Prisustvo *Campylobacter spp.* u mesu peradi

Belmin GOGIĆ^{1*}, Dušica LOZO¹, Ena SELIMOVIĆ¹

¹Univerzitet u Sarajevu, Veterinarski fakultet, Odsjek za higijenu i tehnologiju namirnica, BiH

*Autor za korespondenciju: Belmin Gogić, belmin.gogic@student.vfs.unsa.ba

Sažetak

Kampilobakterioza je oboljenje koje je uzrokovano patogenom gram negativnom bakterijom iz roda *Campylobacter spp.* (sa naglaskom na termotolerantne vrste kao što su *C.jejuni* i *C.coli*). Ovo oboljenje je ujedno i zoonoza jer do infekcije dolazi konzumacijom kontaminiranog pilećeg mesa. Bakterije ovog roda su komensali digestivnog trakta peradi, dok su za ljude patogeni, te dovode do pojave gastroenteritisa. Najčešće se mogu naći u svježem mesu i mesnim prerađevinama peradi. Ove bakterije je teško držati pod kontrolom, prvenstveno zbog toga što su ubikvitarne, a kao komensali veoma brzo se adaptiraju na život u crijevima peradi. Kampilobakterioza je sezonsko oboljenje, i javlja se u proljetnim i ljetnim periodima. Važnu ulogu u širenju ovog oboljenja imaju i vektori kao što su muhe, pacovi i divlje ptice koje tokom migracije predstavljaju rezervoar infekcije. Unakrsna kontaminacija predstavlja glavni put širenja ove bakterije kako u uzgoju, klaonicama i objektima za preradu mesa, tako i u domaćinstvu. Sama činjenica da pileće meso kao jedan od svakodnevnih proizvoda u ishrani većine domaćinstava, predstavlja izvor infekcije nam govori o ozbiljnosti ove zoonoze. U prevenciji širenja ove zoonoze najznačajnija je redovna kontrola životinja u uzgoju, poštovanje higijensko–sanitarnih pravila objekata i osoblja gdje se vrši klanje i prerada mesa i mesnih proizvoda, kao i održavanje higijene u domaćinstvu u cilju sprečavanja unakrsne kontaminacije.

Ključne riječi: *kampilobakterioza, perad, meso, unakrsna kontaminacija*

1-O-7

Presence of *Campylobacter spp.* in poultry meat

Belmin GOGIĆ^{1*}, Dušica LOZO¹, Ena SELIMOVIĆ¹

¹University of Sarajevo, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology

*Corresponding author: Belmin Gogić, belmin.gogic@student.vfs.unsa.ba

Abstract

Campylobacteriosis is an infectious disease caused by gram negative pathogenic bacteria of the genus *Campylobacter*. In addition, campylobacteriosis is a zoonotic disease as human infections occur due to consumption of poultry meat. *Campylobacter spp.* is part of the microflora in the digestive tract of poultry. However, it is pathogenic for humans and usually lead to development of gastroenteritis. Commonly, they can be found in fresh meat and meat products of poultry. These bacteria are difficult to keep in check, primarily because they are ubiquitous, and as commensals, they adapt very quickly to life in poultry intestines. Campylobacteriosis is a seasonal disease, as it occurs in spring and summer. Vectors such as flies, rats and wild birds, which are a reservoir of infection during migration, also play an important role in the spread of this disease. Cross-contamination is the main route of transmission of these bacteria in breeding, slaughterhouses and meat processing facilities, as well as in the household. The very fact that chicken meat, as one of the most common food products in everyday life in the diet of most households, is a source of infection, tells us about the seriousness of this zoonosis. Prevention and containment of this zoonosis requires regular control of animals in breeding, respecting the hygienic and sanitary rules of facilities and personnel, where slaughter and processing of meat and meat products occurs, as well as maintaining household hygiene in order to prevent cross contamination.

Keywords: *campylobacteriosis, poultry, meat, cross-contamination*

Patvorenje maslinovog ulja

Melika HADŽIAHMETOVIĆ, Irina VELETIĆ, Mebrur KRAJČIN

Veterinarski fakultet, Univerzitet u Sarajevu

Sažetak

Slučajevi patvorenja hrane su vrlo česti, naročito kada se radi o visoko kvalitetnim proizvodima, te posljednjih godina ovakve neželjene radnje dobivaju pozornost šire javnosti. S ciljem ostvarenja visokih profita, proizvođači distribuiraju izmijenjenu hranu na tržište s namjerom prevare potrošača. Prevarom se smatra i krivo naznačeno porijeklo zemlje proizvoda te krivotvorenje certifikata. Neki od proizvoda kojima se najviše manipulira su med, biljna ulja, posebno ekstra djevičansko maslinovo ulje, mlijeko i mliječni proizvodi, riba i proizvodi od ribe, meso i mesni proizvodi, začini i voćni sokovi. Ekstra djevičansko maslinovo ulje se, zbog svojih ljekovitih svojstava i široke upotrebe, nalazi vrlo visoko na ljestvici namirnica koje podliježu prevarama hranom. Ovim radom se problematizira način njegovog razrjeđivanja uljima niže kvalitete i drugim sastojcima, koje se kao takvo daje u prodaju radi veće ekonomske dobiti. Također je prikazana najnovija metoda DNA barkoda pomoću koje se razotkrivaju patvorenja ekstra djevičanskog maslinovog ulja, spomenuta učestalost patvorenja istoimenog ulja kroz primjere, te opisane smjernice Europske unije za sprječavanje raznoraznih prevara. Jedna od glavnih zabrinutosti koje patvorenja hrane nosi sa sobom jeste ta što će potrošači zbog navedenog razviti nepovjerenje u označavanje prehrambenih proizvoda, posebno onih za koje je dokazano patvorenje. Zbog toga je cilj rada prvenstveno podići svijest o ozbiljnosti posljedica patvorenja hrane kroz promicanje obrazovanja potrošača, kao i potaknuti istraživanja o prehrambenim pitanjima kako bi se pomoglo da se učini sve da hrana zadovoljava najviše standarde, da se spriječe prevare, zaštititi prodaja, formuliraju strategije i zakoni o hrani kao i njenoj sigurnosti.

1-O-8

Olive oil adulteration

Melika HADŽIAHMETOVIĆ, Irina VELETIĆ, Mebrur KRAJČIN

Faculty of Veterinary Medicine, University of Sarajevo

Abstract

Food fraud cases are very common, especially when it comes to high quality products, and in recent years such scandals have received wide attention. With the aim of making high profits, modified food is distributed to the market with the intention of deceiving consumers. Misdeclarations and forgery of certificates are also considered fraud. Some of the most manipulated products are honey, vegetable oils, especially extra virgin olive oil, milk and dairy, fish, meat and their products, spices and fruit juices. Extra virgin olive oil, due to its medicinal properties and wide use, is very high on the list of foods that are subjected to fraud. This paper problematizes the method of diluting it with lower quality oils and other ingredients, which as such are put up for sale for greater economic gain. The latest DNA barcode method is also presented, which reveals the forgery of olive oil, frequency of forgery of the oil is mentioned through examples, and European Union guidelines for the prevention of various frauds are described. Main concerns about food fraud is that consumers will develop mistrust in food labeling, which will continue to influence consumer behavior long after a documented incident occurs. Therefore, the aim of the paper is to raise awareness of the seriousness of the consequences of food fraud by promoting consumer education, as well as to encourage research on food issues to help make food meet the highest standards, prevent fraud, protect sales, formulate strategies and food laws as well as its safety.

Hormonski promotori rasta kod farmskih životinja

Dušica LOZO^{1*}, Ivan BAGARIĆ¹

¹Univerzitet u Sarajevu, Veterinarski fakultet, Odsjek za higijenu i tehnologiju namirnica, BiH

*Autor za korespondenciju: Dušica Lozo, dusica.lozo@student.vfs.unsa.ba

Sažetak

Hormoni su hemijske supstance, koje proizvode specijalizirane ćelije, obično u endokrinim žlijezdama, koji se otpuštaju u krvotok i djeluju na ciljne ćelije i tkiva. Hormonalne supstance se često daju farmskim životinjama u svrhu terapije reproduktivnih poremećaja, ali istovremeno imaju potencijal i za korištenje u anaboličke svrhe tj. za promociju rasta kod životinja. U komercijalnoj upotrebi koriste se sintetički i prirodni hormoni estradiol, progesteron i testosteron, a prema novijim istraživanjima i fungalni estrogene kao što je zeranol, te neki sintetički derivati kao npr. trenbolon acetat. Aplikacija hormona kao promotora rasta životinjama se vrši preko subkutanih implantata, koji se u tkiva otpuštaju bifazično, čime se dostiže visoka koncentracija hormona u krvnoj plazmi već u prvih 24 – 48 h nakon implantacije. Hormonski implantati utiču na rast kroz dva glavna mehanizma: ostvarivanjem pozitivnog efekta na konverziju hrane, te na proliferaciju (rast) tkiva. Kod mladih jedinki goveda, koje su još uvijek u razvoju, konverzija hrane se estrogenim implantatima može povećati za 6 – 8%. U zemljama članicama Europske Unije zabranjeno je korištenje hormona u anaboličke svrhe, stoga je ključno praćenje i kontrola rezidua ovih supstanci u cilju sprječavanja i zloupotrebe, kako bi se sačuvalo zdravlje ljudi. U pogledu efekta na zdravlje ljudi, smatra se da anabolički promotori rasta mogu u nekim slučajevima dovesti do endokrinih, razvojnih, imunoloških, neurobioloških, imunotoksičnih, genotoksičnih i kancerogenih učinaka.

Ključne riječi: *hormoni, promotori rasta, implantati, rezidue*

1-O-9

Growth promoting hormones in farm animals

Dušica LOZO^{1*}, Ivan BAGARIĆ¹

¹University of Sarajevo, Faculty of Veterinary Medicine, Department of Food Safety and Technology

*Corresponding author: Dušica Lozo, dusica.lozo@student.vfs.unsa.ba

Abstract

Hormones are chemical compounds, produced by specialized cells, usually in the endocrine glands, that are released into the bloodstream and act on target cells and tissues. Hormonal therapy is usually used on farm animals for the treatment of reproductive disorders, but at the same time, they have the potential to be used for anabolic purposes, i.e. to promote growth in animals. For commercial purposes, synthetic and natural hormones such as oestradiol, progesterone and testosterone are generally used, and according to recent research, fungal estrogens such as zeranoland some synthetic derivatives, for example trenbolone acetate. Application of these hormones is done via subcutaneous implants that release hormones biophysically, achieving high concentrations of hormones in blood plasma even in first 24 - 48 h after implantation. Hormonal implants affect growth through two main mechanisms: by exerting a positive effect on food conversion, and on tissue proliferation (growth). In heifers, which are still in development, the conversion of food with estrogen implants can be increased by 6-8%. The member countries of the European Union have banned the use of hormones for anabolic purposes, so monitoring and control of these residues is very important in order to prevent abuse and to protect consumer's health. In terms of effects on human health, it is thought that anabolic growth promoters may in some cases lead to endocrine, developmental, immunological, neurobiological, immunotoxic, genotoxic and carcinogenic effects.

Keywords: *hormones, growth – promoters, implants, residues*

Oboljenja specifična za zaposlene u sektoru kontrole hrane

Azijada MULALIĆ, Merlina HADŽIMEŠIĆ

Univerzitet u Sarajevu, Veterinarski fakultet, BiH

Autor za korespondenciju: Azijada Mulalić, azijada.mulalic@student.vfs.unsa.ba

Sažetak

Rastom ljudske populacije došlo je do povećanih potreba za hranom kako biljnog tako i životinjskog porijekla. Povećanje industrijske proizvodnje mesa i mesnih proizvoda dovodi u veći rizik zaposlene u sektoru kontrole hrane. Po definiciji Svjetske Zdravstvene Organizacije (SZO) 'Zoonoze su one bolesti koje se prenose između životinja i čovjeka prirodnim putem'. Brojna su oboljenja koja kod životinja prolaze asimptomatski dok kod ljudi isti uzročnik može dovesti do teških posljedica. Kontakt sa uzročnikom, ishod zoonoze, dijagnosticanje i liječenje ovisi o brojnim faktorima. Na veterinarsko osoblje zoonoze se najčešće prenose kontaktom, vektorima i aerosolima. Zbog prirode posla osoblje je direktno izloženo uzročnicima koji ulaze kroz ugrizne rane, ogrebotine, ali i ubodne rane stoga je ovo osoblje svrstano u rizičnu skupinu. Neki od uzročnika najčešćih zoonotskih oboljenja u sektoru kontrole hrane su arthropode, bakterije, gljivice, helminti, prioni, praživotinje, rikecije, virusi. Kontrolni sektor u klaonicama je u direktnom kontaktu sa životinjskim tkivom i samim tim je za očekivati njihovu izloženost uzročnicima oboljenjima. Prvi zadatak jeste da se ukaže na postojanja ovih patogena i način njihovog prenosa na zaposlene u sektoru kontrole hrane, a ujedno i na potrošače. Zatim, da bi se na neki način suzbila i spriječila zoonotska oboljenja trebao bi postojati odgovarajući prijavni sistem, dovoljna saradnja i komunikacija između ljudskog zdravstva i veterinarskih specijalista. Vakcinacija, standardne i dodatne mjere opreza, pranje ruku, edukacija i obuka kao i korištenje personalne zaštitne opreme tamo gdje je to prikladno, je glavna kontrolna strategija za prevenciju zaraze kod radnika u klaonicama i radnika u sektoru kontrole hrane.

Ključne riječi: *zoonotska oboljenja, prenošenje oboljenja, uzročnici, izlaganje uzročnicima, sprječavanje oboljenja*

Specific diseases for employees in the food control sector

Azijada MULALIĆ, Merlina HADŽIMEŠIĆ

University of Sarajevo, Veterinary faculty, BiH

Corresponding author: Azijada Mulalić, azijada.mulalic@student.vfs.unsa.ba

Abstract

With the growth of the human population, there has been an increased need for food of both plant and animal origin. Increasing industrial production of meat and meat products puts employees in the food control sector at greater risk. According to the definition of the World Health Organization (WHO), "Zoonoses are those diseases that are transmitted between animals and humans naturally". There are many diseases that are asymptomatic in animals, while in humans the same cause can lead to severe consequences. Contact with the causative agent, the outcome of zoonosis, diagnosis and treatment depend on a number of factors. Zoonoses are most commonly transmitted to veterinary staff by contact, vectors, and aerosols. Due to the nature of the work, the staff is directly exposed to pathogens that enter through bite wounds, scratches and stab wounds, so this staff is classified as a risk group. Arthropods, bacteria, fungi, helminths, prions, protozoa, rickettsiae, viruses causes some of the most common zoonotic diseases in the food control sector. The control sector in slaughterhouses is in direct contact with animal tissue and therefore their exposure to diseases is to be expected. The first task is to point out the existence of these pathogens and the ways of their transmission to employees in the food control sector, and at the same time to consumers. Then, in order to prevent zoonotic diseases in some way, there should be an appropriate notification system, sufficient cooperation and communication between human health system and veterinary specialists. Vaccination, standard and additional precautions, hand washing, education and training as well as the use of personal protective equipment where appropriate, is the main control strategy for infection prevention in slaughterhouse workers and workers in the sector food control.

Keywords: *zoonotic diseases, disease transmission, causative agents, exposure to pathogens, disease prevention*

Razvoj proizvoda na bazi meda i jezgrastog voća

Adaleta ŠABIĆ^{1*}, Lejla BIBER²

^{1*} Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Odsjek za prehrambene tehnologije

² Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Katedra za tehnologiju prehrambenih proizvoda animalnog porijekla

*Autor za korespondenciju: Adaleta Šabić, sabcadaleta@gmail.com

Sažetak

Med je prirodno sladak, tekući, viskozni ili kristalizirani proizvod koji proizvode medonosne pčele (*Apis mellifera*). U radu su ispitivani fizičko-hemijski parametri dva uzorka meda (bagremov med i medljikovac). U uzorcima meda su određivani sljedeći parametri: sadržaj vlage, slobodna kiselina, električna provodljivost i sadržaj hidroksimetilfurfurala (HMF). Analizirani uzorci meda ispunjavaju kriterije o sastavu sadržaja vlage, slobodne kiseline, električne provodljivosti i sadržaja hidroskimetilfurfurala, definisane Pravilnikom o medu i drugim pčelinjim proizvodima (Sl. glasnik BiH, br. 37/09). Nakon izvršenih fizičko-hemijskih analiza, pristupljeno je razvoju proizvoda. Prema utvrđenoj recepturi, pripremljen je bagremov med sa komadićima lješnjaka i badema te medljikovac sa komadićima oraha. Cilj izrade meda sa dodacima jeste ponuditi novi proizvod koji je obogaćen sa jezgrastim voćem. Fortifikacijom meda sa funkcionalnim komponentama kao što su lješnjaci, bademi i orasi dobija se proizvod sa dodanom vrijednosti koji povoljno utiče na ljudsko zdravlje. Med je i dalje nezamjenjiv proizvod koji se može pronaći na tržištu, ali med se može dodatno unaprijediti nutritivno bogatim namirnicama i predstavljati pravi eliksir za imunitet i zdravlje.

Ključne riječi: *bagremov med, medljikovac, fizičko-hemijski parametri*

The development of honey products with nuts

Adaleta ŠABIĆ^{1*}, Lejla BIBER²

^{1*} University of Sarajevo, Faculty of Agriculture and Food Sciences, Department of Food Science and Technology

² University of Sarajevo, Faculty of Agriculture and Food Sciences, Department of Production Technology of Animal Based Food Products

*Corresponding author: Adaleta Šabić, sabcadaleta@gmail.com

Abstract

Honey is the natural sweet substance produced by honey bees (*Apis mellifera*). The aim of this thesis was to examine physical and chemical parameters in two samples of honey (acacia and honeydew honey). Moisture content, free acidity, electrical conductivity and content of hydroxymethylfurfural were determined for samples of honey. The analyzed samples of honey meet the criteria on the composition of moisture content, free acids, electrical conductivity and hydroxymethylfurfural content, defined by the Rulebook on honey and other bee products (Official Gazette of BiH, No. 37/09). After obtained physical and chemical parameters we have proceeded toward the development of acacia honey with hazelnuts and almonds and honeydew honey with nuts. The aim of making honey with added ingredients is to offer a new product that is enriched with nuts. Fortification of honey with functional components such as hazelnuts, almonds and walnuts gives a value-added product that has a beneficial effect on human health. Honey is irreplaceable product that can be found on the market and can be further enhanced with nutrient-dense foods.

Keywords: *acacia honey, honeydew honey, physical and chemical parameters*

Blijedo, mekano i vodenasto meso svinja

Anel VEJZOVIĆ^{1*}, Metod VREČKO¹

¹Univerzitet u Sarajevu, Veterinarski fakultet

Autor za korespondenciju: Anel Vejzović, anel_vejzovic@hotmail.com

Sažetak

Intenzivna i jednostrana selekcija svinja na veću mesnatost uzrokovala je promjenu njihovog neuro-hormonalnog stanja, a posljedica je nestabilnost njihove homeostaze, veća sklonost stresnim stanjima i pad kvalitete mesa. Stres kod svinja prije klanja može dovesti do iznenadnih uginuća, tačkastih krvarenja u mesu, modrica i oštećenja kože, krvnih podljeva, slomljenih kostiju, nedovoljne kvalitete mesa (blijedo, mekano i vodenast omeso - BMV i tamno, čvrsto i suho meso) i kontaminacije trupova patogenim mikroorganizmima. Uzrok za nastajanje BMV mesa, možemo tražiti i u korelaciji sa sindromom svinjskog stresa (PSS), jer kod stresnih situacija prije klanja nivo laktata raste i to uzrokuje pad pH u mesu što ima direktnu vezu sa pojavom BMV mesa. Ovakvo stanje je uzrokovano naglim padom pH određenih mišića tokom klanja usljed povećane potrošnje rezervi glikogena u vezi sa stresom. Bijela mišićna vlakna su osjetljivija na pojavu blijedog, mekanog i vodenastog mesa jer sadrže veću koncentraciju glikogena. Kao jedan od aspekata ove pojave navodi se i genetska predisponiranost. Različita istraživanja su pokazala da specifični gen kod svinja može pospješiti nastanak ovakvog mesa. Tzv. Halotan gen je također uzrok i povećanog broja uginuća pred klanje. Dokazano je da su neke rase (Pietrain, Duroc, Landras), izrazito mršave i mišićave rase, sklonije ka pojavi BMV mesa, jer su osjetljivije na stres. Danas se za smanjivanje pojave BMV mesa uključuju pažljiv dizajn vozila, dizajn klaonica, proces hlađenja, isto tako se koriste razni aditivi i/ili sastojci kako bi poboljšali kvalitet BMV mesa. Pitanja koja se često postavljaju su: “Da li BMV meso utiče na rok trajanja mesa?” i “Da li ovakvo meso može dovesti do povećane prisutnosti bakterija?”

Ključne riječi: *BMV, meso, svinje, PSS*

Pale, soft and exudative pig meat

Anel VEJZOVIĆ^{1*}, Metod VREČKO¹

¹University of Sarajevo, Veterinary faculty of Sarajevo

*Corresponding author: Anel Vejzović, anel_vejzovic@hotmail.com

Abstract

Intensive and directed selection of swine for bigger fleshiness has led to change of their neuro-endocrine condition, and the consequence is instability of homeostasis, larger sensitivity to stressful conditions and decreasing of meat quality. Stress in pigs before slaughter can lead to sudden deaths, petechial bleeding in meat, bruises, and skin damage, hemorrhage, broken bones, and lack of meat quality (pale, soft and exudative meat-PSE and dark, firm and dry meat- DFD) and contamination of carcasses with the pathogen microorganisms. Reason of PSE meat development can be in correlation with the PSS - Porcine stress syndrome, because during the stressful situations before slaughter, increased level of lactates is causing decrease of meat pH which is directly connected with PSE meat appearance. This condition is caused by sudden decrease of specific muscles pH during the slaughter because of stress-related increase of glycogen reserves consumption. White muscle fibers are more predisposed to the development of pale, soft and exudative meat because they contain larger concentration of glycogen. As one of the aspects of PSE, genetic predisposition is mentioned. Different researches have shown that specific gene in swine can enhance development of this kind of meat. So-called Halothane gene is also cause of large number of deaths before slaughter. It is proven that some race (Pietrain, Duroc, Landras), significantly thin and muscular race are more likely to develop PSE meat because they are more stress-sensitive. For minimalizing occurrence of PSE today, special design of vehicles, slaughterhouses, systems of cooling are introduced as well as different additives and ingredients which improve the quality of PSE meat. Questions often asked are: “Does PSE meat affect shelf life of meat?” and “Can this kind of meat lead to greater presence of bacteria?”

Keywords: *PSE, meat, swine, PSS*

2. TOKSIKOLOGIJA I SIGURNOST HRANE
FOOD SAFETY AND TOXICOLOGY

Uloga HACCP sistema u prevenciji nastanka i širenja bolesti koje se prenose hranom

Merima BEĆIREVIĆ^{1*}, Sabina ŠEČIĆ¹, Melda PIRIĆ¹, Franka MATIĆ¹,
Eldina SMJEČANIN¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Merima Bećirević, becirevicmerima@gmail.com

Sažetak

Sigurnost hrane definisana je kao osiguranje da hrana koja se priprema i konzumira na pravilan način neće naštetiti ljudskom zdravlju i blagostanju. Bolesti koje se prenose hranom (FBD) nastaju kao rezultat unošenja u organizam kontaminirane hrane i kao takve smatraju se važnim uzrokom morbiditeta i mortaliteta širom svijeta. Cilj rada bio je ukazati na važnost i ulogu efektivne implementacije HACCP sistema u svrhu sprečavanja nastanka i širenja zaraznih oboljenja koja se prenose hranom. Istraživanje je sprovedeno pregledom dostupne naučne i stručne literature publicirane u relevantnim bazama podataka upotrebom ključnih riječi „HACCP“, „food safety“ „foodborn diseases“. Rad je urađen kao pregledni članak. Proaktivni sistem sigurnosti hrane HACCP prepoznat je kao vodeći javno-zdravstveni instrument kojim se osiguravaju visoki standardi higijene i sigurnost u cjelokupnom lancu hrane. Subjekti u poslovanju s hranom koji pravilno primjenjuju i provode načela HACCP-a imaju manji rizik za kontaminaciju hrane unutar svojih objekata kao i razvoj oboljenja koja se prenose hranom među populacijom. Istraživanja pokazuju da visoka stopa oboljenja, smrtnih slučajeva kao i ekonomskih gubitaka povezanih s hranom ukazuju da jedino pravilna implementacija i efektivno funkcionisanje HACCP sistema u znatnoj mjeri prevenira ovakve neželjene ishode. Uspjeh u razvoju, implementaciji, nadzoru i verifikaciji uspješnosti HACCP sistema zavisi o složenom spoju upravljačkih, organizacijskih i tehničkih komponenti. Rastući trend bolesti povezanih s hranom u Evropi naglašava da utjecaj preventivnih mjera u posljednjih nekoliko godina nije bio dovoljno učinkovit kako se očekivalo. Pravilna primjena HACCP-a kao zakonska obaveza svih subjekata u poslovanju s hranom ne treba i ne smije biti isključivo administrativno-tehnička mjera već alat za osiguranje sigurnosti hrane i zaštitu ljudskog zdravlja.

Ključne riječi: *HACCP, sigurnost hrane, bolesti koje se prenose hranom*

2-O-1

The role of the HACCP system in the prevention and spread of foodborne diseases

Merima BEĆIREVIĆ^{1*}, Sabina ŠEČIĆ¹, Melda PIRIĆ¹, Franka MATIĆ¹,
Eldina SMJEČANIN¹

¹University of Sarajevo, Faculty of Health Studies, Department of Environmental Health,
BiH

*Corresponding author: Merima Bećirević, becirevicmerima@gmail.com

Abstract

Food safety is defined as ensuring that food which is prepared and consumed properly will not harm human health and well-being. Foodborne diseases (FBD) occurs as a result of consumption of contaminated food and as such they are considered an important cause of morbidity and mortality worldwide. The aim of this study was to point out the importance and role of effective implementation of the HACCP system in order to prevent the occurrence and spread of foodborne diseases. The research was conducted by reviewing the available scientific and professional literature published in relevant databases using the keywords "HACCP", "food safety". The paper was prepared as a review article. Proactive food safety system - HACCP is recognized as a leading public health instrument that ensures high standards of hygiene and safety throughout the food chain. Food business operators that properly apply and implement the principles of the HACCP system have a lower risk of food contamination within their facilities as well as the development of foodborne diseases among the population. Recent researches show that the high rate of disease, deaths and food-related economic losses indicate that only the proper implementation and effective functioning of the HACCP system can significantly prevent such adverse outcomes. Success in the development, implementation, monitoring and verification of the effective HACCP system depends on a complex combination of management, organizational and technical components. The growing trend of foodborne diseases in Europe highlights that the impact of preventive measures in recent years has not been as effective as expected. Proper implementation of HACCP as a legal obligation of all food business operators should not be exclusively an administrative and technical measure but a tool for ensuring food safety and protecting human health.

Keywords: *HACCP, food safety, foodborn diseases*

Utjecaj klimatskih promjena na sigurnost hrane

Iram GLADAN

Univerzitet u Sarajevu, Veterinarski fakultet, Odsjek za higijenu i tehnologiju namirnica,
BiH

*Autor za korespondenciju: Iram Gladan, iram.gladan@student.vfs.unsa.ba

Sažetak

Klimatske promjene predstavljaju veliku opasnost po sigurnost hrane u različitim segmentima prehrambenog lanca - od proizvodnje do konzumacije. Mnogi klimatski faktori, kao što su promjene temperature i količine padavina, povećana učestalost vremenskih prilika, zagrijavanje okeana, velike suše, šumski požari, otapanje ledenjaka i sve jače vremenske nepogode imaju izravan učinak na sigurnost hrane i prehrambeni sistem. Navedeni klimatski faktori doprinose promjenama postojećih patogena, te dovode do pojave novih patogena u hrani. Kontinuirane promjene temperature znatno utječu na postojanost i pojavu bakterija, virusa, parazita, štetnih algi, gljivica i njihovih vektora, te na širenje različitih bolesti koje se prenose hranom. Pored ovih utjecaja, uslijed pojave štetočina, dolazi do porasta hemijskih rezidua pesticida i veterinarskih lijekova u biljnim i životinjskim proizvodima. Klimatske promjene postale su naša svakodnevica i nezaobilazna tema u svim područjima znanosti. Znatno broj stručnjaka iz različitih znanstvenih oblasti međusobno koordinira na rješavanju problematike klimatskih promjena i omogućavanju međunarodne suradnje, s ciljem boljeg razumijevanja, razvoja i implementacije strategija za rješavanje problema sigurnosti hrane i javnog zdravlja. Osnovni cilj je identificiranje potencijalnih utjecaja klimatskih promjena i njihov utjecaj na sigurnost hrane, te njihova kontrola u svim fazama prehrambenog lanca.

Ključne riječi: *klimatske promjene, sigurnost hrane, javno zdravlje*

2-O-2

Impact of climate change on food safety

Iram GLADAN

University of Sarajevo, Faculty of Veterinary Medicine, Department of Food Hygiene and Technology

*Corresponding author: Iram Gladan, iram.gladan@student.vfs.unsa.ba

Abstract

Climate change has a major impact on food safety in various stages of food chain, from primary production to consumption. Climatic factors which include global mean precipitation and temperature changes, increased frequency of extreme weather conditions, ocean warming, major droughts, forest fires, melting glaciers as well as the increasing weather disasters highly affect food safety and the food system. These factors contribute to the change of existing pathogens, and lead to the emergence of new pathogens in food. Continuous changes in temperature significantly affect the persistence and appearance of bacteria, viruses, parasites, harmful algae, fungi and their vectors which contribute to spreading of various food-borne diseases. In addition to these effects, climate change alters the abundance and seasonal patterns of various pests, which leads to increase in chemical residues of pesticides and veterinary drugs in plant and animal products. In the past few years climate change has become a defining issue in all fields of science. Scientists and researchers from different disciplines contribute to addressing the issue of climate change by enabling international cooperation through cross – disciplinary collaborations. The main goal is to detect and manage the increased foodborne risks associated with climate change by developing and implementing strategies in food safety and public health.

Keywords: climate change, food safety, public health

Značaj humanog mlijeka kao uzorka u procjeni moguće ekspozicije dojenčadi postojanim organskim polutantima

Aida LUGUŠIĆ^{1*}, Aleksandra MARJANOVIĆ¹, Jasmina DJEDJIBEGOVIĆ¹, Miroslav ŠOBER¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku

*Autor za korespondenciju: Aida Lugušić, aida.lugusic@ffsa.unsa.ba

Sažetak

Postojani organski polutanti (POP) su organske hemijske supstance veoma otporne na fotolitičku, biološku i hemijsku degradaciju, te su samim tim vrlo postojani. Također, zbog izražen esemivolatilnosti podložne su atmosferskom transportu na velike udaljenosti. Najznačajnija karakteristika ovih jedinjenja je lipofilnost, pa lako prolaze kroz fosfolipidne strukture biloloških membrana nakon čega se deponuju u masnom tkivu i drugim tkivima sa visokim sadržajem lipida. Sve nabrojane osobine im omogućuju akumulaciju tokom vremena kao i biomagnifikaciju kroz lanac ishrane, što rezultira prisustvom POP i u organizmu ljudi i divljih životinja. Izloženost POP može uzrokovati razne štetne efekte na zdravlje ljudi. Sve navedeno ukazuje na značaj i potrebu redovnog monitoringa POP kako u okolišu tako i u hrani koja predstavlja i osnovni izvor ekspozicije populacije ovim polutantima. Prilikom monitoringa POP, neophodno je dati poseban značaj majčinom mlijeku kao hrani s velikim sadržajem masti. Majčino mlijeko predstavlja optimalnu prirodnu hranu za dojenčad a kako su POP lipofilne supstance koje imaju tendenciju akumulacije u masnom tkivu, često su prisutni u majčinom mlijeku. Cilj rada je bio istaknuti značaj praćenja koncentracija POP u majčinom mlijeku u svrhu procjene moguće ekspozicije dojenčadi POP. Rad je urađen kao pregledni članak u okviru kojeg je analizirano nekoliko naučnih radova objavljenih u relevantnim naučnim bazama podataka. Rezultati pretrage su doveli do zaključka da je upravo istraživanje sadržaja POP u uzorcima majčinog mlijeka od izuzetnog značaja, te može poslužiti i kao procjena ekspozicije za dojenče i kao procjena opterećenja populacije.

Ključne riječi: *majčino mlijeko, postojani organski polutanti, procjena ekspozicije dojenčadi*

2-O-3

Significance of human milk as sample in assessment of possible infant exposures to Persistent organic pollutants

Aida LUGUSIC^{1*}, Aleksandra MARJANOVIC¹, Jasmina
DJEDJIBEGOVIĆ¹, Miroslav SOBER¹

¹University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analytics

*Corresponding author: Aida Lugušić, aida.lugusic@ffsa.unsa.ba

Abstract

Persistent organic pollutants (POPs) are organic chemical substances very resistant to photolytic, biological and chemical degradation which makes them very persistent. Because of high semi-volatility they can be transported by atmosphere to long distances. The most significant feature of these compounds is lipophilicity so they easily pass through biological membranes whereupon are deposited in tissues with high percentage of lipids. All these features enable their accumulation and bio-magnification through the food chain over time resulting in presence of POPs both in humans and wildlife. Exposure can cause various harmful effects on human health. All this points to significance and need of regular monitoring of POPs both in environment and food. Through monitoring of POPs, special importance should be given to the food with high fat content such as human milk. Human milk is the optimal natural food for infants, and since POPs are lipophilic substances that have tendency to accumulate in adipose tissue, they are often present in human milk. The aim of this study was to highlight the importance of monitoring of POPs concentration in human milk with purpose of assessing possible infant exposure to POPs. The paper was written as review article, in which few scientific articles published in relevant scientific databases were analysed. The results of research led to the conclusion that the research of POP content in human milk samples is of exceptional importance and can serve both as an assessment of exposure for infants and as an assessment of the burden on the population.

Keywords: breast milk, persistent organic pollutants, infant exposure assessment

Procjena unosa sulfita konzumacijom hrane za dojenčad i malu djecu u Bosni i Hercegovini

Aida LUGUŠIĆ^{1*}, Aleksandra MARJANOVIĆ¹, Jasmina DJEDJIBEGOVIĆ¹, Miroslav ŠOBER¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku

*Autor za korespondenciju: Aida Lugušić, aida.lugusic@ffsa.unsa.ba

Sažetak

U namirnicima namijenjenim prehrani dojenčadi i male djece, prema zakonodavstvu Bosne i Hercegovine kao i Direktivama Europske Unije, nije dopuštena upotreba prehrambenih aditiva, uključujući i sulfite. Sulfiti se kao prehrambeni aditivi većinom dodaju u voćne sokove, pekarske proizvode, sušeno voće, vino i mesne prerađevine, a sve u svrhu antimikrobnog djelovanja, te konzerviranja prehrambenih proizvoda. Neka od dosadašnjih istraživanja su pokazala da su upravo voćni sokovi najvažniji izvor izloženosti djece sulfitima što se može objasniti povećanom konzumacijom voćnih sokova u pedijatrijskoj populaciji. Shodno tome, ciljevi rada su bili utvrditi prisutnost i sadržaj sulfita u voćnim sokovima i dečijoj hrani prisutnoj na tržištu Bosne i Hercegovine kao i procijeniti eventualnu izloženost djece istim. U ovom radu korištena je konvencionalna spektrofotometrijska metoda za određivanje sulfita u atmosferi koja je modifikovana i validirana za određivanje sulfita u hrani. U većini analiziranih uzoraka sadržaj sulfita je bio ispod propisane granice ali imajući na umu da je upotreba sulfita kao aditiva u hrani za dojenčad i malu djecu zabranjena možemo zaključiti da gotovo nijedan analizirani uzorak nije u skladu za važećim nacionalnim i međunarodnim propisima. Međutim, prosječna izloženost sulfitima iz procijenjenog dnevnog unosa hrane nije prekoračila prihvatljivi dnevni unos. Sve izračunate vrijednosti procjenjene izloženosti sulfitima bile su znatno ispod vrijednosti prihvatljivog dnevnog unosa ispitivane populacije.

Ključne riječi: *prehrambeni aditivi, sulfiti, hrana za djecu i dojenčad, procjena izloženosti*

2-O-4

Estimation of sulfites intake by food consumption for infants and toddlers in Bosnia and Herzegovina

Aida LUGUŠIĆ^{1*}, Aleksandra MARJANOVIC¹, Jasmina DJEDJIBEGOVIĆ¹, Miroslav SOBER¹

¹University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analytics

*Corresponding author: Aida Lugušić, aida.lugusic@ffsa.unsa.ba

Abstract

According to the legislation of Bosnia and Herzegovina and European Union Directives, the use of food additives, including sulfites, is not allowed in food for infants and toddlers. Sulfites, as food additives, are mostly added to fruit juices, bakery products, dried fruits, wine and meat products, with the purpose of antimicrobial effect and preservation of food products. Some of previous studies show that fruit juices are the most important source of children's exposure to sulfites, which can be explained by increased consumption of fruit juices in the pediatric population. Accordingly, the main objectives of this study were to determine presence and content of sulfites in fruit juices and ready to eat baby food present on Bosnia and Herzegovina food market, as well as to estimate possible exposure. In this study conventional spectrophotometric method for determining of sulfites in atmosphere was used, which was then modified and validated for sulfite determination in food. In most of the analyzed samples the sulfite content was below the prescribed limit, but having in mind that usage of sulfites like food additives in food product for infants and toddlers is prohibited, we can conclude that almost all of analyzed samples are not in accordance with applicable national and international regulations. However, the mean estimate dietary exposure to the sulfites did not exceed the acceptable daily intake. All calculated values of the estimated dietary exposure to sulfites of studied population were significantly below the acceptable daily intake values.

Keywords: food additives, sulfites, food for nursing child and toddlers, exposure assessment

HACCP sistem u klaonicama

Vahidin MEHMEDOVIĆ^{1*}, Senad KOVAČEVIĆ¹, Jasmin DUROVIĆ¹

¹Univerzitet u Sarajevu, Veterinarski fakultet, BiH

*Autor za korespondenciju: Vahidin Mehmedović, vahidin.mehmedovic@hotmail.com

Sažetak

Hazard Analysis and Critical Control Point ili HACCP predstavlja sistem kontrole hrane koji se zasniva na prevenciji, odnosno sprječavanju kontakta između mikroorganizama i hrane, u ovom slučaju mesa. HACCP sistem se zasniva na sedam principa: (1) Provođenje analize rizika, (2) Određivanje kritične kontrolne tačke (Critical Control Point ili CCP), (3) Uspostavljanje kritičnih limita, (4) Uspostavljanje sistema nadzora CCP, (5) Uspostavljanje popravnih mjera koje se poduzimaju kada sistem nadzora indicira da određeni CCP nije pod kontrolom, (6) Uspostavljanje procedura za potvrdu da HACCP sistem funkcioniše ispravno i (7) Utvrđivanje dokumentacije u pogledu svih procedura i odgovarajućih zapisa koji su vezani za navedene principe i njihovu aplikaciju. Hazardi, odnosno rizici koji mogu uzrokovati kontaminaciju mesa podijeljeni su na biološke, hemijske i fizičke. Od bioloških hazarda u obzir dolaze najčešće: *Salmonella*, *E. coli O157:H7*, *Campylobacter spp.*, *Yersinia enterocolitica*, *Listeria monocytogenes* i prioni. Hemijski rizici su više vezani za HACCP sistem na samoj farmi dok se fizički rizici uklanjaju postupcima dobre proizvodne prakse (GMP ili Good Manufacturing Process). Klaonice predstavljaju jedno od idealnih mjesta, prije svega zbog prisustva velike količine organskog materijala, za kontaminaciju hrane pa je stoga neophodno uvođenje HACCP sistema. Komercijalno najznačajnije su klaonice goveda, peradi i svinja. Analiza rizika u toku i procesu klanja ovih životinja osigurava siguran proizvod za konzumente.

Ključne riječi: *HACCP sistem, biološki rizici, klaonice*

2-O-5

HACCP system in slaughterhouses

Vahidin MEHMEDOVIĆ^{1*}, Senad KOVAČEVIĆ¹, Jasmin DUROVIĆ¹

¹University of Sarajevo, Faculty of Veterinary Medicine, B&H

*Corresponding author: Vahidin Mehmedovic, vahidin.mehmedovic@hotmail.com

Abstract

Hazard Analysis and Critical Control Point or HACCP represent a system of food control which is based on prevention, apropos stopping contact between microorganisma and food, in this case meat. HACCP si based on seven principles: (1) Conduct a hazard analysis, (2) Determine the Critical Control Points (CCPs), (3) Establish critical limits, (4) Establish a system to monitor control of the CCP, (5) Establish the corrective actions to be taken when monitoring indicates that a particular CCP is not under control, (6) Establish procedures for verification to confirm that the HACCP system is working correctly and (7) Establish documentation concerning all procedures and records appropriate to these principles and their application. Hazards which can cause meat contamination can be divided in to: biological, chemical and physical. Most important biological hazards are: *Salmonella*, *E. coli O157:H7*, *Campylobacter spp*, *Yersinia enterocolitica*, *Listeria monocytogenes* and prions. Chemical hazards sholud be more considered by HACCP system on the farm and physical hazards within good manufacturing practices (GMPs). Because there is a large amounts of organic material, slaughterhouses represents place where food contamination can happen very easily. Commercially most important slaughterhouses are for the beef, polutry and swine, and analysis of hazards in the flow and slaughtering proces can ensure safe product for the client.

Keywords: *HACCP system, biological hazards, slaughterhouses*

Trovanja hranom kontaminiranom bakterijama i načini njihove prevencije

Martina MEŠTROVIĆ^{1*}, Ivan GADŽA¹, Ivana GOBIN^{1,2}

¹Sveučilište u Mostaru, Fakultet zdravstvenih studija, Mostar

²Sveučilište u Rijeci, Medicinski fakultet, Zavod za mikrobiologiju i parazitologiju, Rijeka

* Autor za korespondenciju: Martina Meštrović, tina.mestrovic15@gmail.com

Sažetak

Bakterije su najrasprostranjeniji mikroorganizmi u prirodi koji se nalaze u zraku, vodi i zemlji. Veliki dio bakterija se prirodno nalazi u ili na čovjeku odnosno u njihovom probavnom sustavu, koži, nosnoj i usnoj šupljini te u drugim dijelovima čovjekovog organizma. Bakterije koje uzrokuju bolesti kod čovjeka, samostalno ili izlučivanjem svojih štetnih produkata nazivaju se patogenim bakterijama. Bakterijske vrste koje se mogu naći u hrani, a samostalno ili svojim toksičnim produktima uzrokuju trovanje hranom pripadaju rodovima: *Campylobacter*, *Escherichia*, *Listeria*, *Clostridium*, *Vibrio* i drugi. Trovanje hranom nastaje nakon konzumacije kontaminirane hrane i javlja se unutar 1 – 36 sati. Svaka bakterijska vrsta ima različiti izvor zaraze, infektivnu dozu, vrijeme inkubacije, kliničke simptome te tijekom izlječenja. Metodologija izrade rada bazirana je na pregledu literature objavljenoj od strane akademije za prehranu i dijetetiku (*Academy of Nutrition and Dietetics*). U ovom radu naglasak će biti na hrani koja može biti izvor različitih bakterijskih vrsta, a najčešće je riječ o različitim vrstama mesa, mlijeku, jajima te voću i povrću. Cilj ovoga rada je ukazati na važnost adekvatne pripreme i obrade namirnica kako bi se spriječio neželjen utjecaj konzumirane hrane na zdravlje čovjeka.

Ključne riječi: *bakterije, patogene bakterije, hrana, trovanje hranom, zdravlje čovjeka*

Food poisoning contaminated with bacteria and ways to prevent them

Martina MEŠTROVIĆ^{1*}, Ivan GADŽA¹, Ivana GOBIN^{1,2}

¹University of Mostar, Faculty of Health Studies, Mostar

²University of Rijeka, Faculty of Medicine, Department of Microbiology and Parasitology, Rijeka

*Corresponding author: Martina Meštrović, tina.mestrovic15@gmail.com

Abstract

Bacteria are the most widespread microorganisms in nature that are found in air, water and soil. A large part of bacteria is naturally found in or on humans, ie in their digestive system, skin, nasal and oral cavity, and in other parts of the human body. Bacteria that cause disease in humans, on their own or by excreting their harmful products, are called pathogenic bacteria. Bacterial species that can be found in food, and alone or with their toxic products cause food poisoning belong to the genera: *Campylobacter*, *Escherichia*, *Listeria*, *Clostridium*, *Vibrio* and others. Food poisoning occurs after consumption of contaminated food and occurs within 1 - 36 hours. Each bacterial species has a different source of infection, infectious dose, incubation time, clinical symptoms, and course of treatment. The methodology of the labor is based on a review of the literature published by the Academy of Nutrition and Dietetics. In this labor, the emphasis will be on food that can be a source of different bacterial species, and most often it is different types of meat, milk, eggs and fruits and vegetables. The aim of this labor is to point out the importance of adequate preparation and processing of food in order to prevent the undesirable impact of consumed food on human health.

Keywords: *bacteria, pathogenic bacteria, food, food poisoning, human health*

Rezidue pesticida u hrani

Edis NALOVIĆ^{1*}, Dženana MUJEZINOVIĆ¹, Berina DOBRAČA¹, Nejra HODŽIĆ¹, Ema PINDŽO¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Edis Nalović, nalovicedis99@gmail.com

Sažetak

Hrana je kombinacija različitih hemijskih komponenata koje su važne za ishranu i zdravlje. Primjena pesticida je sastavni dio moderne poljoprivrede, kojoj je jedan od osnovnih ciljeva proizvodnja zdravstveno ispravne hrane. Zbog velike upotrebe čest je slučaj pojave rezidua pesticida u hrani koji sadrže visoko otrovne tvari koje uzrokuju ozbiljne probleme za ljudsko zdravlje čak i u vrlo niskim koncentracijama. Cilj ovog rada je prikazati pregled trenutnih saznanja o štetnim efektima rezidua pesticida na zdravlje ljudi. Istraživanje je sprovedeno na osnovu pregleda naučne i stručne literature objavljene u relevantnim bazama podataka upotrebom ključnih riječi. Upotreba pesticida u poljoprivredi postala je vrlo česta praksa u zemljama u razvoju. Istraživanja navode da je povećana koncentracija rezidua pesticida u voću i povrću. Prisutnost ostataka pesticida u voću dovodi do ozbiljnih zdravstvenih problema, posebno kod djece. Pristup sigurnoj i pouzdanoj pitkoj vodi od vitalne je važnosti za zdravu populaciju. Međutim, površinske vode mogu biti onečišćene pesticidima zbog poljoprivrednih površina koje se nalaze u blizini. Ostaci pesticida negativno utiču na zdravlje, a negativni efekti često nisu vidljivi odmah, već nakon niza godina unošenja usljed kumulativnog dejstva nakon čega dolazi do razvoja teških oboljenja. Proširena upotreba pesticida očekivano rezultira ostacima u hrani. Ostaci pesticida predstavljaju visoki rizik za zdravlje ljudi zbog konzumacije hrane koja je kontaminirana tokom poljoprivredne proizvodnje.

Ključne riječi: *rezidue pesticida, zdravlje, hrana*

2-O-7

The pesticide residues in food

Edis NALOVIĆ^{1*}, Dženana MUJEZINOVIĆ¹, Berina DOBRAČA¹, Nejra HODŽIĆ¹, Ema PINDŽO¹

¹ University of Sarajevo, Faculty of Health Studies, Study program sanitary engineering, BIH

*Corresponding author: Edis Nalović, nalovicedis99@gmail.com

Abstract

Food is a combination of different chemical components that are important for nutrition and health. Pesticide application is an integral part of modern agriculture, one of the basic goals is the production of healthy food. Due to its high use, it is common for pesticide residues to appear in foods that contain highly toxic substances that cause serious problems for human health even in very low concentrations. The goal of this work is to present an overview of current knowledge about the harmful effects of pesticide residues on human health. The research was conducted on the basis of a review of scientific and professional literature published in relevant databases. The use of pesticides in agriculture has become a very common practice in developing countries. Research states that the concentration of pesticide residues in fruits and vegetables is increased. The presence of pesticide residues in the fruit leads to serious health problems, especially in children. Access to safe and reliable drinking water is vital for a healthy population. However, surface waters can be contaminated with pesticides due to nearby farmland. Pesticide residues have a negative effect on health, and the negative effects are often not visible immediately, but after a number of years of application due to the cumulative effect, after which severe diseases develop. Extended use of pesticides is expected to result in food residues. Pesticide residues pose a risk to human health due to the consumption of food contaminated during agricultural production, and it is necessary to respect the principles of good manufacturing practice, in order to prevent food contamination and adverse health effects.

Key words: *pesticide residues, health, food*

Javnozdravstveni značaj *Listeriae monocytogenes*

Edis NALOVIĆ^{1*}, Mirela MANDAK¹, Šejla MAŠIĆ¹, Ema PINDŽO¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Edis Nalović, nalovicedis99@gmail.com

Sažetak

Listeria monocytogenes jedan je od najčešćih patogena koji se prenose hranom. Meso i proizvodi od peradi glavni su nositelji patogenih sojeva *L. monocytogenes* za ljude. Listerioza je bolest uzrokovana konzumacijom hrane koja je kontaminirana *L. monocytogenes* i koja predstavlja veliki značaj za javno zdravlje, obzirom da može izazvati ozbiljne komplikacije. Najveći rizik predstavlja loša higijenska praksa pri rukovanja sa hranom u procesu proizvodnje kao i mogućnost patogena da raste na temperaturi hlađenja. Novorođenčad, starije osobe, trudnice i imunokompromitovane osobe imaju veći rizik za nastanak oboljenja u odnosu na druge populacione skupine. Cilj ovog rada je prikazati pregled trenutnih saznanja o javnozdravstvenom značaju *L. monocytogenes* kao patogena koji se prenosi hranom. Istraživanje je sprovedeno na osnovu pregleda naučne i stručne literature objavljene u relevantnim bazama podataka (Google scholar, PubMed). Mlijeko, meso i mesne preradevine predstavljaju glavni izvor nastanka infekcije. Epidemije listerioze u nekim zemljama, uzrokovane potrošnjom mlijeka i mliječnih proizvoda onečišćenih bakterijom *L. monocytogenes*, ukazuju na rizik i opasnost za zdravlje potrošača. Istraživanja pokazuju da osobe starije od 60 godina češće oboljevaju od listerioze. Također, važno je naglasiti da se među infekcijama koje se prenose hranom, listerioza svrstava u grupu bolesti s najčešćim smrtnim ishodom. U razvijenim zemljama zabilježeno je da od 20% do 25% infekcija dovodi do pobačaja ili mrtvorodenog ploda. Dobra higijenska praksa dovodi do smanjenja rizika od nastanka infekcije. Bolesti koje se prenose hranom usljed prisustva mikrobioloških kontaminanata predstavljaju ozbiljnu prijetnju za zdravlje ljudi.

Ključne riječi: *Listeria monocytogenes*, javnozdravstveni značaj, hrana.

2-O-8

The public health significance of *Listeria monocytogenes*

Edis NALOVIĆ^{1*}, Mirela MANDAK¹, Šejla MAŠIĆ¹, Ema PINDŽO¹

¹University of Sarajevo, Faculty of health sciences, Sanitary engineering, BiH

*Corresponding author: Edis Nalović, nalovicedis99@gmail.com

Sažetak

Listeria monocytogenes is one of the most common foodborne pathogens. Meat and poultry products are the main carriers of pathogenic strains of *L. monocytogenes* for humans. Listeriosis is a disease caused by the consumption of food that is contaminated with *L. monocytogenes* which represents a great concern for public health, as it can cause serious complications. The greatest risk is poor hygiene practices when handling food during the production process as well as the possibility of pathogens growing at cooling temperatures. Newborns, the elderly, pregnant women and immunocompromised persons have a higher risk of developing the disease compared to other population groups. The aim of this work is to present a review of current knowledge of the significance of *L. monocytogenes* as a foodborne pathogen and its impact on the public health. The research was conducted based upon a review of scientific and professional literature published in relevant databases (Google Scholar, PubMed). Milk, meat and meat products are the main source of infection. In some countries epidemics of listeriosis, caused by the consumption of milk and dairy products contaminated with *L. monocytogenes*, indicate a risk and danger to consumers health. Research shows that people over the age of 60 are more likely to get listeriosis. Also, it is important to emphasize that among food-borne infections, listeriosis is the one with the most common fatal outcome. In developed countries, 20% to 25% of infections have been reported to lead to miscarriage or stillbirth. Good hygiene practice reduces the risk of infection. Foodborne diseases pose a serious threat to human health due to the presence of microbiological contaminants.

Keywords: *Listeria monocytogenes*, public health significance, food

Genetski modificirana hrana

Medina OMERHODŽIĆ*, Samir RAMIĆ, Zerina AHMEDOVIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

*Autor za korespondenciju: Medina Omerhodžić, medinaomerhodzic@ffsa.unsa.ba

Sažetak

Genetska modifikacija podrazumijeva izdvajanje odabranih gena iz jednog organizma i umjetno prebacivanje u kompletne druge vrste. GMO su rezultat biotehnologije, odnosno primjene genetskog inženjstva s namjerom mijenjanja određenih ciljnih karakteristika organizama. Hrana porijeklom od GMO nije testirana kao što su to lijekovi, suplementi i aditivi. Za GM hranu niko ne jamči sigurnost. Najveći proizvođači i izvoznici GM hrane su SAD, Kanada i Argentina. Važnost hrane u našem svakodnevnom životu je ključna, pa je njena zdravstvena bezbjednost postala bezuvjetan zahtjev, kako potrošača tako i domaćeg i međunarodnog zakonodavstva. Iako GMO nisu povezani sa novim slučajevima bolesti, u javnosti je stvoren skepticizam i strah od GMO, virusa, bakterija i DNK. U svakom slučaju, mogućnost nemara u kontroli kvaliteta hrane i opasnost za zdravlje su najveće brige nedovoljno upućene javnosti, te bi nauka poseban akcenat trebala staviti upravo na informisanje o genetski modificiranoj hrani. Genetički modificirana hrana je danas najveći javni izazov i to polazeći od stava apsolutne negacije, a sa druge strane pobornici te hrane vide rješenje za eliminiranje gladi koja je veliki problem, a ujedno vide u ovom obliku proizvodnje temeljnu budućnost poljoprivrede. Ove suprotstavljene krajnosti je gotovo nemoguće izmiriti i gotovo je nemoguće kompromis između opredjeljenja koja se međusobno isključuju.

Ključne riječi: *genetski modificirana hrana, korist, izazov, budućnost*

2-O-9

Genetically modified food

Medina OMERHODŽIĆ, Samir RAMIĆ, Zerina AHMEDOVIĆ

University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analysis, BiH

*Corresponding author: Medina Omerhodžić, medinaomerhodzic@ffsa.unsa.ba

Abstract

Genetic modification involves the isolation of selected genes from one organism and artificial transfer to complete other species. GMOs are the result of biotechnology, ie the application of genetic engineering with the intention of changing certain target characteristics of organisms. Foods derived from GMOs have not been tested such as drugs, supplements and additives. No one guarantees safety for GM food. The largest producers and exporters of GM food are the United States, Canada and Argentina. The importance of food in our daily lives is crucial, so its health safety has become an unconditional requirement, both for consumers and domestic and international legislation. Although GMOs are not linked to new cases of the disease, public skepticism and fear of GMOs, viruses, bacteria and DNA have been created. In any case, the possibility of negligence in food quality control and the danger to health are the biggest concerns insufficiently addressed to the public, and science should place special emphasis on information about genetically modified food. Genetically modified food is the biggest public challenge today, starting from the attitude of absolute negation, and on the other hand, proponents of that food see a solution to eliminate hunger, which is a big problem, and also see in this form of production the fundamental future of agriculture. These opposing extremes are almost impossible to reconcile and it is almost impossible to compromise between mutually exclusive commitments.

Keywords: *genetically modified food, benefit, challenge, future*

Genetski modificirana hrana i zakonska regulativa u Bosni i Hercegovini

Melda PIRIĆ^{1*}, Sabina ŠEČIĆ¹, Merima BEĆIREVIĆ¹, Franka MATIĆ¹,
Amar ŽILIC¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Melda Pirić, melda_piric98@yahoo.com

Sažetak

Genetski modificirana (GM) hrana je hrana koja potječe od organizama čiji je genetski materijal (DNK) modificiran na način koji se ne javlja prirodno, npr. uvođenjem gena iz drugog organizma. Tehnologija se često naziva „moderna biotehnologija“ ili „genska tehnologija“, ponekad također „tehnologija rekombinantne DNA“ ili „genetski inženjering“. Trenutno dostupna GM hrana proizlazi uglavnom iz biljaka, ali u budućnosti će se hrana koja dolazi od GM mikroorganizama ili GM životinja vjerojatno uvesti na tržište. Većina postojećih genetski modificiranih usjeva razvijena je za poboljšanje prinosa uvođenjem otpornosti na biljne bolesti ili povećane tolerancije na herbicide. GM hrana također može omogućiti smanjenje cijena hrane kroz poboljšane prinose i pouzdanost, međutim pojava i uključenje GMO-a u životnu sredinu, prvenstveno u lanac prehrane, primjena u humanoj medicini, kao i trgovina GM namirnicama rezultirali su debatom globalnih razmjera o opravdanosti primjene ovih proizvoda biotehnologije. Ovaj rad daje pregled glavnih stajališta o kojima se trenutno raspravlja u sektoru prehrambene biotehnologije kada je u pitanju genetski modificirana hrana u svijetu. Pored toga, opisane su i osnovne karakteristike principa i smjernica za međunarodnu trgovinu, kontrolu i procjenu rizika GMO-a, naročito hrane bazirane na GMO-ima, kao i pitanje sadašnje međunarodne, regionalne i bosanskohercegovačke legislative o GMO-ima.

Ključne riječi: *GMO, genetski modificirana hrana, tehnologija, legislativa*

2-O-10

Genetically modified food and legislation in Bosnia and Herzegovina

Melda PIRIĆ^{1*} Sabina ŠEČIĆ¹ Merima BEĆIREVIĆ¹ Franka MATIĆ¹
Amar ŽILIC¹

¹University of Sarajevo, Faculty of Health Studies, Department of Environmental Health,
BiH

*Corresponding author: Melda Pirić, melda_piric98@yahoo.com

Abstract

Genetically modified (GM) foods are foods derived from organisms whose genetic material (DNA) has been modified in a way that does not occur naturally, e.g. through the introduction of a gene from a different organism. The technology is often called “modern biotechnology” or “gene technology”, sometimes also “recombinant DNA technology” or “genetic engineering”. Currently available GM foods stem mostly from plants, but in the future foods derived from GM microorganisms or GM animals are likely to be introduced on the market. Most existing genetically modified crops have been developed to improve yield through the introduction of resistance to plant diseases or of increased tolerance of herbicides. GM foods can also allow for reductions in food prices through improved yields and reliability. However, the emergence and inclusion of GMOs in the environment, primarily in the food chain, applications in human medicine, as well as trade in GM foods have resulted in a global debate on the justification for the use of these biotechnology products. This paper provides an overview of the main views currently being discussed in the food biotechnology sector when it comes to genetically modified food in the world. In addition, the basic characteristics of the principles and guidelines for international trade, control and risk assessment of GMOs, especially GMO-based foods, are described, as well as the issue of current international, regional and Bosnian legislation on GMOs.

Keywords: *GMO, genetically modified food, technology, legislation*

Alergije na hranu

Samir RAMIĆ, Zerina AHMEDOVIĆ, Medina OMERHODŽIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

*Autor za korespondenciju: Samir Ramić, ramic_samir2011@hotmail.com

Sažetak

Alergija je neuobičajeni i neprimjereni odgovor imunološkog sistema na različite faktore okoline. Riječ alergija dolazi od dvije grčke riječi: „allos“ – drugo; te „ergon“ - rad. Alergija se manifestira kao reakcija preosjetljivosti na faktore okoline koje nazivamo antigenima ili alergenima. Simptomi alergijske reakcije mogu biti opći (sistematski) ili lokalni, lokalizirani na organ ili organski sistem putem kojeg je alergen ušao u tijelo (koža i sluznice, probavni/respiratorni trakt). Simptomi alergijske reakcije znatno se razlikuju u brzini nastanka i intenzitetu. Katkada se lokalni i opći simptomi razvijaju izrazito brzo te mogu ugroziti život bolesnika (anafilaktički šok). Alergije predstavljaju i odgovor našeg organizma na strane molekule. Problem stranih molekula je u tome što one ne uzrokuju svaki put trovanja kad dospiju u naš organizam, nego naš imuni sistem trpi hroničnu, dugotrajnu ekspoziciju tom antigenu. Alergija na hranu (nutritivna alergija) je oblik nepodnošenja hrane uzrokovane imunološkim mehanizmom. Najčešći je mehanizam posredovan IgE antitijelima, onim koja posreduju alergijske reakcije na alergene iz zraka (astmu, alergijski rinokonjuktivitis) i otrov insekata (urtikarija, anafilaktički šok). U slučaju alergije na hranu, sama hrana postaje alergenom. Alergija na hranu najčešća je u djetinstvu, a potom se vremenom gubi. U dobi od 0 do 3 godine alergija na hranu se otkriva u 8%-28% djece, a u odraslih ne više od 1,4%-2%. Da bi se postigla dobra kontrola bolesti, potrebno je individualno odabrati odgovarajuće lijekove, utvrditi i izbjegavati uzročne alergene, poučiti bolesnika o postupcima liječenja i samopomoći te redovno nadzirati i prilagođavati liječenje stepenu težine bolesti.

Ključne riječi: *alergije, alergeni, antigeni, hrana, neželjene reakcije*

2-O-11

Food allergies

Samir RAMIĆ, Zerina AHMEDOVIĆ, Medina OMERHODŽIĆ

University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analysis, BiH

Corresponding author: Samir Ramić, email: ramic_samir2011@hotmail.com

Abstract

Allergy is an unusual and inappropriate response of the immune system to various environmental factors. The word allergy comes from two Greek words: "allos" - second; and "ergon" - work. Allergy manifests as a reaction of hypersensitivity to environmental factors that we call antigens or allergens. Symptoms of an allergic reaction can be general (systemic) or local, localized to an organ or organ system through which the allergen has entered the body (skin and mucous membranes, digestive / respiratory tract). The symptoms of an allergic reaction vary considerably in speed and intensity. Sometimes local and general symptoms develop extremely rapidly and can be life-threatening (anaphylactic shock). Allergies are also our body's response to foreign molecules. The problem with foreign molecules is that they do not cause poisoning every time they enter our body, but our immune system suffers from chronic, long-term exposure to that antigen. Food allergy (nutritional allergy) is a form of food intolerance caused by an immune mechanism. The most common mechanism is mediated by IgE antibodies, those that mediate allergic reactions to airborne allergens (asthma, allergic rhinoconjunctivitis) and insect venom (urticaria, anaphylactic shock). In the case of a food allergy, the food itself becomes an allergen. Food allergies are most common in childhood and then disappear over time. At the age of 0 to 3 years, food allergy is detected in 8% - 28% of children and in adults no more than 1.4% - 2%. In order to achieve good disease control, it is necessary to individually select appropriate drugs, identify and avoid causative allergens, teach patients about treatment and self-help procedures, and regularly monitor and adjust treatment to the severity of the disease.

Keywords: *allergies, allergens, antigens, food, side effects*

Analiza RASFF obavijesti o rizicima po sigurnost hrane koje uključuju Bosnu i Hercegovinu

Sabina ŠEČIĆ^{1*}, Melda PIRIĆ¹, Merima BEĆIREVIĆ¹, Franka MATIĆ¹,
Eldina SMJEČANIN¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Sabina Šečić, sabinasecic84@gmail.com

Sažetak

Evropski sistem brzog uzbunjivanja za hranu i hranu za životinje (RASFF) jedan je od najznačajnijih alata za međunacionalnu komunikaciju o rizicima po sigurnosti hrane duž globalnog lanca opskrbe hranom kao i za zaštitu zdravlja i interesa potrošača. Cilj rada bio je analizirati RASFF obavijesti o rizicima po sigurnost hrane za ljudsku upotrebu, a koje su se odnosile na Bosnu i Hercegovinu. Podaci su korišteni sa službenog EU RASFF portala. Analizirane su ukupno 142 obavijesti koje su uključivale BiH kao zemlju trećeg reda u RASFF mreži za period od augusta 2003. do augusta 2020. godine. Rad je urađen kao opservaciona, deskriptivna studija. Od ukupno 142 zaprimljene obavijesti, 28.8% obavijesti odnosilo se na hranu porijeklom iz BiH, 66.9% obavijesti bilo je vezano za hranu koja je distribuirana na tržište BiH iz drugih zemalja. 4,2% obavijesti nacionalna kontakt tačka BiH zaprimila je za hranu porijeklom iz drugih zemalja, ali koja nije distribuirana na tržište BiH. Od ukupnog broja obavijesti dominantne su bile hitne obavijesti (59.8%). U odnosu na kategoriju hazarda najveći broj obavijesti odnosio se na neusklađenosti u pogledu prisustva stranih tijela (12.6%), sastava hrane (11.3%), te patogenih mikroorganizama (9.6%). U odnosu na nivo rizika, 38.0% zaprimljenih obavijesti bile su u kategoriji ozbiljnog rizika. U odnosu na kategoriju proizvoda najveći broj obavijesti zaprimljen je za dodatke prehrani i hranu obogaćenu nutrijentima (19.0%), te za voće i povrće (16.9%). Pridruživanjem RASFF mreži, BiH je učinila veliki iskorak u pogledu bržeg i efikasnijeg djelovanja u slučaju pojave rizika po sigurnost hrane kako na nacionalnom tako i na međunarodnom nivou.

Ključne riječi: *RASFF, sigurnost hrane, opasnosti, BiH*

2-O-12

Analysis of RASFF notifications on food safety risks including Bosnia and Herzegovina

Sabina ŠEČIĆ^{1*}, Melda PIRIĆ¹, Merima BEĆIREVIĆ¹, Franka MATIĆ¹,
Eldina SMJEČANIN¹

¹University of Sarajevo, Faculty of Health Studies, Department of Environmental Health, BiH

*Corresponding author: Sabina Šečić, sabinasecic84@gmail.com

Abstract

The European Rapid Alert System for Food and Feed (RASFF) is one of the most important tool for transnational communication on food safety risks along the global food supply chain as well as for the protection of health and consumer interests. The aim of this study was to analyze RASFF notification on food safety risks for food intended for human consumption, which were related to Bosnia and Herzegovina. Data were extracted from the EU RASFF portal. A total of 142 notifications that included BiH as a third country in the RASFF network were analyzed. Notifications were analyzed for the period from August 2003 to August 2020. The study was conducted as descriptive observational study. Out of total 142 received notifications, 28.8% of notifications referred to food originating from BiH, 66.9% of notifications were related to food distributed to the BiH market from other countries. 4.2% of the notifications were received by the BiH National Contact Point for food originating from other countries, but not distributed on the BiH market. Out of the total number of notifications, emergency notifications were dominant (59.8%). In relation to the category of hazards, the most of notifications referred to discrepancies in terms of the presence of foreign bodies (12.6%), food composition (11.3%) and pathogenic microorganisms (9.6%). In relation to the level of risk, 38.0% of received notifications were in the category of serious risk. In relation to the product category, the largest number of notifications were received for food supplements and food rich in nutrients (19.0%) and for fruits and vegetables (16.9%). Joining the RASFF network, BiH has made a big step forward in terms of faster and more efficient action in case of food safety risks at national and international levels.

Keywords: *RASFF, food safety, hazards, BiH*

Uticaj nitrata i nitrita u hrani i vodi na razvoj methemoglobinemije

Emir ŠEHERČEHAJIC^{1*}, Adisa RAMIĆ¹, Almedina HAJROVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija

*Autor za korespondenciju: Emir Šeherčehajić, sehercehajic.e@outlook.com

Sažetak

Nitrati i nitriti su tvari prirodnog ili vještačkog porijekla u hrani, koji u koji zavisnosti od unijete količine mogu imati pozitivan odnosno negativan uticaj na zdravlje. Dominatni izvori nitrata i nitrita u hrani su aditivi te kontaminirana voda. Ciljevi ovog istraživanja su: ispitati učestalost i uticaj egzogeno unešenih nitrata i nitrita na zdravlje različitih starosnih grupa sa fokusom na methemoglobinemiju, definisati prihvatljivi dnevni unos nitrata i nitrita i preporučiti mjere u cilju prevencije intoksikacije nitratima i nitritima. Materijal ovog rada predstavljaju istraživačke studije objavljenje u periodu od 2014. do 2020. godine. Rad je analitička i komparativna studija. Uneseni nitrati se reduciraju u nitrite te se apsorbiraju iz probavnog sistema u cirkulaciju, a zatim se uklanjaju putem bubrega. Prilikom vezanja nitrita i hemoglobina nastaje methemoglobin, koji ima manji afinitet ka kisiku. Stoga, prekomjeran unos nitrata može dovesti do razvoja methemoglobinemije, koja se najčešće susreće kod djece kao "sindrom plavog djeteta". Ovakvo akutno stanje se upravo najčešće i susreće kod djece, zbog prisustva fetalnog hemoglobina, koji je osjetljiviji na oksidaciju od adultnog hemoglobina. Najviše koncentracije ovih spojeva su u područjima intenzivne poljoprivredne proizvodnje gdje se akumuliraju u tlu i podzemnim vodama. FAO i WHO postavile su prihvatljivi dnevni unos u hrani na maksimalno 3,7 mg nitratnog jona ili 5 mg natrijevog nitrata/kg tjelesne mase, te 0,07 mg/kg/dan za nitrite. Prema Pravilniku o zdravstvenoj ispravnosti vode za piće dozvoljena koncentracija nitrata u vodi je <50 mg/l, a nitrita 0,5 mg/l. Preventivne mjere se mogu usmjeriti na smanjenje upotrebe gnojiva obogaćenog nitratima, pravilno skladištenje hrane, te prečišćavanje kontaminirane vode.

Ključne riječi: *nitrati, nitriti, methemoglobinemija, sindrom plavog djeteta, kontaminacija*

2-O-13

Effect of nitrate and nitrite in food and water on the development of methemoglobinemia

Emir SEHERCEHAJIC^{1*}, Adisa RAMIC¹, Almedina HAJROVIC¹

¹University of Sarajevo, Faculty of Health Studies

*Corresponding author: Emir Sehercehajic, sehercehajic.e@outlook.com

Abstract

Nitrates and nitrites are substances of natural or artificial origin in food, which, depending on the amount ingested, can have a positive or negative impact on health. The dominant sources of nitrate and nitrite in food are additives and contaminated water. The objectives of this study are: to examine the frequency and impact of exogenously ingested nitrates and nitrites on the health of different age groups with a focus on methaemoglobinaemia, to define acceptable daily intake of nitrates and nitrites and to recommend measures to prevent nitrate and nitrite intoxication. The material of this paper is research studies published in the period from 2014 to 2020. The paper is an analytical and comparative study. Ingested nitrates are reduced to nitrites and absorbed from the digestive system into the circulation and then excreted by the kidneys. When nitrite and hemoglobin bind, methemoglobin is formed, which has a lower affinity for oxygen. Therefore, excessive nitrate intake can lead to the development of methaemoglobinaemia, which is most commonly encountered in children as “blue baby syndrome”. This acute condition is most common in children, due to the presence of fetal hemoglobin, which is more sensitive to oxidation than adult hemoglobin. The highest concentrations of these compounds are in areas of intensive agricultural production where they accumulate in soil and groundwater. The FAO and WHO set an acceptable daily dietary intake of a maximum of 3.7 mg nitrate ion or 5 mg sodium nitrate/kg body weight, and 0.07 mg/kg/day for nitrites. According to the Ordinance on the health safety of drinking water, the permitted concentration of nitrate in water is <50 mg/l, and nitrite 0.5 mg/l. Preventive measures can be aimed at reducing the use of nitrate-enriched fertilizers, proper food storage, and purification of contaminated water.

Keywords: *nitrates, nitrites, methemoglobinemia, blue baby syndrome, contamination*

Mikroplastika u hrani

Lamija TUZLAK^{1*}, Ilma TERZIĆ¹

¹Univerzitet u Sarajevu, Veterinarski fakultet, BiH

*Autor za korespondenciju: Lamija Tuzlak, lamija_tuzlak@hotmail.com

Sažetak

Plastika sve češće zamjenjuje druge materijale zbog svojih povoljnih svojstava. Zbog neodrživog načina gospodarenja plastičnim otpadom, te zbog nepotpune razgradnje, plastika se nakuplja u morskome okolišu u obliku krupnog plastičnog otpada te se degradacijom preko fizikalnih, hemijskih i bioloških parametara stvara mikroplastika čije čestice ne prelaze promjer od 5 milimetara. Cilj ovog rada je utvrditi prisustvo mikroplastike u hrani, kao i njen eventualni rizik i posljedice po zdravlje ljudi i životinja. Mikroplastika u morima ima štetan utjecaj na živi svijet, ulazi u probavni sistem morskih organizama, a toksični spojevi koje na sebe privlači, nakupljaju se i prenose kroz hranidbene lance, te s vremenom dolaze do čovjeka. Uslijed toga povećan je broj istraživanja koja su fokusirana na moguće zdravstvene implikacije konzumiranja mikroplastike. Istraživanja su pokazala proporcionalan porast mikroplastike i gustoće naseljenosti određenog područja. Potrebna su dodatna istraživanja mogućnosti bioakumulacije toksičnih tvari u mikroplastici. Posljednjih je godina problem mikroplastike sve primjećeniji i poznatiji, no i dalje se istraživanja temelje na nižim trofičkim oblicima života.

Ključne riječi: *mikroplastika, prehrambeni lanac, mikroplastično zagađenje, javno-zdravstveni problem*

Microplastic in food

Lamija TUZLAK^{1*}, Ilma TERZIĆ¹

¹ University of Sarajevo, Faculty of Veterinary Medicine, BiH

* Corresponding author: Lamija Tuzlak, lamija_tuzlak@hotmail.com

Abstract

Plastic is increasingly replacing other materials due to its favorable properties. Due to unsustainable management of plastic waste and incomplete decomposition, plastic accumulates in the marine environment in the form of large plastic waste. Degradation through physical, chemical and biological parameters creates microplastics, which particles do not exceed 5 millimeters in diameter. The purpose of this study is to determine the presence of microplastic in the food chain, potential risks and consequences for human and animal health. Microplastics in the seas have a harmful impact on the living world, it enters the digestive system of marine organisms, and toxic compounds, which it attracts, are being accumulated and transmitted through food chains and eventually reach humans. As a result, an increasing number of studies is focused on the possible health implications of microplastic consumption. Studies have shown a proportional increase in microplastics and population density of a particular area. Further research into the potential for bioaccumulation of toxic substances in microplastics is needed. Over the last few years, the problem of microplastics has become increasingly noticeable and well-known, but research is still based on lower trophic life forms.

Keywords: *microplastic, food chain, microplastic pollution, public health*

3. ISHRANA TOKOM ŽIVOTNOG CIKLUSA
LIFECYCLE NUTRITION

Poteškoće prilikom provođenja bezglutenske prehrane kod osoba oboljelih od celijakije

Toni ANDROJA^{1*}, Ivan GADŽA¹, Ivona LJEVAK²

¹Sveučilište u Mostaru, Fakultet zdravstvenih studija, Mostar, Bosna i Hercegovina

²Sveučilište u Mostaru, Fakultet zdravstvenih studija, Katedra za kliničku zdravstvenu njegu, Mostar, Bosna i Hercegovina,

*Autor za korespondenciju: Toni Androja, tandroja@gmail.com

Sažetak

Celijakija je kronična gastroenterološka, autoimuna bolesti čiji je uzrok trajna nepodnošljivost proteina glutena koji je prisutan u pšenici, ječmu, raži. Tipična glutenska enteropatija se može manifestirati kod nekih osoba i izazvati teško oštećenje sluznice tankog crijeva, zbog čega je umanjena resorpcija hrane. Simptomi bolesti kod odraslih su nešto drugačiji od simptoma u dječjem dobu, te ponekad nisu povezani sa probavnim sustavom, nego se bolest manifestira isključivo izvan probavnog sustava. Liječenje se provodi strogom doživotnom dijetom bez glutena, i to je jedini mogući način liječenja oboljelih. Ispitati s kojim poteškoćama se susreću odrasle osobe oboljele od celijakije kod provođenja bezglutenske dijeta. U istraživanju je sudjelovalo ukupno 249 ispitanika kojima je celijakija dijagnosticirana u starijoj životnoj dobi (od 18 do 79 godina starosti). Primijenjen je upitnik koji sadrži ukupno 24 varijable, a koje se odnose na tijek bolesti, zadovoljstvo pojedinim aspektima bezglutenske prehrane, njihov stav o sigurnosti proizvoda koje konzumiraju. Anketa je provedena preko Google ankete, a za statističku analizu se koristio program Statistica1 0.0. Prosječna starosna dob ispitanika je 39 godina. Rezultati istraživanja ukazuju na to da se 90,36% ispitanika pridržava bezglutenske prehrane, 70,28% smatra kako bezglutenska prehrana nije lako dostupna, dok 61,04% ispitanika smatra da je hrana manje ukusna. Istraživanje je također pokazalo kako se 62,24% ispitanika moralo odreći omiljenih jela nakon otkrivene dijagnoze celijakije. Provedenim istraživanjem se može zaključiti kako oboljeli od celijakije imaju izražene poteškoće kod provođenja bezglutenske prehrane.

Ključne riječi: *celijakija, simptomi, bezglutenska prehrana, dostupnost*

3-O-1

Difficulties in gluten-free diet for people with celiac disease

Toni ANDROJA^{1*}, Ivan GADŽA¹, Ivona LJEVAK²

¹ University of Mostar, Faculty of Health Studies, Mostar, Bosnia and Herzegovina

² University of Mostar, Faculty of Health Studies, Department of Clinical Health Care,
Mostar, Bosnia and Herzegovina,

*Corresponding author: Toni Androja, tandroja@gmail.com

Abstract

Celiac disease is a chronic gastroenterological, autoimmune disease caused by a persistent intolerance to the gluten protein found in the protein of wheat, barley, rye and oats. The result is a typical gluten enteropathy that manifests in some people and causes severe damage to the lining of the small intestine, resulting in reduced food resorption. The symptomatology of the disease in adulthood is somewhat different from the symptoms in childhood, and sometimes they have nothing to do with the digestive system, but the disease manifests itself exclusively outside the digestive system. Treatment is carried out with a strict lifelong gluten-free diet, and this is the only possible way to treat the sick. To examine the difficulties faced by adults with celiac disease when following a gluten-free diet. A total of 249 subjects participated in the study. Celiac disease was detected in old age (18 to 79 years of age). A self-created questionnaire containing a total of 24 variables was applied, which relate to the course of the disease, satisfaction with certain aspects of a gluten-free diet, their position on the safety of the products they consume. The survey was conducted through a Google survey, and the Statistica 10.0 program was used for statistical analysis. The average age of the respondents was 39 years. The results of the survey indicate that 90.36% of respondents adhere to a gluten-free diet, 70.28% believe that a gluten-free diet is not readily available, while 61.04% of respondents believe that food is less tasty. The study also showed that 62.24% of respondents had to give up favorite foods after a diagnosis of celiac disease was discovered. The conducted research can conclude that patients with celiac disease have severe difficulties in implementing a gluten-free diet.

Keywords: celiac disease, symptoms, gluten-free diet, availability.

Ishrana domaćinstava u tri grada u FBiH tokom pandemije Covid-19

Amra BAJRIĆ^{1*}, Dženad AVDOVIĆ¹, Emir HAJDAREVIĆ¹, Majda BAJRIĆ², Irma ČEHIĆ^{1,2}, Sanela Merjem RUSTEMPAŠIĆ¹

¹Univerzitet u Sarajevu, Pedagoški fakultet, Odsjek za razrednu nastavu, BiH

²Univerzitet u Sarajevu, Pedagoški fakultet, Odsjek za predškolski odgoj, BiH

*Autor za korespondenciju: Amra BAJRIĆ, amrabajric0506@gmail.com

Sažetak

Svjedoci smo da su se u posljednjih nekoliko mjeseci u našim životima dogodile brojne promjene uzrokovane pandemijom virusa Covid-19. Značajne promjene desile su se u svim sferama života, pa tako i u prehrani domaćinstava. Shodno tome, Svjetska zdravstvena organizacija (WHO) dala je preporuke koje se odnose na sigurnost hrane uključujući savjete o primjeni dobre higijenske prakse prilikom rukovanja i pripreme hrane. Iako mnoga domaćinstva gotova jela i prerađenu hranu vide kao brz i jeftin način da prehrane svoje članove, dostupne su i praktične, povoljne i zdrave alternative. Cilj ovog rada bio je ispitati promjene u ishrani domaćinstava u tri grada Bosne i Hercegovine. U svrhu istraživanja proveden je intervju u 20 domaćinstava iz tri grada u BiH: Sarajevo, Goražde i Sanski Most. Intervju je sadržavao pitanja koja se odnose na nabavku i način pripreme hrane, upotrebu posebnih higijenskih mjera, uključivanja dodatka prehrani i korištenja namirnica koje su bogate različitim vitaminima. Također ispitali smo koliko se razlikuje način pripreme hrane prije i u toku pandemije. Ovim istraživanjem željeli smo ispitati koliko su se domaćinstva pridržavala preporuka Svjetske zdravstvene organizacije i drugih stručnih lica. Ishodi istraživanja i konačni zaključci bit će objavljeni u prezentaciji.

Ključne riječi: *domaćinstva, ishrana, Covid-19*

3-O-2

Household nutrition in three cities of FBiH during the Covid-19 pandemic

Amra BAJRIĆ^{1*}, Dženad AVDOVIĆ¹, Emir HAJDAREVIĆ¹, Majda BAJRIĆ², Irma ČEHIĆ^{1,2}, Sanela Merjem RUSTEMPAŠIĆ¹

¹University of Sarajevo, Faculty of Educational Sciences, Department of Lower Elementary Education, B&H

²University of Sarajevo, Faculty of Educational Sciences. Department of Preschool Education, B&H

*Corresponding author: Amra Bajrić, amrabajric0506@gmail.com

Abstract

We have witnessed numerous changes in our lives in the last few months caused by the Covid-19 virus pandemic. Significant changes have taken place in all spheres of life, including household nutrition. Accordingly, the World Health Organization (WHO) has made recommendations related to food safety, including advice on the application of good hygiene practices in food handling and preparation. Although many households consider ready-made meals and processed food as a quick and cheap way to feed their family members, there are other practical, affordable, and healthy alternatives that are also available. The main goal of this research was to examine changes in household nutrition in three cities in Bosnia and Herzegovina. For the purpose of the research, an interview was conducted in 20 households from three cities in BiH: Sarajevo, Goražde and Sanski Most. The interview included questions related to the procurement and method of food preparation, the use of special hygiene measures, the inclusion of dietary supplements and the use of foods rich in various vitamins. We also examined the difference in the way of food preparation before and during the pandemic. With this research we wanted to examine the extent to which households adhered to the recommendations of the World Health Organization (WHO) and other experts. The outcomes of the research and the final conclusions will be published in the presentation.

Keywords: *households, nutrition, Covid-19*

Uticaj pravilne ishrane i fizičke aktivnosti na ishod trudnoće

Amra ČANA^{1*}, Dalila KARAPUŠ¹, Minela VELAGIĆ¹

¹ Fakultet zdravstvenih studija Univerziteta u Sarajevu, Stjepana Tomića 1, Sarajevo

*Autor za korespondenciju: cana.amra@gmail.com

Sažetak

Tokom trudnoće tijelo trudnice doživljava značajne anatomske i fiziološke promjene svih organskih sistema koje počinju odmah od začeća. Zdrave prehrabene navike povezane su sa smanjenim rizikom od dijabetesa tipa 2, određenim vrstama karcinoma (poput kolorektalnog i postmenopauzalnog karcinoma dojke), prekomjernom težinom i pretilošću. Nova naučna saznanja ukazuju na postojanje odnosa između prehrabnenih navika i nekih neurokognitivnih poremećaja i urođenih anomalija kod novorođenčadi. Cilj ovog rada bio je prikazati uticaj pravilne ishrane i fizičke aktivnosti kod trudnica na konačan ishod trudnoće. Provedena je analitička studija pregledom dostupne naučne literature u relevantnim bazama podataka (ScienceDirect, PubMed, Medline i Google Scholar) objavljene u periodu od januara 2015. godine do 01.10.2020. godine koristeći ključne riječi: „pregnancy“, „nutrition of pregnant woman“, „physical activity“ and „pregnancy outcomes“. Temeljni aspekti zdravog prehrabnenog ponašanja tokom trudnoće uključuju konzumiranje hrane koja sadrži optimalne količine energije, makro- i mikronutrijenata, postizanje odgovarajućeg povećanja tjelesne mase, pridržavanje opštih i za trudnice specifičnih preporuka sigurnosti hrane, te izbjegavanje unosa štetnih tvari. Tjelesna aktivnost trudnica je individualna i može se mijenjati tokom trudnoće. Neadekvatna prehrabnena ponašanja u trudnoći povećavaju rizik od štetnih ishoda trudnoće: preeklampsiju, prijevremeni porod, te neurorazvojne probleme fetusa. Pravilna, uravnotežena prehrana i tjelesna aktivnost tokom trudnoće od presudnog su značaja za podržavanje optimalnog rasta i razvoja fetusa i fizioloških promjena majke. Promocija tjelesne aktivnosti može dati značajan doprinos u prevenciji gestacionog debljanja i naknadnih komplikacija u trudnoći poput gestacionog dijabetesa i hipertenzije, carskog reza, makrosomije i neonatalnog respiratornog morbiditeta.

Ključne riječi: *trudnoća, ishrana trudnica, fizička aktivnost, ishod trudnoće*

3-O-3

The impact of nutrition and physical activity on pregnancy outcomes

Amra ČANA^{1*}, Dalila KARAPUŠ¹, Minela VELAGIĆ¹

¹University of Sarajevo, Faculty of Health Studies, Stjepana Tomića 1, Sarajevo

*Corresponding author: cana.amra@gmail.com

Abstract

During pregnancy women's body undergoes significant anatomical and physiological changes of all organ systems which starting immediately after conception. Healthy dietary habits are associated with a reduced risk of type 2 diabetes, certain types of cancer (such as colorectal and postmenopausal breast cancer), overweight and obesity. New scientific findings indicate the existence of a relationship between dietary habits and some neurocognitive disorders and congenital anomalies in newborns. The objective of this paper was to show the impact of proper nutrition and physical activity in pregnant women on the pregnancy outcomes. An analytical study was conducted by reviewing the available scientific literature in relevant databases (ScienceDirect, PubMed, Medline and Google Scholar) published in period between January 2015 and 1st of October 2020 using the following keywords: "pregnancy", "nutrition of pregnant woman", "physical activity" and "pregnancy outcomes". Fundamental aspects of healthy dietary habits during pregnancy include consuming foods that contain optimal amounts of energy, macro- and micronutrients, achieving appropriate weight gain, adhering to general and specific food safety recommendations for pregnant woman and avoiding ingestion of harmful substances. The physical activity of pregnant women is individual and can change during pregnancy. Inadequate eating behaviors in pregnancy increase the risk of harmful pregnancy outcomes: preeclampsia, premature birth, and fetal neurodevelopmental problems. Proper, balanced diet and physical activity during pregnancy are crucial to support optimal growth and development of the fetus and the physiological changes that occur in the mothers. The promotion of physical activity can make a significant contribution to the prevention of gestational disease and subsequent complications in pregnancy such as gestational diabetes and hypertension, cesarean section, macrosomia and neonatal respiratory morbidity.

Keywords: pregnancy, nutrition of pregnant women, physical activity, pregnancy outcome

Znanja i stavovi majki o ekskluzivnom dojenju

Lamija DIZDAREVIĆ^{1*}, Amina MURTO¹, Amela SALIHOVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studij Zdravstvena njega, BiH

* Autor za korespondenciju: Lamija Dizdarević, lamija_98@outlook.com

Sažetak

Dojenje je prirodan način prehrane dojenčeta i malog djeteta koji osigurava optimalan rast, razvoj i zdravlje. Vrijednost majčina mlijeka možemo objasniti kroz pet faktora: prehrambeni, odbrambeni, psihosocijalni, praktični i ekonomski. Svjetska zdravstvena organizacija i Američka akademija za pedijatriju preporučuju ekskluzivno dojenje do šest mjeseci. Ekskluzivno dojenje, definisano je kao konzumacija mlijeka samo iz dojke (tj. bez adaptiranog mlijeka ili krute hrane) što je povezano sa boljim ishodima za zdravlje dojenčadi, uključujući smanjenje prekomjerne težine, zaraznih bolesti i infekcije dišnih puteva. Ekskluzivno dojenje smanjuje smrtnost dojenčadi tokom prvih 6 mjeseci života. Međutim, stope isključivog dojenja ostaju niske u mnogim područjima. Cilj ovog rada bio je procijeniti znanja i stavove majki o ekskluzivnom dojenju. Provedena je retrospektivna studija pregledom naučne literature u bazama: PubMed, Medline i Google Scholar. Izvršena je analiza naučnih radova objavljenih u periodu od 2014. godine do 2020. godine. U SAD 95,9 % ispitanica smatra da je dojenče potrebno hraniti samo mlijekom u prvih 6 mjeseci života. Bolja znanja ispitanica o dojenju su pozitivno povezana sa primjenom ekskluzivnog dojenja u prvih šest mjeseci života. Samo 16,6% djece u SAD je dojeno isključivo majčinim mlijekom u prvih 6 mjeseci života, u Južnom Jordanu 21,2% , u Gani 27,7% , 39 % u Hrvatskoj. Istraživanja pokazuju da je većina ispitanica upoznato sa terminom ekskluzivnog dojenja. Rezultati istraživanja pokazuju zadovoljavajuće znanje majki o ekskluzivnom dojenju, međutim možemo zaključiti da je stopa ekskluzivnog dojenja veoma niska i da većina majki ne slijedi preporuke SZO.

Ključne riječi: *ekskluzivno dojenje, znanje, stavovi, dojenje, postpartum*

Knowledge and attitudes of mothers about exclusive breastfeeding

Lamija DIZDAREVIĆ^{1*}, Amina MURTO¹, Amela SALIHOVIĆ¹

¹University of Sarajevo, Faculty of Health Studies, Study program of Nursing, B&H

*Corresponding author : Lamija Dizdarević, lamija_98@outlook.com

Abstract

Breastfeeding is a natural way of feeding an infant and young child that ensures optimal growth, development and health. The value of breast milk can be explained through five factors: nutritional, defensive, psychosocial, practical, and economic. The World Health Organization and the American Academy of Pediatrics recommend exclusive breastfeeding for up to six months. Exclusive breastfeeding is defined as the consumption of milk only from the breast (ie without formula or solid foods) which is associated with better outcomes for infant health, including reduction of overweight, infectious diseases and respiratory infections. Exclusive breastfeeding reduces infant mortality during the first 6 months of life. However, exclusive breastfeeding rates remain low in many areas. Objective of this study was to assess mothers' knowledge and attitudes about exclusive breastfeeding. A retrospective study was conducted by reviewing the scientific literature in the databases: PubMed, Medline and Google Scholar. An analysis of scientific papers published in the period from 2014 to 2020 was performed. In the USA, 95.9% of respondents believe that an infant should only be fed with milk in the first 6 months of life. Better knowledge of breastfeeding subjects is positively associated with the use of exclusive breastfeeding in the first six months of life. Only 16.6% of children in the United States are breastfed exclusively in breast milk in the first 6 months of life, 21.2% in South Jordan, 27.7% in Ghana, and 39% in Croatia. Research shows that most respondents are familiar with the term exclusive breastfeeding. The results of the research show satisfactory knowledge of mother's about exclusive breastfeeding, however we can conclude that the rate of exclusive breastfeeding is very low and that most mother's do not follow the WHO recommendations.

Keywords: *exclusive breastfeeding, knowledge, attitude, breastfeeding, postpartum*

Prednosti i nedostaci keto prehrane

Dea DUGANDŽIĆ^{1*}, Marina ĆURLIN¹

¹Sveučiliste u Mostaru, Fakultet zdravstvenih studija, Mostar, Bosna i Hercegovina

*Autor za korespondenciju: Dea Dugandžić, dugandzicdea@gmail.com

Sažetak

Keto prehrana novi je trend u načinu ishrane, a i alat za bolje gubljenje viška kilograma. Svoju popularnost dosegla je u zadnjih desetak godina zbog uspješnog kratkoročnog učinka na mršavljenje. Vrlo je poznat i po svom jednostavnom načinu provođenja. Keto prehrana temelji se na niskom unosu ugljikohidrata, a visokom udjelu proteina i masti. Svođenjem ugljikohidrata na minimum tijelo stvara ketone. Ketoza je posebno stanje organizma, kojeg karakterizira povišena razina ketona u krvi, do čega dolazi uslijed pretvorbe masti u masne kiseline i ketone. Nakon 48 sati od početka ovog načina prehrane, organizam počinje koristiti ketone kako bi efikasnije koristio energiju skladištenu u masnim stanicama. Primarni izvor energije više nisu ugljikohidrati nego masti tj. masne kiseline. Kada je tijelo u stanju ketoze, više nema potrebu za ketonima i počinje ih oslobađati putem mokraćne. To znači da će mokraćna početi izlučivati mast. Najbolje od svega je to što tijelo više nema potrebu pohranjivati energetske supstrate za buduću upotrebu. Keto prehrana će također smanjiti razinu inzulina u tijelu, pa će na taj način potaknuti lipolizu i oslobađanje glicerola. Kao negativni učinak keto prehrane očitovati će se u manjku koncentracije, manjku mikronutrijenata koju su bitni za zdravlje tijela. Mnoga istraživanja su pokazala da ovakav način prehrane nije dugoročno održiv zbog povećanih kardiovaskularnih rizika. Također, kod nepravilnog provođenja ovakvog načina prehrane, tj. ne dovoljnog unosa masti može se javiti gubitak menstrualnog ciklusa kod žena. Cilj ovog rada, pregledom dosadašnje literature, je objasniti način djelovanja keto prehrane i ukazati kako na prednosti, tako i na nedostatke u ovakvom načinu ishrane.

Ključne riječi: *keto prehrana, prednosti, nedostaci, zdravlje, masti, ugljikohidrati*

Advantages and disadvantages of keto diet

Dea DUGANDŽIĆ^{1*}, Marina ĆURLIN¹

¹Faculty of Health Studies, University of Mostar, Mostar

*Corresponding author: Dea Dugandžić, dugandzicdea@gmail.com

Abstract

The keto diet is a new trend in the way of eating, and also a tool for better weight loss. It has reached its popularity in the last ten years due to its successful short-term effect on weight loss. It is also very famous for its simple way of conducting. The keto diet is based on a low carbohydrate intake and a high protein and fat content. By minimizing carbohydrates, the body creates ketones. Ketosis is a special condition of the body, which is characterized by elevated levels of ketones in the blood, which occurs due to the conversion of fats into fatty acids and ketones. After 48 hours of starting this diet, the body begins to use ketones to make more efficient use of the energy stored in fat cells. The primary source of energy is no longer carbohydrates but fats, ie fatty acids. When the body is in a state of ketosis, it no longer needs ketones and begins to release them through urine. This means that urine will begin to excrete fat. Best of all, the body no longer needs to store energy substrates for future use. The keto diet will also reduce the level of insulin in the body, thus stimulating lipolysis and the release of glycerol. As a negative effect of the keto diet will manifest itself in a lack of concentration, a lack of micronutrients that are essential for the health of the body. Many studies have shown that this diet is not sustainable in the long run due to increased cardiovascular risks. Also, with the improper implementation of this diet, ie insufficient fat intake, loss of the menstrual cycle can occur in women. The aim of this paper, by reviewing the literature so far, is to explain the mode of action of the keto diet and point out both the advantages and disadvantages of this diet.

Keywords: *keto diet, advantages, disadvantages, health, fats, carbohydrates*

Utjecaj karantina na životni stil studenata Univerziteta u Sarajevu

Sumeja HADŽALIĆ^{1*}, Ema HADŽIĆ¹

¹ Univerzitet u Sarajevu, Farmaceutski fakultet, BiH

* Autor za korespondenciju: Sumeja Hadžalić, sumejahadzalic@ffsa.unsa.ba

Sažetak

Početak ove godine životne navike ljudi širom svijeta su promijenjene uslijed potpuno nepredvidive situacije koja se desila. Studenti kao mlade osobe čine iznimno osjetljiv dio populacije. Stoga je logična pretpostavka da je u ovako stresnoj situaciji mogla biti povećana tendencija ka donošenju odluka loših po njihovo zdravlje. Jedan od prvih i ključnih koraka u sprječavanju toga jeste podizanje svijesti o važnosti psihičkog zdravlja i edukacija o pogubnosti štetnih životnih navika. S ciljem utvrđivanja koliko su studenti u Bosni i Hercegovini uslijed stresa uzrokovanog pandemijom i karantinom pribjegavali konzumaciji proizvoda štetnih po zdravlje (cigarete, alkohol, droga), provedena je online anketa među studentima Univerziteta u Sarajevu u julu 2020. godine. U anketi je učestvovalo 235 osoba. Fokus ovog istraživanja je bio na psihičkom stanju i odlukama proizašlim kao rezultat tog stanja. U stanjima stresa, neizvjesnosti, uplašenosti, napetosti i nervoze ljudima je potrebno nešto što će ih vratiti u ravnotežu i pružiti (lažni) osjećaj stabilnosti i smirenosti ili samo bijeg od stvarnosti. Tada su vrlo ozbiljna i realna prijetnja cigarete, alkohol, lijekovi za smirenje uzeti po vlastitom nahođenju bez konsultacije s liječnikom i nedozvoljene supstance poput droge. Stoga su studenti u anketi upitani da li su imali povećanu želju za konzumiranjem gore navedenog a odgovori su pokazali da 60% ispitanika inače ne konzumira ništa od navedenog, 20% njih je imalo pojačanu želju za konzumacijom istih, a 20% nije imalo pojačanu tu želju. Umjesto izbora lošeg životnog stila, većina studenata je rješenje potražila u prirodi, knjigama i muzici. Generalni utisak je da su rezultati istraživanja pozitivni, ali da je neophodno akcentirati važnost očuvanja psihičkog zdravlja i štetnost loših životnih navika kako bi se ovi rezultati održali i poboljšali.

Ključne riječi: *životni stil, pandemija, stres, studenti*

3-O-6

**Influence of the quarantine on the lifestyle of the students at
University of Sarajevo**

Sumeja HADŽALIĆ^{1*}, Ema HADŽIĆ¹

¹ University of Sarajevo, Faculty of pharmacy, BiH

*Corresponding author: Sumeja Hadžalić, sumejahadzalic@ffsa.unsa.ba

Abstract

By the start of this year, a completely unpredictable situation has happened and changed all of life habits. Students, as young people, make a sensitive part of the population. Therefore, it was logical to assume that their tendency for making bad decisions for their own health could have been increased in this stressful situation. One of the first and key steps in preventing this is raising awareness about the importance of mental health and education about the fatality of harmful life habits. In order to determine how many students in Bosnia and Herzegovina made use of harmful products to health (cigarettes, alcohol, drugs) due to the stress caused by the pandemic and quarantine, an online survey was conducted among students at the University of Sarajevo in July 2020. 235 people participated in the survey. The focus of this research was on the mental state and decisions that were made in such a condition. In such a state, the threat of cigarettes, alcohol, sedatives that are taken without consulting a doctor and illegal substances, such as drugs are very serious and real. Therefore, students in the survey were asked if they had an increased desire to consume the above and the answers showed that 60% of respondents don't normally consume any of the above, 20% of them had an increased desire to consume them and 20% didn't have an increased desire. Instead of choosing a bad lifestyle, most students found a solution in nature, books and music. The general impression is that the research results are positive, but it is necessary to emphasize the importance of maintaining mental health and the harmfulness of bad life habits in order to maintain and improve these results.

Keywords: lifestyle, pandemic, stress, students

Ishrana u životu studenata

Amra BAJRIĆ¹, Dženad AVDOVIĆ¹, Emir HAJDAREVIĆ^{1*}, Majda BAJRIĆ², Irma ČEHIĆ^{1,2}, Sanela Merjem RUSTEMPAŠIĆ¹

¹Univerzitet u Sarajevu, Pedagoški fakultet, Odsjek za razrednu nastavu, BiH

²Univerzitet u Sarajevu, Pedagoški fakultet, Odsjek za predškolski odgoj, BiH

* Autor za korespondenciju: Emir Hajdarević, hajdarevic.emir@hotmail.com

Sažetak

Pravilna ishrana je osnovni faktor optimalnog rasta i razvoja čovjekovog organizma te direktno utječe na njegovu radnu sposobnost i dužinu života. Međutim, današnju tzv. savremenu ishranu uglavnom karakterišu nepravilni i nedovoljno izbalansirani obroci tokom dana. Nepravilna ishrana je faktor rizika za nastanak različitih oboljenja. Studenti se, uslijed brzog načina života i mnoštva obaveza, najčešće susreću sa izazovima savremene prehrane, ali i njenim posljedicama. Cilj ovog istraživanja bio je ispitati stavove studenata u vezi njihove prehrane prije pandemije izazvane virusom Covid-19 i u toku pandemije. Ciljna skupina ispitanika bili su studenti Univerziteta u Sarajevu. U svrhu istraživanja provedena je onlajn anketa kojom je ispitano 200 studenata sa različitih fakulteta na Univerzitetu u Sarajevu. Anketa je sadržavala pitanja koja se odnose na prehrambene navike studenata i njihovostavove u vezi sa istom. Pri provođenju ankete i analizi rezultata, u obzir su uzeti i različiti parametri kao što su: spol ispitanika, godina studija i smještaj tokom studija. Ovim istraživanjem željeli smo prvenstveno ukazati na važnost pravilne prehrane ali i skrenuti pažnju na svakodnevne izazove koje savremena ishrana nosi naročito među studentskom populacijom. Ishodi istraživanja i konačni zaključci bit će objavljeni u prezentaciji.

Ključne riječi: *studenti, prehrambene navike, Covid-19*

Nutrition in student life

Amra BAJRIĆ¹, Dženad AVDOVIĆ¹, Emir HAJDAREVIĆ^{1*}, Majda BAJRIĆ², Irma ČEHIĆ^{1,2}, Sanela Merjem RUSTEMPAŠIĆ¹

¹University of Sarajevo, Faculty of Educational Sciences, Department of Lower Elementary Education, B&H

²University of Sarajevo, Faculty of Educational Sciences. Department of Preschool Education, B&H

*Corresponding author: Emir Hajdarević, hajdarevic.emir@hotmail.com

Abstract

Proper nutrition is a major factor in the optimal growth and development of the human organism and it directly affects its ability to work and its life expectancy. However, today's so called modern diet is mainly characterized by irregular and insufficiently balanced meals during the day. Improper nutrition is a risk factor for the development of various diseases. Due to their fast lifestyle and numerous obligations, students most often face the challenges of modern diet, but also its consequences. The main goal of this research was to examine students' attitudes regarding their nutrition, before and during the pandemic caused by the virus Covid-19. The target group of respondents were students of the University of Sarajevo. For the purpose of the research, an online survey which examined 200 students of the various faculties of the University of Sarajevo, was conducted. The survey contained items related to the students' eating habits and their attitudes regarding it. While conducting the survey and analyzing the results, various parameters were taken into account, such as: gender of respondents, year of study and accommodation during the study. With this research, we primarily wanted to point out the importance of proper nutrition, but also to draw attention to the everyday challenges that modern diet brings, mainly among the student population. The outcomes of the research and the final conclusions will be published in the presentation.

Keywords: *students, eating habits, Covid-19*

Higijensko-dijetetski režim osoba oboljelih od Diabetes mellitus-a tip 2

Dalila KARAPUŠ^{1*}, Amra ČANA¹, Minela VELAGIĆ¹

¹ Fakultet zdravstvenih studija Univerziteta u Sarajevu, Stjepana Tomića 1, Sarajevo

*Autor za korespondenciju: dalila.karapus@outlook.com

Sažetak

Pojam Diabetes mellitus opisuje metabolički poremećaj multiple etiologije kojeg karakteriše hronična hiperglikemija sa poremećajem u metabolizmu ugljikohidrata, masti i proteina, a što je posljedično uzrokovano defektom inzulinske sekrecije, djelotvornosti inzulina ili kombinacijom oba ova uzroka. Svaki pacijent ima individualnu terapiju koja podrazumijeva opće principe liječenja i doktrinarnih stavova: edukacija pacijenta, samokontrola, dijetalna diabetična ishrana, fizička aktivnost i lijekovi. Cilj ovog rada bio je definisati osnovne elemente higijensko-dijetetskog režima i njegov značaj kod osoba oboljelih od Diabetes Mellitus-a tip 2. Provedena je analitička studija pregledom dostupne naučne literature u relevantnim bazama podataka (ScienceDirect, PubMed, Medline i Google Scholar) objavljene u periodu od januara 2015. godine do oktobra 2020. godine koristeći ključne riječi: „diabetes mellitus“, „nutrition“, „physical activity“, „personal hygiene“ and „complication prevention“. Primjena individualnog pristupa u regulaciji i adekvatnom načinu ishrane kod osoba sa Diabetes mellitus-om tip 2 postiže se određivanjem individualno prilagođene dijetete kao i edukacijom za primjenu individualno prilagođenog programa fizičke aktivnosti vodeći se njihovim pacijentovim željama i preferencijama. Uz sve navedeno, pravilno održavanje lične higijene, nošenje pamučne odjeće i adekvatne obuće prevenirat će nastanak daljih komplikacija izazvanih progresijom ove bolesti. Potreba za medikamentnim pristupom procjenjuje se samo kao dopunski tretman u slučaju nedovoljne efikasnosti promjene načina života i postojanja odgovarajućih individualnih karakteristika pacijenata. U cilju rane detekcije i adekvatne prevencije komplikacija izazvanih Diabetes mellitus-om tip 2 neophodno je utvrditi i definisati socio-medicinsku dijagnozu na osnovu koje će se planirati i sprovoditi promotivno-preventivne intervencije. Prevencija nastanka i rano otkrivanje komplikacija ove bolesti je moguće.

Ključne riječi: *diabetes mellitus, ishrana, fizička aktivnost, lična higijena, prevencija komplikacija*

3-O-8

Hygiene-dietary regime of persons with Diabetes mellitus type 2

Dalila KARAPUŠ^{1*}, Amra ČANA¹, Minela VELAGIĆ¹

¹ Univesity of Sarajevo, Faculty of Health Studies, Stjepana Tomića 1, Sarajevo

*Corresponding author: dalila.karapus@outlook.com

Abstract

Diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with a disorder in the metabolism of carbohydrates, fats and proteins, which is consequently caused by a defect in insulin secretion, insulin efficiency or a combination of both. Each patient has an individual therapy that includes general principles of treatment and doctrinal attitudes: patient education, self-control, dietary diabetic diet, physical activity and medication. Objective of this paper was to define the basic elements of the hygienic-dietary regime and its importance in persons with Type 2 Diabetes. An analytical study was conducted by reviewing the available scientific literature in relevant databases (ScienceDirect, PubMed, Medline and Google Scholar) published in the period from January 2015 to October 2020 using the keywords: "diabetes mellitus", "nutrition", "physical activity", "personal hygiene" and "complication prevention". An individual approach in regulation and balanced diet in people with Type 2 Diabetes is achieved by determining an individually tailored diet and education for the application of an personally tailored physical activity program made in accordance to patient's wishes and preferences. In addition to all of the above, proper personal hygiene, wearing cotton clothes and adequate footwear will prevent the occurrence of further complications which might be caused by the progression of this disease. The need for a medication approach is assessed only as an additional treatment in case of insufficient effectiveness of lifestyle changes and the existence of appropriate individual characteristics of patients. In purpose of early detection and adequate prevention of complications caused by Type 2 Diabetes it is necessary to determine and define the socio-medical diagnosis on the basis of which promotional-preventive interventions will be planned and implemented. Prevention and early detection of complications of this disease is possible.

Keywords: *diabetes mellitus, nutrition, physical activity, personal hygiene, complication prevention*

Ishrana oboljelih od reumatoidnog artritisa

Emina KLIS^{1*}, Esma ARIFOVIĆ¹, Sumeja FALJIĆ¹, Adela EROVIĆ
VRANEŠIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, BiH

* Autor za korespondenciju: klis.emina@gmail.com

Sažetak

Reumatoidni artritis je hronična, autoimuna, upalna reumatska bolest koju karakteriše sinovitis s posljedičnom destrukcijom hrskavice i zglobova, što dovodi do invaliditeta. Češća je kod žena u odnosu na muškarce. S obzirom da ne postoji lijek za reumatoidni artritis, glavni terapijski cilj jeste smanjenje boli i kontrola upale, čime se nastoje ublažiti simptomi. Veliki broj pacijenata ima perzistentni oblik bolesti na koji lijekovi u današnjoj primjeni ne ostvaruju adekvatan učinak, stoga je potrebna kombinacija pravilne prehrane i terapije. Cilj ovog rada bio je pregledom dostupne naučne literature iz relevantnih baza podataka prikazati učinak pojedinih obrazaca prehrane na zdravstveni ishod pacijenata oboljelih od reumatoidnog artritisa. Rad je urađen kao pregledni članak. Korišteni su radovi koji su obrađivali temu prehrana kod reumatoidnog artritisa, objavljeni u relevantnim bazama podataka (Google Scholar, PubMed, Medline). Većine studija upućuju na protektivni učinak konzumiranja masne ribe bogate omega-3 masnim kiselinama, maslinova ulja, povrća i voća (posebno bogatog vitaminom C) te mliječnih proizvoda. Rastuća je spoznaja o povezanosti nedostatka vitamina D sa povećanim rizikom od razvoja reumatoidnog artritisa i sa većom aktivnosti bolesti. Istaknuto je da je za pacijente sa reumatoidnim artilisom izuzetno važan adekvatan unos proteina, a što se tiče lipida, potrebno je povećati unos omega-3 a smanjiti unos omega-6 masnih kiselina. Od popularnih pristupa prehrani koji se često predlažu pacijentima najpogodnija za prehranu sa reumatoidnim artilisom je mediteranska dijeta. Za osobe sa reumatoidnim artilisom pravilno balansirana ishrana predstavlja temelj za prevenciju nastanka komplikacija i dalje progresije oboljenja.

Ključne riječi: *ishrana, reumatoidni artritis, protektivni učinak, mediteranska dijeta.*

3-O-9

Nutrition of patients with rheumatoid arthritis

Emina KLIS^{1*}, Esma ARIFOVIĆ¹, Sumeja FALJIĆ¹, Adela EROVIĆ
VRANEŠIĆ¹

¹University of Sarajevo, Faculty of Health Studies

^{-1*}Corresponding author: klis.emina@gmail.com

Abstract

Rheumatoid arthritis is a chronic, autoimmune, inflammatory rheumatic disease characterized by synovitis which leads to cartilage destruction and joint deformity. In severe cases it can cause physical disability. Women are more often affected. The main aim of the therapy is to alleviate the symptoms by decreasing the pain and controlling the inflammation. There is a need for combination of the therapy and diet because many patients have persistent disease that is not adequately responding to available drugs. The main aim of this research/article is investigation of the newest scientific evidence about effect of specific dietary plans and certain foods or food components on the disease outcome, either including or removing them from the diet, whether they lead to improvement or progression of the disease. Material used for this research includes research articles with topics linking diet and rheumatoid arthritis published in relevant data bases (Google Scholar, PubMed, Medline). Results of most studies show that consuming fish rich in omega-3 fatty acids, olive oil, vegetables and fruit (especially those rich in vitamin C) and dairy products have protective effect. There is an increase awareness about connection of lack of vitamin D and increased risk for development of rheumatoid arthritis and worse symptoms. It is important to emphasize that proteins are important for the patients with rheumatoid arthritis. Regarding lipids, it is necessary to increase consumption of omega-3 and decrease amounts of omega-6 fatty acids. One of the most popular dietary plans for patients with rheumatoid arthritis is mediterranean diet. For patients with rheumatoid arthritis balanced diet is the basis for prevention of complications and further disease progression.

Keywords: *diet, rheumatoid arthritis, protective effect, mediterranean diet.*

Korištenje dodataka prehrani kod rekreativnih sportaša

Elena KRIŽANAC¹, Mirjana ĐERMANOVIĆ^{1*}

¹Univerzitet u Banjoj Luci, Medicinski fakultet, Studijski program farmacija, BiH

*Autor za korespondenciju: Mirjana Đermanović, mirjanadjermanovicbl@gmail.com

Sažetak

Razvoj svijesti o važnosti zdravlja i prehrane dovela je do procvata tržišta dodataka prehrani. U posljednje vrijeme sve je veći broj različitih dodataka prehrani dostupnih na tržištu, te u populaciji rekreativnih sportaša sve više raste postotak njihovog korištenja. Dodacima prehrani se smatraju pripravci s hranjivim ili fiziološkim učinkom koji imaju svrhu dodatno obogatiti uobičajenu prehranu u cilju održavanja zdravlja. Budući da je malo istraživanja o upotrebi dodataka prehrani kod rekreativnih sportaša cilj ovog istraživanja bio je procijeniti korištenje dodataka prehrani kod rekreativnih sportaša kao i trenera, razloge njihove upotrebe, te procijeniti znanje ovih populacija o dodacima prehrani. U istraživanju je sudjelovalo 100 ispitanika, dobi 12-38 godina. Korišten je on-line upitnik posebno kreiran u svrhu ovog istraživanja, koji je sadržavao 34 pitanja, podijeljena u tri dijela. Rezultati su pokazali da dodatke prehrani koristi 80% rekreativnih sportaša dok njih 20% ne koristi. Najčešće korišteni dodaci prehrani su proteini, zatim vitamini i minerali. Analizom procjene znanja o dodacima prehrani utvrđeno je da je znanje o dodacima prehrani neadekvatno. Veliki broj rekreativnih sportaša koristi dodatke prehrani neracionalno, bez jasnih indikacija i preporuka od strane zdravstvenih radnika. Stoga je neohodno uložiti dodatne edukativne napore ne samo prema zdravstvenim radnicima nego i prema svima onima koji rade u fitness centrima/teretanama sa rekreativnim sportašima sa ciljem da upotreba dodataka prehrani bude bezbjedna, kontrolirana i racionalna.

Ključne riječi: *dodaci prehrani, rekreativni sportaši, upotreba*

3-O-10

Use of dietary supplements in recreational athletes

Elena KRIŽANAC¹, Mirjana ĐERMANOVIĆ^{1*}

¹University of Banja Luka, Faculty of Medicine, Department of Pharmacy, Bosnia and Herzegovina

*Corresponding author: MirjanaDjermanovic, mirjanadjermanovicbl@gmail.com

Abstract

The increasing awareness of importance of health and nutrition has led to a boom in the market of dietary supplements. Lately, an increasing number of all kinds of different dietary supplements are available on the market, and the percentage of their use in the population of recreational athletes is growing. Dietary supplements are considered to be nutritional or physiological preparations intended to further enrich the usual diet while maintaining health. Considering a lack of research on the use of dietary supplements among recreational athletes, the main goal of this study was to assess the use of the dietary supplements in recreational athletes and their coaches, the reasons for their use as well as to assess the knowledge of this population about dietary supplements. A total of 100 subjects, age 12-38, participated in the study. The data was collected through questionnaire specifically created for the purpose of this study, which contained 34 questions divided into three sections. The results showed that dietary supplements are used by recreational athletes (80%). The most commonly used were protein supplements, followed by vitamins and minerals. An analysis of the knowledge about dietary supplements showed that the knowledge of the supplements is inadequate. A large number of recreational athletes use dietary supplements irrationally, without clear indications and recommendations from health professionals. Therefore, it is necessary to introduce additional educational efforts not only towards health professionals but also towards all those who work in fitness centers/gyms with recreational athletes in order to ensure that the use of dietary supplements is safe, controlled and rational.

Keywords: dietary supplements, amateur athletes, use

Dislipidemija i hiperglikemija kao prediktori kardiovaskularnih oboljenja

Vedina KUČUKOVIĆ^{1*}, Emsel PAPIĆ¹, Martina BRNJIC¹, Almedina HAJROVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, BiH

*Autor za korespondenciju: Vedina Kučuković, vedina.kucukovic@gmail.com

Sažetak

Nepravilno balansirana ishrana i savremene životne navike uz genetsku predispoziciju mogu biti uzrok metaboličkih poremećaja, kao što su dislipidemija i hiperglikemija. Ciljevi istraživanja su: objasniti mehanizam uticaja dislipidemije i hiperglikemije na nastanak kardiovaskularnih oboljenja, te istražiti ulogu pravilno balansirane ishrane u prevenciji metaboličkih poremećaja, prediktora kardiovaskularnih bolesti. Rad je urađen kao pregledni članak. Analizirano i komparirano je 12 radova iz relevantnih baza podataka kao što su Pubmed i Medline. Mehanizam nastanka hiperglikemije i dislipidemije predstavlja kompleksne procese koje uključuju sinergističko djelovanje što dovodi do nastanka kardiovaskularnih bolesti. Povećane vrijednosti lipoproteina i glukoze učestvuju u formiranju plaka u unutrašnjosti krvnih sudova. Ovaj mehanizam utiče na nastanak ateroskleroze čija komplikacija može rezultirati nastankom srčanog infarkta. Različita istraživanja ukazuju da je veća stopa mortaliteta kod bolesnika sa dijabetesom i dislipidemijom u odnosu na bolesnike koji imaju samo dijabetes. Sniženim unosom ugljikohidrata i lipida dolazi do smanjenja vrijednosti ukupnog serumskog holesterola i LDL-a, a povećava se vrijednost HDL-a, čime se direktno utiče i na vrijednosti odnosa HDL-a i LDL-a (aterogenog indeksa). Dokazano je da dislipidemija i hiperglikemija sinergistički utiču na povećanje rizika od nastanka kardiovaskularnih oboljenja. Dugoročni period pravilno balansirane ishrane pokazuje pozitivne rezultate u prevenciji nastanka oboljenja i sniženje vrijednosti ključnih parametara za nastanak kardiovaskularnih oboljenja. Izbalansirana ishrana predstavlja prvu fazu liječenja osoba s dijagnozom kardiovaskularnih oboljenja. Ukoliko promjena načina ishrane rezultira neuspješnom redukcijom vrijednosti krvnih parametara (ukupnog holesterola i LDL-a), pribjegava se medikamentnim terapijama.

Ključne riječi: dislipidemija, hiperglikemija, kardiovaskularna oboljenja, dijabetes

3-O-11

Dyslipidemia and hyperglycemia as predictors of cardiovascular diseases

Vedina KUČUKOVIĆ^{1*}, Emsel PAPIĆ¹, Martina BRNJIC¹, Almedina
HAJROVIĆ¹

¹University of Sarajevo, Faculty of Health Studies, B&H

*Corresponding author: Vedina Kučuković, vedina.kucukovic@gmail.com

Abstract

Improperly balanced diet and modern living habits with genetic predisposition can be the cause of metabolic disorders, such as dyslipidemia and hyperglycemia. The study aimed to explain the mechanism of how dyslipidemia and hyperglycemia affect the development of cardiovascular diseases, and to investigate the impact of properly balanced diet in the prevention of metabolic disorders that are predictors of cardiovascular diseases. The study is a scientific review. Twelve authentic publications available in the relevant databases such as Pubmed and Medline were compared and discussed. The mechanism underlying the development of hyperglycemia and dyslipidemia is a complex process that leads to the development of cardiovascular disease. Increased values of lipoproteins and glucose form plaque that builds up inside blood vessels affecting atherosclerosis development and causing heart attack. Various studies indicate that the mortality rate is higher in patients with diabetes and dyslipidemia compared to patients who have diabetes only. Reduced carbohydrate consumption and lipid intake decreases serum cholesterol and LDL values, and increases high-density lipoprotein (HDL) concentrations, which directly affects the values of the ratio of HDL and LDL (atherogenic index). Dyslipidemia and hyperglycemia synergistically increase the risk of developing cardiovascular disease. A properly balanced diet is the first phase of treatment that showed positive results in the prevention of disease and lowering the values of key parameters correlated with development of cardiovascular disease. If the result is unsuccessful, drug therapy is used to reduce the values of blood parameters (total cholesterol and LDL).

Keywords: *dyslipidemia, hyperglycemia, cardiovascular diseases, diabetes*

Znanje, stavovi i praksa studenata Fakulteta zdravstvenih studija o deklarisanju hrane

Tarik KULOVIĆ^{1*}, Aldina ČEHAJIC¹, Bejana OHRAN¹, Elma RIZVO¹,
Selma BUHIĆ¹, Eldina SMJEČANIN¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Tarik Kulović, kulovictarik95@gmail.com

Sažetak

Kako bi se postigao visok nivo zaštite potrošača i osiguralo njihovo pravo na informacije, potrebno je osigurati primjereno informisanje potrošača u vezi s hranom koju konzumiraju. Deklaracije hrane važne su informacije za potrošače, ali samo ako supredstavljene na pravilan način i ako ih potrošači razumiju i upotrebljavaju. Cilj ovog rada bio je ispitati znanje, stavove i praksu studenata Fakulteta zdravstvenih studija Univerziteta u Sarajevu o deklarisanju hrane. U istraživanju je učestvovalo 103 studenta Fakulteta zdravstvenih studija u Sarajevu, oba spola, sa tri različita studijska programa. Studija je provedena u mjesecu oktobru i dizajnirano je kao presječna studija. Kao instrument istraživanja korišten je anonimni anketni upitnik. Iako je 59.2% ispitanika mišljenja da su informacije na deklaracijama hrane korisne za potrošače, samo 10.7% ispitanika uvijek čita iste, dok se nešto više od polovine ispitanika (53.3%) izjasnilo da ponekad pročita informacije na deklaracijama hrane. Informacije koje ispitanici najčešće čitaju su rok upotrebe, cijena proizvoda te informacije o nutritivnim vrijednostima. Skoro polovina ispitanika smatra da je informacije o alergenima teško pronaći. 52.4% ispitanika nije znalo da se alergeni poput celera, gorušice i rakova trebaju istaći na deklaraciji proizvoda. Postoji statistički značajna razlika u znanju, stavovima i praksi o deklaracijama hrane među ispitanicima u odnosu na studijski program. Kako bi se povećala učestalost korištenja i razumijevanja deklaracija hrane najveći broj ispitanika ukazao je potrebu za dodatnom edukacijom te poboljšanjem čitljivosti teksta na deklaracijama hrane. Znanje, stavovi i praksa studenata Fakulteta zdravstvenih studija u vezi s informacijama na deklaracijama hrane nisu zadovoljavajući. Ističemo potrebu za dodatnom edukacijom studenata u ovoj oblasti.

Ključne riječi: *deklaracije, hrana, edukacija*

3-O-12

Knowledge, attitudes and practice of students of the Faculty of Health Studies about food declaration

Tarik KULOVIĆ^{1*}, Aldina ČEHAJIĆ¹, Bejana OHRAN¹, Elma RIZVO¹,
Selma BUHIĆ¹, Eldina SMJEČANIN¹

¹University of Sarajevo, Faculty of Health studies, Sanitary engineering, BiH

*Corresponding author: Tarik Kulović, kulovictarik95@gmail.com

Abstract

In order to get a high level of protection of the consumers and ensure their right for information, it is necessary to give adequate information to the consumer about the food. Food declarations are important for consumers, but only if they are presented in the right way and when the consumers use and understand them. Objective of this study was to examine the knowledge, attitudes and practice of the students of the Faculty of Health Studies about food declaration. The research involved 103 students from the Faculty of Health Studies in Sarajevo, both genders, with three different study programs. The study was conducted in October and was designed as a cross-sectional study. As a research instrument was used an anonymous survey questionnaire. Although 59.2% of respondents think that the information on food labels is useful for consumers, only 10.7% of respondents always read the same, while slightly more than half of the respondents (53.3%) stated that they sometimes read the information on food labels. The information that respondents most often read is the expiration date, the price of the product and information on nutritional values. Almost half of the respondents think that information on allergens is difficult to find. 52.4% of respondents did not know that allergens such as celery, mustard and crab should be highlighted on the product label. There is a statistically significant difference in knowledge, attitudes and practices about food declarations among respondents compared to the study program. In order to increase the frequency of use and understanding of food declarations, the largest number of respondents indicated the need for additional education and improving the readability of the text on food declarations. The knowledge, attitudes and practice of the students of the Faculty of Health Studies regarding the information on food declarations are not satisfactory. We emphasize the need for additional education of students in this area.

Keywords: *declaration, food, education*

Ishrana i fizička aktivnost djece sa Down sindromom

Adna MAŠIĆ^{1*}, Amna KULJANINOVIĆ¹, Melisa ŠEHIĆ¹, Adela EROVIĆ VRANEŠIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, BiH

* Autor za korespondenciju: adna.masic6@hotmail.com

Sažetak

Down sindrom ili trisomija 21 je genetski poremećaj i najčešći je uzrok mentalnog zaostajanja. Neadekvatan pristup ishrani djece s Down sindromom može imati dugoročne zdravstvene posljedice kako na tjelesni tako i na njihov kognitivni rast i razvoj. Karakteristika Down sindroma je opšta hipotonija miškulature koja direktno utiče na lokomotorni aparat, te dovodi do komplikacija i sa probavnim sistemom (tzv „lijena crijeva“), usljed čega se zbog hipotonije javlja opstipacija. Oko 80% dječesa Down sindromom ima teškoće vezane za hranjenje i ishranu. Cilj ovog rada bio je prikazati barijere u ishrani, efekte nutrijenata i dejstvo fizičke aktivnosti u poboljšanju zdravstvenog stanja i kvaliteta života djece sa Down sindromom. Rad je urađen kao pregledni članak u kojem su korišteni radovi objavljeni u relevantnim naučnim bazama podataka. Postoje mnogobrojna istraživanja o učinku sastojaka hrane bez energetske vrijednosti na metabolizam i cjelokupno funkcionisanje organizma. Važna je odgovarajuća kvalitetna prehrana, jer nedostatak različitih vitamina i minerala, kao što je cink, može pogoršati funkciju štitnjače, imunodefijenciju, a time i mentalni razvoj djeteta. Djeca sa Down sindromom rado prihvataju zadatke s područja motorike, uče metodom imitacije od svojih vršnjaka, ali im je potrebno više vremena za uvježbavanje pojedinih aktivnosti. Fizička aktivnost i poboljšava tonus i trofiku miškulature, usporava pojavu deformiteta lokomotornog aparata, te direktno kroz aktivnosti utiče na bolju probavu i regulaciju tjelesne mase. Ishrana i fizička aktivnost podrazumjevaju kontinuiran proces edukacije i savjetovanja svih osoba koje su uključene u brigu, što će omogućiti očuvanje fizičkog i mentalnog zdravlja.

Ključne riječi: *Down sindrom, hrana, fizička aktivnost, zdravlje*

3-O-13

Nutrition and physical activity of children with Down syndrome

Adna MAŠIĆ^{1*}, Amna KULJANINOVIĆ¹, Melisa ŠEHIĆ¹, Adela EROVIĆ
VRANEŠIĆ¹

¹University of Sarajevo, Faculty of Health Studies, BiH

*Corresponding author: adna.masic6@hotmail.com

Down syndrome or trisomy 21 is a genetic disorder and it is the most common cause of mental retardation. Inadequate access to nutrition for children with Down syndrome can have long-term health consequences for both physical and cognitive growth and development. The characteristic of Down syndrome is general hypotonia of the musculature, which directly affects the locomotor system and leads to complications with the digestive system ("lazy gut"), as a result of which constipation occurs due to hypotonia. About 80% of children with Down syndrome have difficulty eating and eating. The objective of this study was to describe the barriers in the diet, the effects of nutrients and the effect of physical activity in improving the health status and quality of life of children with Down syndrome. It is made as a transparent article which used articles published in the relevant scientific databases. There are numerous studies on the impact of food ingredients without the energy value of the metabolism and the overall functioning of the organism. Proper quality nutrition is important, because a lack of various vitamins and minerals, such as zinc, can worsen thyroid function, immunodeficiency, and thus a child's mental development. Children with Down syndrome willingly accept assignments in the field of motor skills, learn the method of imitation of their peers, but they need more time to practice certain activities. Physical activity improves the tone and trophism of the muscles, slows down the appearance of deformities of the locomotor system and directly through the activities affects better digestion and regulation of body weight. Nutrition and physical activity imply a continuous process of education and consultation of all persons involved in the care, which will enable the preservation of physical and mental health.

Keywords: Down syndrome, food, physical activity, health

Uticaj konzumiranja doručka na zdravlje

Amina MURTO^{1*}, Lamija DIZDAREVIĆ¹, Amela SALIHOVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studij Zdravstvena njega, BiH

* Autor za korespondenciju: Amina Murto, urtoamina@gmail.com

Sažetak

Doručak kao dio zdrave prehrane i načina života pozitivno utiče na dječije zdravlje. Doručak je u cjelini povezan sa zdravijim izborom hrane ili prehrambenim navikama kod djece i adolescenata. Tokom dana važno je ne preskakati glavne obroke i započeti dan s doručkom. Tokom cijelog života trebalo bi doručkovati 365 puta godišnje, jer doručak osigurava energiju potrebnu za početak dana, poboljšava pamćenje, pridonosi boljem raspoloženju i većem samopoštovanju. U tu svrhu provedena je retrospektivna studija pregledom naučne literature u bazama: PubMed, Medline i Google Scholar. Cilj ovog rada bio je istražiti podatke iz literature koji se odnose na učestalost konzumiranja doručka kod bh populacije i njegov uticaj na zdravlje. Rezultati istraživanja pokazuju da 73,7 % ispitanika u Bosni i Hercegovini doručkuje svaki radni dan. Ispitanici koji nisu doručkovali imali su veći dnevni unos energije iz grickalica i slatkiša u toku dana. Ukupno 49 % ispitanika koji nisu doručkovali su imali veće vrijednosti BMI. Prevalenca depresije je zastupljenija kod ispitanika koji nisu doručkovali. Istraživanja pokazuju da mlađi ispitanici češće konzumiraju doručak u odnosu na starije ispitanike. Redovno konzumiranje doručka omogućava kontinuiran unos hranjivih sastojaka, posebno mikronutrijenata, što može uticati na kratkoročne i dugoročne zdravstvene ishode.

Ključne riječi: *doručak, zdravlje, ishrana, depresija, preskakanje doručka*

3-O-14

The impact of breakfast consumption on health

Amina MURTO^{1*}, Lamija DIZDAREVIĆ¹, Amela SALIHOVIĆ¹

¹University of Sarajevo, Faculty of Health Studies, Study program of Nursing, B&H

* Corresponding author: Amina Murto, murtoamina@gmail.com

Abstract

Breakfast, as a part of a healthy diet and lifestyle, has a positive effect on children's health. Breakfast is generally associated with healthier food choices or eating habits in children and adolescents. During the day, it is important not to skip the main meals and start the day with breakfast. You should eat breakfast 365 times a year throughout your life, because breakfast provides the energy needed to start the day, improves memory, contributes to a better mood and greater self-esteem. For this purpose, a retrospective study was conducted by reviewing the scientific literature in the databases: PubMed, Medline and Google Scholar. The aim of this study was to investigate data from the literature related to the frequency of breakfast consumption among BiH population and its impact on health. The results of the research show that 73.7% of respondents in Bosnia and Herzegovina have breakfast every working day. Respondents who did not eat breakfast had a higher daily energy intake from snacks and sweets during the day. A total of 49% of respondents who did not have a breakfast had higher BMI values. The prevalence of depression is more prevalent in subjects who did not eat breakfast. Research shows that younger respondents consume breakfast more often than older respondents. Regular consumption of breakfast allows continuous intake of nutrients, especially micronutrients, which can affect short-term and long-term health outcomes.

Keywords: *breakfast, health, nutrition, depression, breakfast skipping*

Procjena unosa vitamina B₁₂ kroz namirnice među mladom populacijom u okviru Banjalučke regije

Maja RAILIĆ¹, Mirjana ĐERMANOVIĆ^{1*}

¹Univerzitet u Banjoj Luci, Medicinski fakultet, Studijski program farmacija, BiH

*Autor za korespondenciju: Mirjana Đermanović, mirjanadermanovicbl@gmail.com

Sažetak

Vitamin B₁₂ je jedan od najvažnijih nutrijenata koji dobijamo iz namirnica životinjskog porijekla. Njegov nedostatak obuhvata širok spektar hematoloških, gastrointestinalnih, psihijatrijskih i neuroloških poremećaja. Sve veći broj ljudi koji se odlučuje na vegetarijansku ili vegansku prehranu uticao je na to da se namirnice sve češće obogaćuju ovim vitaminom. Kako individualni faktori, tako i faktori stanovništva poput socioekonomskog statusa, religije, običaja i politike javnog zdravlja, doprinose opštem zdravstvenom stanju i statusu vitamina B₁₂. U martu 2020.godine vršeno je anketiranje ispitanika o unosu vitamina B₁₂ kroz pojedine namirnice na mjesečnom nivou. U istraživanju je učestvovalo 100 ispitanika starosne dobi od 16 do 31 godine, koji žive na području Banjalučke regije. Upitnik je obuhvatio najvažnije izvore ovog vitamina: meso, riba, jaja, mlijeko i mliječni proizvodi. Na osnovu tablica hemijskog sastava namirnica procjenjeno je da sedamnaest ispitanika unose manje od preporučene količine ovog vitamina. Najveći procenat B₁₂ unosi se iz mesa (32,94%), zatim iz jaja (24,11%), nešto manje iz riba (23,27%), 17,22% iz mlijeka i mliječnih proizvoda, dok samo 2,46% dolazi iz žitarica. Ova procjena je veoma korisna jer ukazuje na enorman značaj ovog vitamina, kao i na značaj raznovrsne ishrane koja doprinosi poboljšanju i očuvanju cjelokupnog zdravstvenog stanja.

Ključne riječi: *vitamin B₁₂, poremećaji, namirnice, istraživanje, zdravstveno stanje*

3-O-15

Estimation of vitamin B₁₂ intake through foods among the younger population within the Banja Luka region

Maja RAILIĆ¹, Mirjana ĐERMANOVIĆ^{1*}

¹University of Banja Luka, Faculty of Medicine, Department of Pharmacy, Bosnia and Herzegovina

*Corresponding author: Mirjana Djermanovic, mirjanadjermanovicbl@gmail.com

Abstract

Vitamin B₁₂ is one of the most important nutrients we get from foods of animal origin. Its deficiency includes a wide range of hematological, gastrointestinal, psychiatric and neurological disorders. The increasing number of people opting for a vegetarian or vegan diet has made it increasingly common for foods to be enriched with this vitamin. Both individual factors and population factors such as socioeconomic status, religion, customs and health policy contribute to health and general vitamin B₁₂ status. In March 2020, there was a study on the intake of vitamin B₁₂ through certain foods on a monthly basis. The survey involved 100 respondents aged 16 to 31, who live in the Banja Luka region. The survey covered the most important sources of this vitamin: meat, fish, eggs, milk and dairy products. Based on the tables of chemical composition of foods, it was estimated that seventeen subjects ingested less than the recommended amount of this vitamin. The highest percentage of B₁₂ is ingested from meat (32,94%), followed by eggs (24,11%), slightly less from fish (23,27%), 17,22% from milk and dairy products, while only 2,46% comes from cereals. The results of this study should indicate the importance of the intake of this vitamin, as well as the importance of a varied diet that will contribute to improving and maintaining the overall health.

Keywords: *vitamin B₁₂, disorders, foods, survey, health*

Biohemijski i hematološki markeri kod vegetarijanske i nevegetarijanske ishrane

Adisa RAMIĆ^{1*}, Emir ŠEHERČEHAJIĆ¹, Almedina HAJROVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija

*Autor za korespondenciju: Adisa Ramić, adisa41@hotmail.com

Sažetak

Poznato je da svakodnevna ishrana koja se uglavnom temelji na namirnicama životinjskog porijekla može uzrokovati različite bolesti koje mogu dovesti do morbiditeta i mortaliteta. Zato ona predstavlja jedan od faktora koji utiču na pojavu različitih hroničnih bolesti i sve je više dokaza da vegetarijanska ishrana, koja isključuje konzumiranje mesa, promoviše zdravlje i smanjuje pojavu mnogih bolesti. Ciljevi ovog istraživanja su: analizirati i uporediti biohemijske i hematološke markere kod vegetarijanske i nevegetarijanske ishrane, uočiti razlike u odabranim markerima na osnovu specifičnog unosa hrane, te procjena prehranbenog statusa vegetarijanaca u poređenju sa nevegetarijanskim prehranbenim statusom i njegov uticaj na zdravlje. Osam analiziranih istraživanja bavilo se proučavanjem hematoloških markera kod vegetarijanca i nevegetarijanca, koji su naglasili da su kod vegetarijanca uočili smanjenje broja leukocita, hemoglobina i hematokrita. Većina studija je zabilježila nisku koncentraciju vitamina B₁₂ i željeza. Jedno od istraživanja navodi i da je lipidni status imao regularnije vrijednosti kod vegetarijanaca, na šta ukazuju značajno niže vrijednosti holesterola, triglicerida i LDL-a. Kod vegetarijanaca je primjećen pad smrtnosti od ishemijske bolesti srca, vjerovatno zbog niže koncentracijeholesterola u serumu, manje prevalence gojaznosti i veće potrošnje antioksidanata. Dalja istraživanja na većem uzorku, posebno među ljudima iz različitih geografskih područja, potrebna su kako bi se olakšali programi javnog zdravlja posvećeni smanjenju zdravstvenih rizika zbog nutritivnih faktora.

Ključne riječi: *ishrana, biohemijski markeri, hematološki markeri, vegetarijanci, nevegetarijanci*

3-O-16

Biochemical and hematological markers in vegetarian and non-vegetarian diets

Adisa RAMIC^{1*}, Emir SEHERCEHAJIC¹, Almedina HAJROVIC¹

¹University of Sarajevo, Faculty of Health Studies

*Correspondence author: Adisa Ramic, adisa41@hotmail.com

Abstract

It is known that daily nutrition, mainly based on foods of animal origin can cause various diseases that can lead to morbidity and mortality. It is one of the factors that affect the emergence of various chronic diseases and there is growing evidence that a vegetarian diet, which excludes meat consumption, promotes health and reduces the occurrence of many diseases. The objectives of this study are: to analyze and compare biochemical and hematological markers in vegetarian and non-vegetarian diets, to detect differences in selected markers based on specific food intake, and to assess the nutritional status of vegetarians compared to non-vegetarian nutritional status and its impact on health. Eight of the analyzed studies studied hematological markers in vegetarians and non-vegetarians, who emphasized a decrease in the number of leukocytes, hemoglobin and hematocrit in vegetarians. Most studies have reported low levels of vitamin B12 and iron. One study founds that lipid status had more regular values in vegetarians, indicating lower cholesterol, triglycerid and LDL. Vegetarians have a drop in mortality from ischemic heart disease, due to lower serum cholesterol, lower obesity prevalence and higher antioxidant consumption. Further research on a larger sample, especially among people from different geographical areas, is needed to facilitate public health programs dedicated to reducing health risks due to nutritional factors.

Keywords: *diet, biochemical markers, hematological markers, vegetarians, non-vegetarians*

Znanja o imunološkom sustavu i jačanju imuniteta

Nerma OMERAGIĆ, Berina PROZO, Alma NIZIĆ, Antonela SELAK,
Sanela RUSTEMPAŠIĆ, Irma ČEHIĆ

Univerzitet u Sarajevu, Pedagoški fakultet, Odsjek za razrednu nastavu

Sažetak

Jedan od osnovnih i najvažnijih preduvjeta za zdravlje, a onda i kvalitetan život je zdrav i uravnotežen imunološki sustav. Veliki broj ljudi u današnje vrijeme živi ubrzanom načinom života, hrani se neredovito i nezdravo, nedovoljno se kreće i ne vježba te nema dovoljno sna. Pored toga nutritivni nedostaci, pretjerano uzimanje antibiotika, svakodnevne brige čimbenici su koji utječu na slabljene imunološkog sustava.

Svjesni smo da uz pravilnu prehranu i održavanje lične higijene možemo pridonijeti jačanju imunološkog sustava. Pored toga postoje i drugi načini poput boravka na svježem zraku, dovoljno sna, voda, dodaci prehrani (vitamini, minerali i sl.) koji mogu pomoći pri prevenciji i tretiranju infekcija koje se javljaju uslijed oslabljenog imuniteta. Od rođenja organizam je izložen napadima patogenih mikroorganizama. Da nema primjerene zaštite, brzo bismo podlegli različitim bolestima. Jačanje imuniteta se razlikuje kod starijih i kod djece. Dijete se javlja s imunitetom koji je naslijedio od majke, a svoj razvija tek nakon nekoliko mjeseci.

U našem radu sproveli smo anketu među studentima Pedagoškog fakulteta Univerziteta u Sarajevu o tome da li prepoznaju namirice koje su važne za jačanje imuniteta, u kojoj mjeri koriste određene namirnice, da li se dovoljno kreću, što je potrebno za jačanje imuniteta, koji su uzroci koji utiču na slabljenje imuniteta. Tijekom našeg istraživanja spoznali smo da studenti ne poznaju sve načine na koje bi mogli ojačati svoj imunitet, kao i to da su svjesni važnosti korištenja određenih namirnica, ali radije biraju namirnice koje dovode do slabljenja njihovog imuniteta. Usvajanje zdravih životnih navika može poboljšati imunitet za čitav život.

Ključne riječi: *imunološki sistem, jačanje i slabljenje imuniteta, bolesti i namirnice*

3-O-17

Knowledge on the immune system and strengthening immunity

Nerma OMERAGIĆ, Berina PROZO, Alma NIZIĆ, Antonela SELAK,
Sanela RUSTEMPAŠIĆ, Irma ČEHIĆ

University of Sarajevo, Faculty of Education, Department of Classroom Teaching

Summary

One of the basic and most important prerequisites for health and then quality of life is a healthy and balanced immune system. A large number of people nowadays live a fast-paced lifestyle, eat irregularly and unhealthily, do not move enough and do not exercise, and do not get enough sleep. In addition, nutritional deficiencies, excessive antibiotic use, daily worries are factors that affect a weakened immune system.

We are aware that with proper nutrition and maintaining personal hygiene we can contribute to strengthening the immune system. In addition, there are other ways, such as: staying in the fresh air, enough sleep, water, dietary supplements (vitamins, minerals, etc.) that can help prevent and treat infections that occur due to weakened immunity. From birth, body is exposed to attacks of pathogenic microorganisms. Without proper protection, we would quickly succumb to various diseases. The strengthening of immunity differs between the elderly and children. The child appears with the immunity inherited from the mother, and develops its own only after a few months.

In our work, we conducted a survey among students of the Faculty of Education, University of Sarajevo on whether they recognize foods that are important for strengthening immunity, to what extent they use certain foods, whether they move enough, what is needed to strengthen immunity, and causes that affect the weakening of immunity. During our research, we learned that students do not know all the ways they could strengthen their immunity, as well as that they are aware of the importance of using certain foods, but prefer to choose foods that lead to a weakening of their immunity. Adopting healthy living habits can improve lifelong immunity.

Keywords: *immune system, strengthening and weakening of immunity, diseases and foods*

Procjena učestalosti konzumacije ribe i morskih plodova u BiH

Nejla SIJERČIĆ*, Jasmina ĐEĐIBEGOVIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

* Autor za korespondenciju: Nejla Sijerčić, nejlasijercic@ffsa.unsa.ba

Sažetak

Riba je centralni sastojak dobro uravnotežene prehrane, zbog niskog sadržaja holesterola, visokokvalitetnih bjelančevina, omega-3 masnih kiselina, izvor je energije, vitamina i drugih važnih hranjivih tvari. Redovan unos ribe može umanjiti rizik od nekih bolesti poput kardiovaskularnih bolesti i astme. Mnoge javne zdravstvene institucije, kao što je SZO, preporučuju redovnu konzumaciju ribe u količini 1-2 serviranja sedmično. Alternativno, plodovi mora mogu zamijeniti drugu, manje povoljnu, proteinsku hranu u ishrani. Faktori koji utiču na učestalost unosa ribe u Europi su: starost, ekonomski status i obrazovanje. U sklopu istraživačkog rada provedena je anketa na populaciji starijoj od 18 godina da bi se stekao uvid o konzumaciji ribe i morskih plodova. Anketa sadržava demografske podatke (dob, spol, stepen obrazovanja, zvanje), socioekonomski status, pitanja o učestalosti konzumacije i vrsti konzumirane ribe i morskih plodova. Cilj rada je procijeniti učestalost konzumacije morskih plodova, riba i školjki po spolu, dobi, ekonomskom statusu i obrazovanju. Prikupljeno je 756 validnih anketnih upitnika: 711 iz FBiH, 43 iz RS i 2 iz Distrikta Brčko. Od ukupnih rezultata ribu jede 94,05% ispitanika, od čega procentualno najviše 36,29% 2-3 puta mjesečno. Morske plodove jede ukupno 43,65% ispitanika, od čega procentualno najviše 52,42% manje od jednom mjesečno. Rezultati sugerišu da kod konzumacije ribe nema značajnih razlika u odnosu na dob, spol, obrazovanje i ekonomski status. Suprotno tome, konzumacija ostalih morskih plodova raste sa stepenom obrazovanja i ekonomskim statusom, te ih više konzumiraju osobe od 30 do 60 godina u odnosu na mlađe i starije od ove dobne skupine. Rezultati istraživanja će doprinijeti poznavanju prehrambenih navika odraslog stanovništva u BiH.

Ključne riječi: *riba, morski plodovi, prehrambene navike*

3-O-18

Frequency estimation of fish and seafood consumption in B&H

Nejla SIJERČIĆ*, prof.dr. Jasmina ĐEĐIBEGOVIĆ

University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analysis, B&H

*Corresponding author: Nejla Sijerčić, nejlasijercic@ffsa.unsa.ba

Abstract

Fish is a central constituent of well-balanced diet, offering low cholesterol level, high-quality proteins, omega-3 fatty acids, healthy source of energy, vitamins and other important nutrients. The regular intake of fish may reduce the risk of some illnesses, such as cardiovascular disease and asthma. Many public health institutions, such as WHO, recommend regular fish consumption in the amount of 1-2 servings per week. Alternatively, seafood may replace other, less advantageous, protein foods in the diet. Age, economic status and education have been found to be associated with fish intake in Europe. As part of the research work, a survey was conducted on the population older than 18 years in order to gain insight into the consumption of fish and seafood. The survey contains demographic data (age, sex, level of education, profession), socioeconomic status, questions on the frequency of consumption and the type of fish and seafood consumed. The purpose of this study was to estimate the frequency of consumption of seafood, fish and shellfish by sex, age, economic status and education. 756 valid survey questionnaires were collected: 711 from FB&H, 43 from RS and 2 from District Brčko. 94,05% of all respondents eat fish, of which in the highest percentage of 36,29% 2-3 times a month. 43,65% of all respondents eat seafood, of which in the highest percentage of 52,42% less than once a month. The results suggest that there are no significant differences in fish consumption in relation to age, gender, education and economic status. In contrast consumption of other seafood increases with education and economic status, and is consumed more by people aged 30 to 60 compared to younger and older than this age group. The results of the research will contribute to the knowledge of eating habits of the adult population in B&H.

Keywords: *fish, seafood, eating habits*

Povezanost inzulinske rezistencije i dislipidemije sa sindromom policističnih jajnika (PCOS)

Zehra SMAJIĆ^{1*}, Rabija HUSEJNOVIĆ¹, Selma IMAMOVIĆ¹, Almedina HAJROVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, BiH

* Autor za korespondenciju: Zehra Smajić, smajiczehra48@gmail.com

Sažetak

Sindrom policističnih jajnika (PCOS) predstavlja najčešći reproduktivno-metabolički poremećaj u žena reproduktivne dobi. Inzulinska rezistencija (IR) je stanje smanjene osjetljivosti ciljnih ćelija na metaboličku aktivnost inzulina. U cirkulaciji raste koncentracija glukoze što uzrokuje kompenzatornu hiperinzulinemiju. IR predstavlja istaknuto obilježje PCOS-a, a dislipidemije do kojih dolazi predstavljaju rizični faktor za razvoj kardiovaskularnih oboljenja. PCOS među ženama u 20-im ima povezanost s povećanim rizikom za kasnijom pojavom dijabetesa i dislipidemije. Ciljevi ovog istraživanja su: analizirati podatke iz istraživanja o uticaju dislipidemije i inzulinske rezistencije na nastanak i tok PCOS-a, te prikaz osnovne poveznice gojaznosti i PCOS-a. Rad je urađen kao pregledni članak. Kao materijal korišteno je 12 radova iz relevantnih baza podataka. Studije su pokazale da u PCOS-u dolazi do prekomjerne proizvodnje androgena zbog veze inzulinske rezistencije i hiperandrogenizma, što dovodi do metaboličkih poremećaja. Procijenjeno je da 70% žena sa sindromom policističnih jajnika ujedno rezistentno na inzulini, te da pacijentice sa PCOS-om imaju veći rizik od razvoja poremećaja tolerancije glukoze. Kod gojaznih pacijentica sa PCOS-om veća je učestalost inzulinske rezistencije koja dodatno pogoršava simptome PCOS-a, te može uticati na pojavu steriliteta. Udruženi PCOS i gojaznost imaju dvostruko veći metabolički rizik, jer poremećena funkcija masnog tkiva, uzrokuje pojačanu produkciju hormona adipokina, testosterona, estrogena. Dokazana je uska povezanost između poremećaja metabolizma lipida i inzulinske rezistencije kod PCOS, te pogoršanje simptoma i ishoda ukoliko je gojaznost pr pratni faktor. Navedeno ukazuje na potrebu za preventivnim i edukativnim programima koji uključuju skrining metode, regulaciju metaboličkih poremećaja i promjenu životnih stilova.

Ključne riječi: *dislipidemija, inzulinska rezistencija, gojaznost, sindrom policističnih jajnika*

3-O-19

Connection between insulin resistance and dyslipidemia with polycystic ovary syndrom (PCOS)

Zehra SMAJIĆ^{1*}, Rabija HUSEJNOVIĆ¹, Selma IMAMOVIĆ¹, Almedina HAJROVIĆ¹

¹University of Sarajevo, Faculty of health studies, B&H

*Corresponding author: Zehra Smajić, smajiczehra48@gmail.com

Abstract

Polycystic ovary syndrome (PCOS) is the most common reproductive-metabolic syndrome disorder in women of reproductive age. Insulin resistance (IR) is a condition of reduced sensitivity of target cells to insulin metabolic activity. Concentration increases in the circulation glucose which causes compensatory hyperinsulinemia. IR is a prominent feature of PCOS, and dyslipidemias that occur are a risk factor for development of cardiovascular diseases. PCOS among women in their 20s has an connection with increased risk of later occurrence of diabetes and dyslipidemia. The goals of this research are: to analyze data from the research on the impact of dyslipidemia and insulin resistance on the occurrence of and the course of PCOS, and the presentation of the basic link between obesity and PCOS. The paper has been done as a review article. 12 papers from relevant databases were used the material. Studies have shown that, in PCOS, androgen overproduction appears due to the link between insulin resistance and hyperandrogenism and that leads to metabolic disorder. It has been estimated that 70% of women with polycystic ovary syndrome are also insulin resistant, and that patients with PCOS have higher risk of developing glucose tolerance disorders. When it comes to obese patients with PCOS, the frequency of insulin resistance is higher, which further worsens the symptoms of PCOS, and can influence the occurrence of sterility. Combined PCOS and obesity have twice the metabolic risk because a disturbed function of adipose tissue causes increased production of adipokine, testosterone, estrogen hormones. A close connection has been proven between lipid metabolism disorder and insulin resistance in PCOS, and worsening of symptoms and outcomes if obesity is an accompanying factor. This indicates the need for preventive and educational programs that include screening methods, regulation of metabolic disorders and lifestyle changes.

Keywords: *dyslipidemia, insulin resistance, obesity, polycystic ovary syndrome*

Utjecaj bezglutenske ishrane na zdravlje osoba bez zdravstvenih poremećaja povezanih sa glutenom

Edvin SUPUR^{1*}, Anes FEHRIĆ¹, Fazila ĐUDERIJA¹, Minela VELAGIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Studijski program Sanitarno inženjerstvo, BiH

*Autor za korespondenciju: Edvin Supur, edvinsupur41019@gmail.com

Sažetak

Hrana koja sadrži gluten povezuje se s brojnim alergijskim, autoimunim i imunološki posredovanim poremećajima, no međutim posljednjih nekoliko decenija bezglutenska ishrana postala je trend i smatra se zdravijim obrascem ponašanja među općom populacijom. Cilj ovog rada bio je utvrditi potencijalne rizike bezglutenske ishrane na zdravlje opće populacije bez zdravstvenih poremećaja povezanih sa glutenom. Istraživanje je sprovedeno pregledom dostupne naučne i stručne literature publicirane u relevantnim bazama podataka (PubMed, Medline, Google Scholar i Nutrition journal) upotrebom ključnih riječi „*gluten free*“, „*gluten free diet*“, „*non-celiac gluten sensitivity*“. Rad je urađen kao pregledni članak. Rezultati istraživanja pokazuju da opredjeljenost ka bezglutenskoj ishrani je u većini slučajeva samoinicijativna odluka pojedinaca bez prethodnih nutricionističkih konsultacija. Konzumiranje proizvoda bez glutena, bez značajne raznolikosti u izboru namirnica, dovodi do većeg rizika za izloženost određenim toksinima poput teških metala u usporedbi s klasičnim načinom prehrane koji ne isključuje gluten. Najveći rizik svakako je neuravnotežena prehrana praćena nedostatnim unosom esencijalnih makro i mikronutrijenata koji potiču iz namirnica koje prirodno sadrže gluten. Bezglutenska prehrana dugoročno povećava rizik za nutritivne manjkove, naročito za manjak vlakana, vitamina B12, D, minerale poput željeza, cinka, magnezijuma i kalcijuma neophodnih za normalno funkcionisanje ljudskog organizma. Neophodno je kontinuirano provoditi edukaciju pojedinaca koji praktikuju bezglutensku ishranu u svrhu poboljšanja unosa raznolike hrane, povećanja konzumacije cjelovitih, svježih i neprerađenih namirnica te usvajanja metode pripreme jela.

Ključne riječi: *bezglutenska, ishrana, ne-celijačna osjetljivost na gluten*

3-O-20

The impact of gluten-free diet on the health of people without gluten-related health disorders

Edvin SUPUR^{1*}, Anes FEHRIC¹, Fazila ĐUDERIJA¹, Minela VELAGIĆ¹

¹University of Sarajevo, Faculty of Health Studies, Department of Environmental Health, BiH

* Corresponding author: Edvin Supur, edvinsupur41019@gmail.com

Abstract

Gluten-containing food have been linked to a number of allergic, autoimmune and immune-mediated disorders but in recent decades gluten-free diets have become a trend and considered a healthier pattern of behavior among the general population. Aim of this paper was to determine the potential risks of a gluten-free diet to the health of the general population without gluten-related health disorders. The research was conducted by reviewing the available scientific and professional literature published in relevant databases (PubMed, Medline, Google Scholar and Nutrition journal) using the keywords "*gluten free*", "*gluten free diet*", "*non-celiac gluten sensitivity*". The paper was prepared as a review article. Recent researches show that the commitment to a gluten-free diet is in most cases a self-initiated decision of individuals without prior nutritional consultation. Consuming gluten-free products, without significant diversity in food choices, leads to a higher risk of exposure to certain toxins such as heavy metals compared to a classic gluten-free diet. The biggest risk is certainly an unbalanced diet accompanied by an insufficient intake of essential macro and micronutrients derived from foods that naturally contain gluten. A gluten-free diet in the long run increases the risk of nutritional deficiencies, especially a lack of fiber, vitamins B12, D, minerals such as iron, zinc, magnesium and calcium necessary for the normal functioning of the human body. It is necessary to continuously educate individuals who practice a gluten-free diet in order to improve the intake of a variety of foods, increase consumption of whole, fresh and unprocessed foods and adopt a method of cooking.

Keywords: *gluten free, diet, non-celiac gluten sensitivity*

Procjena kvalitete školske užine

Ena BRKIĆ¹, Jasmina ZUKANOVIĆ^{1*}, Tarik KANTIĆ², Naida MAHMIĆ²
Irzada TALJIĆ^{1,2}

¹Univerzitet u Sarajevu, Pedagoški fakultet, Odsjek za razrednu nastavu, BiH

²Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, Odsjek za prehrambene tehnologije, BiH

* Autor za korespondenciju: Jasmina ZUKANOVIĆ, jasmina.zukanovic@yahoo.com

Sažetak

Školska užina je jedini obrok koji djeca konzumiraju tokom svog boravka u osnovnoj školi na području Bosne i Hercegovine. Taj obrok treba biti nutritivno i energetski adekvatan i zadovoljavati 20% dnevnih energetskih potreba školskog djeteta. Ovisno o kvalitetu obroka, djeca će imati bolju koncentraciju, bolje pamtili i postići bolje rezultate. Cilj ovog istraživanja je procjena vrste i sadržaja školske užine kao obroka. Ispitanici su roditelji učenika razredne nastave od 1. do 5. razreda, iz pet gradova u Bosni i Hercegovini (Kiseljak, Maglaj, Sanski Most, Sarajevo, Tešanj). Korištena metoda istraživanja je posebno dizajnirana anketa za ovo istraživanje koja je sprovedena „online“ putem Google form obrasca. Anketa sadrži opći dio (mjesto boravka, starost učenika) zatim vrstu, sadržaj i učestalost konzumiranja određenih namirnica u okviru školske užine. Rezultati ankete pokazuju da najveći broj djece (67%) nosi užinu od kuće, od toga 70% su sendviči pretežno pripremljeni od integralnog peciva sa jako malim procentom povrća. Voće konzumira 79% učenika, 80% učenika konzumira slatkiše, te 89% konzumira vodu svakodnevno. Pored navedenog rezultati ankete su pokazali da učitelji/učiteljice u maloj mjeri propagiraju pravilnu ishranu u školi. Podatak da djeca nose užinu od kuće ukazuje da se svijest o pravilnoj ishrani povećava među roditeljima, ali veliki procenat zastupljenosti slatkiša ukazuje da ima još mjesta za intervencije i promociju pravilne ishrane. Edukacija je ključ promjene prehrambenih navika koje treba korigovati tokom nižih razreda osnovne škole i uloga učitelja je veoma bitna.

Ključne riječi: *školska užina, procjena, kvaliteta, učenici, roditelji*

3-O-21

School lunch quality assessment

Ena BRKIĆ¹, Jasmina ZUKANOVIĆ^{1*}, Tarik KANTIĆ², Naida MAHMIĆ²
Irzada TALJIĆ^{1,2}

¹University in Sarajevo, Faculty of educational sciences,, Department for classroom teaching,
BiH

²University in Sarajevo, Faculty of Agriculture and Food, department for food technology,
biH

* Corresponding author: Jasmina ZUKANOVIĆ, jasmina.zukanovic@yahoo.com

Abstract

School lunch is the only meal that children consume during their stay in elementary school in Bosnia and Hercegovina. That meal should be nutritionally and energetically adequate and satisfy 20% of daily energy needs of a school child. Depending on the quality of the meal, children will have better concentration, better memory and better results.

The goal of this research is assessment of kind and content of school lunch as a meal. The respondents are parents of students in lower elementary grades from five cities in Bosnia and Hercegovina (Kiseljak, Maglaj, Sanski most, Sarajevo, Tešanj). The research method is specially designed survey which is conducted „online“ in Google form pattern. The survey contains a general part (place of residence, students age), the kind, content and frequency of consumption of certain groceries within the school lunch. The results of the survey show that the highest number of children (67%) take the school lunch from home, of which 70% are sandwiches usually made of integral pastry with very low percent of vegetables. The fruit is consumed by 79% of students, 80% of students consume sweets and 89% consume water on daily basis. In addition to above, the results of survey have shown that teachers rarely encourage the proper nutrition in the school. The fact that children bring snacks from home indicates that awareness of proper nutrition is increasing among parents, but the high percentage of sweets consumption indicates that there is still room for intervention and promotion of proper nutrition. Education is the key to change eating habits which have to be corrected during the lower grades of primary school. The role of the teacher is for sure very important.

Keywords: *school lunch, assessment, quality, pupils, parents*

Ishrana kroz Kur'an, sa osvrtom na sinergističko djelovanje smokve i masline

Amina BEGANOVIĆ¹, Fahrija DACIĆ¹, Sumejja MEMIJA¹, Nermina ŽIGIĆ^{1*}

¹Univerzitet u Sarajevu, Farmaceutski fakultet, BiH

* Autor za korespondenciju: Nermina Žigić, nerminazigic@ffsa.unsa.ba

Sažetak

U Kur'anu se između ostalih tema spominju ishrana i određene namirnice. Smokva i maslina se spominju u 1. ajetu (stih iz Kur'ana), 95. sure (poglavlje) Kur'ana, pod nazivom At-Tin – Smokva, gdje se Uzvišeni Bog kune ovim dvjema namirnicama. Smokva i maslina se koriste samostalno u tradicionalnoj medicini, i brojne studije potvrđuju njihovu djelotvornost, a obzirom na njihovo istovremeno spominjanje u gore navedenom ajetu, zadatak ovog rada je bio da istraži njihovo zajedničko djelovanje. *Olea europea* L. (*Oleaceae*) – maslina; njen plod sadrži 40% ulja, 5% bjelančevina, manitola, heterozida i saponozida, listovi sadrže fenolne spojeve visokog antioksidacijskog kapaciteta. *Ficus carica* L. (*Moraceae*) – smokva, sadrži fenole, kumarine, flavonoide. Visoka koncentracija fenola sadržanih u smokvi i maslini veže se za njihovu antioksidativnu aktivnost. Zahvaljujući svom antioksidativnom djelovanju, smokva i maslinovo ulje smanjuju toksične efekte 5-fluorouracila na srce i bubrege. *Lupeol*, triterpen sadržan u smokvi i maslini ima antiinflamatorni i antiartritički efekat te su različite studije pokazale značajan učinak upotrebe ove dvije biljke na remisiju reumatoidnog artritisa. Njihovom primjenom kod hiperlipidemije, dolazi do poboljšanja nivoa jetrenih enzima. Cilj rada je bio prikazati nutritivna i farmakološka djelovanja smokve i masline, sa posebnim fokusom na njihovo sinergističko djelovanje. Na osnovu dostupnih studija može se zaključiti da postoji sinergističko djelovanje smokve i masline u tretmanu određenih stanja kao. Ipak, potrebna su dalja istraživanja s ciljem potvrde efikasnosti, ali i sigurnosti ove kombinacije.

Ključne riječi: *smokva, maslina, ishrana, Kur'an*

3-O-22

Nutrition through the Qur'an, with special reference on synergistic pharmacological effect of fig and olive

Amina BEGANOVIĆ¹, Fahrija DACIĆ¹, Sumejja MEMIJA¹, Nermina ŽIGIĆ¹ *

¹University of Sarajevo, Faculty of Pharmacy, BiH

* Corresponding author: Nermina Žigić, nerminazigic@ffsa.unsa.ba

Abstract

In the Qur'an, among other topics, nutrition and foods are also mentioned. Fig and olive are mentioned in verse 1, chapter 95 of the Qur'an, called At-Tin – Fig, where Almighty God swears by these two plants. Figs and olives have been used in traditional medicine. Numerous studies confirm their effectiveness. Following the fact that these two plants were mentioned together in this specific verse, the aim of this paper was to present their synergistic pharmacological effect. *Olea europea* L. (*Oleaceae*) – olive; its fruit contains 40% oil, 5% protein, mannitol, heterosides and saponosides, the leaves contain phenolic compounds with high antioxidant capacity. *Ficus carica* L. (*Moraceae*) – fig; contains phenols, coumarins and flavonoids responsible for its pharmacological effect. The high concentration of phenols contained in both plants is linked to their antioxidant activity. Thanks to its antioxidant action, fig and olive oil reduce the toxic effects of cytostatics, 5-Fluorouracil on the heart and kidneys. *Lupeol*, the triterpene contained in figs and olives, has an anti-inflammatory and anti-arthritic effect, and various studies have shown a significant effect of the use of these two plants on the remission of rheumatoid arthritis. In treatment of hyperlipidemia, they improve liver enzyme levels. The aim of this paper was to present nutritional and pharmacological effects of fig and olive, and focus on their synergistic effect. Available studies indicate that there is the synergistic effect of figs and olives in treatment of various conditions. Further research is required to confirm the effectiveness and safety of this combination.

Keywords: *fig, olive, nutrition, Qur'an*

Ishrana kao potencijalni etiološki faktor nastanka ortodontskih nepravilnosti

Selma ŠUJIĆ*, Amila WEILER, Lejla REDŽEPAGIĆ-VRAŽALICA

Stomatološki fakultet sa klinikama Univerziteta u Sarajevu, BiH

*Autor za korespondenciju: Selma Šujić, selmasujic783@gmail.com

Sažetak

Različita vrsta hrane, prema svojim kvalitativnim i kvantitativnim svojstvima, nosi različite utjecaje na stanje orofacijalnog sistema. Kariogena hrana predstavlja faktor rizika za nastanak zubnog karijesa. S druge strane, tekstura hrane utječe na kraniofacijalnu morfologiju preko žvačnih mišića i temporomandibularnog zgloba. Brojna istraživanja ukazuju na korelaciju modela ishrane i pojave malokluzija. Cilj ovog rada je kroz sistematski pregled literature prikazati utjecaj ishrane na potencijalni nastanak određenih ortodontskih nepravilnosti. Kompjuterskim pretraživanjem pregledani su, potom analizirani članci objavljeni u okviru baza podataka *Google Scholar* i *PubMed*, a na temu ishrane i malokluzija. Rezultati provedenog istraživanja pokazuju da razvoj vilica i okluzalnih odnosa nije samo genetski određen već na njega utječu i lokalni faktori od kojih važnu ulogu ima ishrana. Konzistencija hrane koju koristimo utječe na jačinu mastikacije koju trebamo primjeniti. Sistemskim pregledom literature došli smo do zaključka da konzistencija hrane utječe na razvoj čitavog stomatognatnog sistema. Konzumiranje hrane mekše konzistencije dovodi do prilagođavanja funkcija stomatognatnog sistema, te dugoročno može imati za posljedicu pojavu malokluzije. U skladu sa tom problematikom ortodonti preporučuju prelazak od meke na tvrdnu hranu kod djece uzrasta od 12-14 mjeseci života koja odgovara pojavi prvih mliječnih molara.

Ključne riječi: *ishrana, žvakanje, djeca, malokluzije, ortodontske nepravilnosti*

3-P-1

Nutrition as a potential etiological factor in the development of orthodontic anomalies

Selma ŠUJIĆ*, Amila WEILER, Lejla REDŽEPAGIĆ-VRAŽALICA

Faculty of Dental Medicine with clinics, University of Sarajevo, BiH

*Corresponding author: Selma Šujić, selmasujic783@gmail.com

Abstract

Different kind of foods, regarding its qualitative and quantitative properties, can have various influences on the orofacial system. Cariogenic foods is a risk factor for the formation of the dental caries. On the other hand, the texture of the food can affects craniofacial morphology, via the masticatory muscles and temporomandibular joint. Numerous studies point out the correlation between nutrition and malocclusions. The main aim of this work is to present results of the systematic review of the literature that demonstrate the possible connection between the nutrition and development of certain orthodontic anomalies. We have conduct the survey of the published articles within databases Google Scholar and PubMed, in the field of nutrition and malocclusion. Results of this survey showed that the development of occlusion is not only geneticaly driven, but also can be affected by local factors, such as diet. The chewing force may be influenced by the texture of food. Results of sistematic literature review showed that food texture affects the development of the entire stomatognathic system. The consumption of the soft food leads to adaptation of the stomatognathic system, which can cause malocclusion. For that reason, orthodontists recommend shift from the soft to a hard food in toddlers at the age of 12-14 months, when first milk teeth appear.

Keywords: *nutrition, chewing, chlidren, malocclusions, orthodontic anomalies*

4. DIJETOTERAPIJA
DIETOTHERAPY

Zdravstveni efekti primjene ćurokota (*Nigella sativa*)

Amra ADŽAMIJA¹, Naida BAŠIĆ^{1*}, Semira BUDIMOVIĆ¹, Zekira HRNJICA¹, Ilma SENDO¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

*Autor za korespondenciju: Naida Bašić, naidabasic@ffsa.unsa.ba

Sažetak

U posljednje vrijeme primjena fitoterapeutika u tretmanu brojnih oboljenja je dramatično povećana zbog lake dostupnosti i niske cijene, te uvjerenja da prirodni lijekovi imaju manje štetnih učinaka u odnosu na sintetičke lijekove. Ćurokot (*Nigella sativa* L., *Ranunculaceae*) se smatra jednom od najcjenjenijih biljaka po bogatstvu hranjivim tvarima, te se trenutno provode brojna znanstvena istraživanja u svrhu potvrde tradicionalno utvrđenih upotreba sjemena ove biljke. Dosad su brojne studije pokazale da su sjeme *Nigella sativa* i njegov glavni aktivni sastojak, timokinon, medicinski vrlo učinkoviti u borbi protiv različitih oboljenja. Sumiranjem rezultata provedenih studija dostupnih u različitim bazama podataka (izvor: PubMed, Google Scholar, Science Direct) u ovom radu smo došli do zaključka da ćurokot, odnosno njegovi aktivni sastojci (prvenstveno timokinon) posjeduju širok spektar aktivnosti: antidiuretsku, antihipertenzivnu, antidijabetičku, antikancerogenu i imunomodulatornu, antimikrobnu, antihelmintičku, analgetsku i protuupalnu, spazmolitičku, bronhodilatatorsku, gastroprotektivnu, hepatoprotektivnu i antioksidativnu. U posljednje vrijeme sve je veći fokus na mogućoj primjeni ćurokota u formi dodatka prehrani, zbog snažnog antioksidativnog potencijala, uz minimalne nuspojave. Razna randomizirana kontrolirana ispitivanja, pilot studije, izvještaji o slučajevima i *in vitro* i *in vivo* studije potvrdile su da *N. Sativa* može imati pozitivno djelovanje na znakove i simptome COVID-19, te da može pomoći pacijentima koji imaju i popratne komorbiditete (hipertenziju, dijabetes, astmu). Preliminarni rezultati pokazali su da timokinon može imati inhibitornu aktivnost protiv SARS CoV2 proteaze, te se *N. Sativa* može smatrati potencijalnim kandidatom za fitoterapiju ove infekcije. Visok stepen učinkovitosti djelovanja *N. Sativa* na neke bolesti pokazale su studije *in vivo* i *in vitro*, međutim još uvijek nema dovoljno kliničkih studija, koje bi to i potvrdile.

Ključne riječi: *Nigella sativa*, crno sjeme, farmakološka dejstva, timokinon

4-O-1

Therapeutic effects of black seed (*Nigella sativa*)

Amra ADŽAMIJA¹, Naida BAŠIĆ^{1*}, Semira BUDIMOVIĆ¹, Zekira HRNJICA¹, Ilma SENDO¹

¹University of Sarajevo, Faculty of Pharmacy, BiH

*Corresponding author: NaidaBašić, naidabasic@ffsa.unsa.ba

Abstract

Lately, the use of phytotherapeutics in the treatment of various number of diseases has dramatically increased due to its availability and low cost, and the belief that natural remedies have fewer harmful effects compared to synthetic drugs. Black seed (*Nigella sativa* L., *Ranunculaceae*) is considered one of the most valued plants in terms of nutrient richness and numerous scientific studies are currently being conducted to confirm the traditionally established uses of the seeds of this plant. So far, studies have shown that *Nigella sativa* seeds and its main active ingredient, thymoquinone, are medically very effective in fighting various diseases. By summarizing the results of conducted studies available in different databases (source: PubMed, Google Scholar, Science Direct) in this paper, we came to the conclusion that *N. sativa* and its active ingredients (primarily thymoquinone) have a wide range of activities: antidiuretic, antihypertensive, antidiabetic, anticancer and immunomodulatory, antimicrobial, analgesic and anti-inflammatory, antispasmodic, bronchodilator, gastroprotective, hepatoprotective and antioxidant. Lately, there has been an increasing focus on the possible use of black seed in the form of a dietary supplement due to its strong antioxidant potential, with minimal side effects. Various randomized controlled trials, pilot studies, case reports, *in vitro* and *in vivo* studies have confirmed that *N. sativa* can have a positive effect on the signs and symptoms of COVID-19, and that it can help patients who have concomitant comorbidities (hypertension, diabetes, and asthma). Preliminary results have shown that thymoquinone may have inhibitory activity against SARS CoV2 protease, and *N. sativa* may be considered a potential candidate for phytotherapy of this infection. *In vivo* and *in vitro* studies have shown a high degree of efficacy of *N. sativa* in some diseases, however there are still not enough clinical studies to confirm this.

Keywords: *Nigella sativa*, black seed, pharmacological effects, thymoquinone

Prehrana i Hashimoto tireoiditis

Kana BORČAK^{1*}, Jasmina ĐEĐIBEGOVIĆ¹, Zeliya VELIJA-AŠIMI²

¹Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

²Outpatient clinic "Dr Al Tawil" Sarajevo; Sarajevo Medical School, SSST

* Autor za korespondenciju: Kana Borčak, borcakkana@gmail.com

Sažetak

Hashimoto tireoiditis spada u grupu organo-specifičnih autoimunih bolesti koja je karakteristična za štitnu žlijezdu. Novija istraživanja upućuju na moguć značaj uloge prehrane u terapiji Hashimoto tireoiditisa. Sama farmakoterapija ne rješava sve simptome bolesti kod pacijenata. Uvođenje adekvatnih dijetoterapijskih mjera kod oboljelih pacijenata poboljšavaju kvalitet života i dovode do objektivnih pokazatelja pozitivnih terapijskih ishoda. Cilj rada je bio ispitati uticaj modifikacije prehrane na simptome i kliničku sliku pacijenta sa Hashimoto tireoiditisom. U radu su prikazani rezultati efekata modifikacije prehrane na simptome i kliničku sliku 11 odraslih pacijenata (dobi od 17 do 56 godina). Rezultati pokazuju da izbalansirana prehrana bez glutena i rafiniranih šećera, upotreba adekvatne suplementacije i izbalansirana fizička aktivnost doprinosi poboljšanju cjelokupne kliničke slike kod pacijenata. Kod 91% ispitanika je došlo do poboljšanja nalaza, 82% je primjetilo promjene vezane za simptome bolesti, a kod 82% je došlo do redukcije tjelesne težine. Naši rezultati pokazuju benefite eliminacije određenih namirnica iz prehrane kod oboljelih koji se ogledaju u smanjenju nadutosti, poboljšanju probave, osjećaju lakoće, smanjenju bolova i napetosti u želucu, redukciji tjelesne težine. Redukcija tjelesne težine je moguće posebno značajna jer je pokazano da smanjenjem tjelesne težine dolazi i do stabiliziranja hormonskog statusa kod pacijenata. Zaključno, ovakve suportivne terapijske mjere bi mogle biti od koristi za pacijente, te bi ih trebalo potvrditi u većem istraživanju kako bi se uvele i u standardni protokol u tretmanu bolesti.

Ključne riječi: *Hashimoto tireoiditis, prehrana, dijetoterapija, suplementi, gluten*

4-O-2

Diet and Hashimoto thyroiditis

Kana BORČAK^{1*}, Jasmina ĐEĐIBEGOVIĆ¹, Zeliya VELIJA-AŠIMI²

¹University of Sarajevo, Faculty of Pharmacy, Department for Pharmaceutical Analysis, BiH

² Outpatient clinic "Dr Al Tawil" Sarajevo; Sarajevo Medical School, SSST

*Corresponding author: Kana Borčak, borcakkana@gmail.com

Abstract

Hashimoto thyroiditis belongs to a group of organ-specific autoimmune diseases of the thyroid gland. Recent researches suggest a possible role for diet in the treatment of Hashimoto's thyroiditis. Pharmacotherapy alone does not resolve all the symptoms of the disease in patients. The introduction of adequate dietary measures for patients, improves the quality of life and leads to objective indicators of positive therapeutic outcomes. The aim of this study was to examine the impact of dietary modification on the symptoms and clinical picture in patients with Hashimoto's thyroiditis. The paper presents the results of the effects of dietary modification on the symptoms and clinical picture of 11 adult patients (aged 17 to 56 years). The results pointed that a balanced diet without gluten and refined sugars, the use of adequate supplementation as well as balanced physical activity contributes to the improvement of the overall clinical condition in diseased patients. 91% patients noticed improvement in clinical reports, in 82% patients their disease symptoms were changed, 82% patients experienced a reduction in body weight. Our results show the benefits of eliminating certain food from the diet in patients that are reflected in reducing bloating, improving digestion, feeling light, reducing pain and tension in the stomach, weight reduction. Weight reduction is possibly particularly significant because it has been shown that weight loss also leads to stabilization of hormonal status in patients. In conclusion, such supportive therapeutic measures could be beneficial for patients, and should be confirmed in a larger study to be introduced into a standard protocol in the treatment of the disease.

Keywords: *Hashimoto thyroiditis, diet, diet therapy, supplements, gluten*

Zdravstveni efekti dijeta s niskim sadržajem ugljikohidrata

Azra HAMIDOVIĆ^{1*}, Matej PLANINIĆ¹, Jasmina ĐEĐIBEGOVIĆ¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

*Autor za korespondenciju: Azra Hamidović, azrahamidovic@ffsa.unsa.ba

Sažetak

Cilj ovog rada je istražiti naučne dokaze o zdravstvenim efektima dijete s niskim sadržajem ugljikohidrata, a informacije i podaci korišteni za izradu rada preuzeti su iz relevantnih stručnih literatura, te baza podataka oficijelnih referentnih institucija. Iako danas jedna od popularnijih vrsta dijeta koje se primjenjuju, kao što su ketogena ili paleo dijeta, ona nije tačno definisana, te svako ponaosob ima različito shvatanje ove dijete na koje, u velikoj mjeri, utiče kako marketing, tako i mediji i društvene mreže. Rezultati koje smo dobili istraživanjem su da su studije dijeta s niskim sadržajem ugljikohidrata usredotočene na gubitak tjelesne težine, kao i na bolesnike koji imaju ili su u riziku od kardiometaboličkih bolesti poput dijabetesa T2 i bezalkoholne bolesti masne jetre. Ketogena dijeta koristi se i u kontroli epileptičnih napada, održavanje balansa kod inzulinske rezistencije, a sve se više radi i na istraživanjima na temu učinaka kod neurodegenerativnih, zloćudnih, pa čak i nekih autoimunih bolesti. Međutim, iako pokazuju benefite kod navedenih stanja, također pokazuju rizik za razvijanje određenih kardiovaskularnih poremećaja, koji su najviše izraženi radi povećanog unosa masti. Zaključili smo da s obzirom na to da ovaj tip dijete nije tačno definisan, te na studije koje su heterogene, konzumenti ne bi smjeli sprovoditi ovakve restriktivne dijete bez prethodne konsultacije sa ljekarom, nutricionistom ili farmaceutom.

Ključne riječi: *dijeta, nizak sadržaj ugljikohidrata, ketogena dijeta*

Health effects of low carbohydrate diets

Azra HAMIDOVIĆ¹ *, Matej PLANINIĆ¹, Jasmina ĐEDIĆBEGOVIĆ¹

¹University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analytics,
B&H

* Corresponding author: Azra Hamidović, azrahamidovic@ffsa.unsa.ba

Abstract

The aim of this paper is to investigate the scientific evidence on the health effects of a low carbohydrate diet, and the information and data used to prepare the paper are taken from the relevant professional literature and databases of official institutions. Although one of the most popular types of diets used today, such as the ketogenic or paleo diet, it is not precisely defined, and everyone has a different understanding of this diet, which is greatly influenced by marketing, media and social networks. The results we obtained from the study are that studies of low carbohydrate diets have focused on weight loss, as well as on patients who have or are at risk for cardiometabolic diseases such as T2 diabetes and nonalcoholic fatty liver disease. The ketogenic diet is also used for control of epileptic seizures, maintaining balance in insulin resistance, and more and more work is being done on research on the effects of neurodegenerative, malignant, and even some autoimmune diseases. However, although they show benefits in these conditions, they also show a risk for developing certain cardiovascular disorders, which are most pronounced due to the increased fat intake. We concluded that since this type of diet is not precisely defined, and the studies are heterogeneous, consumers should not conduct such restrictive diets without prior consultation with a physician, nutritionist, or pharmacist.

Keywords: *diet, low carbohydrate content, ketogenic diet*

Upotreba ulja noćurka (*Oenothera biennis* L. *Onagraceae*) u tretmanu ženskog zdravlja

Azra HERIĆ¹*

¹ Univerzitet u Sarajevu, Farmaceutski fakultet, BiH

* Autor za korespondenciju: Azra Herić, azraheric@ffsa.unsa.ba

Sažetak

Sindrom policističnih jajnika ili PCOS je morfološki poremećaj ili biohemijsko stanje okarakterisano povećanim nivoima androgena, nepravilnim menstruacionim ciklusima i malim cistama na jednom ili oba jajnika. Tretman pacijentica sa policističnim jajnicima zavisi od simptoma. Također, procedure u toku liječenje zavise uveliko od željenog ishoda, npr. liječenje feritliteta, regulacija nepravilnog menstrualnog ciklusa, ublažavanje simptoma hiperandrogenizma i liječenje pretilosti. Terapija koja se koristi u tretmanu PCOS je uspješna, u većini slučajeva, ali ti lijekovi imaju mnoge neželjene efekte. Cilj ovog rada jeste, na osnovu postojećih podataka, istražiti uticaj i efikasnost upotrebe ulja noćurka u tretmanu ženskog zdravlja, kao „zdravije alternative“. Ulje noćurka se u apotekama nalazi kao dodatak prehrani i često se koristi kao alternativna terapija u tretmanu raznovrsnih oboljenja. Zbog bogatog sadržaja omega-6 masnih kiselina često se koristi u tretmanu hroničnih inflamacija u organizmu, kao i u tretmanu nekoliko različitih ženskih stanja kao što su mastalgija, menopauzalni i premenstrualni simptomi. Ulje noćurka sadrži 2 tipa omega-6 masnih kiselina uključujući linolnu kiselinu (60%-80%) i γ -linolensku kiselinu (8%-14%) koje spadaju u esencijalne nutrijente posebno za ženski organizam. Rezultati mnogobrojnih studija ukazuju na to da je ulje noćurka efikasno u održavanju ženskog zdravlja sa posebnim naglaskom na korištenje u tretmanu mastalgije, kao i nepravilnosti u menstrualnim ciklusima. Ono što je za očekivati kod preparata koji su na biljnoj bazi jeste da odgovor organizma upotrebom ovog preparata neće uslijediti odmah, nego nakon četiri do šest mjeseci kontinuirane upotrebe.

Ključne riječi: *sindrom policističnih jajnika, ulje noćurka, ulje noćurka u tretmanu ženskih bolesti, PCOS*

Use of evening primrose oil (*Oenothera biennis* L. *Onagraceae*) in the treatment of women 's health

Azra HERIĆ¹*

¹ University of Sarajevo, Faculty of Pharmacy, BH

* Corresponding author: Azra Herić, azraheric@ffsa.unsa.ba

Abstract

Polycystic ovary syndrome or PCOS is a morphological disorder or biochemical condition characterized by increased androgen levels, irregular menstrual cycles, and small cysts on one or both ovaries. Treatment of patients with polycystic ovaries depends on the symptoms. Also, procedures during treatment depend largely on the desired outcome, e.g. treatment of fertility, regulation of irregular menstrual cycle, alleviation of symptoms of hyperandrogenism and treatment of obesity. The therapy used in the treatment of PCOS is successful, in most cases, but these drugs have many side effects. The aim of this paper is, based on existing data, to investigate the impact and effectiveness of the use of evening primrose oil in the treatment of women's health, as a "healthier alternative". Evening primrose oil is found in pharmacies as a dietary supplement and is often used as an alternative therapy in the treatment of various diseases. Due to its rich content of omega-6 fatty acids, it is often used in the treatment of chronic inflammation in the body, as well as in the treatment of several different female conditions such as mastalgia, menopausal and premenstrual symptoms. Evening primrose oil contains 2 types of omega-6 fatty acids including linoleic acid (60% -80%) and γ -linolenic acid (8% -14%) which are essential nutrients especially for the female body. The results of numerous studies indicate that evening primrose oil is effective in maintaining women's health, with special emphasis on its use in the treatment of mastalgia, as well as irregularities in menstrual cycles. What is to be expected with herbal preparations is that the body's response to the use of this preparation will not follow immediately, but after four to six months of continuous use.

Key words: *polycystic ovary syndrome, evening primrose oil, evening primrose oil in the treatment of gynecological diseases, PCOS*

Povezanost prehrane i ankilozantnog spondilitisa

Nejira KAJTAZ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

Autor za korespondenciju: Nejira Kajtaž, e-mail adresa: nejira.kajtaž1@gmail.com

Sažetak

Ankilozantni spondilitis je hronična, progresivna, sistemska, reumatska, inflamatorna bolest koja pretežno pogađa kičmu i sakroilijakalni zglob. Identificirani HLA-B27 gen prisutan je kod 85-90% pacijenata oboljelih od ankilozantnog spondilitisa. Pokazalo se da je upala crijeva važan prognostički faktor, jer je povezana s opsežnijim edemom sakroilijakalnih zglobova te većim rizikom od progresije bolesti. Postoje snažni dokazi koji sugerišu povezanost upale intestinalne sluznice i ankilozantnog spondilitisa. *K. pneumoniae* ima značajnu etiopatogenetsku ulogu u razvoju ankilozantnog spondilitisa. Monosaharadi i disaharidi, koji se uglavnom izvode iz digestije škroba i složenih ugljikohidrata u crijevima, glavni su supstratni materijali potrebni za rast mikroba u kolonu. Posljednjih godina, istraživanja su usmjerena ka utvrđivanju važnosti prehrane za sastav ljudskog mikrobioma. Iako je sastav mikrobiote debelog crijeva kod odraslih relativno stabilan, njegova koncentracija može se manipulirati dijetalnim sredstvima. Dakle, razni hranjivi sastojci utiču na strukturu mikrobne zajednice i predstavljaju esencijalne supstrate za mikrobni metabolizam. Glavni ciljevi ovog rada su prikazati etiologiju i patogenezu oboljenja ankilozantni spondilitis, te napraviti kritički pregled studija koje ispituju povezanost prehrane i ankilozantnog spondilitisa. Manipulativnim prehrabenim mjerama, uključujući upotrebu nisko-škrobne prehrane, vjerovatno se može suzbiti opterećenje mikroba u crijevima i samim tim smanjiti antibakterijski imunološki odgovor, ublažiti jačina upalne reakcije i spriječiti daljnja oštećenja crijevnog trakta kod pacijenata s ankilozantnim spondilitisom. Nutricionistička terapije kod ovog oboljenja ograničeno utiče na tok bolesti zbog genetske determinante HLAB27.

Ključne riječi: *ankilozantni spondilitis, prehrana, dijetalni režim*

4-O-5

Relationship between diet and Ankylosing spondylitis

Nejira KAJTAZ

University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analysis, B&H

Corresponding author: Nejira Kajtaz, e-mail adress: nejira.kajtaz1@gmail.com

Abstract

Ankylosing spondylitis is a chronic, progressive, systemic, rheumatic, inflammatory disease that mainly affects the spine and sacroiliac joint. The identified HLA-B27 gene is present in 85-90% of patients with ankylosing spondylitis. Inflammation of the intestine has been shown to be an important prognostic factor, as it is associated with more extensive edema of the sacroiliac joints and a higher risk of disease progression. There is strong evidence to suggest an association between inflammation of the intestinal mucosa and ankylosing spondylitis. *K. pneumoniae* has a significant etiopathogenetic role in the development of ankylosing spondylitis. Monosaccharides and disaccharides, which are mainly derived from the digestion of starch and complex carbohydrates in the gut, are the main substrate materials required for microbial growth in the colon. In recent years, research has focused on determining of diet for the composition of the human microbiome. Although the composition of the colon microbiota in adults is relatively stable, its concentration can be manipulated by dietary agents. Thus, various nutrients affect the structure of the microbial community and represent essential substrates for microbial metabolism. The main objectives of this paper are to present the etiology and pathogenesis of ankylosing spondylitis, and to make a critical review of studies examining the relationship between diet and ankylosing spondylitis. Manipulative dietary measures, including the use of a low-starch diet, are likely to suppress the microbial load in the gut and thereby reduce the antibacterial immune response, alleviate the intensity of the inflammatory response, and prevent further intestinal damage in patients with ankylosing spondylitis.

Keywords: *ankylosing spondylitis, nutrition, diet*

Prehrana kod pacijenata sa sindromom iritabilnog crijeva

Naida MIRVIĆ*, Jasmina ĐEDIĆBEGOVIĆ, Amila TURALIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BIH

*Autor za korespondenciju: Naida Mirvić, naidamirvic@ffsa.unsa.ba

Sažetak

Definicija sindroma iritabilnog crijeva (IBS- engl. *Irritable Bowel Syndrome*) nije jednostavna uprkos činjenici da je u pitanju relativno česta pojava u kliničkoj praksi. Prema sadašnjim saznanjima, radi se o gastrointestinalnoj smetnji koja se manifestuje simptomima blagog osjećaja nelagode do jake boli te promjenjivim motilitetom gornjeg i donjeg probavnog sistema, koji kao rezultat daje izmjenu opstipacije i dijareje. Kod pacijenata sa iritabilnim crijevom, kao odgovor na konzumaciju hrane nastaje hipertonični želučano-crijeveni refleks koji se manifestuje sa povećanim mišićnim tonusom i segmentnim kontrakcijama, uz ubrzanje peristaltike i pojavu stolice. Cilj rada je bio istražiti efikasnost modifikacija prehrane na simptome i znakove IBS-a. Za postizanje pomenutog cilja, kao izvori podataka korišteni su: dostupna stručna literatura, originalni članci objavljeni u naučnim časopisima te medicinske baze podataka. Prema opštim smjernicama za prehranu osoba sa IBS, namirnice koje bi trebalo izbjegavati su brašno, tjestenina, luk, bijeli luk, paprika, kupus i repa, gazirana pića, banana, grah i grašak, te mlijeko i mliječne proizvode. Vlakna kao dodatak prehrani se preporučuje osobama sa IBS kod kojih preovladava konstipacija, sve u cilju omekšavanja i povećanja volumena stolice, te poticanja peristaltike i olakšanog pražnjenja. Dokazano je da prehrana sa niskim sadržajem FODMAP (*Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols*) učinkovito reducira simptome poput abdominalne boli, nadutosti i nepravilnog pražnjenja crijeva, čime se poboljšava kvaliteta života. Poboljšanje simptoma uočeno je i uvođenjem prehrane siromašne slobodnom fruktozom i fruktanima, obzirom da se malapsorpcija fruktoze javlja kod 24% oboljelih od IBS. Kod velikog broja oboljelih od IBS primjećeno je poboljšanje nakon isključivanja glutena iz prehrane, iako im nije dijagnosticirana ni celijakija ni alergija na pšenicu. Na osnovu provedenog istraživanja moguće je izvesti zaključak da prehrambene navike pacijenta sa dijagnozom sindroma iritabilnog crijeva imaju veliki utjecaj na razvoj, poboljšanje / pogoršanje simptoma, kao i na kvalitet života.

Ključne riječi: *sindrom iritabilnog crijeva, FODMAP, gluten, fruktoza*

4-O-6

Diet for patients with irritable bowel syndrome

Naida MIRVIĆ*, Jasmina ĐEDIĆ, Amila TURALIĆ

University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analysis, B&H

*Corresponding author: Naida Mirvić, naidaamirvic@ffsa.unsa.ba

Abstract

The definition of irritable bowel syndrome is not simple despite the fact that it is very common in the clinical practice. What is known so far, it is a gastrointestinal disorder with symptoms from mild feeling of discomfort to strong pain and changes in upper and lower digestive system motility, which results in changing obstipation and diarrhea. Patients with irritable bowel, as a response to consuming food, develop a hypertonic gastrointestinal reflux which manifests as enlarged muscle tonus and segmented contractions, with acceleration of peristalsis and stool appearance. Work goal was to research what is the efficiency of diet changes on IBS symptoms and signs. Professional literature and original articles published in scientific journals, as well as medicinal databases were used as sources for achieving these goals. According to the general diet instructions patients suffering from IBS should avoid flour, pasta, onion, garlic, pepper, cabbage, turnip, carbonated drinks, banana, bean, peas, as well as milk and dairy. Fibers, as dietary supplements, are recommended to IBS patients with constipation predominance, all for the purpose of softening and increasing the stool volume, stimulating peristalsis and relieved defecating. It has been scientifically proven that low-FODMAP (*Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols*) diet successfully reduces symptoms like abdominal pain, flatulence and irregular bowel emptying, which improves the quality of life. Improvement in symptoms was also observed with the introduction of low free-fructose and fructans diet, since fructose malabsorption occurs in 24% of IBS patients. In a large number of IBS patients, improvement was observed after the exclusion of gluten from the diet, although they were not diagnosed with celiac disease or wheat allergy. Based on the research, it is possible to conclude that the eating habits of a patient diagnosed with irritable bowel syndrome have a great influence on the development, improvement / worsening of symptoms, as well as on the quality of life.

Keywords: *irritable bowel syndrome, FODMAP, gluten, fructose*

Uticaj prisustva voćnog soka na *in vitro* ispitivanje brzina rastvaranja ljekovitih supstanci

Irma MUREŠKIĆ¹, Anđelka RAČIĆ², Biljana GATARIĆ², Nataša BUBIĆ-PAJIĆ²

¹ Univerzitet u Banjoj Luci, Medicinski fakultet, Studijski program Farmacija, Bulevar vojvode Petra Bojovića 1A, 78 000 Banja Luka, Bosna i Hercegovina

² Univerzitet u Banjoj Luci, Medicinski fakultet, Katedra za farmaceutsku tehnologiju i kozmetologiju, Save Mrkalja 14, 78 000 Banja Luka, Bosna i Hercegovina

Sažetak

Pacijenti vrlo često uzimaju oralne farmaceutske oblike, posebno analgetika, sa tečnostima koje nisu voda, kao što su npr. voćni sokovi, mlijeko i dr. Cilj ove studije je bio procjena uticaja voćnog soka na profile oslobađanja šest različitih ljekovitih supstanci iz preparata dostupnih na tržištu BiH. Ispitani su diazepam, karbamazepin, ibuprofen, acetisalicilna kiselina i paracetamol tablete, te ketoprofen kapsule. Ispitivanje brzine rastvaranja ljekovitih supstanci *in vitro* vršeno je u dvije faze primjenom odgovarajućih farmakopejskih metoda. U prvoj fazi korišćen je propisani vodeni rastvor pufera u propisanoj zapremini, a u drugoj fazi ispitivanja 200 ml ovog medijuma zamijenjeno je voćnim sokom. Dobijeni rezultati pokazuju značajno smanjenje procenta rastvorenog ibuprofena i diazepama iz tableta, dok se u prisustvu voćnog soka povećala količina rastvorenih ljekovitih supstanci iz tableta paracetamola i karbamazepina. Prisustvo soka je izuzetno ometalo oslobađanje ibuprofena iz tableta, te je sadržaj ljekovite supstance u uzorcima bio ispod limita detekcije. Ovi rezultati upućuju na mogućnost postojanja interakcije između ibuprofena i komponenata iz soka. Jedini preparati kod kojih dodatak soka u medijum nije uticao na profil brzine rastvaranja ljekovite supstance, bili su acetilsalicilna kiselina, tablete i ketoprofen, kapsule. Očigledno je da je prisustvo soka u medijumu za ispitivanje brzine rastvaranja ljekovite supstance, imalo različit efekat kod testiranih preparata što svakako može uticati na biološku raspoloživost oralno primijenjenih lijekova. Dakle, pacijente je potrebno savjetovati da prilikom uzimanja lijekova slijede uputstva za pacijente.

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Ključne riječi: *diazepam, karbamazepin, NSAIL, voćni sok, brzina oslobađanja lijeka*

4-O-7

Influence of the presence of a fruit juice on dissolution profiles of different drugs

Irma MUREŠKIĆ¹, Anđelka RAČIĆ², Biljana GATARIĆ², Nataša BUBIĆ-PAJIĆ²

¹Department of Pharmacy, University of Banja Luka-Faculty of Medicine, Bulevar vojvode Petra Bojovića 1A, 78000 Banja Luka, Bosnia and Herzegovina,

²Department of Pharmaceutical Technology and Cosmetology, University of Banja Luka-Faculty of Medicine, Save Mrkalja 14, 78000 Banja Luka, Bosnia and Herzegovina

Abstract

Patients often take oral dosage forms, especially of NSAIDs, with fluids other than water, e.g. fruit juice. The aim of this study was to determine the effect of fruit juice on in vitro dissolution profile of six drugs, commercially available on the market. Diazepam, carbamazepine, ibuprofen, acetylsalicylic acid and paracetamol tablets and ketoprofen capsule were tested. In vitro dissolution tests were studied in two phases using appropriate pharmacopoeial methods. In the first phase, aqueous buffered solution in appropriate volume was used as a dissolution medium. In the second phase, 200 ml of the medium was replaced with fruit juice. The obtained results showed significant decrease of extent of ibuprofen and diazepam dissolved in the medium containing fruit juice. In the case of ibuprofen, the concentration of drug in the medium containing fruit juice was below the limit of detection. This indicates the possibility of interaction between the drug and the components of fruit juice. On the other hand, in the case of paracetamol and carbamazepine tablets, the drug dissolved (%) was higher when dissolution medium was mixed with fruit juice. The release of acetylsalicylic acid and ketoprofen from investigated dosage forms was not affected by fruit juice. Thus, it seems that the presence of fruit juice in dissolution medium could influence the dissolution kinetics of some drug products, which could further lead to the significant changes in their bioavailability. Therefore, the patients should be advised to take medicines as it is described in patient information leaflet (PIL).

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Keywords: *diazepam, carbamazepine, NSAID, fruit juice, dissolution profile*

Uticaj suplementacije preparatima željeza i folnom kiselinom na hematološko biohemijski status u trudnoći

Ajla PODGORICA^{1*}, Almedina HAJROVIĆ¹

¹Univerzitet u Sarajevu, Fakultet zdravstvenih studija

*Autor za korespondenciju: Ajla Podgorica, podgoricaajla@gmail.com

Sažetak

Hematopoeza, kao proces sinteze krvnih ćelija, zahtjeva prisustvo vitamina B6, B12, folne kiseline te željeza, a oni predstavljaju najčešće suplemente u trudnoći. Ovi suplementi imaju značajan uticaj na hematološko-biohemijski status u trudnoći. Ciljevi ovog istraživanja su: predstaviti efekte suplementacije željezom i folnom kiselinom na biohemijsko-hematološki status u trudnoći i dejstvo smanjene koncentracije na zdravlje trudnica i ploda. Rad je urađen kao pregledni članak, za čiju izradu se koristilo 12 naučnih članaka koji prate relevantnu bazu podataka. U većini istraživanja dokazano je da su potrebe za folnom kiselinom u trudnoći značajno povećane, jer je ona neophodna za pravilan rast i razvoj posteljice i ploda. Kako navodi jedno od istraživanja, cilj unosa je izbjeći neželjene posljedice kao što je spriječavanje defekta neuralne cijevi. Nedostatak folne kiseline tokom trudnoće povezuje se s poremećajima razvoja gornje usne, urinarnoga trakta i ekstremiteta, te se povezuje s razvojem anemije, leukopenije i trombocitopenije. Pored folne kiseline, važnu ulogu igra i suplement željeza. Studije su potvrdile da žene koje su uzimale suplemente željeza, rodile su djecu sa većom tjelesnom težinom. Deficit željeza i anemija u ranoj trudnoći su povezani s povećanim rizikom od prijevremenog poroda. Vrlo je bitan planiran unos Fe i folne kiseline, kako bi se obezbijedili uslovi za pravilan razvoj fetusa. Deficiti željeza i folne kiseline izazivaju mnogobrojne rizike u trudnoći, kao što su anemija, leukopenija i trombocitopenija. Sve navedeno ističe potrebu za edukacijom na nacionalnom nivou, te planiranu i kontrolisanu trudničku ishranu i suplementaciju.

Ključne riječi: *suplementacija, folna kiselina, željezo, trudnoća, plod*

Influence of supplementation with iron preparations and folic acid on hematological biochemical status in pregnancy

Ajla PODGORICA^{1*}, Almedina HAJROVIĆ¹

¹University of Sarajevo, Faculty of Health Studies

*Corresponding author: Ajla Podgorica, podgoricaajla@gmail.com

Abstract

Hematopoiesis, as a process of blood cell synthesis, requires the presence of vitamins B6, B12, folic acid, and iron, and they are the most common supplements in pregnancy. These supplements have a significant impact on hematological-biochemical status in pregnancy. The objectives of this study are: to present the effects of iron and folic acid supplementation on the biochemical-hematological status in pregnancy and the effect of reduced concentration on the health of pregnant women and the fetus. The paper was done as a review article, for the development of which 12 scientific articles were used, which follow the relevant database. Most studies have shown that the need for folic acid in pregnancy is significantly increased because it is necessary for the proper growth and development of the placenta and fetus. According to one study, the goal of intake is to avoid side effects such as preventing neural tube defects. Folic acid deficiency during pregnancy is associated with disorders of the development of the upper lip, urinary tract, and extremities, and is associated with the development of anemia, leukopenia, and thrombocytopenia. In addition to folic acid, iron supplementation also plays an important role. Studies have confirmed that women who took iron supplements gave birth to children with higher body weight. Iron deficiency and anemia in early pregnancy are associated with an increased risk of preterm birth. The planned intake of Fe and folic acid is very important, in order to provide conditions for proper fetal development. Iron and folic acid deficiencies pose numerous risks in pregnancy, such as anemia, leukopenia, and thrombocytopenia. All of the above emphasizes the need for education at the national level, as well as planned and controlled pregnancy nutrition and supplementation.

Keywords: *supplementation, folic acid, iron, pregnancy, fetus*

Potencijalno hipotenzivno djelovanje biljnih droga

Amina BIHORAC^{1*}, Amina HRNČIĆ¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, BiH

*Autor za korespondenciju: Amina Bihorac, aminabihorac@ffsa.unsa.na

Sažetak

Biljne droge predstavljaju osnovu fitoterapije. Fitoterapija predstavlja metodu liječenja, prevencije i ublažavanja simptoma biljnim drogama odnosno svim njihovim dijelovima kao što su korijen, list, cvijet, nadzemni dio biljke, kao i pripravcima koji se dobivaju laganom preradom biljnih dijelova. To su najčešće ekstrakti, infuzi, macerati, tinkture te eterična ulja. *De facto* se u liječenju biljem koriste farmakološki aktivni sastojci tih biljaka, odnosno u konačnici njihovi standardizirani preparati. Biljne vrste koje se koriste u fitoterapiji hipertenzije su: *Crategi folium cum flore*, list i cvijet gloga; *Alium sativi bulbis*, lukovica bijelog luka; *Equiseti herba*, rastavić. Pored ovih vrsta, u radu će se spomenuti i nova istraživanja u ovom polju. Droge koje će se spominjati u nastavku, nisu novootkrivene, ali je njihov hipotenzivni učinak do sada bio nepoznat. U istraživanjima se spominju mnoge biljne vrste kao npr.: *Andrographis paniculata*, justicija; *Coriandrum sativum*, korijander; *Crocus sativus (saffron)*, šafran; *Hibiscus sabdariffa (roselle)*, hibiskus, rozela; *Camellia sinensis*, kineski čajevac; *Zingiber officinale*, đumbir, *Petroselinum crispum*, peršun; *Achillea millefolium*, stolisnik. Fitoterapija često predstavlja prvi stepen liječenja kojem se pacijenti okreću u samomedikaciji. Neke od biljnih droga namjenjenih za fitoterapiju hipertenzije se koriste svakodnevno u ishrani, ali se mogu naći i kao različiti dodaci prehrani kako u apotekama, tako i u slobodnoj prodaji na tržištu, na prodajnim mjestima koja nisu dovoljno zakonski regulisana. Edukacijom o novootkrivenim farmakološkim djelovanjima određenih biljnih droga, farmaceut će biti u stanju pacijentu pružiti potpunu farmaceutsku zdravstvenu zaštitu.

Ključne riječi: hipertenzija, biljna droga, fitoterapija

4-P-1

Potential hypotensive effect of herbal drugs

Amina BIHORAC^{1*}, Amina HRNČIĆ¹

¹University of Sarajevo, Faculty of Pharmacy, Bosnia and Herzegovina

*Corresponding author: Amina Bihorac, aminabihorac@ffsa.unsa.ba

Abstract

Herbal drugs are the basis of phytotherapy. Phytotherapy is a method of treatment, prevention, and alleviation of symptoms with herbal drugs or all their parts such as root, leaf, flower, aboveground part of the plant, as well as preparations obtained by light processing of herbal parts. These are most often extracts, infusions, macerates, tinctures, and essential oils. De facto, the pharmacologically active ingredients of these plants are used in herbal treatment, and ultimately their standardized preparations. Herbal species used in the phytotherapy of hypertension are: *Crategi folium cum flore*, hawthorn leaf and flower; *Alium sativi bulbus*, garlic bulb; Equiseti herba, horsetail. In addition to these species, the paper will mention new research in this field. The drugs that will be mentioned below are not newly discovered, but their hypotensive effect has been unknown so far. Many plant species are mentioned in the research, such as *Andrographis paniculata*, creat; *Coriandrum sativum*, coriander; *Crocus sativus (saffron)*, saffron; *Hibiscus sabdariffa (roselle)*, hibiscus, roselle; *Camellia sinensis*, Chinese tea tree; *Zingiber officinale*, ginger, *Petroselinum crispum*, parsley; *Achillea millefolium*, yarrow. Phytotherapy is often the first stage of treatment that patients turn to in self-medication. Some of the herbal drugs intended for phytotherapy of hypertension are used daily in the diet, but they can also be found as various dietary supplements both in pharmacies and in the free sale on the market, at points of sale that are not sufficiently legally regulated. By educating about the newly discovered pharmacological effects of certain herbal drugs, the pharmacist will be able to provide the patient with complete pharmaceutical health care.

Keywords: *hypertension, herbal drug, phytotherapy*

Hepatoprotektivni i hepatotoksični uticaj Rooibos čaja (*Asphalatus linearis*)

Amina BIHORAC^{1*}, Amina HRNČIĆ¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, BiH

*Autor za korespondenciju: Amina Hrnčić, aminahrncic@ffsa.unsa.ba

Sažetak

Biljka *Asphalatus linearis*, poznatija kao čaj rooibos ili „majčino čudo iz Južne Afrike“, prisutna je kao samostalna komponenta čajeva, a može se naći i kao sastavni dio brojnih čajnih mješavina prisutnih na bosanskohercegovačkom tržištu. Bogat je izvor neuobičajenih glikoziliranih biljnih polifenola, flavonoida, a sadržava i polisaharide, oligosaharide i velik broj mineralnih tvari s različitim ključnim svojstvima za unaprjeđenje zdravlja. Brojne studije potvrdile su da *Asphalatus linearis* ima pozitivne efekte na gastrointestinalni trakt, djeluje hepatoprotektivno, hemoprotektivno, i kardioprotektivno. Preporučuje se i kod osoba slabog imuniteta, akutnih anemija zbog nedostatka željeza i u prehrani dojilja, te kao adjuvant u terapiji Diabetes mellitusa. Rad je baziran na hepatoprotektivno i hepatotoksično djelovanje *Asphalatus linealisa*. *In vitro* studije potvrdile su histološke regresije steatoze i ciroze u tkivima, inhibiciju povećanja malondialdehida, triacilglicerola i holesterola, smanjenje plazmatskih koncentracija aminotransferaza (AST, ALT), alkalne fosfataze i bilirubina, koji se smatraju markerima funkcionalnog stanja jetre i slične pozitivne promjene, za koje su odgovorne aktivne komponente iz biljke *Asphalatus linearis*. S druge strane, nekoliko studija slučaja iz kliničke prakse, pokazalo je upravo suprotno. U praksi se dešavalo da je baš *Asphalatus linearis* doveo do hepatotoksičnih efekata, a sve u skladu sa neadekvatnom primjenom ove biljke. Na kraju je dat zbirni prikaz istraživanja koja su pokazala ili hepatoprotektivno ili hepatotoksično djelovanje *Asphalatus linealisa*, uz kvalitativnu i kvantitativnu analizu dobivenih rezultata.

Ključne riječi: *rooibos*, *Asphalatus linearis*, *hepatoprotektivnost*, *hepatotoksičnost*, *čajna mješavina*

4-P-2

Hepatoprotective and hepatotoxic effects of Rooibos tea (*Asphalatus linearis*)

Amina BIHORAC^{1*}, Amina HRNČIĆ¹

¹University of Sarajevo, Faculty of Pharmacy, Bosnia and Herzegovina

*Corresponding author: Amina Hrnčić, aminahrncic@ffsa.unsa.ba

Abstract

The plant *Asphalatus linearis*, better known as rooibos tea or "mother's miracle from South Africa", is present as an independent component of teas, and can also be found as an integral part of many tea blends present on the market of Bosnia and Herzegovina. It is a rich source of unusual glycosylated plant polyphenols, flavonoids, and also contains polysaccharides, oligosaccharides, and a large number of minerals with various key health-promoting properties. Numerous studies have confirmed that *Asphalatus linearis* has positive effects on the gastrointestinal tract, has hepatoprotective, chemoprotective, and cardioprotective effects. It is also recommended for people with weak immunity, acute anemia due to iron deficiency and in the diet of breastfeeding mothers, and as an adjuvant in the treatment of Diabetes mellitus. The work is based on the hepatoprotective and hepatotoxic effects of *Asphalatus linearis*. In vitro studies have confirmed histological regressions of steatosis and cirrhosis in tissues, inhibition of increased malondialdehyde, triacylglycerol, and cholesterol, decreased plasma concentrations of aminotransferases (AST, ALT), alkaline phosphatase, and bilirubin, which are considered markers of liver function, for which are responsible active components of the plant *Asphalatus linearis*. On the other hand, several case studies from clinical practice have shown exactly the opposite. In practice, it seems that *Asphalatus linearis* led to hepatotoxic effects, all under the inadequate use of this plant. Finally, a summary of studies showing either hepatoprotective or hepatotoxic activity of *Asphalatus linearis* is given, with a qualitative and quantitative analysis of the results obtained.

Keywords: *rooibos*, *Asphalatus linearis*, *hepatoprotection*, *hepatotoxicity*, *tea blend*

Značaj antitumorskog djelovanja ljetnog vrganja (*Boletus edulis* Bull., 1782)

Belma NAHIĆ^{1*}, Amna ZUKIĆ¹, Amina BIHORAC², Amina HRNČIĆ²

¹Univerzitet u Sarajevu, Prirodno-matematički fakultet, BiH

²Univerzitet u Sarajevu, Farmaceutski fakultet, BiH

*Autor za korespondenciju: Belma Nahić, belmanahic@yahoo.com

Sažetak

Jedna od novih strategija u liječenju karcinoma je kemoprevencija, koja uključuje upotrebu spojeva za blokiranje ili prekretanje karcinogeneze. U ovom kontekstu veoma interesantnim se pokazao ljetni vrganj (*Boletus edulis*). Ova gljiva je česta gljiva sjeverne hemisfere, te je veoma rasprostranjena i na području Bosne i Hercegovine. Jestiva je gljiva, i na ovim prostorima se oduvijek smatrala i ljekovitom. Ljetni vrganj smatra se sigurnom gljivom za branje zbog svog karakterističnog izgleda, te ga je veoma teško zamijeniti sa nekom drugom gljivom. Međutim treba paziti da se sakuplja na mjestima koja nisu izložena djelovanju teških metala, jer je sklon akumulaciji istih. Dobar je izvor proteina, masti, vitamina B kompleksa, vlakana, bakra, kalija, cinka, i selena. Veliki broj studija dokazao je antitumorsko djelovanje ekstrakta ove gljive, kada je u pitanju karcinom debelog crijeva. Biopolimeri vrganja ekstrahirani vrućom vodom i pročišćeni anionskom izmjenjivačkom hromatografijom pokazali su antiproliferativno djelovanje u stanicama raka debelog crijeva. U ovom radu dat je tabelaran prikaz studija koje su potvrdile potencijal ekstrakta ove gljive u kemoprevenciji. Objasnjeno je o kojim se dijelovima genoma radi, te na koji način je ostvaren mehanizam antitumorskog djelovanja. Na kraju su izvedeni zaključci koji se odnose na značaj primjene ove gljive u svakodnevnoj ishrani, njenom antitumorskom potencijalu, te mogućnosti razvoja dijetetskih suplemenata koji su bazirani isključivo na onim dijelovima genoma *Boletus edulis* koji je pokazao antitumorsko djelovanje, a s ciljem prevencije karcinoma debelog crijeva.

Ključne riječi: *vrganj, kemoprevencija, Boletus edulis, karcinom, ekstrakt*

4-P-3

Significance of antitumor activity of summer boletus (*Boletus edulis* Bull., 1782)

Belma NAHIĆ^{1*}, Amna ZUKIĆ¹, Amina BIHORAC², Amina HRNČIĆ²

¹University of Sarajevo, Faculty of Natural Sciences and Mathematics, B&H

²University of Sarajevo, Faculty of Pharmacy, B&H

* Corresponding author: Belma Nahić, belmanahic@yahoo.com

Abstract

One of the new strategies in cancer treatment is chemoprevention, which involves the use of compounds to block or reverse carcinogenesis. In this context, the summer boletus (*Boletus edulis*) proved to be very interesting. This fungus is a common fungus of the northern hemisphere, which is very widespread in Bosnia and Herzegovina. It is an edible mushroom, and I have always considered it medicinal in this area. Summer boletus is considered a safe mushroom to pick because of its characteristic appearance and is very difficult to confuse with any other mushroom. However, care should be taken to collect it in places that are not exposed to heavy metals, as it is prone to their accumulation. It is a good source of protein, fat, B complex vitamins, fiber, copper, potassium, zinc, and selenium. A large number of studies have proven the antitumor activity of the extract of this fungus when it comes to colon cancer. *Boletus edulis* biopolymers extracted with hot water and purified by anion exchange chromatography showed antiproliferative activity in colon cancer cells. In this paper, a tabular presentation of studies that confirmed the potential of this fungus extract in chemoprevention is given. It is explained which parts of the genome are involved, how the mechanism of antitumor activity is realized. Finally, conclusions were drawn regarding the importance of this fungus in the daily diet, its antitumor potential, and the possibility of developing dietary supplements based solely on those parts of the genome *Boletus edulis* that showed antitumor activity, with the aim of preventing colon cancer.

Keywords: *boletus*, *chemoprevention*, *boletus*, *cancer*, *extract*

Uloga mioinozitola u prevenciji gestacijskog dijabetes melitusa

Nina OKUKA^{1,2}

¹Univerzitet u Banjoj Luci, Medicinski fakultet, Studijski program farmacija, BiH

²Univerzitet u Beogradu, Farmaceutski fakultet, Srbija (student doktoralnog studija)

*Autor za korespondenciju: Nina Okuka, nina.vukicevic@med.unibl.org

Sažetak

Gestacijski dijabetes melitus (GDM) predstavlja stanje poremećenog metabolizma glukoze i djelovanja insulina, specifično za trudnoću, a manifestuje se povećanim nivoom glukoze u krvi. Najčešće se javlja u drugom ili trećem trimestru trudnoće kod zdravih žena, a može dovesti do prijevremenog poroda, kao i do malformacija ploda (makrozomija, akutni respiratorni distress sindrom). Fizička aktivnost i dijetarne intervencije se smatraju veoma značajnim faktorima u prevenciji ovog oboljenja. Pregledom relevantne literature, može se uočiti da dodaci ishrani koji sadrže mioinozitol, kao biološki aktivno jedinjenje, mogu pomoći u prevenciji GDM-a. Mioinozitol predstavlja najzastupljeniji izomer cikličnog poliola inozitola, koji se u organizam može unijeti putem dodataka ishrani i konzumiranjem namirnica bogatih mioinozitolom kao što su žitarice, narandža, grejpfrut i dinja. U organizmu, on predstavlja prekursora inozitol-fosfoglikana, koji imaju ulogu posrednika kaskadne signalizacije insulina, te se smatra da na taj način dovodi do regulisanja djelovanja ovog hormona. Studije su pokazale da suplementacija mioinozitolom, od prvog trimestra trudnoće, može smanjiti incidencu gestacijskog dijabetesa (60% manja incidenca u grupi koja je uzimala mioinozitol u odnosu na kontrolnu grupu), kao i prijevremenog poroda, dok rezultati OGTT-a (Oralnog Glukoza Tolerans Testa) i incidenca makrozomije ploda nisu usaglašeni. Dnevne doze mioinozitola, koje su dovodile do navedenih pozitivnih efekata, bile su 4 g/dan. S obzirom da je u pitanju veoma osjetljiva populacija, poseban značaj dodataka ishrani koji sadrže mioinozitol, jeste taj što nisu uočeni neželjeni efekti, zbog čega se smatraju veoma bezbjednim za primjenu u prevenciji GDM-a.

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Ključne riječi: *gestacijski dijabetes melitus, mioinozitol, dodaci ishrani*

4-P-4

Role of myo-inositol in prevention of gestational diabetes mellitus

Nina OKUKA^{1,2}

¹University of Banja Luka, Faculty of Medicine, Department of Pharmacy, BiH

²University of Belgrade, Faculty of Pharmacy, Serbia (PhD student)

*Corresponding author: Nina Okuka, nina.vukicevic@med.unibl.org

Abstract

Gestational diabetes mellitus (GDM) is a condition of impaired glucose metabolism and insulin action, specific for pregnancy, manifested by increased blood glucose levels. Most commonly, occurs in second or third trimester of pregnancy in healthy women, and can lead to premature birth, as well as to fetal malformations (macrosomia, acute respiratory distress syndrome). Physical activity and dietary interventions are considered to be very important factors in prevention of this condition. A review of relevant literature shows that dietary supplements containing myo-inositol, as a biologically active compound, may help in prevention of GDM. Myo-inositol is the most common isomer of cyclic polyol inositol, which can be ingested through dietary supplements and by consuming food rich in myo-inositol such as cereals, oranges, grapefruit and melons. It is known as a precursor of inositol phosphoglycans, which act as a mediator of insulin signal transduction, thus leading to regulation of action of this hormone. Studies have shown that myo-inositol supplementation, from the first trimester of pregnancy, can reduce incidence of gestational diabetes (60% lower incidence in group taking myo-inositol compared to control group), as well as preterm birth, while the results of OGTT (Oral Glucose Tolerance Test) and the incidence of fetal macrosomia were not consistent. Daily doses of myo-inositol, which led to these positive effects, were 4 g/day. Special significance of dietary supplements containing myo-inositol is that no side effects have been observed, which is why they are considered very safe for use in prevention of GDM.

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Keywords: gestational diabetes mellitus, myo-inositol, dietary supplements

5. SAVREMENA DIJAGNOSTIKA I ANALITIKA HRANE
CURRENT TRENDS IN FOOD ANALYSIS

Sadržaj joda u različitim vrstama soli na tržištu BiH

Merima BUKVA, Nejra BULJUBAŠIĆ, Elmedina DŽANANOVIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet

Sažetak

Jod je sastavni dio hormona štitne žlijezde, bitnih za regulaciju metabolizma, sa direktnim efektom na rast i razvoj organizma. Iako široko rasprostranjen u prirodi, deficijencija joda nije rijedak poremećaj. Optimalan unos joda je neophodan za zdravo tijelo, a ukoliko je unos neodovoljan dolazi do brojnih poremećaja od kojih su najčešći toksična guša, a zatim kretinizam kod djece. Kako bi se prevenirali navedeni poremećaji povezani sa nedostatkom joda, 1924. godine je započelo jodiranje soli. Danas je to uobičajen i zakonom definisan proces koji se obavlja u čitavom svijetu. Konkretno, na tržištu Bosne i Hercegovine, jodiranje soli je definisano Pravilnikom o soli za ljudsku ishranu ("Sl. glasnik BiH", broj: 39/09) gdje je preporučeni sadržaj elementarnog joda 20-30 mg/kg soli. U našem istraživanju smo odlučili provjeriti koliko je pravilno jodirana i deklarirana so na tržištu u BiH. Izvršili smo analizu određivanja sadržaja joda na 10 različitih uzoraka soli metodom indirektno jodometrijske titracije natrijum tiosulfatom ($\text{Na}_2\text{S}_2\text{O}_3$) uz škrob kao indikator, te došli do zaključka da, iako se sadržaj joda u uzorcima kretao od 15,86 mg/kg-47,44 mg/kg soli, čak 6 uzoraka ne odgovara zakonskim odredbama u pogledu deklarisanog sadržaja joda i datuma jodiranja. Definitivno je potrebno vršiti mnogo detaljniju kontrolu deklaracije proizvoda soli te izvršiti dopune Pravilnika o soli za prehranu ljudi, u skladu sa potrebama tržišta, ali i pratiti smjernice Svjetske zdravstvene organizacije (WHO) i Fonda Ujedinjenih naroda za djecu (UNICEF).

Ključne riječi: *so, jod, deficijencija joda, indirektna jodometrijska titracija*

5-O-1

Iodine content in different types of salt on the BiH market

Merima BUKVA, Nejra BULJUBAŠIĆ, Elmedina DŽANANOVIĆ

University of Sarajevo, Faculty of Pharmacy

Abstract

Iodine is an integral part of the thyroid hormones, essential for the regulation of metabolism, with a direct effect on the growth and development of the organism. Although widespread in nature, iodine deficiency is not a rare disorder. Optimal iodine intake is essential for a healthy body, and if the intake is insufficient, a number of disorders occur, of which the most common are toxic goiter, followed by the cretinism in children. In order to prevent these disorders associated with the iodine deficiency, salt iodization began in 1924. Today, it is a common and legally defined process that is performed all over the world. Specifically, on the market of Bosnia and Herzegovina, salt iodization is defined by the Rulebook on Salt for Human Consumption ("Official Gazette of BiH", No. 39/09) where the recommended content of elemental iodine is 20-30 mg/kg of salt. In our research, we decided to check how correctly iodized and declared salt is on the market in BiH. We performed an analysis of the determination of iodine content on 10 different salt samples via indirect iodometric titration method with sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3$) and starch as an indicator, and came to a conclusion that, although the iodine content in the samples ranged from 15.86 mg/kg-47.44 mg/kg of salt, as many as 6 samples did not comply with the legal provisions regarding the declared iodine content and the date of iodination. There is definitely a need for much more detailed control of the salt product declaration and amendments to the Rulebook on Salt for Human Consumption, in accordance with the market needs, but also to follow the guidelines of the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).

Keywords: salt, iodine, iodine deficiency, indirect iodometric titration

Karakterizacija i antimikrobni učinak poliflornog meda s područja Bosne i Hercegovine na bakteriju *Streptococcus pyogenes*

Ivan GADŽA^{1*}, Martina MEŠTOVIĆ¹, Borka TUTIŠ^{1,2}, Ivana GOBIN^{1,3}

¹Sveučilište u Mostaru, Fakultet zdravstvenih studija, Mostar, Bosna i Hercegovina

²Sveučilišna klinička bolnica Mostar, Zavod za mikrobiologiju i molekularnu dijagnostiku, Mostar, Bosna i Hercegovina

^{1,3}Sveučilište u Rijeci, Medicinski fakultet, Zavod za mikrobiologiju i parazitologiju, Rijeka, Hrvatska

*Autor za korespondenciju: Ivan Gadža, igadza@gmail.com

Sažetak

Rezistencija bakterija na antibiotike predstavlja ozbiljan javnozdravstveni problem. U svijetu već postoje multirezistentni sojevi bakterija koje se jako teško ili nikako ne liječe postojećim antibioticima. *Streptococcus pyogenes*, ili beta hemolitički streptokok skupine A, glavni je ljudski patogen koji godišnje uzrokuje više od 600 milijuna infekcija. Ova vrsta je sposobna kolonizirati gornje dišne puteve i kožu asimptomatskih nosioca, ali je također odgovorna za širok raspon bolesti, uključujući gnojne infekcije i ne-gnojne komplikacije. Na sreću, *S. pyogenes* je ostao visoko osjetljiv na antimikrobna sredstva, posebno na peniciline. Zbog mogućnosti nastanka komplikacija neliječenih infekcija, ali i rekurentnih infekcija, trebalo bi pronaći prirodne načine liječenja. U ovom istraživanju ispitala su se antibakterijska svojstva dvije odabrane vrste poliflornog meda s područja Federacije Bosne i Hercegovine prema kliničkim izolatima bakterije *Streptococcus pyogenes*. Odrađene su melisopalinološka analiza i fizikalno kemijska analiza meda. Za ispitivanje antimikrobnog učinka korištene su metode difuzije uz bušenje rupa u agaru te određivanje minimalne inhibitorke koncentracije (MIK). Melisopalinološka analiza potvrdila je podrijetlo i peludni sastav meda. Rezultati ispitivanja su pokazali da svi ispitivani sojevi *S. pyogenes* pokazuju osjetljivost na antibakterijsko djelovanje oba meda. Med livade s primjesom divljeg luka pokazao je antibakterijsko djelovanje pri koncentraciji od 0,1 mg/ml, dok je med livade djelovao pri koncentraciji od 0,2 mg/ml. Difuzijskom metodom uz bušenje rupa na agaru dobiveni su rezultati zona inhibicije i to kod meda livade 6 mm do 14 mm, a kod meda livade s primjesom divljeg luka 7 mm do 17 mm. Kao pozitivna kontrola korišten je Penicilin G sa zonom inhibicije od 30 mm. S obzirom na pokazano antibakterijsko djelovanje meda, med bi se mogao koristiti kao prirodno sredstvo u liječenju infekcija uzrokovanih bakterijom *S. pyogenes*.

Ključne riječi: *Streptococcus pyogenes*, rezistencija bakterija, prirodno liječenje, antibakterijska svojstva meda

5-O-2

Characterization and antimicrobial effect of polyfloral honey from Bosnia and Herzegovina on the bacterium *Streptococcus pyogenes*

Ivan GADŽA^{1*}, Martina MEŠTOVIĆ¹, Borka TUTIŠ^{1,2}, Ivana GOBIN^{1,3}

¹University of Mostar, Faculty of Health Studies, Mostar, Bosnia and Herzegovina

²University Clinical Hospital Mostar, Department of Microbiology and Molecular Diagnostics, Mostar, Bosnia and Herzegovina

^{1,3}University of Rijeka, Faculty of Medicine, Department of Microbiology and Parasitology, Rijeka, Croatia

* Corresponding author: Ivan Gadža, igadza@gmail.com

Abstract

Bacterial resistance to antibiotics is a serious public health problem. There are already multi-resistant strains of bacteria in the world that are very difficult to treat. *Streptococcus pyogenes*, or group A beta hemolytic streptococcus, is a major human pathogen that causes more than 600 million infections annually. This species is capable of colonizing the upper respiratory tract and skin of asymptomatic carriers, but is also responsible for a wide range of diseases, including purulent infections and non-purulent complications. Fortunately, *S. pyogenes* remained highly sensitive to antimicrobials, especially penicillins. Due to the possibility of complications of untreated infections, but also recurrent infections, natural treatments should be found. In this study, the antibacterial properties of two selected species of polyfloral honey from the Federation of Bosnia and Herzegovina against clinical isolates of *Streptococcus pyogenes* were examined. Melisopalinalogical analysis and physicochemical analysis of honey were performed. Diffusion methods using drilling holes in agar and determining the minimum inhibitory concentration (MIC) were used to investigate the antimicrobial effect. Melisopalinalogical analysis confirmed the origin and pollen composition of honey. The test results showed that all tested strains of *S. pyogenes* show sensitivity to the antibacterial activity of both honeys. Meadow honey mixed with wild onions showed antibacterial activity at a concentration of 0.1 mg/ml, while meadow honey had an effect at a concentration of 0.2 mg/ml. The results of inhibition zones were obtained by diffusion method with drilling holes on agar. By measuring the zones of inhibition in meadow honey, results from 6 mm to 14 mm were obtained. Zone of inhibition from 7 mm to 17 mm was measured in meadow honey with wild onion admixture. Penicillin G with a 30 mm inhibition zone was used as a positive control. Given the demonstrated antibacterial activity of honey, honey could be used as a natural remedy in the treatment of infections caused by the bacterium *S. pyogenes*.

Keywords: *Streptococcus pyogenes*, bacterial resistance, natural treatment, antibacterial properties of honey

Pregled mesa zaklanih goveda na cisticerkozu

Esma KADRIĆ^{1*} Almedina POPARIĆ¹

¹Univerzitet u Sarajevu, Veterinarski fakultet, student, BiH

* Autor za korespondenciju: Esma Kadrić, esmakadric98@gmail.com

Sažetak

Cisticerkoza, poznata i pod nazivom bobičavost, je oboljenje goveda koje uzrokuje parazit *Taenia saginata*. Ovaj parazit spada u klasu Cestoda, odnosno trakavica, adulti parazitiraju u tankom crijevu čovjeka, a razvojni oblici u muskulaturi goveda. Životinje ingestijom unesu u probavni trakt jajašca, iz kojih se u tankom crijevu oslobodi larva koja aktivno migrira u kapilarni krvotok zida crijeva, odakle krvotokom dospijeva u bogato vaskulariziranu poprečno-prugastu muskulaturu. Goveda predstavljaju prelaznog domaćina za ovog parazita dok su konačni domaćini ljudi. Iako nema veći patogeni značaj kod goveda (infestacija je asimptomatska), zbog odbacivanja mesa i slabijeg kvaliteta mesa, njen ekonomski značaj je velik. Pored toga, važnost ove bolesti proistječe iz mogućnosti infestacije čovjeka putem zaraženog goveđeg mesa. Čovjek se infestira konzumirajući sirovo, nedovoljno termički obrađeno ili slabo sušeno goveđe meso. Jajašca ili gravidni članci parazita prisutni su u fecesu čovjeka sto dana nakon infestacije. Meso cisticerkoznih goveda, kao izvor infestacije ljudi može predstavljati značajan zdravstveni problem. Razvojni oblici trakavica mehanički oštećuju tkiva prilikom migracije, uzrokujući zapaljenja. Uginuli razvojni oblici parazita ili metabolički produkti nastali resorpcijom toksično djeluju na centralni i hematopoetski sistem domaćina. Simptomi kod ljudi su najčešće intenzivna abdominalna bol, nauzeja, dijareja ili konstipacija. Zbog mogućnosti infestacije ljudi ovim parazitom konzumiranjem mesa koje sadrži *Cysticercus bovis* (bobice), uveden je obavezan pregled goveđeg mesa na bobičavost. Pregleda se trup svakog zaklanog goveda, kao i trupovi teladi starosti do šest mjeseci. U ovom radu ćemo predstaviti značaj parazitarnog oboljenja cisticerkoze u mesnoj industriji, postupke i metode pregleda mesa zaklanih goveda, te ukazati na opasnosti koje ovo oboljenje predstavlja u javnom zdravstvu.

Ključne riječi: *cisticerkoza, bobičavost, goveda, pregled mesa, Taenia saginata*

5-O-3

Examination of slaughtered cattle meat for cysticercosis

Esma KADRIĆ^{1*} Almedina POPARIĆ²

¹University of Sarajevo, Faculty of Veterinary Medicine, student, B&H

*Corresponding author: Esma Kadrić, esmakadric98@gmail.com

Abstract

Cysticercosis, also known as berry blight, is a bovine disease caused by the parasite *Taenia saginata*. This parasite belongs to the group of cestodes, adults parasitize in the small intestine of humans and developmental forms in the musculature of cattle. Animals are infected by eggs entering their digestive tract by ingestion, from which the larva is released in the small intestine and then actively migrates into the capillary bloodstream of the intestinal wall, from where it reaches the transverse striated musculature through the bloodstream. Cattle are the transitional host for this parasite while the final hosts are humans. Although it has no greater pathogenic significance in cattle (the infestation is asymptomatic), due to meat rejection and poorer meat quality, its economic significance is great. In addition, the importance of this disease stems from the possibility of infecting a human through infected beef. A person is infected by consuming raw, undercooked or poorly dried beef. Eggs or pregnant articles of the parasite are present in human feces one hundred days after infestation. The meat of cattle with cysticercosis, as a source of human infestation, can be a significant health problem. Developmental forms of tapeworms mechanically damage tissues during migration, causing inflammation. Dead developmental forms of parasites or metabolic products caused by resorption have a toxic effect on the central and hematopoietic system of the host. Symptoms in humans are most often intense abdominal pain, nausea, diarrhea or constipation. Due to the possibility of infecting humans with this parasite by consuming meat containing *Cysticercus bovis* (berries), a mandatory examination of beef for berryiness was introduced. Every slaughtered cattle's corpse is examined, as well as corpses of calves up to six months old. In this paper, we will present the importance of the parasitic disease cysticercosis in the meat industry, procedures and methods of examination of meat of slaughtered cattle, and point out the dangers that this disease poses in public health.

Keywords: *cysticercosis*, *berry*, *cattle*, *meat examination*, *Taenia saginata*

Dokazivanje formaldehida u mlijeku

Evelina PULO, Irma SINANOVIĆ, Lamija SMAKA, Muamera SUBAŠIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku

Sažetak

Konzervansi su hemijske supstance koje se dodaju u hranu u svrhu prevencije kvarenja hrane, odnosno produženja vijeka trajanja hrane. Dodavanje konzervansa u mlijeko strogo je zabranjeno, ipak u praksi se mogu naći u njegovom sastavu. Formalin, jedan od konzervansa u upotrebi, predstavlja 40% otopinu formaldehida te je njegova konzumacija izuzetno opasana za ljudsko zdravlje. Cilj ovog rada je ispitati prisustvo formaldehida u pet različitih uzoraka mlijeka. Prisustvo formaldehida je ispitivano različitim metodama: test sa sulfatnom i nitratnom kiselinom; Hehner-ov test (prednosti: jednostavna, osjetljiva metoda, bez lažno pozitivnih rezultata u prisustvu acetaldehida); test sa hromotropnom kiselinom (prednosti: osjetljiva i selektivna metoda, nedostaci: zahtijeva vrijeme i veće volumene vruće sulfatne kiseline koja je potencijalno opasna i korozivna) i Leach test. Prilikom dokazivanja formaldehida sa nitratnom i sulfatnom kiselinom, pozitivnom reakcijom se smatra pojava ljubičaste/tamnoplave boje, a svih pet uzoraka dalo je negativnu reakciju uz pojavu smeđe boje na graničnoj površini koja potiče od karamelizovane laktoze. Izvođenjem Hehner-ovog testa sa sulfatnom kiseline, koja sadrži željezo (III) hlorid u tragovima, svih pet uzoraka pokazalo je negativnu reakciju na prisustvo formaldehida. Nadalje, test sa hromotropnom kiselinom dao je negativne rezultate na prisustvo ovog konzervansa. Posljednja korištena metoda, Leach test metoda koja se temelji na dokazivanju formaldehida sa željezo (III) hloridom je također pokazala odsustvo formaldehida u svim uzorcima. Na osnovu navedenih podataka možemo zaključiti da je svih pet uzoraka sigurno za konzumaciju, sa aspekta korištenja formaldehida kao konzervansa, jer je u svim testiranim uzorcima utvrđeno njegovo odsustvo.

Ključne riječi: *formaldehyd, formalin, konzervans, mlijeko*

Detection of formaldehyde in milk

Evelina PULO, Irma SINANOVIĆ, Lamija SMAKA, Muamera SUBAŠIĆ

University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analysis

Abstract

Preservatives are chemical substances added to food in order to prevent food spoilage, and to extend the shelf life of food. The addition of preservatives to milk is strictly forbidden, but in practice they can still be found in its composition. Formalin, one of the preservatives in use, is a 40% solution of formaldehyde and its consumption is extremely dangerous to human health. The aim of this study was to examine the presence of formaldehyde in five different milk samples. The presence of formaldehyde was examined by four methods: test with sulfuric and nitric acid; Hehner's test (advantages: simple, delicate, and free from false positive test in presence of acetaldehyde); chromotropic acid test (advantages: sensitive and selective, disadvantages: time consuming and needs large volume of hot concentrated sulfuric acid which is potentially hazardous and corrosive) and Leach test. In the test for formaldehyde with nitric and sulfuric acid, the appearance of purple / dark blue color is considered a positive reaction, and all five samples gave a negative reaction with the appearance of brown color on the boundary surface originating from caramelized lactose. By performing the Hehner's test with sulfuric acid which contains traces of iron (III) chloride, all five samples showed a negative reaction to the presence of formaldehyde. Furthermore, the chromotropic acid test gave negative results for the presence of this preservative. The last method used, the Leach test method based on the detection of formaldehyde with iron (III) chloride also showed the absence of formaldehyde in all samples. Based on the presented results, we can conclude that all five samples are safe for consumption, from the aspect of using formaldehyde as a preservative, because its absence was determined in all tested samples.

Keywords: *formaldehyde, formalin, preservative, milk*

Komparativna analiza djelovanja eteričnog ulja bosiljka, kadulje i mente na rast G- bakterija

Irhad SEFEROVIĆ,^{1*} Riad MUHIĆ,¹ Berina IMAMOVIĆ,¹ Saud HAMIDOVIĆ¹

Univerzitet u Sarajevu, Poljoprivredno-prehrambeni fakultet, BiH

*Autor za korespondenciju: Irhad Seferović, irhad_bugojno95@hotmail.com

Sažetak

Veliko je zanimanje u novije vrijeme za moguće ljekovito djelovanje biljaka, posebno što se percipiraju kao manje toksične u odnosu na konvencionalne lijekove, a i zbog bolje ekonomske održivosti biljne proizvodnje. Eterična ulja biljaka zbog mogućeg antimikrobnog djelovanja našla su primjenu kao konzervansi u cilju produženja trajnosti hrane, aromaterapiji i proizvodnji lijekova. Antimikrobni mehanizam djelovanja ovisi o vrsti esencijalnih ulja ili soju upotrijebljenog mikroorganizma. Eterična ulja bosiljka (*Ocimum basilicum*), kadulje (*Salvia officinalis*) i mente (*Mentha arvensis*) imaju široku primjenu u farmaceutskim, agronomskim, prehrambenim, sanitarnim, kozmetičkim, parfemskim i drugim industrijama. Cilj ovog rada je bio ispitati antimikrobni potencijal eteričnih ulja dobivenih postupkom hidrodestilacije iz različitih biljnih vrsta (*Ocimum basilicum*, *Salvia officinalis* i *Mentha arvensis*) na bakterije iz porodice *Enterobacteriaceae* (*Escherichia coli* i *Salmonella spp.*). Antimikrobna aktivnost eteričnih ulja ispitana je test difuznom metodom. Kao test mikroorganizmi korištene su čiste kulture G-bakterija (*Escherichia coli* i bakterije iz roda *Salmonella spp.*). Rezultati istraživanja su potvrdili inhibitorno djelovanje navedenih eteričnih ulja na rast *Escherichie coli* i *Salmonelle spp.*, to jest, dokazano je da su ispitivane bakterije osjetljive na navedena ulja. Najjači inhibitorni uticaj na rast *Escherichie coli* pokazalo je eterično ulje bosiljka, dok je na *Salmonellu spp.* najjači uticaj imalo eterično ulje mente.

Ključne riječi: *esencijalno ulje bosiljka, esencijalno ulje kadulje, esencijalno ulje mente, antimikrobno djelovanje, G-bakterije*

Comparative analysis of the effect of basil, sage and mint essential oil on the growth of G-bacteria

Irhad SEFEROVIĆ,^{1*} Riad MUHIĆ,¹ Berina IMAMOVIĆ,¹ Saud HAMIDOVIĆ¹

University of Sarajevo, Faculty of Agriculture and Food, BiH

*Corresponding author: Irhad Seferović, irhad_bugojno95@hotmail.com

Summary

There is great interest in recent times for the possible medicinal effects of plants, especially as they are perceived as less toxic compared to conventional drugs, and also because of the better economic sustainability of plant production. Due to their possible antimicrobial action, plant essential oils have been used as preservatives in order to prolong the shelf life of food, aromatherapy and drug production. The antimicrobial mechanism of action depends on the type of essential oil or strain of the microorganism used. The essential oils of basil (*Ocimum basilicum*), sage (*Salvia officinalis*) and mint (*Mentha arvensis*) are widely used in the pharmaceutical, agronomic, food, sanitary, cosmetic, perfume and other industries. The aim of this study was to examine the antimicrobial potential of essential oils obtained by hydrodistillation from different plant species (*Ocimum basilicum*, *Salvia officinalis* and *Mentha arvensis*) to bacteria from the family *Enterobacteriaceae* (*Escherichia coli* and *Salmonella spp.*). The antimicrobial activity of essential oils was examined by diffusion test. Pure cultures of G-bacteria (*Escherichia coli* and bacteria of the genus *Salmonella spp.*) were used as test microorganisms. The results of the study confirmed the inhibitory effect of these oils on the growth of *Escherichia coli* and *Salmonella spp.*, that is, it was proved that the tested bacteria are sensitive to these oils. The strongest inhibitory effect on the growth of *Escherichia coli* was shown by the essential oil of basil, while on *Salmonella spp.* peppermint essential oil had the strongest effect.

Keywords: *basil essential oil, sage essential oil, peppermint essential oil, antimicrobial activity, G-bacteria*

Određivanje sadržaja i dissolution test preparata vitamina C

Amar ALAGIĆ, Amina MUJAGIĆ, Faruk ŠEHIĆ*, Minela VITEŠKIĆ-NUROVIĆ

Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku, BiH

*Autor za korespondenciju: Faruk Šehić, faruk_sehic@hotmail.com

Sažetak

Literaturni podaci pokazuju da veliki broj stanovnika često koristi dodatke prehrani, uglavnom iz grupe vitamina i minerala. Na tržištu je prisutan veliki broj vitaminskih suplemenata različitih proizvođača, u različitim dozama i oblicima i ponekada značajno različite prodajne cijene koja nužno ne korelira s kvalitetom proizvoda. Cilj istraživanja je odrediti kvalitet (sadržaj i disoluciju) nasumično odabranih čvrstih oblika lijekova i dodataka prehrani s vitaminom C. Među uzorcima nalazile su se i tablete sa postupnim oslobađanjem. Za analizu sadržaja vitamina C korištena je oficinalna USP hromatografska metoda, procedura 2. Analiza sadržaja obavljena je HPLC metodom, a kao uređaj korišten je Agilent 1100, sa software-om Chemstation LC. Za test disolucije korišten je uređaj VanKel 7010 VK8000. U testu disolucije tableta s postupnim oslobađanjem oslobođeni sadržaj vitamina C određivan je nakon prvog, šestog i dvanaestog sata. Samo dva preparata odstupaju od graničnih vrijednosti (90%-110%) za vitamin C koji je registriran kao lijek. Svi testirani proizvodi s trenutnim oslobađanjem su zadovoljili farmaceutske kriterije u testu disolucije. Test disolucije je nakon 12 sati pokazao potpuno oslobađanje (100% sadržaja) u jednom i djelimično (60%) oslobađanje u drugom testiranom proizvodu tableta s postupnim oslobađanjem. Na osnovu rezultata zaključuje se da skoro svi preparati, čak i oni koji se registriraju kao suplementi, sadrže vitamin C u granicama dozvoljenih odstupanja za lijek. Jedini preparati čiji je sadržaj izlazio van dozvoljenih granica preparata koji se registriraju kao lijek bili su prašci i tablete sa velikom prosječnom masom. Skuplji preparati se od jeftinijih nisu razlikovali po kvaliteti, jer svi preparati imaju sadržaj vitamina C u sklopu graničnih vrijednosti, te zadovoljavaju *dissolution test*, već samo skuplji preparati dolaze u većim dozama i sadrže više tableta u pakovanju.

Analiza je urađena u farmaceutskoj kompaniji Bosnalijek, te se ovom prilikom želimo zahvaliti na gostoprimstvu i saradnji.

Ključne riječi: *vitamin C, sadržaj, dissolution test*

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Content analysis and dissolution test of vitamin C products

Amar ALAGIĆ, Amina MUJAGIĆ, Faruk ŠEHIĆ*, Minela VITEŠKIĆ-NUROVIĆ

University of Sarajevo, Faculty of Pharmacy, Department of pharmaceutical analytics, BiH

*Corresponding author: Faruk Šehić, faruk_sehic@hotmail.com

Abstract

Literature data show that a large number of people often use dietary supplements, mainly from the group of vitamins and minerals. There are a large number of vitamin supplements on the market from different manufacturers, in different doses and forms, and sometimes significantly different sales prices, which do not necessarily correlate with the quality of the product. The aim of the study was to determine the quality (content and dissolution) of randomly selected solid forms of drugs and dietary supplements with vitamin C. The official USP chromatographic method, procedure 2, was used to analyze the vitamin C content. Content analysis was performed by HPLC method, and Agilent 1100 was used as a device, with Chemstation LC software. The VanKel 7010 VK8000 was used for the dissolution test. In the sustained release tablet dissolution test, the released vitamin C content was determined after the first, sixth and twelfth hours. Only two products deviate from the limit values (90% -110%) for vitamin C registered as a medicine. All examined immediate release products met the pharmaceutical criteria in the dissolution test. The dissolution test after 12 hours showed complete release (100% content) in one and partial (60%) release in the other examined product of the sustained release tablet. Based on the results, it is concluded that almost all products, even those classified as supplements, contain vitamin C within the limits for vitamin C preparations classified as a drug. The only products whose content exceeded the permitted limits of products registered as a medicine were powders and tablets with a high average mass. The more expensive products did not differ from the cheaper ones in terms of quality, because all products have the content of vitamin C within the limit values, and satisfy the dissolution test; however more expensive products come in higher doses and contain more tablets.

The analysis was conducted in the pharmaceutical company Bosnalijek, and we would like to take this opportunity to thank them for their hospitality and cooperation.

Keywords: *Vitamin C, content, dissolution test*

Određivanje sadržaja fenolnih spojeva i antioksidativnog kapaciteta ploda drenjka (*Cornus mas L.*) i ogrozda (*Ribes uva-crispa L.*)

Aida LUGUŠIĆ^{1*}, Aleksandra MARJANOVIĆ¹, Jasmina DJEDJIBEGOVIĆ¹, Miroslav ŠOBER¹

¹Univerzitet u Sarajevu, Farmaceutski fakultet, Katedra za farmaceutsku analitiku

*Autor za korespondenciju: Aida Lugušić, aida.lugusic@ffsa.unsa.ba

Sažetak

Drenjak (*Cornus mas L.*) i ogrozd (*Ribes uva-crispa L.*) spadaju u grupu divljih voćnih vrsta koje se rijetko koriste u svakodnevnoj ljudskoj ishrani. Međutim, počinju dobijati sve više na značaju, jer se smatraju važnim izvorom antioksidanasa i bioaktivnih spojeva. Na sadržaj nutritivnih i nenutritivnih materija (npr. polifenola) značajno utječe sorta, način uzgoja kao i vremenske prilike. Današnji način života, u kojem smo svakodnevno izloženi stresu, zahtijeva konzumaciju namirnica bogatih antioksidansima koji pomažu organizmu u borbi protiv slobodnih radikala. Shodno tome, cilj ovog rada je bio odrediti sadržaj fenolnih spojeva i antioksidativnog kapaciteta ploda drenjka (*Cornus mas L.*) i ogrozda (*Ribes uva-crispa L.*) i doći do saznanja da li u ovim, dosad zanemarenim voćnim vrstama koje prirodno rastu u divljoj flori BiH, postoji saradnik u borbi protiv oksidativnog stresa. Sadržaj ukupnih fenolnih spojeva je određen primjenom više spektrofotometrijskih metoda dok je njihov antioksidativni kapacitet određen primjenom serije *in vitro* testova. Rezultati istraživanja su pokazali da drenjak u odnosu na ogrozd ima puno veći sadržaj fenolnih spojeva i značajno veći ukupni antioksidativni kapacitet. Na osnovu dobivenih rezultata možemo zaključiti da su ispitivani uzorci, pogotovo drenjak, pokazali značajan antioksidativni potencijal čime se javlja potreba za dodatnim istraživanjima ispitivanih voćnih vrsta kao i mogućnosti većeg iskorištavanja istih u svakodnevnoj ljudskoj ishrani.

Ključne riječi: *drenjak, ogrozd, fenolni spojevi, antioksidativni kapacitet*

Determination of phenolic compounds content and antioxidant capacity of Cornelian cherry (*Cornus mas L.*) and gooseberry (*Ribes uva-crispa L.*)

Aida LUGUŠIĆ^{1*}, Aleksandra MARJANOVIĆ¹, Jasmina DJEDJIBEGOVIĆ¹, Miroslav SOBER¹

¹University of Sarajevo, Faculty of Pharmacy, Department of Pharmaceutical Analytics

*Corresponding author: Aida Lugušić, aida.lugusic@ffsa.unsa.ba

Abstract

Cornelian cherry (*Cornus mas L.*) and Gooseberry (*Ribes uva-crispa L.*) belong to the group of wild fruit species that are not commonly used in everyday human diet. However, they are beginning to gain increased importance as they are considered an important source of antioxidants and bioactive compounds. The content of nutritive and non-nutritive compounds (e.g. polyphenols) depends on type of variety, cultivation methods and weather conditions. Today's lifestyle which is full of stress, requires the consumption of food rich in antioxidants that helps the human organism to fight free radicals. Accordingly, the aim of the study was to determine the content of phenolic compounds and antioxidant capacity of Cornelian cherry (*Cornus mas L.*) and gooseberry (*Ribes uva-crispa L.*) and to find out whether these neglected fruit species, that naturally grow in wild flora of Bosnia and Herzegovina, can help in the fight against oxidative stress. The content of total phenolic compounds was determined using several spectrophotometric methods, while their antioxidant capacity was determined using series of different *in vitro* tests. Samples analysed in this study showed that Cornelian cherry has a much higher content of phenolic compounds as well as antioxidant capacity compared to gooseberries. Based on the results, we can conclude that analysed samples, especially Cornelian cherry, showed significant antioxidant potential, which emphasizes the need for further research of analysed fruit varieties as well as the possibility of their higher utilization in everyday human diet.

Keywords: *Cornelian cherry, Gooseberry, phenolic compounds, antioxidant capacity*

PRIJATELJI KONGRESA

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