

UNIVERZITET U SARAJEVU

UNIVERSITY OF SARAJEVO



VI Studentski Kongres

„HRANA-ISHRANA-ZDRAVLJE“

sa međunarodnim učešćem

**KNJIGA SAŽETAKA**

Sarajevo, novembar 2021.

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**6th Students Congress „Food-Nutrition-Health“**  
with international participation

BOOK OF ABSTRACTS

Sarajevo, 2021

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## PREDGOVOR

Studentski kongres „HRANA-ISHRANA-ZDRAVLJE“ organizuje se već tradicionalno šesti put na Univerzitetu u Sarajevu, s ciljem promovisanja univerzalnih vrijednosti zajedništva i multidisciplinarnog pristupa u proizvodnji hrane, njenom higijenskom statusu i kvalitetu, različitim načinima ishrane, kao i mogućim zdravstvenim implikacijama na čovjeka što će biti od izuzetne važnosti u rješavanju značajnijih pitanja u ovoj životnoj oblasti. Ovakav pristup u sagledavanju ovog kompleksnog pitanja, kroz multidisciplinarnost, predstavlja i savremeni trend „evropske nacije,“ u iznalaženju najracionalnijih odgovora na mnoga pitanja gotovo u svim sferama društvenog života i djelovanja.

Za 6. 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 predstavljena 62 studentska rada, 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 6. 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 odbora 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 Jasmina Đeđibegović, predsjednica Organizacionog/Koordinacionog odbora

## FOREWORD

The Student Congress „FOOD-NUTRITION-HEALTH“ is traditionally organized for the sixth time at the University of Sarajevo. The primary aim is to promote universal community values and a multidisciplinary approach to food production, its hygienic status and quality, different ways of nutrition, and an understanding of implications on the human health. This will be very important in addressing significant issues in this area of life. A multidisciplinary approach to addressing this complex issue is a contemporary way of the “European nation“ in finding the most rational answers to many questions in almost all parts of social life and activity.

The Organizing Committee selected five sections for the 6th 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 62 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 Jasmina Đeđibegović, Chairwoman of the Organizing Coordinating Committee



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## **Plenarno predavanje**

### **UV stabilnost i (foto)degradacija pesticida u različitim vrstama hrane**

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#### **Sažetak**

Trenutna potreba za povećanjem proizvodnje hrane kako bi se mogla obezbijediti dovoljna količina za rastuću populaciju ljudi, uslovljava intenzivnu upotrebu pesticida i fertilizatora. Upotreba sintetskih pesticida u stalnom je porastu širom svijeta i dosada se u poljoprivrednoj proizvodnji upotrebljavaju duže od šest decenija. Više različitih tipova pesticida je sintetisano i našlo je svoju primjenu, od organohlornih insekticida od kojih je većina zabranjena za proizvodnju i upotrebu do organofosfornih i danas uglavnom korištenih rianodin pesticida. Iako su različite perzistentne organske hemiklajje zamijenjene više biorazgradivim spojevima, kontaminacija zaostalim ali i reziduama pesticida koji se danas koriste i dalje značajno utiče na kvalitet vode za piće, hrane i okoliš. Iz tog razloga budući izazovi u proizvodnji hrane odnose se na proizvodnju hrane boljeg kvaliteta, a sa manje toksičnih kontaminanata. Ovo podrazumijeva stalni razvoj naprednih praksi u cilju zaštite javnog zdravlja, pažljivu procjenu rizika i odobravanje za upotrebu, kao i educiranje poljoprivrednika u implementaciji dobrih praksi za održivi razvoj poljoprivrede, ribarstva i akvakulture. Fokus ovog plenarnog predavanja će biti na UV stabilnost i (foto)degradaciju različitih pesticida (organofosfornih pesticida, kao i neonicotinoide i rianodin insekticida i njihovih metabolita) u različitim uzorcima hrane pod uticajem UV zračenja kao sredstva za konzervisanje hrane zajedno sa identifikacijom transformacionih ili degradacionih produkata i procjenom njihove toksičnosti.

*Keywords: UV stabilnost, fotodegradacija, pesticidi*

## Plenary lecture

### **UV stability and (photo)degradation of various pesticides in different food matrices**

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### **Summary**

Current need to increase food production to feed a rapid growing human population maintains pressure on the intensive use of pesticides and fertilizers. Consumption of synthetic pesticides increases constantly worldwide and so far they have been used for more than six decades. Several different types of pesticides were synthesised and put into application; from organochlorine insecticides, that are now mostly banned for the production and use, to organophosphorus type and lately to ryanodine type of pesticides. Although various persistent organic chemicals have been replaced by more biodegradable chemicals, contamination by legacy residues and recent residues still impacts on the quality of human food, water, and environment. Therefore, future challenges in food production have to go along with production of food with better quality and with less toxic contaminants. That means further development of advanced practices to protect public health, careful risk assessment and licensing, as well as education of farmers and users in implementation of good practices for sustainable development of agriculture, fisheries, and aquaculture. The focus of this plenary lecture will be on UV stability and (photo)degradation of various pesticides (organophosphorus insecticides as well as neonicotinoid and ryanodine insecticides and their metabolites) in different food matrices under ultraviolet irradiation as a food preservation tool together with identification of transformation or degradation products and toxicity assessment.

Keywords: *UV stability, photodegradation, pesticides*



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



## Šta predstavlja organska hrana? Da li je organsko zaista bolje?

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### Sažetak

U savremenom društvu, generalno, vlada mišljenje da je hrana iz organske proizvodnje zdravija, prirodnija, etičnija i bolja za okoliš, čime se potrošačima kupovina takvih, uglavnom skupljih proizvoda, prezentira kao odgovornija i moralnija opcija. Ovaj rad predstavlja analizu relevantnih literaturnih izvora i usporedbu nekoliko faktora koji formiraju ukupni uticaj hrane na zdravlje potrošača i okoliša, kako bi se demistificiralo pitanje kvaliteta organskih proizvoda. Brojne studije potvrđuju da organski proizvodi sadrže više antioksidansa, vitamina i drugih korisnih materija, a razlog za to vjerovatno leži u činjenici da se takve biljke od štetnih uticaja okoline moraju braniti same, usljed čega upravo i sintetiziraju navedene materije. Ipak, postoje i istraživanja koja negiraju postojanje razlike u prehranenoj vrijednosti između hrane proizvedene na organski i konvencionalni način. Također, čest argument za potrošnju organske hrane jeste izbjegavanje štetnih sintetičkih tvari kao što su pesticidi, pri čemu se najčešće zaboravlja da postoje i određeni pesticidi čija je upotreba u organskoj proizvodnji dozvoljena, a djelovanje na čovjeka jednako štetno. U pogledu uticaja na okoliš organska hrana ima prednost u smislu manjeg zagađenja i potrošnje energije, s tim da je u takvom sistemu potrebna veća površina za proizvodnju jednake količine hrane, a emisija stakleničkih plinova je praktično ista kao u konvencionalnoj proizvodnji. Pozitivni efekti organske hrane na okoliš se dodatno umanjuju ukoliko su lanci opskrbe duži, što je čest slučaj u razvijenim zemljama. Istraživanje pokazuje da organska proizvodnja ne predstavlja rješenje niti jednog od aktualnih problema u proizvodnji hrane. Umjesto toga, soluciju treba tražiti u potrošnji regionalne i sezonalne hrane.

Ključne riječi: *organska hrana, konvencionalna hrana, pesticidi, zdravlje, okoliš*

1-0-1

## **What does organic food stand for? Is organic food really better?**

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### **Summary**

In modern society, in general, the opinion is that food from organic production is healthier, more natural, more ethical, and better for the environment. That presents the purchase of such, mostly more expensive products, as a more responsible and moral option. This paper presents an analysis of relevant literature sources and a comparison of several factors that form the overall impact of food on consumer health and the environment, in order to demystify the issue of organic product quality. Numerous studies confirm that organic products contain more antioxidants, vitamins, and other beneficial substances, and the reason for that probably lies in the fact that such plants have to defend themselves from harsh environmental conditions, which is why they synthesize these substances. However, some studies deny the existence of a difference in nutritional value between food produced organically and conventionally. Also, a common argument for the consumption of organic food is the avoidance of harmful synthetic substances such as pesticides, often forgetting that there are certain pesticides allowed in organic production, with equally harmful effects on humans. In terms of environmental impact, organic food has an advantage in terms of less pollution and energy consumption, although such a system requires a larger area to produce the same amount of food, and greenhouse gas emissions are practically the same as in conventional production. The positive effects of organic food on the environment are further reduced if supply chains are longer, which is often the case in developed countries. Research shows that organic production is not the solution to any of the current problems in food production. Instead, a solution should be sought in the consumption of regional and seasonal food.

Keywords: *organic food, conventional food, pesticides, health, environment*

## **Procjena potrošnje mineralnih i organskih gnojiva u Bosni i Hercegovini i njihov uticaj na okoliš**

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### **Sažetak**

Cilj ovog rada je bila procjena potrošnje mineralnih i organskih gnojiva u BiH za 2019. godinu i njihov uticaj na okoliš. Na osnovu analiziranog stanja o uvozu i izvozu mineralnih gnojiva u BiH za referentnu godinu, došlo se do procjene ukupne potrošnje mineralnih gnojiva kao i ukupnih količina azota, fosfora i kalija iz mineralnih gnojiva. Na osnovu poljoprivrednih i obradivih površina u BiH je prikazana potrošnja azota, fosfora i kalija po jedinici površine. Procjena proizvodnje organskih gnojiva u BiH je prikazana na osnovu broja grla stoke i prosječne proizvodnje stajnjaka po grlu. Nakon provedene analize i dobivenih rezultata utvrđeno je stanje potrošnje gnojiva u BiH u komparaciji sa pojedinim zemljama Evrope. Iako je primjena mineralnih i organskih gnojiva u BiH ispod nivoa prosjeka mnogih zemalja u Evropi i ispod nivoa koji dopušta Nitratna direktivna od 170 kg N/ha poljoprivrednog zemljišta to ne znači da ne postoje problemi kada je u pitanju način primjene i manipulacija mineralnim gnojivima i stajnjakom na farmi. U cilju smanjenja rizika od zagađenja azotom i fosforom iz poljoprivrede, potrebno je podstaknuti i unaprijediti način upravljanja farmom izborom adekvatnih tehnika. Gnojidba treba da korespondira sa potrebom biljaka u hranjivima i stanjem optimalne plodnosti tla uz minimum zagađenja okoline. Ukupna količina mineralnih đubriva koja se primjenjuje na poljoprivredno zemljišta je sigurno važan element pri razmatranju i procjeni ukupnog uticaja poljoprivrede na okoliš i kvalitet vode. Upotreba đubriva i uticaj na okoliš je usko vezano za način na koji farmer aplicira đubriva biljkama i sveukupni način upravljanja sistema na farmi.

Ključne riječi: *Potrošnja gnojiva, azot, fosfor, kalij, okoliš*

1-O-2

## **The estimation of the consumption of mineral and organic fertilizers in BiH and their impact on the environment**

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### **Summary**

The aim of this paper was to estimate the consumption of mineral and organic fertilizers in BiH for 2019. Based on the analyzed situation on the import and export of mineral fertilizers in BiH for the reference year, we come to an estimate of the total consumption of mineral fertilizers as well as the total amounts of nitrogen, phosphorus and potassium from mineral fertilizers. Based on agricultural and arable land in BiH, the consumption of nitrogen, phosphorus and potassium per unit area is shown. Assessment of organic fertilizer production is presented on the basis of the number of livestock and the average production of manure per head. After the analysis and the obtained results, the state of fertilizer consumption in BiH was determined in comparison with individual countries in Europe. Although the application of mineral and organic fertilizers in BiH is below the average level of many countries in Europe and below the level allowed by the Nitrates Directive of 170 kg N/ha of agricultural land, this does not mean that there are no problems when it comes to application and manipulation of mineral fertilizers and manure. In order to reduce the risk of nitrogen and phosphorus pollution from agriculture, it is necessary to encourage and improve the way the farm is managed by choosing adequate techniques. Fertilization should correspond to the need of plants in nutrients and the state of optimal soil fertility with a minimum of environmental pollution. The total amount of mineral fertilizers applied to land is certainly an important element in considering and assessing the overall impact of agriculture on the environment and water quality. Fertilizer use and environmental impact are closely related to the way a farmer applies fertilizer to plants and the overall way the farm system is managed.

Keywords: *Fertilizers consumption, nitrogen, phosphorus, potassium, environment*

## **Parametri kvaliteta brašna od raži (*Secale cereale*), ječma (*Hordeum vulgare*) i heljde (*Fagopyrum esculentum*)**

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### **Sažetak**

Raž (*Secale cereale*), ječam (*Hordeum vulgare*) i heljda (*Fagopyrum esculentum*) su žitarice i pseudožitarice bogatog nutritivnog i bioaktivnog sastava, čija brašna posjeduju mnogobrojna pozitivna dejstva na zdravlje čovjeka. Na kvalitet brašna utiču različiti faktori kao što su uslovi uzgoja žita, genetske osobine određene klase i sorte, tehnološki uslovi prevođenja zrna u brašno, te nivo izbrašnjavanja. Cilj ovog rada je bio ispitati kvalitet integralnih brašna od raži, ječma i heljde proizvedenih na tradicionalni način u kamenim mlinovima, te uporediti sa referentnim industrijski dobijenim brašnima i vrijednostima definisanim važećim pravilnikom. Ispitivanje kvaliteta brašna uključivalo je fizičko-hemijske analize (sadržaj vlage, pepela, stepen kiselost i pH vrijednost) i senzornu ocjenu (boja, miris i okus). Rezultati su pokazali da tradicionalno proizvedena brašna imaju veći udio čvrstih dijelova zrna, zbog načina odvajanja primjesa i samog mljevenja, te zbog toga sadrže veći udio pepela i vlage. S druge strane, senzornom ocjenom je utvrđeno da industrijski proizvedena brašna imaju izraženiju aromu i miris u odnosu na tradicionalno proizvedena.

Ključne riječi: *brašno, kvalitet, fizičko-hemijske analize, senzorna ocjena*

1-O-3

**Quality parameters of rye flour (*Secale cereale*), barley (*Hordeum vulgare*) and buckwheat (*Fagopyrum esculentum*)**

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**Summary**

Rye (*Secale cereale*), barley (*Hordeum vulgare*) and buckwheat (*Fagopyrum esculentum*) are cereals and pseudocereals of rich nutritional and bioactive composition, whose flours have many positive effects on human health. The quality of flour is influenced by various factors such as grain growing conditions, genetic characteristics of a certain class and variety, technological conditions for converting grain into flour and the degree of flour extraction. The aim of this work was to examine the quality of integral rye, barley and buckwheat flours produced in the traditional way in stone mills, and to compare them with reference industrially obtained flours and values defined by the valid ordinance. Flour quality testing included physico-chemical analyzes (moisture content, ash, degree of acidity and pH value) and sensory evaluation (color, odor and taste). The results showed that traditionally produced flours have a higher proportion of solid parts of the grain, due to the way of separation of impurities and grinding, and therefore contain a higher proportion of ash and moisture. On the other hand, the sensory evaluation determined that industrially produced flours have a more pronounced aroma and smell compared to traditionally produced ones.

*Keywords: flour, quality, physico-chemical analyzes, sensory evaluation*



## Upravljanje čvrstim otpadom iz industrije voća i povrća u Bosni i Hercegovini

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### Sažetak

Zbrinjavanje čvrstog otpada u industriji voća i povrća predstavlja veliki problem za prehrambenu industriju jer u otpadu završi od 10% do 60% polazne sirovine. U industriji voća i povrća otpad koji nastaje tokom prerade čine: sjemenke, pokožica (kora), koštica, ljuska, lišće, peteljka. Pored otpada organskog porijekla, izazov za proizvođače predstavlja i odlaganje ambalažnog otpada. Iskorištenje otpada postiže se kroz model cirkularne ekonomije koja ima za cilj obnavljanje prirodnih resursa, zadržavanje sirovina u upotrebi i produženi životni vijek proizvoda. To je model u kojem proizvodi na kraju životnog vijeka ne postaju otpad i ne doprinose zagađenju. Cilj ovog rada je prikazati mogućnosti korištenja čvrstog otpada iz industrije voća i povrća kao i najefikasnije metode proizvodnje te analizirati načine upravljanja otpadom u Bosni i Hercegovini. Rad je baziran na teorijskom dijelu iz oblasti cirkularne ekonomije i metoda iskorištavanja nusproizvoda i otpada te na anketi koja je obuhvatila 14 kompanija u BiH koje se bave preradom voća i povrća. Rezultati ankete su pokazali da su prerađivači voća i povrća u BiH upoznati sa modelom cirkularne ekonomije koji teži da zamijeni linearnu ekonomiju i unaprijedi upravljanje otpadom. Također su svjesni kompleksnosti problema odlaganja otpada međutim, i dalje ne koriste otpad za ekstrakciju vrijednih bioaktivnih komponenata poput proteina, fenolnih spojeva, enzima, prehrambenih vlakana i sl. i još uvijek najveći dio ovog vrijednog resursa završi kao gnojivo ili potpuno neiskorišteno na odlagalištu komunalnog otpada.

Ključne riječi: *otpad, voće, povrće, prehrambena industrija, cirkularna ekonomija, ekstrakcija, bioaktivne materije*

1-O-4

## **Disposal of solid waste in the fruit and vegetable industry in Bosnia and Herzegovina**

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### **Summary**

Disposal of solid waste in the fruit and vegetable industry is a major problem for the food industry because 10% to 60% of the raw material ends up in the waste. In the fruit and vegetable industry, the waste generated during processing consists of: seeds, skin (peel), stone, shell, leaves, stalk. In addition to waste of organic origin, the challenge for producers is the disposal of packaging waste. Waste recovery is achieved through a circular economy model that aims to renew natural resources, retain raw materials in use and extend product life. This is a model in which end-of-life products do not become waste and do not contribute to pollution. The aim of this paper is to present the possibilities of using solid waste from the fruit and vegetable industry as well as the most efficient production methods and analyze waste management methods in Bosnia and Herzegovina. The paper is based on the theoretical part in the field of circular economy and methods of utilization of by-products and waste, and on a survey that included 14 companies in BiH that deal with fruit and vegetable processing. The results of the survey showed that fruit and vegetable processors in BiH are familiar with the circular economy model that seeks to replace the linear economy and improve waste management. They are also aware of the complexity of waste disposal problems however, they still do not use waste to extract valuable bioactive components such as proteins, phenolic compounds, enzymes, dietary fiber and the like. and still most of this valuable resource ends up as fertilizer or completely unused in a municipal waste landfill.

Keywords: *waste, fruits, vegetables, food industry, circular economy, extraction, bioactive substances*

### **Jestivi insekti kao hrana budućnosti**

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### **Sažetak**

Poznato je više od 1400 jestivih vrsta insekata. Tkivo im obiluje proteinima, mastima, šećerima, vlaknima, mineralima, vitaminima i može zamjeniti proteine animalnog porijekla. Nutritivna vrijednost zavisi od vrste i razvojnog stadija insekata. Konzumirani su sirovi, a danas se termički obrađuju i kombinuju sa drugom hranom. Jestivi insekti pripadaju „*Novoj hrani*“ sa historijom sigurne upotrebe u trećem svijetu. U Europskoj uniji zakonodavstvo je regulisalo uzgoj i konzumiranje sušenih ličinki velikog brašnara *Tenebrio molitor*. Za ostale vrste ne postoji ujednačenost pravnih akata zemalja Europske unije. U Bosni i Hercegovini u toku je izrada prednacrtta Pravilnika o „*Novoj hrani*“ na uzoru na pravne akte Europske unije, što će omogućiti plasman na domaćem tržištu. Zbog nestašice hrane (mesa) jestivi insekti imaju potencijala za korištenje u ishrani ljudi i tovu životinja, a uzgoj je i ekološki prihvatljiv.

Ključne riječi: *jestivi insekti, nova hrana, EU legislativa i BH legislativa o insektima*

### Edible insects as food of the future

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### Summary

More than 1, 400 edible insect species are known. Their tissue is rich in proteins, fats, sugars, fiber, minerals, vitamins and can replace proteins of animal origin. The nutritional value depends on the type and developmental stage of the insect. They are consumed raw, and today they are thermally processed and combined with other foods. Edible insects belong to a "*Novel food*" with a history of safe use in the third world. In the European Union, legislation has regulated the cultivation and consumption of dried larvae of the large flour mill *Tenebrio molitor*. For other species, there is no uniformity of legal acts of the European Union countries. In Bosnia and Herzegovina, a preliminary draft of the Rulebook on "*Novel food*" is being drafted, based on the legal acts of the European Union, which will enable placement on the domestic market. Due to the lack of food (meat), edible insects have the potential to be used in human nutrition and animal fattening, and breeding is also environmentally friendly.

Keywords: *edible insects, novel foods, EU legislation and BH insect legislation*

## **Model poljoprivredne savjetodavne službe općine Odžak**

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### **Sažetak**

Poljoprivredna savjetodavna služba je dio agrarnog sistema koji se temelji na transferu znanja, snaženju ljudskih potencijala, snaženju društvenih potencijala i održivom upravljanju prirodnim resursima. U općini Odžak je organizovana prema Zakonu o poljoprivrednim savjetodavnim službama 66/13 i tako je čini u potpunosti modernom savjetodavnom službom, međutim rezultatima anketnog upitnika se utvrdilo da ne ispunjava očekivanja njenih korisnika. Korisnici savjetodavne službe općine Odžak su pretežno muškarci zrelije životne dobi, bave se sektorom stočarstva sa niskim intenzitetom proizvodnje. Koriste savjetodavne usluge i edukacije bez obzira na godine te ne vide svijetlu budućnost općine. Ipak, smatraju da je općina Odžak poljoprivredni kraj visokog potencijala zbog čega su izabrali bavljenje poljoprivredom kao primarni izvor prihoda. Rezultati istraživanja su prikupljeni UNDP-ovim metodama ispitivanja potreba poljoprivrednika na čemu se i baziralo istraživanje. Sumarna statistika, korelacija, chi-kvadrat, historijski i komparativni metod su korišteni da bi se podaci obradili i analizirali. Istraživanje je pokazalo dosta mjesta za napredak i pokazalo da nije dostupno dovoljno podataka o relevantnim temama, što naglašava potrebu za istraživanjem potencijala ovog područja.

Ključne riječi: *poljoprivredna savjetodavna služba, općina Odžak, poljoprivrednik, obrazovanje, model*

1-O-6

## **Model of the agricultural advisory service of the municipality of Odžak**

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### **Summary**

The Agricultural Advisory Service is part of an agricultural system based on knowledge transfer, strengthening human resources, strengthening social resources and sustainable management of natural resources. In the municipality of Odžak, it is organized according to the Law on Agricultural Advisory Services 66/13 and thus makes it a completely modern advisory service, however, the results of the survey questionnaire showed that it does not meet the expectations of its users. The beneficiaries of the advisory service of the Odžak municipality are mostly men of mature age, dealing with the livestock sector with low production intensity. They use counseling services and education regardless of age and do not see a bright future for the municipality. However, they believe that the municipality of Odžak is an agricultural area of high potential, which is why they chose to engage in agriculture as their primary source of income. The results of the research were collected by UNDP methods of examining the needs of farmers, on which the research was based. Summary statistics, correlation, chi-square, historical and comparative method were used to process and analyze the data. The research showed a lot of room for improvement and showed that not enough data is available on relevant topics, which emphasizes the need to explore the potential of this area.

*Keywords: agricultural advisory service, Odžak municipality, farmer, education, model*

## Razvoj urbane poljoprivrede u Bosni i Hercegovini – stavovi i ponašanje Z generacije

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### Sažetak

Snažni urbanizacijski trendovi praćeni periodičnim nedostacima u lancu snabdijevanja hrane motiviraju (peri)urbano stanovništvo i inicijative da proizvode, prerađuju i isporučuju dovoljne količine hrane visokog kvaliteta. Osim toga, politički procesi i inicijative kao što su UN-HABITAT, FAO, Food for the cities, MUFPP, RUAF, PURPLE stvaraju povoljno okruženje za urbane poljoprivredne inicijative, što rezultuje snažnim razvojem i velikom atraktivnošću urbane poljoprivrede i kratkih lanaca opskrbe hranom. Međutim, iako sa sobom nosi višestruke ekonomske, društvene i okolišne koristi za lokalnu zajednicu, urbana poljoprivreda često se suočava sa mnogim izazovima, uključujući tržišnu konkurenciju, nedostatak direktiva urbane politike, nepravedno planiranje korišćenja zemljišta i odluke o zakupu zemljišta i sl. Postavlja se pitanje, je li razvoj urbane poljoprivrede održiv? Održivost urbane poljoprivrede (UA) u budućnosti će snažno ovisiti o stavovima mladih ljudi, budućih potrošača i aktivista koji olakšavaju promjenu percepcije potrošača koja je neophodna za snažniji razvoj urbane poljoprivrede. Mlađa populacija pokazuje tendenciju da bude produktivnija, kao i otvorenija za nove ideje, skloniji su poduzimanju rizika te su i inovativniji, stoga ova studija ima za cilj identificiranje stavova, ponašanja i namjera mladih koristeći se Teorijom planskog ponašanja. Razumijevanje stavova i motivacije ove specifične grupe obogatit će bazu znanja i pružiti dokaze za procjenu prilika i izazova urbane poljoprivrede oblikovanih ponašanjem potrošača / tržišta. Istovremeno, pružit će informacije neophodne za stvaranje boljih javnih politika koje mogu dati snažniji zamah za razvoj urbane poljoprivrede na tržištima u razvoju, poput bosanskohercegovačkog.

Ključne riječi: *urbana poljoprivreda, generacija Z, teorija planskog ponašanja, Bosna i Hercegovina, razvoj*

1-O-7

**Development of urban agriculture in Bosnia and Herzegovina –  
Z generation attitudes and behavior**

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**Summary**

Strong urbanisation trends followed by periodical food supply chain shortages/failures motivate (peri)urban population and initiatives to produce, process and deliver enough quantity and quality food. Besides, high-level policy processes and events/initiatives such as UN-HABITAT, FAO, Food for the cities, MUFPP, RUAF, PURPLE create enabling environment for urban agriculture initiatives, resulting in strong development and high attractiveness of urban agriculture and short food supply chains. One question arises, is UA policy-led development sustainable? The sustainability of urban agriculture (UA) in the future will strongly depend on the attitudes of young people, future consumers and activists which are facilitators of consumers' perception change that is necessary for stronger urban agriculture development. The youth population tends to be more productive, as well as more open to new ideas, they are greater risk-takers and therefore more innovative. Therefore, this study aims to identify attitudes, behavior and intention of young people by using the Theory of Planned Behavior. Understanding the attitudes and motivation of this specific group will enrich the knowledge base and provide evidence to estimate urban agriculture opportunities and challenges shaped by consumers/market behaviour. At the same time, it will provide insights necessary to create better public policy that can give stronger impetus for urban agriculture development in emerging markets such as Bosnian and Herzegovinian.

*Keywords: Urban Agriculture, Generation Z, Theory of Planned Behavior, Bosnia and Herzegovina, development*



2. TOKSIKOLOGIJA I SIGURNOST HRANE  
FOOD SAFETY AND TOXICOLOGY



## Teški metali u kakao proizvodima

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### Sažetak

Kakao u prahu i čokolada su proizvodi koji proizilaze iz proizvodnje kakovih zrna (*Theobroma cacao L.*). Glavne komponente potiču od fermentiranih, zdrobljenih i prženih zrna kakaovca. Kadmij se nalazi u tlu na kojem rastu biljke kakaovca, od kojih se dobijaju zrna kaka. Biljka korijenjem crpi vodu i hranjive materije iz tla, a tako može unijeti i kadmij. Kadmij se pohranjuje u nemasnom dijelu kakaovog zrna te prelazi u kakao prah koji se dobije mljevenjem zrna i odvajanjem masnoće, odnosno kakao maslaca. Upravo zato će tamne čokolades najvećim postotnim udjelom kakao praha imati i najviše koncentracije kadmija. U Evropi postoje posebne regulative koje određuju maksimalne dopuštene koncentracije kadmija u čokoladi, upravo zato što se problem s unosom kadmija iz hrane najčešće ne događa zbog hrane koja ima najviši udio kadmija, već zbog hrane koja se najviše konzumira. To se posebno odnosi na rayne čokolade i čokoladne proizvode, a djeca spadaju pod najrizičniju skupinu. Olovo se kao jedan od najrasprostranjenijih teških metala u prirodi lako može naći i u tlu gdje rastu biljke kakaoca, koje ga mogu apsorbirati putem korijenja. Međutim glavni problem predstavlja onečišćenje prirode olovom koje prouzrokuje industrija. Biljke mogu olovo apsorbirati i putem lišća, posebno kad se olovo nalazi u prašini koju otpušta okolona tvornica. S obzirom na to da lišće kakaovca apsorbira najviše olova, testovi su pokazali da se u odrasloj biljci kakaovca najviše olova nalazi upravo u lišću, zatim u ljusci kakaovog zrna te najmanje u zreloom kakaovom zrnu. Međutim, nakon odvajanja, transporta i obrade kakaovog zrna u njemu se na kraju ipak nađu više koncentracije olova nego prije. Kao i za kadmij, više koncentracije olova u zrnu će sadržavati ona čokolada koja ima veći postotni udio kakao praha u seni, ali su poređenju s kadmijem te koncentracije minimalne te pretežno nisu razlog za brigu. Pojava ovih metala u čokoladi nije razlog za odustajanje od konzumacije čokolade, alimože biti razlog za brigu i oprez, ali i zaštitu potrošačkih prava. Svjesnost o riziku i porijeklu čokolade te pravilnom radu nadležnih institucija koje koncentracije tuh metala trebaju redovno kontrolirati treba biti imperativ kupcu kao krajnjem potrošaču.

Ključne riječi: *kakao, čokolada, teški metali*

2-O-1

## Heavy metals in cocoa products

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### Summary

Cocoa powder and chocolate are products derived from the production of cocoa beans (*Theobroma cacao L.*). The main components come from fermented, crushed and roasted cocoa beans. Cadmium is found in the soil on which cocoa plants grow from which cocoa beans are obtained. The root of the plants draws water and nutrients from the soil, as well as cadmium. Cadmium is stored in the non-fat part of cocoa beans and transforms to cocoa powder by grinding the beans and separating the fat i.e. cocoa butter. That is why chocolates with the highest percentage of cocoa powder will have the highest concentrations of cadmium. In Europe, there are special regulations that set maximum permissible concentrations of cadmium in chocolate, precisely because the problem with the intake of cadmium from food usually does not occur because of the food that has the highest cadmium content, but because of the food that is most consumed. This is especially true for a variety of chocolate products, and children belong to the highest risk group. Lead, as one of the most widespread heavy metals in nature, can easily be found in the soil where cocoa plants grow, and it can be absorbed through the roots. However the main problem is industry caused lead pollution. Plants can also absorb lead through the leaves, especially when the lead is in the dust released by the surrounding factories. Since cocoa leaves absorb the most lead, tests have shown that in the adult cocoa plant most lead is found in leaves, then in the shell of the cocoa bean and least in the mature cocoa bean itself. However, after separation, transport and processing of cocoa beans, it eventually contains higher concentrations of lead than before. As for cadmium, higher concentrations of lead in the grain will be contained in chocolate that has a higher percentage of cocoa powder in it, but compared to cadmium, these concentrations are minimal and mostly not a cause of concern. The appearance of these metals in chocolate is not a reason to give up consuming chocolate, but it can be a reason for concern and caution, but also protection of consumer rights. Awareness of the risk, origin of chocolate and the proper operation of the competent institutions that are supposed to monitor the concentrations of these metals in food should be an imperative for the buyer as the final consumer.

Keywords: *cocoa, chocolate, heavy metals*

### **Efekat kratke edukacije na stavove potrošača o GMO hrani**

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### **Sažetak**

Upotreba genetski modificiranih organizama (GMO) u usjevima i prehrambenim proizvodima postala je jedno od najkontroverznijih pitanja u svjetskom društvu, a prihvatanje ili odbijanje takve vrste hrane imat će veliki utjecaj na prehranu i zdravlje ljudi. Pristalice GMO hrane doživljavaju je kao rješenje za globalne probleme poput klimatskih promjena i gladi u svijetu, dok su osobe koje se protive upotrebi GMO hrane zabrinute zbog potencijalnih nepredvidivih posljedica. Najrasprostranjenija GMO hrana su proizvodi na bazi soje, kukuruza i pšenice. Cilj ovog rada je da istraži stavove potrošača o GMO hrani, prije i poslije sprovedene edukacije na tu temu. Za potrebe ovog istraživanja organizovan je webinar pod nazivom „Sve što (ni)ste znali o GMO hrani“. Glavni fokus edukacije bio je na sigurnosti GMO hrane, odnosno na prednostima i nedostacima njene primjene. U toku održavanja webinar-a izvršeno je pre- i post-testiranje 36 prisutnih učesnika, koje je pokazalo da je većina ispitanika imala unaprijed formirane stavove o GMO hrani. Ohrabrujuća vijest je da su ispitanici poslije edukacije izrazili svoju naklonjenost struci, prevashodno Evropskoj agenciji za sigurnost hrane i Agenciji za sigurnost hrane BiH. Edukaciju možemo okvalificirati kao uspješnu jer se značajno smanjio broj ispitanika sa negativnim stavom u pogledu sigurnosti GMO hrane i njenih posljedica na zdravlje.

*Ključne riječi: GMO hrana, sigurnost, stav potrošača*

### **The effect of short education on consumer attitudes about GMO food**

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### **Summary**

The use of genetically modified organisms (GMOs) in crops and food products has become one of the most controversial issues in world society and the acceptance or rejection of this type of food will have a major impact on human nutrition and health. Proponents of GMO food see it as a solution to global problems such as climate change and world hunger, while those who oppose the use of GMO food are concerned about potential unpredictable consequences. The most common GMO foods are products based on soy, corn and wheat. The aim of this paper is to investigate the attitudes of consumers about GMO food, before and after the conducted education on this topic. For the purposes of this research, a webinar entitled "Everything you (didn't) know about GMO food" was organized. The main focus of the education was on the safety of GMO food, ie on the advantages and disadvantages of its application. During the webinar, pre- and post-testing of 36 participants was performed, which showed that most of the respondents had pre-formed attitudes about GMO food. The encouraging news is that after the training, the respondents expressed their affection for the profession, primarily the European Food Safety Agency and the Food Safety Agency of BiH. We can qualify the education as successful because the number of respondents with a negative attitude regarding the safety of GMO food and its consequences for health has significantly decreased.

Keywords: *GMO food, safety, consumer attitude*

## Značaj ehinokokoze u javnom zdravstvu

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### Sažetak

Ehinokokoza (hidatidoza) je jedna od najstarijih poznatih bolesti ljudskog bića. Ovu bolest su Egipćani opisali u dokumentu koji datira iz 1534. Ehinokokoza je druga parazitarna zoonoza koja se smatra prioritetom prilikom nadzora parazitarne zoonoze. Razlog tome su brojne epidemije ove bolesti, biološki potencijal koji ovaj parazit posjeduje, kao i veliki postotak smrtnosti koju uzrokuju pojedini oblici ove bolesti. Za javno zdravstvo najvažnije su dvije vrste, a to su *Echinococcus granulosus* koji izaziva cističnu ili uniokularnu ehinokokoza i *Echinococcus multilocularis* koji izaziva alveolarnu ehinokokoza. Psi su uobičajeni definitivni domaćini, dok veliki broj vrsta sisara može biti posrednički domaćini, uključujući i čovjeka. Izvor infekcije su cistično promijenjeni unutarnji organi životinja koji se sirovi daju psima, pa su stoga češće invadirane osobe u kontaktu sa tim iznutricama hranjenim psima. Bolest se ne prenosi sa čovjeka na čovjeka. Lokalizacija parazitiranja je u tankom crijevu. Ciste mogu dovesti do letalnih ishoda pored ekonomskih gubitaka na polju stoke. Ove ciste mogu dovesti do letalnih ishoda pored ekonomskih gubitaka na polju stoke; učestalost ove bolesti je velika kod ljudi jer je mogućnost njenog otkrivanja samo slučajno tokom radioloških pregleda ili raznih hirurških operacija, ali kod životinja se otkriva tokom rutinskog pregleda u klaonici. Uz trihinelozu, službeni i ovlašteni veterinari moraju voditi evidenciju o svakom nalazu ehinokoka kod domaćih i divljih životinja, te o tome obavijestiti nadležni veterinarski ured, a promijenjene organe dostaviti u službeni laboratorij, te je kao takav pregled na ehinokokoza obavezan prilikom pregleda mesa. Ehinokokoza je zdravstveni i ekonomski problem u većini dijelova svijeta i neke studije bilježe više od 50 slučajeva na 100.000 ljudi godišnje u endemičnim oblastima. U ovom radu daćemo osvrt na značaj parazitarne oboljenja u javnom zdravstvu, način njegovog opstanka i širenja u populaciji, kao i preventivne mjere za njegovu kontrolu.

*Ključne riječi: ehinokokoza, javno zdravlje*

2-O-3

## Significance of echinococcosis in public health

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### Summary

Hydatidosis is one of the oldest known diseases of human being. This disease was described by the Egyptians in a document dating from 1534. Echinococcosis is another parasitic zoonosis that is considered a priority in the control of parasitic zoonoses. These diseases. For public health, the two most important are, namely, *Echinococcus granulosus* which causes cystic or unilocular echinococcosis, and *Echinococcus multilocularis* which causes alveolar echinococcosis. Dogs are common definitive hosts, while a large number of mammal species can be intermediate hosts, including humans. The source of infection is cystically altered internal organs of animals that are given raw to dogs, and therefore more often invaded persons are in contact with these intestines fed to dogs. The disease is not transmitted from person to person. The localization of parasitism is in the small intestine. Cysts can lead to lethal outcomes in addition to economic losses in the livestock field. These cysts can lead to lethal outcomes in addition to economic losses in the livestock field; The incidence of this disease is high in humans because the possibility of its detection is only accidental during radiological examinations or various surgical operations, but in animals, it is detected during a routine examination in slaughterhouses. Wild animals, and inform the competent veterinary office, and submit the changed organs to the official laboratory, and as such an examination for echinococcosis is mandatory during the examination of meat. Echinococcosis is a health and economic problem in most parts of the world and some studies record more than 50 cases per 100,000 people per year in endemic areas. In this paper, we will review the importance of parasitic disease in public health, the way it survives and spreads in the population, as well as preventive measures for its control.

Keywords: *Echinococcosis, public health*



## Antimikrobna rezistencija izolata *Escherichia coli* različitih životinja, BiH

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### Sažetak

Ovdje izvještavamo o rezultatima ispitivanja osjetljivosti na antibiotike kod 25 izolata *E. coli* iz domaćih životinja: pas (n=7), mačka (n=6), govedo (n=4), konj (n=2), kunić (n=1) i golub (n=1) i po jedan izolat divljih životinja: lav, srna, lisica i divlja patka. Izolati su prijeklom iz uzoraka: urin (n=8), vagina (n=3), pluća (n=3), crijeva (n=3), bulereg (n=2) i po jedan izolat iz brisa kože, oka, apscesa, dlake, mlijeka i aparata za glasanje. Za ispitivanje antibiotske osjetljivosti koristila se disk difuziona metoda prema preporukama Instituta za kliničke i laboratorijske standardizacije Evropske komisije za ispitivanje antimikrobne osjetljivosti (CLSI, 2018; EUCAST, 2017a). Studija je potvrdila prisutnost rezistentnih i multirezistentnih sojeva *E. coli*. Najveći broj svih izolata bio je rezistentan na cefalotin (19/25, 76%), dok je najmanji broj bio rezistentan na gentamicin (3/25, 12%). Osim na cefalotin (15/21, 71,4%), veći broj izolata domaćih životinja je bio rezistentan i na neomicin (13/21, 62%) te ampicilin (11/21, 52,4%). Najveći broj izolata svih životinja je bio osjetljiv na marbofloksacin (21/25, 84%). Osim na marbofloksacin (17/21, 81%) veći broj izolata domaćih životinja je bio osjetljiv na ciprofloksacin i ampicilin/ sulbaktam (16/21, 76,2%), te cefotaksim (15/21, 71,4%). Izolati divljih životinja nisu pokazali osjetljivost prema cefalotinu i neomicinu. Multirezistentna *E. coli* otkrivena je u uzorcima domaćih životinja (10/21, 47,6%). Najveća rezistencija, na pet različitih klasa antibiotika, zabilježena je kod izolata *E. coli* iz brisa oka zeca. Prisustvo multirezistentne *E. coli* ukazuje na važnost monitoringa i upotrebe antibiotika na osnovu sačinjenog antibiograma.

Ključne riječi: *Escherichia coli*, različite životinje, antibiotska rezistencija, multirezistencija

## Antimicrobial resistance of *Escherichia coli* isolates from different animals, BiH

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### Summary

Here we report the results of antibiotic susceptibility testing in 25 isolates of *E. coli* from domestic animals: dog (n = 7), cat (n = 6), cattle (n = 4), horse (n = 2), rabbit (n = 1) and a pigeon (n = 1) and one isolate of wild animals each: lion, roe deer, fox and wild duck. Isolates of origin: from samples: urine (n = 8), vagina (n = 3), lungs (n = 3), intestines (n = 3), kidney (n = 2) and one isolate from skin swab, eye, abscesses, hair, milk, and mating apparatus. The disk diffusion method was used for antibiotic susceptibility testing according to the recommendations of the Institute for *Clinical and Laboratory Standards* and the *European Commission for Antimicrobial Susceptibility Testing* (CLSI, 2018; EUCAST, 2017a). The study confirmed the presence of resistant and multidrug-resistant strains of *E. coli*. The largest number of all isolates was resistant to cephalothin (19/25, 76%), while the smallest number was resistant to gentamicin (3/25, 12%). In addition to cephalothin (15/21, 71.4%), a number of domestic animal isolates were also resistant to neomycin (13/21, 62%) and ampicillin (11/21, 52.4%). The largest number of isolates of all animals was sensitive to marbofloxacin (21/25, 84%). In addition to marbofloxacin (17/21, 81%), a number of domestic animal isolates were sensitive to ciprofloxacin and ampicillin / sulbactam (16/21, 76.2%), and cefotaxime (15/21, 71.4%). Wild animal isolates showed no sensitivity to cephalothin and neomycin. Multidrug-resistant *E. coli* was detected in domestic animal samples (10/21, 47.6%). The highest resistance, to five different classes of antibiotics, was observed in *E. coli* isolates from rabbit eye swabs. The presence of multidrug-resistant *E. coli* indicates the importance of monitoring and use of antibiotics based on the compiled antibiogram.

Keywords: *Escherichia coli*, different animals, antibiotic resistance, multidrug resistance

## Procjena iskustava starije populacije u vezi sa rukovanjem hranom i higijenskim zahtjevima tokom epidemije COVID-19

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### Sažetak

Mnogi ljudi vide epidemiju COVID-19 kao izazov za njihovo mentalno i fizičko zdravlje. U našem istraživanju ispitivali smo iskustva u rukovanju hranom i higijenskim zahtjevima među starijom populacijom tokom epidemije COVID-19. Istraživanje je bazirano na upitniku, koji je sadržavao socio-demografske podatke, podatke o ponašanju u trgovinama, rukovanju hranom i higijeni tokom epidemije COVID-19, kao i podatke o prebolijevanju COVID-19. Ukupno je poslano 80 upitnika, osobama starijim od 65 godina. U studiju je na kraju uključeno 58 ispitanika, 19 (32,8 %) muškaraca i 39 (67,2 %) žena. Rezultati su pokazali da se ponašanje u trgovini promijenilo tokom epidemije COVID-19 i to kod 91% ispitanika. Ispitanici su primjetili promjene u nošenju maski, držanju socijalne distance, dezinfekciji ruku i rijetkom posjećivanju prodavnica. Većina ispitanika (78 %) rjeđe ide u nabavku nego prije epidemije COVID-19, zbog rizika od infekcije. U prodavnicama, 98 % ispitanika dodiruje samo onu hranu koju namjeravaju kupiti, jer se boje infekcija i rpenosa virusa. Kako bi se zaštitili od COVID-19 infekcije, više od pola (57 %) svih ispitanika nosi jednokratne rukavice tokom kupovine voća i povrća. Od svih ispitanika, 45% starijih osoba, u potpunosti se slažu da se promijenio način na koji rukuju hranom nakon kupovine u prodavnici, tokom epidemije COVID-19. Jedna trećina njih ne nosi vrećice iz trgovine u kuhinju i više od jedne trećine (32 %) ih dezinfikuju, jer vjeruju da na taj način štite sebe od COVID-19 infekcije. Zbog straha od infekcije, 86 % ispitanika, pere i dezinfikuju ruke češće nego ranije. Od svih ispitanika, njih 17 preboljelo je COVID-19 infekciju. Rezultati ovog istraživanja pokazali su da se starije osobe boje COVID-19 infekcije. Ljudima je potrebno pružiti jasne informacije i upute o rukovanju hranom tokom epidemije i iznad svega na način koji ih osnažuje i razuvjerava.

Ključne riječi: *zdravlje, stariji, rukovanje hranom, higijenski zahtjevi, COVID-19 epidemija*

2-O-5

## **A study on the experiences of food handling and hygiene requirements among older persons during the COVID-19 epidemic**

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### **Summary**

Many people see COVID-19 epidemic as a challenge to their mental and physical health. In our research, we were investigating the experiences of food handling and hygiene requirements among older persons during the COVID-19 epidemic. The study was based on a quantitative methodology. A questionnaire that was used contained socio-demographic data, data on behaviour in trade during COVID-19 epidemic, data on food handling and hygiene during COVID-19 epidemic and data about overcoming disease COVID-19. We invited 80 older persons aged 65 or above. Total of 58 respondents were included in the study, 19 (32,8 %) men and 39 (67,2 %) women. The results showed that behaviour in store during COVID-19 epidemic has changed for 91 % older persons. Respondents observed changes in wearing masks, keeping social distancing, hand disinfection, and infrequent visits to stores. Most respondents (78 %) go to the grocery store less often than before the COVID-19 epidemic, due to risk of infection. In stores, 98 % respondents touch only those foods that they intend to buy, as they are afraid of infection and virus transmission. To protect themselves from COVID-19 infection more than one-half (57 %) of all respondents wear disposable gloves during fruit and vegetable shopping. Of all respondents, 45 % of older persons completely agreed that their handling of food after purchasing from the store changed during the COVID-19 epidemic. One-third of respondents do not carry a shopping bag into the kitchen and more than one-third (32 %) of all respondents disinfect it, because in this way, they believe that they protect themselves from COVID-19 infection. Due to the fear of infection, 86 % of respondents wash and disinfect their hands more frequently. Of all respondents, 17 people overcame COVID-19 infection. The results have shown that older persons are afraid of COVID-19 infection. People need clear information and directions regarding the handling of food during epidemic, and above all, a way of communication that empowers and reassures people.

*Keywords: health, older persons, food handling, hygiene requirements, COVID-19 epidemic*

## Prirodni toksini u hrani

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### Sažetak

Hrana je biološki supstrat i ima sposobnost podržavanja rasta mikroorganizama koji su potencijalni proizvođači toksičnih spojeva. Hrana se uglavnom sastoji od bjelančevina, ugljikohidrata, masti i drugih hranjivih tvari koje se koriste u organizmu. Prirodni toksini su hemijske tvari koje nisu toksične za organizme koji ih proizvode, ali kada se unose hranom mogu predstavljati potencijalni rizik za zdravlje ljudi. Uobičajeni izvori egzogenih toksina su gljive (mikotoksini), otrovne biljke, bakterije, alge ili morski biotoksini (ciguatoksini), što će detaljnije biti predstavljeno u prezentaciji rezultata ovog rada. Glavna poteškoća analitičarima u provjeri sigurnosti hrane je raznolikost ovih bioloških spojeva. Analiza uzoraka hrane nije jednostavna jer su toksini po prirodi složene matrice. Nivoi najvažnijih prirodnih toksina u hrani, koji ne smiju prelaziti nacionalne i međunarodne maksimalne nivoe, moraju biti kontrolisani. Najviše se pažnje pridaje egzogenim toksinima zbog njihovih potencijalno štetnih posljedica po zdravlje ljudi i njihovog utjecaja na prirodnu kontaminaciju. U posljednje vrijeme povećala se neprimjerena upotreba fitoterapeutskih i nutritivnih biljaka, kao i biljnih proizvoda, što je dovelo do povećane učestalosti trovanja. Cilj ovog rada je predstaviti i istaknuti raznolikost prirodnih toksina u hrani i podići svijest o mogućim trovanjima.

Ključne riječi: *prirodni toksini, kontaminacija hrane, složene matrice, trovanje*

2-O-6

## Natural toxins in food

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### Summary

Naturally, food is a biological substrate and has the ability of supporting the growth of microorganisms which are potential producers of toxic compounds. Food consists essentially of proteins, carbohydrates, fats, and other nutrients used in the body of an organism. Natural toxins are chemical substances that are not toxic to the organisms that produce them, but when ingested through food, can be a potential risk to human health. Usual sources of exogenous toxins are fungi (mycotoxins), poisonous plants, bacteria, algae or marine biotoxins (ciguatoxins), which will be elaborated in detail in presentation of this work. The main difficulty to analysts and food safety implications is the diversity of these biological compounds. Analysis of food samples is not simple because toxins, by nature, are complex matrices. Levels of the most relevant natural toxins in food should be controlled and should not pass both national and international maximum levels. The most attention is given to exogenous toxins because of their potential damaging consequences to human health, and their engagement in natural contamination. Lately, unadvised usage of phytotherapeutic and nutritional plants, as well as herbal products has increased and led to more cases of intoxication. The aim of this paper is to present and highlight variety of natural toxins in food and raise awareness of possible intoxications.

Keywords: *natural toxins, food contamination, complex matrices, intoxication*

## Prisutnost akrilamida u hrani

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### Sažetak

Akrilamid je bijela, kristalna čvrsta supstanca, bez mirisa, dobro topiva u vodi. Nastaje termičkom obradom hrane, bogatom ugljikohidratima i mastima, Maillardovom reakcijom asparagina i reducirajućim šećerima na temperaturi iznad 120°C. Otkriće akrilamida u hrani dovelo je do opsežnih studija koje su istraživale njegove mehanizme formiranja i razine izloženosti. Cilj ovog pregleda bio je predstaviti neke rezultate nedavnih istraživanja prisustva akrilamida u prehrambenim proizvodima, te njegov uticaj na zdravlje ljudi. Prisutnost akrilamida utvrđena je u različitim kategorijama prehrambenih proizvoda, koji se svakodnevno konzumiraju, kao što su: proizvodi od krompira, proizvodi na bazi žitarica i kafa. Koncentracije reducirajućih šećera i slobodnog asparagina, uz temperaturu i dužinu termičke obrade, najvažniji su faktori koji utiču na količinu formiranog akrilamida u hrani. Na temelju dosadašnjih istraživanja, studije na životinjama su pokazale da je akrilamid kancerogen, genotoksičan i neurotoksičan spoj, te se smatra glavnim uzrokom perifernih neuropatija. Mogući štetni učinci izloženosti akrilamida putem hrane su na nervni sistem, prenatalni i postnatalni razvoj, te na reproduktivno zdravlje. Akutni toksični učinci su kada su oralne doze veće od 100 mg/kg TT, a smrtonosne su obično veće od 150 mg/kg TT. Nakon oralnog unosa, akrilamid se apsorbira iz gastrointestinalnog trakta i distribuira u sve organe. Prisustvo akrilamida u termički obrađenoj hrani je od javno-zdravstvenog značaja, obzirom da je potencijalni uzrok širokog spektra toksičnih efekata i klasificiran je kao vjerovatno kancerogen kod ljudi. Njegovo prisustvo u mnogim namirnicama, postalo je jedan od najtežih problema s kojima se suočavaju prehrambena industrija i njen lanac snabdijevanja.

Ključne riječi: *hrana, akrilamid, toksičnost, zdravstveni efekti*

2-O-7

### **Presence of acrylamide in food**

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### **Summary**

Acrylamide is a white, crystalline solid, odorless, well soluble in water. It is formed by heat treatment of food, rich in carbohydrates and fats, Maillard reaction of asparagine, and reducing sugars at temperatures above 120 °C. The discovery of acrylamide in food has led to extensive studies investigating its mechanisms of formation and levels of exposure. The goal of this review was to present the results of recent researches on the presence of acrylamide in food products and its impact on human health. The presence of acrylamide has been determined in various categories of food products, which are consumed daily, such as potato products, cereal-based products and coffee. Concentrations of reducing sugars and free asparagine, along with temperature and length of heat treatment are the most important factors influencing the amount of acrylamide formed in food. Based on previous research, animal studies have shown that acrylamide is a carcinogenic, genotoxic and neurotoxic compound, and is considered a major cause of peripheral neuropathies. Possible adverse effects of acrylamide exposure through food are on the nervous system, prenatal and postnatal development, and reproductive health. Acute toxic effects are when oral doses are greater than 100 mg/ kg BW, and lethal are usually greater than 150 mg/ kg BW. After oral administration, acrylamide is absorbed from the gastrointestinal tract and distributed to all organs. The presence of acrylamide in thermally processed foods is of public health importance, as it is a potential cause of a wide range of toxic effects and is classified as probably carcinogenic in humans. Its presence in many foods has become one of the most difficult problems facing the food industry and its supply chain.

Keywords: *food, acrylamide, toxicity, health effects*



## Citotoksičnost *Artemisia annua* L. etanolnog ekstrakta *in vitro*

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### Sažetak

*Artemisia annua* L. (Asteraceae), poznata kao slatki pelin, koristi se kao ljekovita biljka za liječenje nekoliko bolesti u tradicionalnoj medicini što je dovelo do povećanog interesa usljed antivirusnog potencijala i eventualne primjene u liječenju infekcije uzrokovane SARS-CoV-2. Cilj istraživanja bio je procijeniti citotoksičnost komercijalnog *A. annua* L. etanolnog ekstrakta u normalnim (HEK 293T i MDBK) i kancerogenim (5637 i B16-F10) ćelijskim linijama, kao i komparacija pouzdanosti 3-4,5-dimetil-2-tiazolil-2,5-difenil-2H-tetrazolium bromid (MTT) i NRU (eng. *neutral red uptake*) testova. Čelije su zasijane u odgovarajuću podlogu za kultivaciju i tretirane ekstraktom *A. annua* L. razblaženjima 1:10, 1:100 i 1:1000, 24 sata nakon inkubacije. Uočeni rezultati MTT testa pokazali su lažno negativne rezultate za najmanje razblaženje ekstrakta za sve ćelijske linije. Procjena citotoksičnosti primjenom NRU testa pokazala je značajno povećanje citotoksičnosti ( $p < 0,001$ ) u normalnim i u kancerogenim ćelijskim kulturama tretiranim najmanjim ekstraktom razblaženjem u odnosu na najveće razblaženje. Preliminarni rezultati NRU testa ukazuju na posebnu opreznost u korištenju etanolnog ekstrakta *A. annua* L., posebno kada je slabo razblažen, zbog evidentnog citotoksičnog potencijala na normalnim humanim i animalnim ćelijama *in vitro*. Preporučuje se primjena različitih testova za procjenu sigurnih doza ekstrakta prilikom evaluacije njegovog antikancerogenog potencijala kao i farmaceutske primjene.

Ključne riječi: *slatki pelin, MTT test, NRU test*

## 2-P-1

### **Cytotoxicity of *Artemisia annua* L. ethanolic extract *in vitro***

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### **Summary**

*Artemisia annua* L. (Asteraceae), also known as sweet wormwood, has been used as a medicinal plant for the treatment of several diseases in traditional medicine, which recently lead to the growing interest in its anti-viral potential and use in the treatments of SARS-CoV-2 infections. The study aimed to evaluate the cytotoxicity of commercial *A. annua* L. ethanolic extract in normal (HEK 293T and MDBK), and cancer (5637 and B16-F10) cell lines, and to compare the reliability of 3-(4,5-dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) and neutral red uptake (NRU) assays. Cells were seeded in appropriate growing media and treated with *A. annua* L. extract dilutions of 1:10, 1:100, and 1:1000, 24h upon of cell incubation. Observed results showed false-negative results of MTT assay for the lowest extract dilution in all cell lines. On the contrary, NRU assay revealed a significant increase of cytotoxicity ( $p < 0.001$ ) in both normal and cancer cell cultures treated with the lowest extract dilution compared to the highest dilution applied. Preliminary results point to a special carefulness in *A. annua* L. ethanolic extract use, especially when poorly diluted, due to observed cytotoxic potential on normal human and animal cells *in vitro*. Use of various assays in the cytotoxicity determination of harmless extract doses is highly recommended in the evaluation of their anti-cancer potential and pharmaceutical applications.

Keywords: *sweet wormwood*, *MTT assay*, *NRU assay*

## Uticaj pušenja cigareta na oralne sluznice studenata u 4, 5, 6, godini Stomatološkog fakulteta u Sarajevu

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### Sažetak

Cilj našeg istraživanja je utvrditi štetni uticaj pušenja cigareta na oralne sluznice studenata četvrte, pete i šeste godine Stomatološkog fakulteta u Sarajevu. Ukupno je pregledano 115 studenata, od tog je 38 isključeno zbog ekskluzionih kriterija (sistemsko oboljenje ili su pod terapijom), a u istraživanje je uključeno 77 ispitanika, koji su zadovoljavali inkluzione kriterije (sistemski zdravi, pušači ili konzumiraju druge štetne navike). Radi se o presječnom istraživanju. Ispitanicima su postavljena pitanja o štetnim navikama, i o načinima sprovođenja oralne higijene, te im se uradio klinički pregled. Rezultati su statistički analizirani i obrađeni u programu SPSS Statistics 21.0. Veliki broj studenata kao štetnu naviku navodi pušenje cigareta i konzumaciju alkohola. Od ukupnog broja ispitanih studenata njih 50 (65%) konzumira cigarete, dok se 47 (62%) studenata izjasnilo da konzumira alkohol. Navedeno upozorava na trend sve ranijeg prvog kontakta mladih sa pušenjem cigareta, te na potrebu javnozdravstvenih kampanja, posebno na organizirane edukacije u osnovnim, srednjim školama, fakultetima kako bi se preveniralo sve ranije eksperimentiranje mladih sa štetnim navikama. Također možemo zaključiti da relativno kratak period konzumacije je ipak doveo do nastanka oštećenja i narušavanja zdravlja oralne sluznice što ukazuje na potrebu daljih istraživanja o štetnosti pušenja cigareta.

Ključne riječi: *studenti, pušenje, oralne sluznice*

**The effects of cigarette smoking on the oral mucosa of fourth, fifth and sixth-year students at the Faculty of Dentistry in Sarajevo**

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**Summary**

The aim of our research is to determine the harmful effect of cigarette smoking on the oral mucosa of fourth, fifth and sixth-year students at the Faculty of Dentistry in Sarajevo. A total of 115 students were examined, 38 of which were eliminated due to exclusion criteria (systemic illness or were under some form of treatment), and the research included 77 subjects that fulfilled inclusion criteria (systemically healthy, smokers or consume other harmful habits). This is a cross-sectional research. The subjects were asked questions about harmful habits, ways of maintaining oral hygiene, and they have undergone clinical examination. The results were statistically analysed and processed in the programme SPSS Statistics 21.0. A great number of students list cigarette smoking and alcohol consumption as harmful habits. Out of the total number of examined students 50 of them (65%) consume cigarettes, whereas 47 students (62%) stated that they consume alcohol. The aforementioned warns of the trend of an even earlier first contact of young people with cigarette smoking, and of the need for public health campaigns, especially the need for organized educations in primary schools, secondary schools and faculties in order to prevent an even earlier youth experimentation with harmful habits. Additionally, it can be concluded that a relatively short period of consumption still led to the occurrence of damage and health impairment of oral mucosa which indicates to the need for further research on the harmfulness of cigarette smoking.

Keywords: *students, smoking, oral mucosa*

3. ISHRANA TOKOM ŽIVOTNOG CIKLUSA  
LIFECYCLE NUTRITION



## Značaj vitamina B<sub>12</sub>, željeza i folata za eritrocitopoezu

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### Sažetak

Kao i za sve procese koji se odvijaju u živom svijetu, tako i za eritrocitopoezu, nepohodno je prisustvo određenih faktora da bi se ona odvijala normalno i u potpunosti. Među mnogim potrebnim faktorima, ističe se važnost tri nutrijenta – željeza, vitamina B<sub>12</sub> i folne kiseline. Ovaj pregledni članak za cilj istražiti uticaj poremećaja metabolizma željeza, vitamina B<sub>12</sub> i folne kiseline na eritrocitopoezu, te ukratko opisati dijagnostiku i liječenje deficijencija, odnosno anemija izazvanih nedostatkom ovih nutrijenata. Kao materijal za izradu preglednog članka na datu temu, prvenstveno je korištena literatura pronađena na online bazama podataka kao što su *Google Scholar*, *PubMed*, *MedLine*, *ScienceDirect*, uz korištenje ključnih riječi: eritrocitopoeza, željezo, folati, folna kiselina, vitamin B<sub>12</sub>. Nakon analize 12 odabranih studija, utvrđeno je da su željezo, vitamin B<sub>12</sub> i folna kiselina neophodni za proces eritrocitopoeze. Ukoliko se javi nedostatak ranije navedenih, dolazi do inhibicije purina i timidilata, narušavanja sinteze DNA, nedovoljne sinteze hemoglobina, apoptoze prethodnica eritrocita što dovodi do neučinkovite eritrocitopoeze te u konačnici i do raznih tipova anemija, koje su jedne od vodećih javnozdravstvenih problema u svijetu. Također, neka od istraživanja su istakli činjenicu da su pomenuti deficiti veoma često prisutni istovremeno, te da može doći do neprimjećivanja jednih, stoga se treba obratiti veoma velika pažnja diferencijalnoj dijagnozi. Potrebna su opsežnija i temeljitija istraživanja o uticaju ovih nutrijenata na eritrocitopoezu, naročito zbog još uvijek nedovoljno objašnjenog mehanizma nastanka nefektivne eritrocitopoeze.

Ključne riječi: *eritrocitopoeza, vitamin B12, folna kiselina, željezo, deficit, anemija, nutrijenti*

## **The importance of vitamin B12, iron and folate for erythrocytopoiesis**

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### **Summary**

As for all processes that take place in the living world, same goes to erythrocytopoiesis, the presence of certain factors is necessary for it to take place normally and completely. Among many necessary factors, the importance of three nutrients is emphasized – iron, vitamin B<sub>12</sub> and folic acid. This review article aims to investigate the impact of iron, vitamin B<sub>12</sub> and folic acid metabolism disorders on erythrocytopoiesis, and to briefly describe the diagnosis and treatment of deficiencies or anemia caused by a deficiency of these nutrients. As material for creating a review article on a given topic, primarily used literature was found on online databases such as Google Scholar, PubMed, MedLine, ScienceDirect, using the keywords: erythrocytopoiesis, iron, folate, folic acid, vitamin B<sub>12</sub>. After analysis of 12 selected studies, it was determined that iron, vitamin B<sub>12</sub> and folic acid are necessary for the process of erythrocytopoiesis. If there is a deficiency of any of these nutrients, there is inhibition of purines and thymidylates, disruption of DNA synthesis, insufficient hemoglobin synthesis, apoptosis of erythrocyte precursors, which leads to inefficient erythrocytopoiesis and ultimately to various types of anemia, which are one of the leading public health problems in the world. Also, some of the research pointed out the fact that the mentioned deficits are very often present at the same time, and that some of them may go unnoticed, so very much attention should be paid to the differential diagnosis. More extensive and thorough research on the influence of these nutrients on erythrocytopoiesis is needed, especially due to the still insufficiently explained mechanism of ineffective erythrocytopoiesis.

Keywords: *erythrocytopoiesis, vitamin B12, folic acid, iron, deficiency, anemia, nutrients*



## Stavovi i mišljenja učitelja o utjecaju prehrambenih navika učitelja na prehrambene navike učenika

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### Sažetak

Osnovne škole, pored svoje obrazovne, imaju i odgojnu funkciju. Još od prvih školskih dana učitelj je uzor svojim učenicima. Učenici nastoje imitirati ponašanje i različite navike učitelja među kojima su i prehrambene. Cilj ovog rada je bio ispitati stavove i mišljenja učitelja i studenata, kao budućih učitelja, o utjecaju prehrambenih navika učitelja na prehrambene navike učenika. Ciljna skupina ispitanika bili su učitelji u osnovnim školama u Bosni i Hercegovini i studenti Pedagoškog fakulteta Univerziteta u Sarajevu na Odsjeku za razrednu nastavu. U svrhu istraživanja provedena je onlajn anketa kojom je ispitano 100 učitelja i studenata. Anketa je sadržavala pitanja koja se odnose na prehrambene navike učitelja u školi. Pored toga, nastojali smo ispitati stavove i razmišljanja studenata Pedagoškog fakulteta, budućih učitelja. Pri provođenju ankete i analizi rezultata, u obzir su uzeti sljedeći parametri: razred koji učitelj vodi i godina studija koju student pohađa. Ovim istraživanjem željeli smo ustanoviti kakav primjer učitelji daju svojim učenicima u području prehrane. Pored toga željeli smo uvidjeti razliku između razmišljanja i stavova studenata o tome kakav utjecaj imaju učitelji na prehrambene navike učenika. Jedan od glavnih zaključaka ovog istraživanja jeste da većina ispitanika iz grupe učitelja je stava da njihove prehrambene navike imaju veliki utjecaj na prehrambene navike njihovih učenika. Istog razmišljanja bili su i ispitanici iz grupe studenata, budućih učitelja. Detaljni ishodi istraživanja i ostali zaključci bit će objavljeni u prezentaciji.

Ključne riječi: *prehrambene navike, utjecaj, učitelji, studenti, učenici*

### 3-O-2

#### **Teachers' attitudes and opinions about the influence of teachers' eating habits on students' eating habits**

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#### **Summary**

In addition to their educational purposes, elementary schools also have many other functions in life of student. Teachers are role models for their students from the first day. Students tend to imitate behavior of teacher as well as many other habits including the nutrition. The main goal of this research was to examine the attitudes and opinions of teachers and students, as future teachers, about the influence of teachers' eating habits on students' eating habits. The target group of respondents were teachers in primary schools in Bosnia and Herzegovina and students of Faculty of Educational Sciences, University of Sarajevo at the Department of Lower Elementary Education. For the purpose of the research, an online survey which examined 100 teachers and students, was conducted. The survey contained the items regarding to nutrition habits of teachers in school. Besides that, we examined the attitudes and thoughts of students of the Faculty of Educational Sciences, the future teachers. While conducting the survey and analyzing the results, various parameters were taken into account, such as: the class that teacher works with and the year of study that students attend. With this research, we primarily wanted to examine what kind of example teachers give to their students in the field of nutrition, but also to notice the difference between attitudes and thoughts of future teachers about what impact teachers have on student eating habits. One of the main conclusions of this research is that most of the respondents from the group of teachers have the opinion that their eating habits have a great influence on the eating habits of their students. Respondents from the group of students, future teachers, had the same opinion. The detailed outcomes of the research and other conclusions will be presented in the presentation.

*Keywords: eating habits, influence, teachers, students, pupils*

## Učestalost primjene vitamina kao dodataka prehrani među studentima Univerziteta u Sarajevu

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### Sažetak

Termin “dodaci prehrani” obuhvata sve pojedinačne oblike ili mješavine hranjivih tvari koje služe kao dodatak prehrani u smislu njenog obogaćivanja ili se uzimaju direktno u koncentriranom obliku (vitamini, mineralne tvari, bjelančevine, aminokiseline, masne kiseline). Dodaci prehrani ne smiju biti zamjena za uravnoteženu prehranu i ne bi se trebali uzimati prije procjene nutritivnog statusa koju provode stručnjaci: liječnici, magistri farmacije i nutricionisti. Osnovni cilj ovog istraživanja je bio da se kvalitativno i kvantitativno analizira upotreba vitamina kao dodataka prehrani među studentima Univerziteta u Sarajevu. U svrhu istraživanja provedena je online anketa (pomoću Google obrasca), u kojoj je učestvovalo 248 studenata sa različitih fakulteta Univerziteta u Sarajevu. Rezultati su pokazali da vitamine kao dodatke prehrani koristi 90,73% anketiranih studenata. Više od polovine studenata koristi vitamine više puta sedmično (minimalno tri puta sedmično). Najčešće korišteni vitamini su: vitamin C (36,55%), vitamin D (24,58%) i vitamini B kompleksa (23,65%). Vitamine E, K i A koristi manje od 10% anketiranih studenata. Rezultati su pokazali da nema statistički značajnih razlika u učestalosti primjene u odnosu na grupacije fakulteta. Glavnu savjetodavnu ulogu u preporuci za primjenu vitamina kao dodataka prehrani imaju zdravstveni radnici (magistri farmacije, nutricionisti i liječnici). Također, rezultati pokazuju da su anketirani studenti svjesni značaja uravnotežene prehrane kao i činjenice da vitamine prvenstveno treba unositi putem prehrane. Tome u prilog govori i činjenica da se više od 75% anketiranih studenata izjasnilo da vitamine prvenstveno unosi putem prehrane.

Ključne riječi: *dodaci prehrani, vitamini, studenti*

### 3-O-3

#### **Frequency of use of vitamins as dietary supplements among students of the University of Sarajevo**

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#### **Summary**

The term "dietary supplements" includes all individual forms or mixtures of nutrients that serve as a dietary supplements in terms of its enrichment or are taken directly in concentrated form (vitamins, minerals, proteins, amino acids, fatty acids). Dietary supplements should not be a substitute for a balanced diet and should not be taken before assessing nutritional status by experts: doctors, pharmacists and nutritionists. The main goal of this research was to qualitatively and quantitatively analyze the use of vitamins as dietary supplements among students of the University of Sarajevo. For the purpose of the research, an online survey was conducted (using Google forms), in which 248 students from different faculties of the University of Sarajevo participated. The results showed that 90.73% of surveyed students use vitamins as dietary supplements. More than half of students use vitamins several times a week (at least three times a week). The most commonly used vitamins are: vitamin C (36.55%), vitamin D (24.58%) and B complex vitamins (23.65%). Vitamins E, K and A are used by less than 10% of surveyed students. The results showed that there were no statistically significant differences in the frequency of consumption in relation to faculty groups. The main advisory role in the recommendation for the use of vitamins as dietary supplements is played by healthcare professionals (pharmacists, nutritionists and doctors), as shown in our survey. Also, the results show that the surveyed students are aware of the importance of a balanced diet as well as the fact that vitamins should primarily be taken through the nutrition. This is supported by the fact that more than 75% of surveyed students stated that they consume vitamins primarily through food intake.

Keywords: *dietary supplements, vitamins, students*

## Uticaj aktivnih principa biljke *Rhodiola rosea* na promociju zdravlja

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### Sažetak

*Rhodiola rosea* ili Ružičasti žednjak je biljka žutog cvijeta i karakterističnog mirisa na ružu, pripada rodu *Rhodiola*, zajedno sa ostalih 136 vrsta. Pokazano je da sa svojim aktivnim biološkim sastojcima u koje spadaju salidrozidi i rosavini, djeluje kao adaptogen - nespecifično pojačava prirodne snage organizma ne ometajući uobičajne fiziološke procese.

Rad se zasniva na prikupljanju i analizi članaka i objavljenih naučnih radova. Aktivni biološki sastojci salidrozidi i rosavini su efikasni u povećanju ukupnog radnog kapaciteta, skraćanju perioda oporavka nakon teškog fizičkog rada, povećanju otpora organizma na egzogene i endogene stresore. Smatra se da djeluju kao antistresori preko regulacije endokrinog sistema, a imaju i antimutagena i antioksidativna svojstva. *R. Rosea* posjeduje širok sigurnosni profil, što je čini pogodnom za širu upotrebu. Rezultati brojnih kliničkih studija pokazuju da je ružičasti žednjak poboljšava funkcije kardiorespiratornog, nervnog, imunog i reproduktivnog sistema, a svoju primjenu bi mogao imati u prevenciji i terapiji onkoloških oboljenja.

Ključne riječi: *salidrozid, rosavin, adaptogen*

### **Effects of Active Ingredients of *Rhodiola Rosea* on Health Promotion**

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#### **Summary**

*Rhodiola rosea* or golden root is a plant with yellow blossoms and characteristic rose like scent. It is part of *Rhodiola* genus, together with other 136 species. It was shown that *R. rosea* with its active biological ingredients, including salidroside and rosavins, acts as an adaptogen – nonspecifically increasing body's natural defense systems without conflicting with its usual physiological pathways. Data has been collected and analysed from various research resources, including scientific articles and other published literature. Active biological ingredients salidroside and rosavins are found to be effective in increasing total work capacity, shortening the time needed to rest and furthermore increasing the body's resistance to exogenous and endogenous stress. It is believed that they behave as antistressors by regulating the endocrine system, while also demonstrating antimutagenic and antioxidant properties. *R. rosea* shows a strong safety profile, making it suitable for wider use. Results of numerous clinical studies have shown that *R. rosea* increases the function of cardiorespiratory, nervous, immune and reproductive system, with its benefits also seen in oncological prevention and treatment.

Keywords: *salidroside, rosavin, adaptogen*

## Vlakna u prehrani

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### Sažetak

Prehrambena vlakna su materijal biljnog porijekla koji je otporan na probavu potpomognutu humanim enzimima. Cilj našeg istraživanja bio je upoznati se sa samim pojmom vlakana, potrebama organizma za istim i upoznavanje sa njihovim zdravstvenim prednostima i pozitivnim učincima na organizam. Osobina zbog koje se najviše upotrebljavaju se ogleda u nemogućnosti da podlegnu procesu varenja u crijevima. Vlakna se koriste u medicinskoj nutritivnoj terapiji kod tretmana metaboličkih poremećaja i prevenciji kardiovaskularnih oboljenja. Prehrambena vlakna se dijele na topiva i netopiva. Topiva vlakna se u dodiru s vodom razgrađuju, a netopiva bubre i ne razgrađuju se. Njihova uloga u našem organizmu ovisi od toga da li su vlakna topiva ili ne. Istraživanjem literature došli smo do zaključka da u sastav biljnih vlakana ulaze pretežno složeni ugljikohidrati, kao što su celuloza, hemiceluloza, pektini, te biljne smole i gume. Brojna istraživanja pokazuju da vlakna imaju ulogu u prevenciji digestivnih poremećaja i održavanju dobre funkcije probavnog trakta. Osim toga, značajne zdravstvene dobrobiti su sprječavanje nastanka srčanih oboljenja, snižavanje holesterola, snižavanje i stabilizacija nivoa glukoze u krvi, prevencija nastanka raka debelog crijeva, sprječavanje pretilosti, te antioksidativno djelovanje. Zbog navednih benefita važno je obratiti pažnju na obrazovanje potrošača od strane zdravstvenih radnika, kako bi se povećala njihova potrošnja i razvila svijest o njihovom velikom značaju i efektima koje ispoljavaju na zdravlje.

Ključne riječi: *vlakna, zdravlje, prehrana, ugljikohidrati*

3-O-5

### **Dietary fibers**

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### **Summary**

Dietary fibers are materials of plant origin that is resistant to digestion aided by human enzymes. The aim of our research was to get acquainted with the very concept of fibers, the needs of the organism for the same and to get acquainted with their health benefits and positive effects on the organism. The feature for which they are most used is reflected in the inability to undergo the process of digestion in the intestines. Fibers are used in medical nutritional therapy in the treatment of metabolic disorders and the prevention of cardiovascular diseases. Dietary fibers are divided into soluble and insoluble. Soluble fibers decompose on contact with water and insoluble fibers swell and do not decompose. Their role in our body depends on whether the fibers are soluble or not. By researching the literature, we came to the conclusion that the composition of plant fibers includes predominantly complex carbohydrates, such as cellulose, hemicellulose, pectins and plant resins and gums. Numerous studies show that fibers have a role in preventing digestive disorders and maintaining good digestive tract function. In addition, significant health benefits include the prevention of health disease, lowering cholesterol, lowering and stabilizing blood glucose levels, preventing colon cancer, preventing obesity and antioxidant activity. In these benefits lies the importance of drawing attention to the education of consumers by health professionals, in order to increase their consumption and develop awareness of their great importance and the effects they have on health.

Keywords: *fibers, health, nutrition, carbohydrates*



## Šećer u prehrani

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### Sažetak

Šećer je jedan od najosnovnijih sastojaka prehrane, bez kojeg ne bi mogli zamisliti svakodnevnu ishranu, kao ni užitak koji šećer pruža u svom prerađenom i neprerađenom obliku. Šećer se prirodno pojavljuje u svim namirnicama koje sadrže ugljikohidrate, poput voća i povrća, žitarica i mliječnih proizvoda. Konzumiranje hrane koja sadrži prirodni šećer se ne smatra štetnim za zdravlje, međutim prekomjeren unos šećera može izazvati brojne zdravstvene poteškoće, naročito zbog namirnica koje možda „djeluju zdravo“, a u suštini to nisu. Neželjene posljedice koje se javljaju uslijed prekomjerne konzumacije šećera, su: loša prehrana, debljanje, povećani trigliceridi, karijes, te dijabetes. Nutricionisti širom svijeta godinama unazad izučavaju dnevne, sedmične i mjesečne unose različitih vrsta namirnica kako bi kreirali preporučenu ishranu za zdrav i kvalitetan život. Upravo zbog toga su kreirali piramidu zdrave ishrane, koja predstavlja preporučeni unos svakodnevnih namirnica. Cilj ovog rada je sastaviti edukativnu brošuru o šećeru u prehrani za tinejdžere, odnosno populaciju srednjoškolaca. Brošura ima za cilj probuditi svijest mladih o količini šećera koja se nalazi u određenim namirnicama, te pokazati šta je to uravnotežena prehrana. Za izradu ove brošure korišteni su relevantni naučni izvori. Naučni članci pronađeni su u medicinskoj bazi PubMed, dok su ostale internet stranice od relevantnih organizacija kao što je američka Agencija za hranu i lijekove i Centar za kontrolu i prevenciju zaraznih bolesti.

Ključne riječi: *šećer, prehrana, hrana*

### 3-O-6

#### **Sugar in the diet**

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#### **Summary**

Sugar is one of the most basic ingredients of the diet, without sugar we could not imagine a daily diet, as well as the pleasure that sugar provides in its processed and unprocessed form. Sugar occurs naturally in all foods that contain carbohydrates, such as fruits and vegetables, grains, and dairy products. Consuming foods that contain natural sugar is not considered harmful to health, however, excessive sugar intake can cause a number of health problems, especially because of foods that may "work healthily", but are not. Side effects that occur due to excessive sugar consumption are: poor diet, weight gain, increased triglycerides, tooth decay, and diabetes. Nutritionists around the world have been studying daily, weekly and monthly intakes of different types of foods for years in order to create a recommended diet for a healthy and quality life. That is why they created the pyramid of healthy eating, which is the recommended intake of daily foods.

The aim of this paper is to compile an educational brochure about sugar in nutrition for teenagers, that is the population of high school students. The brochure aims to raise young people's awareness of the amount of sugar found in certain foods, and to show what a balanced diet is.

Relevant scientific sources were used to produce this brochure. Scientific articles were found in the PubMed medical database, while other websites were from relevant organizations such as the U.S. Food and Drug Administration and the Center for Infection Control and Prevention.

Keywords: *sugar, diet, food*

## Kvaliteta ishrane studenata UNSA za vrijeme pandemije COVID – 19

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### Sažetak

U prethodne dvije godine studenti su bili suočeni sa različitim izazovima a među njima je i promjena ishrane. U toku istraživanja postavljene su četiri hipoteze koje su trebale biti potvrđene/opovrgnute:

1. U toku pandemije ishrana studenata je postala manje kvalitetna;
2. Medicinska grupacija studenata je više informisana o ishrani;
3. Suplementacija je postala zamjena hrani;
4. Emocije su uticale na promjenu prehrane;

Shodno navedenim hipotezama provedeno je istraživanje među studentima Univerziteta u Sarajevu preko online ankete. Anketa je sprovedena u toku mjeseca septembra te je u njoj učestvovalo 200 studenata. Shodno postavljenim hipotezama, potvrđene su  $\frac{3}{4}$  hipoteze. 62,6 % studenata je uočilo promjenu ishrane a od toga je 38% bilo negativna promjena i unos veće količine hrane. Sljedeću hipotezu također potvrđuje sprovedena anketa u kojoj se navodi da su o ishrani i suplementaciji više informisani studenti medicinske grupacija dok su studenti grupacije umjetnosti mnogo manje informisani. Treću hipotezu je opovrgnula anketa, studenti ne smatraju da je suplementacija zamjena hrani ali smatraju da ima veliku ulogu u podizanju imuniteta. Emocije poput stresa, dosade, straha dovodile su u 89% slučajeva do promjene prehrane čime je potvrđena i četvrta hipoteza. Neki od značajnih odgovora ostavljenih u prostoru za dodatne informacije bilo je: “Nekome se i ishrana popravila jer je za vrijeme izolacije uspio upoznati svoj organizam, a ne šablonski plan ishrane kakav je zastupljen u školama, da se u određeno vrijeme može jesti.”

Ključne riječi: *ishrana, pandemija, emocije, studenti, suplementi*

### 3-O-7

## Quality of nutrition of UNSA students during the COVID - 19 pandemic

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### Summary

In the previous two years, students have faced various challenges and among them is a change in diet. During the research, four hypotheses were set that needed to be confirmed/refuted:

1. During the pandemic, student nutrition became less quality;
2. The medical group of students is more informed about nutrition;
3. Supplementation has become a food substitute;
4. Emotions influenced the change in diet;

According to the above hypotheses, a survey was conducted among students of the University of Sarajevo through an online survey. The survey was conducted during the month of September and 200 students participated in it. According to the set hypotheses, the hypotheses were confirmed. 62.6% of students noticed a change in diet, of which 38% had a negative change and intake of a larger amount of food. The following hypothesis is also confirmed by a survey conducted which states that students of the medical group are more informed about nutrition and supplementation, while students of the art group are much less informed. The third hypothesis was refuted by the survey, students do not consider supplementation to be a food substitute but consider it to play a major role in boosting immunity. Emotions such as stress, boredom, fear led in 89% of cases to a change in diet, which confirmed the fourth hypothesis. Some of the significant answers left in the space for additional information were: "Someone's diet has improved because during isolation he managed to get to know his body, and not the template diet plan as in schools, that you can eat at a certain time. "

Keywords: *nutrition, pandemic, emotions, students, supplements*

## Masti u prehrani

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### Sažetak

Masti su esencijalni dio ljudske prehrane, te bez ovih makronutrijenata ljudski organizam ne bi mogao funkcionisati. Obzirom da postoje zdrave i nezdrave masti u ljudskoj prehrani veoma je važno znati koje su to, i u skladu s tim konzumirati što manje nezdravih masti, a racionalnu količinu zdravih, u skladu sa potrebama organizma. Ovaj rad se bazira na izradi edukacijskog letka za tinejdžere, jer je edukacija o prehrani veoma važna. Pravilna prehrana je veoma važna za rast i razvoj ljudi, ali i za zdravlje. Ona je također veoma važna preventivna mjera za sprječavanje mnogih oboljenja.

Cilj ovog rada je objasniti šta su to masti u prehrani i pronaći relevantne izvore informacija, pomoću kojih će se izraditi informacioni letak o mastima u prehrani. Cilj letka je edukovati mlade ljude o pravilnoj prehrani, tačnije o mastima u prehrani.

Neadekvatna prehrana dovodi do pretilosti, odnosno gojaznosti, a poznato je da je to značajan riziko faktor za razvoj mnogih oboljenja. Da bi se preventivno djelovalo, prije svega je važna edukacija konzumenata, a to je najbolje početi još u mlađim danima života. Kada u mladim danima čovjek nauči da se hrani ispravno, ta mu navika ostaje za cijeli život.

*Ključne riječi: masti, prehrana*

### **Fats in the diet**

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### **Summary**

Fats are an essential part of the human diet and without these macronutrients the human body would not be able to function. Since there are healthy and unhealthy fats in the human diet, it is very important to know what they are, and accordingly consume as few unhealthy fats as possible, and a rational amount of healthy ones, in accordance with the needs of the organism. This paper is based on the development of an educational leaflet for teenagers, because nutrition education is very important. Proper nutrition is very important for the growth and development of people, but also for health. It is also a very important preventive measure to prevent many diseases. The aim of this paper is to explain what dietary fats are and to find relevant sources of information, which will be used to create an information leaflet on dietary fats. The aim of the leaflet is to educate young people about proper nutrition, more precisely about fats in the diet. Inadequate nutrition leads to obesity, and obesity is known to be a major risk factor for the development of many diseases. In order to take preventive action, it is first and most important to educate people, and it is best to start at an early age. When a man learns to eat properly at a young age, this habit remains with him for a lifetime.

*Keywords: fats, diet*

## Prehrana djece u vrtićima u Bosni i Hercegovini

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### Sažetak

Pravilna prehrana, od začeca preko dojenačkog perioda i perioda malog djeteta, preduslov je za optimalan rast i razvoj, a time i formiranje zdrave odrasle osobe. Nepravilna prehrana u ovom periodu, pogotovo u fazama intenzivnog rasta i razvoja, otvara put mnogim hroničnim bolestima djece i odraslih. Svjetska zdravstvena organizacija preporučuje da svaka zemlja usvoji sopstvene prehranbene smjernice koje bi uzele u obzir lokalnu zdravstvenu sliku ciljane populacije, kao i lokalne prehranbene navike, jela i raspoložive namirnice. Federacija Bosne i Hercegovine je 2012. godine izradila smjernice za zdravu ishranu djece predškolskog i školskog uzrasta. Namjena ovih smjernica je da pruže podršku rukovodiocima odgojno-obrazovnih institucija i osoblju zaduženom za pripremu hrane, kao i distributerima hrane, upravi općina, kantona i entiteta, roditeljima/starateljima i svim ostalim licima zaduženim za brigu o hrani i ishrani dojenčadi, djece i omladine u Federaciji Bosne i Hercegovine, kako bi se djeci omogućila izbalansirana ishrana, sa adekvatnim dnevnim unosom ključnih nutrijenata. Ispitivanje jelovnika sprovedi smo u 10 vrtića na području Federacije BiH. Cilj ovog istraživanja je analizirati kvalitet ishrane i prehranbene navike djece vrtićkog uzrasta. U sklopu istraživačkog rada smo ispitali broj dnevnih obroka u vrtićima, te zastupljenost pojedinih vrsta hrane (mliječni proizvodi, svježe voće, visoko prerađena hrana, brza hrana, kuhana hrana). Rezultati ovog istraživanja su pokazali da svi ispitivani vrtići imaju dva glavna obroka (doručak i ručak) te varijabilan broj užina. Evidentirana je visoka zastupljenost svježeg voća, te umjerena zastupljenost brze kao i kuhane hrane.

Ključne riječi: *vrsta hrane, vrtić, obrok*

## Nutrition of children in kindergartens in Bosnia and Herzegovina

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### Summary

Proper nutrition, from the period of conception through infancy and a period of a small child, is a prerequisite for optimal growth and development, and thus the formation of a healthy adult. Improper nutrition in this period, especially in the phases of intensive growth and development, opens the way to many chronic diseases of children and adults. The World Health Organization recommends that each country adopt its own dietary guidelines that take into account the local health picture of the target population, as well as local eating habits, meals, and available foods. In 2012, the Federation of Bosnia and Herzegovina developed guidelines for healthy nutrition of preschool and school age children. The purpose of these guidelines is to provide support to heads of educational institutions and staff in charge of food preparation, as well as food distributors, municipal, cantonal and entity administrations, parents / guardians and all other persons in charge of food and nutrition of infants, children and youth. In the Federation of Bosnia and Herzegovina, in order to provide children with a balanced diet, with adequate daily intake of key nutrients. We conducted the menu examination in 10 kindergartens in the Federation of BiH. The aim of this research is to analyze the quality of nutrition and eating habits of children of kindergarten age. As part of the research work, we examined the number of daily meals in kindergartens, and the presence of certain types of food (dairy products, fresh fruit, highly processed foods, fast food, cooked foods). The results of this study showed that all surveyed kindergartens have two main meals (breakfast and lunch) and a variable number of snacks. A high prevalence of fresh fruit was recorded, as well as a moderate prevalence of fast as well as cooked food.

Keywords: *food type, kindergarten, meal*



## **Promjene u prehrabnim navikama i fizičkoj aktivnosti za vrijeme trajanja pandemije SARS Cov-19**

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### **Sažetak**

Od prve polovine 2020. godine, perioda početka globalne pandemije, svjedočimo promjenama u gotovo svim aspektima života. Usljed provođenja restriktivnih mjera na globalnom nivou, ljudi su bili primorani prilagoditi svoje svakodnevne navike novonajstaloj situaciji. Cilj našeg istraživanja je bio ispitivanje te određivanje količine fizičke aktivnosti kao i bilježenje promjena u prehrabnim navikama naše ciljne grupe – studenata. Podaci o ishrani te nivou fizičke aktivnosti su prikupljeni kroz upitnik koji je podijeljen u tri vremenska perioda – period prije nastupanja pandemije, rani period pandemije te kasni period kontinuiranih ali ublaženih restriktivnih mjera. Pored zabilježenih promjena i razlika u nivou fizičke aktivnosti, korištenjem body mass indexa utvrdili smo i promjene u težini kroz tri vremenska perioda.

Ključne riječi: *ishrana, fizička aktivnost, studenti, pandemija*

**The change in nutrition and physical activity habits during the SARS  
Cov-19 pandemic**

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**Summary**

Since the first half of 2020., when the global pandemic started, we all are witnessing the change in almost every aspect of life. Due to the restriction measures that were applied globally, people were obligated to modify their daily routines. The aim of our study was to question and determine the amount of physical activity as well as to note the differences in the nutrition of our target group – students. The data regarding nutrition and physical activity levels was gathered through the questionnaire divided in three different time periods – the period prior to the pandemic, the early pandemic period and the late period of continuous yet lighter restriction measures. Beside the noted nutrition changes and differences in the level of physical activity, using the body mass index we determined the changes in the weight during the three questioned time periods.

Keywords: *nutrition, physical activity, students, pandemic*

## Učestalost i motivi za odabir organske hrane među potrošačima

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### Sažetak

Usljed sve veće zastupljenosti organskih proizvoda u svakodnevnoj prehrani, cilj rada je bio ispitati motive potrošača za odabir organski proizvedene hrane, učestalost konzumiranja organski proizvedene hrane, kao i povezanost konzumiranja organski proizvedene hrane sa zdravim životnim stilom. U sklopu ovog istraživanja je sprovedena anketa među potrošačima, s ciljem utvrđivanja motiva za odabir organske hrane, učestalost konzumiranja, preferencije, kao i spona između konzumiranja organske hrane i zdravog načina života. *Online* anketi pristupilo je 278 ispitanika. Na osnovu rezultata ankete koju smo sprovedeli, može se zaključiti da su vodeći motivi kupovine i konzumacije organske hrane mišljenje da je organska hrana zdravija, te zaštita i očuvanje okoliša. Rezultati ovog istraživanja se slažu sa literaturnim podacima, odnosno sa drugim studijama, u smislu cijene, okoline tj. dostupnosti i kvalitete kao važnih prepreka u izboru.

Ključne riječi: *organska hrana, konvencionalna hrana, certifikacijski program, organska kontrola, proizvodne strategije*

### 3-O-11

#### **Frequency and consumers motives for choosing organically produced food**

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#### **Summary**

Due to the growing presence of organic products in the daily diet, the aim of the study was to examine consumer motives for choosing organically produced food, the frequency of consumption of organically produced food, as well as the connection of consuming organically produced food with a healthy lifestyle. As part of this research, a survey was conducted among consumers, with determining the motives for choosing organic food, the frequency of consumption, preferences, as well as the link between consuming organic food and a healthy lifestyle. The online survey was attended by 278 respondents. According to the results of the survey we conducted, it can be concluded that the leading motives for buying and consuming organic food are belief that organic food is healthier and the protection and preservation of the environment. Our results coincide with the findings of previous studies when it comes to the price, as well as the environment, regarding availability and quality as important choice obstacles.

**Keywords:** *organic food, conventional food, certification program, Organic Control, production strategies*

## Prehrana pacijenata na terapiji varfarinom

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### Sažetak

Varfarin je lijek koji se ubraja u grupu antikoagulanasa i koristi se u tretmanu niza oboljenja, kao što je prevencija i sprječavanje širenja već prisutne tromboze dubokih vena ili plućne embolije, u prevenciji tromboze i embolije kod pacijenata sa fibrilacijom pretkomora, kao i u prevenciji niza kardijalnih događaja kod pacijenata sa nestabilnim koronarnim sindromima. Obično se uzima jednom dnevno, najčešće uvečer. Prilikom terapije varfarinom obavezno je redovno pratiti INR (Internacionalni normalizovani odnos), s obzirom da spada u grupu lijekova sa uskim terapijskim indeksom. Ukoliko je INR visok potrebno je smanjiti dozu, a ukoliko je pak on nizak, doza varfarina se mora povećati da bi se ostvario željeni učinak. Također, pacijenti na terapiji varfarinom moraju da rade i pretrage krvi svakih 8 - 12 sedmica kako bi se ustanovilo da li je doza lijeka odgovarajuća. Važna karakteristika ovoga lijeka jeste to da on stupa u interakcije sa velikim brojem, kako sintetskih tako i biljnih lijekova, kao i sa određenim namirnicama, te dodacima prehrani. Nažalost, većina pacijenata nije upoznata sa potencijalnim interakcijama varfarina sa navedenim preparatima, te oni, nerijetko, posežu za biljnim lijekovima ili dodacima prehrani paralelno sa konvencionalnom terapijom. Iako veliki broj medijskih izvora savjetuje da se u potpunosti izbjegava upotreba namirnica za koje je dokazano da stupaju u interakcije sa varfarinom, do sad sprovedena naučna istraživanja ukazala su da nije potrebno u potpunosti izbjegavati te namirnice nego da je dovoljno samo ograničiti njihov unos na dozvoljene količine. Cilj ovog rada je ispitivanje i analiziranje rezultata naučnih studija u kojima su ispitivane interakcije varfarina sa određenim namirnicama, te sastavljanje adekvatnog jelovnika za pacijenta na terapiji varfarinom.

Ključne riječi: *varfarin, interakcije sa hranom, vitamin K, suplementacija*

**3-O-12**

### **Nutrition of patients using warfarin therapy**

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### **Summary**

Warfarin belongs to the group of anticoagulants and is used in the treatment of various of diseases, such as prevention of deep vein thrombosis, the spread of pre-existing deep vein thrombosis or pulmonary embolism, in the prevention of thrombosis and embolism in patients with atrial fibrillation, and in the prevention of cardiac events in patients with unstable coronary syndromes. It is usually taken once a day, mostly in the evenings. Warfarin is a drug with a narrow therapeutic index and, during warfarin treatment, it is necessary to regularly monitor the INR (International Normalized Ratio), which if high, indicates that it is necessary to reduce the dose of warfarin, and if low it is necessary to increase the dose. Also, patients who take warfarin need to do blood test every 8 -12 weeks to be sure the dosage is right. Warfarin interacts with a large number of drugs, both synthetic and herbal, with food, and also with dietary supplements. Unfortunately, most patients are not aware of the potential interactions of warfarin with herbal medicines, food, and dietary supplements, and they often resort to herbal medicines, dietary supplements in parallel with conventional therapy. A number of media sources advise that the use of foods that interact with warfarin should be completely avoided, however, scientific research indicates that it is not necessary to completely avoid these foods but to consume them in moderation. The aim of this paper is to examine and analyze the results of scientific studies in which the interactions of warfarin with certain foods were examined, and to compile an adequate menu for a patient on warfarin therapy.

**Keywords:** *warfarin, food interactions, vitamin K, supplementation*

## Znanje i stavovi potrošača o šećerima u prehrani

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### Sažetak

Šećeri predstavljaju jednostavne, probavljive ugljikohidrate, slatkog okusa, iznimno važne u prehrani i metabolizmu svih živih bića. Prirodno mogu biti monosaharidi i oligosaharidi, ovisno od kojeg broja monosaharidnih jedinica su građeni. Oni predstavljaju jednog od glavnih uzročnika pretilosti tj. povećanja tjelesne težine, sa kojom se velik broj ljudi današnjice suočava. Sama pretilost, osim uz povećanje tjelesne težine, može biti uzročnik i mnogih drugih bolesti (kardiovaskularne bolesti, dijabetes, smanjenje polodnosti i dr.). Sve navedeno uzrok je povećane zainteresiranosti naučnika o štetnim učincima šećera u našoj prehrani. Cilj ovoga rada upravo je bio provesti ispitivanje o stavovima i znanju potrošača o šećerima u prehrani, a u sklopu kojega je vršena i anketa. Anketa je sadržavala ukupno 18 pitanja, a ispunila su je 124 ispitanika. Na osnovu dobivenih rezultata moglo se zaključiti kako su ispitanici većinskim djelom svjesni štetnosti šećera po zdravlje ljudi, ali nemaju dobru sliku o količini šećera u pojedinim namirnicama, niti znaju procijeniti vlastiti svakodnevni unos šećera prehranom.

Ključne riječi: *šećeri, prehrana, znanje potrošača, stavovi potrošača*

### 3-O-13

#### Consumer knowledge and attitudes about dietary sugars

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#### Summary

Sugars represent simple, digestible, sweet-tasting carbohydrates, immensely important in the metabolism and diet of all living beings. Naturally, they can be divided into two groups: monosaccharides and oligosaccharides, depending on the number of monosaccharide units which make up their structure. They represent one of the main causes of obesity, aka the increase of body mass, which many modern people have an issue with. Obesity alone, besides the increase of body mass, can be a cause of many other diseases (cardiovascular diseases, diabetes, decrease of fertility etc.). All of the mentioned issues are a cause of many scientists' increased interest, concerning the harmful effects of sugar in our diets. The main goal of this paper was to conduct an examination about the consumers' opinions and knowledge of sugar intake in diets, which included a survey. The survey contained 18 questions in total, and it was taken by 124 respondents. Based on the results of the survey, it could be concluded that the respondents are mostly aware of the harmful effects of sugar on people's health, but they don't have good enough awareness about the amount of sugar in certain products, nor can they estimate their own daily sugar intake.

Keywords: *sugars, diet, consumer knowledge, consumer's opinions*



## Izrada brošure za farmaceute u apotekama (Najčešće interakcije vitamina)

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### Sažetak

Vitamini su mikronutrijenti, organske supstance, koje su neophodne za funkcionisanje ljudskog organizma. Vitamini u promet dolaze i kao suplementi ili dodaci prehrani i mogu da imaju interakcije sa određenim lijekovima. Ovakve interakcije nisu česte kao što je to slučaj sa interakcijama lijek-lijek, ali su ipak moguće i ponekad mogu biti ozbiljne. Cilj rada jeste osmisliti i izraditi brošuru „**Značajne interakcije vitamina**“ koja bi bila dostupna farmaceutima u apotekama i služiti kao brzi podsjetnik pri savjetovanju. U brošuri su navedene najčešće reakcije na koje bi farmaceut trebao obratiti pažnju prilikom izdavanja vitamina uz lijekove. Za prikupljanje informacija korišteni su relevantni naučno – istraživački radovi dostupni na internetskim bazama podataka: Pubmed i ResearchGate, naučni stručni članci te knjige odgovarajuće tematike. Kao krajnji rezultat dobili smo brošuru koja uključuje sažetke i provjerene informacije o:

- Važnosti vitamina i uloga farmaceuta u informisanju pacijenata,
- Značajnim vitamin-lijek interakcijama,
- Značajnim i poznatim vitamin-bolest interakcijama,
- Rezultatima odabranih istraživanja kako bi ukazali farmaceutima u apoteci na malu stopu svjesnosti o mogućim interakcijama vitamina.

Ideja je da farmaceuti u apotekama imaju dostupnu brošuru koja bi im olakšala savjetovanje pacijenata i na taj način doprinijela edukaciji korisnika usluga i bržem snalaženju farmaceuta u svakodnevnom radu te omogućila pružanje kvalitetnije zdravstvene zaštite. Prednost brošure u odnosu na elektronske forme jeste višestruka: samo prisustvo brošure za recepturom je podsjetnik farmaceutu da ne propusti provjeriti i pacijenta informisati o mogućim interakcijama kada je to potrebno, informacije su lako dostupne i bez online povezivanja na mrežu, pisana je na našem jeziku, a u konačnici se može i dati pacijentima koji imaju odgovarajući stepen zdravstvene pismenosti. Naredna faza jeste testiranje prihvatljivosti i efikasnosti brošure od strane ciljne grupe.

### 3-O-14

#### **The most common vitamins interactions – A brochure for pharmacists**

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#### **Summary**

Vitamins are a group of organic compounds which are essential in very small amounts for the normal functioning of the body. Vitamins are included in dietary supplements. They can have interactions with certain medications. Those interactions are not as frequent as drug-to-drug interactions, but they are still significant. The aim of this paper is to design and produce a brochure “**Significant vitamin interactions**” which will be available for pharmacists in pharmacies and serve as a quick reminder when counseling. In the brochure are listed the most common reactions pharmacists must pay attention to when dispensing vitamins with medications.

For this purpose, relevant scientific – research papers available on online databases were used: Pubmed and ResearchGate, scientific professional articles and books in the field of vitamins.

As a final result, we made a brochure that includes informations as:

- The importance of vitamins and the role of pharmacists in informing patients
- Significant vitamin – drug interactions
- Significant and known vitamin – disease interactions
- The results of chosen research to inform pharmacists in pharmacies about low awareness of vitamin use and interactions.

The idea is to offer pharmacists in pharmacies an available brochure and make it easier for them to advise patients, contribute to education and provision of better health care. The advantage of a brochure over electronic forms is multiple: the presence of a brochure is a reminder to the pharmacist not to fail to check and inform the patient about possible interactions, the information is easily accessible without online connection, it is written in our mother language, and ultimately it can also be given to patients who have an appropriate level of health literacy. The next phase is to test the acceptability and effectiveness of the brochure by the target group.

## **Izrada edukacijskog letka o značaju suplementacije folnom kiselinom kod trudnica i žena fertile dobi**

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### **Sažetak**

Folna kiselina/B9 vitamin je važan u metaboličkim procesima i nužan za diferencijaciju i rast ćelija, posebno kod embrija. Povećane su potrebe za folnom kiselinom u trudnoći. Studije u BiH pokazuju da unos ovog vitamina kod žena fertile dobi nije adekvatan. Farmaceuti u apotekama imaju mogućnost učestvovati u aktivnostima vezanim za promociju zdravlja. Stoga je cilj ovog rada bio pripremiti edukacijski letak namijenjen ženama fertile dobi i trudnicama, koji bi se mogao distribuirati kroz apoteke ili učiniti dostupnim ciljnoj grupi u čekaonicama drugih zdravstvenih ustanova (ginekološke ordinacije) i drogerijama. Za prikupljanje materijala korištenog za izradu edukacijskog letka pretraživali smo baze Medline/PubMed i Google Scholar, te relevantne monografije. Sproveli smo i anketu kojom smo željeli ispitati efekat predstavljanja letka ciljnoj grupi. Anketa je postavljena online i popunjavale su je osobe ženskog spola, dobi 18 do 45 godina. Iz rezultata ankete je vidljivo da 61,19% ispitanica ispravno prepoznaje da je folna kiselina vitamin B9. 38,82% ispitanica zna da se folna kiselina rutinski preporučuje za trudnice i žene fertile dobi, a 60,29% njih ispravno prepoznaje ulogu folne kiseline. Nakon što im je predstavljen letak 93,65% ispitanica reklo je da su im informacije u letku jasne, a 96,83% da su iz letka dobile nove korisne informacije. Nadalje, 100% ispitanica smatra da bi letak bio koristan i da bi trebao biti dostupan u zdravstvenim ustanovama. Zaključno, pripremljeni edukativni letak pokazao se adekvatnim (jasnim) za ciljnu grupu od koje je i pozitivno ocijenjen. Obzirom na relativno mali broj ispitanica, rezultate bi trebalo dodatno validirati na većem uzorku.

*Ključne riječi: folna kiselina, edukacija, žene fertile dobi*

### 3-O-15

#### **Making an educational leaflet on the importance of folic acid supplementation in pregnant women and women of fertile age**

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#### **Summary**

Folic acid/vitamin B9 is important in metabolic processes and necessary for cell differentiation and growth, especially in embryos. The need for folic acid in pregnancy is increased. Studies in BiH shows that folic acid intake is inadequate in women of fertile age. Pharmacists in pharmacies have the opportunity to participate in activities related to health promotion. The aim of this work was to prepare an educational leaflet for women of fertile age and pregnant women, which could be distributed through pharmacies or other healthcare institutions and drugstores. We searched the databases of Medline/PubMed and Google Scholar, as well as relevant monographs. We also conducted a survey to examine the effect of a leaflet in the target group. The survey was posted online and was completed by females, aged 18 to 45 years. The results show that 61.19% of respondents recognize that folic acid is vitamin B9. 38.82% of respondents know that folic acid is routinely recommended for pregnant women and women of fertile age, and 60.29% of them recognize the role of folic acid. After being presented with a leaflet, 93.65% of the respondents stated that the information in the leaflet was clear to them, and 96.83% that they received useful information from the leaflet. Furthermore, 100% of respondents believe that the leaflet should be available in healthcare facilities. In conclusion, the prepared educational leaflet proved to be adequate for the target group. Given the relatively small number of respondents, the results should be further validated on a larger sample.

*Keywords: folic acid, education, women of fertile age*

## Uloga farmaceuta u brizi o pacijentima sa fenilketonurijom

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### Sažetak

Fenilketonurija predstavlja nasljednu grešku metabolizma i može rezultirati mentalnom retardacijom, oštećenjem organa, neobičnim držanjem tijela, također može ugroziti trudnoću majki sa fenilketonurijom. Ukoliko se ne dijagnosticira i ne tretira u prve tri sedmice života, mogu se javiti teži simptomi. Cilj ovog rada jeste da pregledom literature predstavimo karakteristike fenilketonurije, kao i načine kontrolisanja ovog oboljenja (to uključuje prilagođenu prehranu i lijekove), te da ispitamo perspektivu pacijenata u FBiH u pogledu zdravstvene njege koju dobijaju, kao i ulogu farmaceuta u tretmanu bolesti. Rad predstavlja revijalni pregled literature na temu „Uloga farmaceuta u brizi o pacijentima sa fenilketonurijom“. Za izradu su korišteni sljedeći izvori literature: stručne knjige, naučni članci, elektronske baze podataka (PubMed, Medline, Google Scholar), ispitivanje pacijenata obavljeno u direktnom intervjuu. Esencijalna aminokiselina fenilalanin nakuplja se u krvi pacijenata sa fenilketonurijom, zbog nedostatka fenilalanin hidroksilaze. Ovaj enzim je neophodan za metabolizam fenilalanina. Nivo fenilalanina koji nije štetan za majku može biti štetan za fetus, jer se koncentracija kod majke udvostručuje u fetusu. Dijeta sa niskim udjelom proteina predstavlja dijetoterapijski tretman fenilketonurije.

Pacijenti sa fenilketonurijom koriste: saporopterin dihidrohlorid, pripravke velikih neutralnih aminokiselina i glikomakropeptide – prirodni proteini koji ne sadrže fenilalanin.

Farmaceuti imaju važnu ulogu u multidisciplinarnom timskom upravljanju fenilketonurijom i savjetovanju pacijenata. Mogu preporučiti zamjenski lijek sa istim djelovanjem, ali bez fenilalanina, kao i supstitucione proteine koji ne sadrže fenilalanin. Oboljeli od fenilketonurije u našoj državi se susreću s nizom problema od kojih su najznačajniji nemogućnost nabavljanja proizvoda potrebnih za ishranu pacijenata koji boluju od fenilketonurije, te visoka cijena istih u drugim državama.

Ključne riječi: *fenilketonurija, fenilalanin, niskoproteinska prehrana*

**3-O-16**

**Pharmaceutical care for patients with phenylketonuria**

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**Summary**

Phenylketonuria is an inherited metabolic disorder and can result in mental retardation, organ damage, unusual posture, and can also endanger the pregnancy. If not treated in the first three weeks of life, more severe symptoms may occur. The aim of this paper is to present the characteristics of phenylketonuria, as well as ways of controlling this disease (customized diet and medication), and to examine the perspective of patients in FBiH in terms of health care they receive, as well as the role of pharmacists in the treatment. The paper presents a review of the literature on the topic “The role of pharmacists in the care of patients with phenylketonuria.” Literature sources that were used: professional books, scientific articles, electronic databases (PubMed, Medline, Google Scholar), direct interview with a patients. Essential amino acid phenylalanine accumulates in the blood of the patients with phenylketonuria, because of the deficiency of the phenylalanine hydroxylase. Concentration in the mother doubles in the fetus. The dietary treatment for phenylketonuria is a low-protein diet. Patients with phenylketonuria use: saporopterin dyhydrochloride, preparations of large neutral amino acids and glycomaclopeptides. Pharmacists have an important role in multidisciplinary team management of phenylketonuria and patient counseling. They can recommend a drug with same effect but without phenylalanine, as well as substitution proteins which do not contain phenylalanine. Patients with phenylketonuria in FBiH face a number of problems, such as inability to procure products needed for the nutrition of patients, and the high price of the same products in other countries.

Keywords: *phenylketonuria, phenylalanine, low protein diet*

## Učestalost konzumacije namirnica bogatih kalcijem među djecom uzrasta od 1. do 4. razreda osnovnih škola

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### Sažetak

Ishrana je jedan od najznačajnijih faktora za pravilan rast i razvoj svakog djeteta. Ishrana mora sadržavati potrebnu energiju, bjelančevine, vitamine i minerale. U slučaju da djetetova ishrana ne sadrži dovoljno minerala, u prvom redu kalcija, doći će do nepravilnog rasta i razvoja djeteta, što može uticati na čitav daljnji tok života. Cilj ovog istraživanja je pokazati važnost prehrambenih navika i unos dovoljnih količina kalcija kod djece od 1. do 4. razreda. Ispitanici su roditelji učenika razredne nastave, iz pet gradova u Bosni i Hercegovini (Breza, Maglaj, Sanski Most, Sarajevo, Tešanj). Korištena metoda istraživanja je posebno dizajnirana anketa za ovo istraživanje koja je sprovedena „online“ putem Google forms obrasca. Anketa sadrži opći dio (mjesto boravka, starost učenika, spol učenika) zatim vrstu, sadržaj i učestalost konzumiranja određenih namirnica koje sadrže kalcij u okviru prehrambenih navika djece. Rezultati ankete pokazuju da 86% roditelja smatra kalcij kao veoma bitan u ishrani njihove djece, te 49% ispitanika namirnice bogate kalcijem uzima iz domaćeg uzgoja. Mlijeko više od pola ispitanika konzumira svaki dan, dok jogurt i sir konzumiraju nekoliko puta sedmično. Kad je riječ o povrću najveću konzumaciju u ishrani djece ove dobi zauzima zelena salata, dok je kelj jako rijetka namirnica u ishrani. Učestalost konzumiranja badema i smokvi je izrazito mala, dok je konzumacija jaja često prisutna. Pored navedenog rezultati ankete su pokazali da edukacija u školi o namirnicama bogatim kalcijem je nedovoljna. Edukacija je ključ promjene prehrambenih navika koje treba korigovati tokom nižih razreda osnovne škole.

Ključne riječi: *prehrambene navike, razredna nastava, kalcij*

3-O-17

**Frequency of consumption of calcium-rich groceries among children  
from 1st to 4th grade of primary school**

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**Summary**

Nutrition is one of the most important factors for proper growth and development of every child. The nutrition must contain the necessary energy, proteins, vitamins and minerals. In case that the child's diet does not contain enough minerals, primarily calcium, there will be an incorrect growth and development of the child, which may affect the entire further course of life. The aim of this study is to show the importance of eating habits and intake of sufficient amounts of calcium in children from 1st to 4th grade in elementary school. The respondents are parents of primary school students from five cities and towns in Bosnia and Herzegovina (Breza, Maglaj, Sanski Most, Sarajevo, Tešanj). The research method used is specially designed poll for this research that was implemented „online“ via Google form. The poll contains the general part (place of residence, age of students, sex of students) then the type, content and frequency of consumption of certain foods that contain calcium within the eating habits of children. The results of the poll show that 86% consider calcium to be very important in their children's diet, and 49% of the respondents take calcium-rich groceries from home cultivation. More than half of the respondents consume milk every day, while yoghurt and cheese are consumed several times a week. When it comes to vegetables, the largest consumption in diet of children of this age is occupied by lettuce (*Lactuca sativa*), while kale is a very rare food in the diet. The frequency of consuming almonds and figs is extremely low, while the consumption of eggs is often present. In the addition of the above, the results of the poll showed that education in schools about calcium-rich groceries is insufficient. Education is the key to changing eating habits that need to be corrected during the lower grades in elementary school.

Keywords: *eating habits, classroom teaching, calcium*



## Značaj dijetalnih vlakana u ljudskoj ishrani

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### Sažetak

Porast svijesti o važnosti dijetalnih vlakana u ljudskoj ishrani je počeo 1970-ih godina. Iako mehanizmi njihovog djelovanja na ljudsko zdravlje još uvijek nisu u potpunosti poznati, posmatrano sa medicinskog i nutritivnog gledišta, ne mogu se smatrati inertnim sastojcima hrane. Izgrađuju ih neskrobni polisaharidi, oligosaharidi i lignin koji ne podliježu digestiji i enzimskoj hidrolizi. Postoje dvije vrste vlakana - topiva i netopiva. Topiva vlakna (pektin, guar guma, glukan, biološki i sintetički polisaharidi) otapaju se u vodi i pomažu snižavanju nivoa glukoze i holesterola u krvi. Netopiva vlakna (strukturne komponente ćelijskog zida kao što su celuloza, hemiceluloza i lignin) se ne otapaju u vodi, pomažu probavu hrane i sprečavaju konstipaciju. Dijetalna vlakna reduciraju rizik od pojave srčanih oboljenja, dijabetesa, oboljenja GIT-a, divertikularne bolesti. Čine važne prebiotike koji su nužni za aktivnost probiotičkih bakterija, te time učestvuju u jačanju imuniteta ljudskog organizma. Najznačajniji izvori dijetalnih vlakana u ljudskoj ishrani su voće, povrće, cjelovite žitarice, leguminoze i orašasti plodovi. Dnevne preporuke za unos vlakana kod zdravih odraslih individua iznosi 25-38 g dnevno. Prekomjeran unos vlakana, posebno kod djece, uzrokuje nedostatak kalcija, željeza, cinka, magnezija. Cilj ovog preglednog rada je sistematičan pregled dostupnih saznanja o vrstama i izvorima dijetalnih vlakana te učinka prehrane bogate vlaknima na ljudsko zdravlje.

Ključne riječi: *vlakna, ishrana, zdravlje*

## Dietary fiber in human nutrition

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### Summary

A growing interest in dietary fiber in human nutrition started in the 1970s. The mechanisms behind the reported effects of dietary fiber on human health are not well established. They contribute to human health and wellbeing and can be considered a functional food. Dietary fiber consists of non-starch polysaccharides, oligosaccharides and lignin which are not digested by human digestive enzymes. There are two types of fiber - soluble and insoluble. Soluble fiber (pectin, guar gum, glucan, biological and synthetic polysaccharides) dissolves in water and helps lower blood sugar and cholesterol levels. Insoluble fibers (structural components of the cell wall such as cellulose, hemicellulose and lignin) do not dissolve in water. They can improve food digestion and relieve constipation. Dietary fiber reduces the risk of developing heart disease, diabetes, GI diseases, diverticular disease. Some dietary fibers can also be classified as prebiotic. Prebiotics change composition and/or activity of the GI microbiota and strengthen human immune system. The most important sources of dietary fiber are fruits, vegetables, whole grains, legumes and nuts. Total dietary fiber intake should be 25-38 g a day. Excessive fiber intake, especially in children, causes side effects such as calcium, iron, zinc and magnesium deficiency. The aim of this paper was systematic review of accessible findings associated with types and sources of dietary fibers as well as contribution of dietary fiber intake to human health.

Keywords: *fiber, nutrition, health*

### Najčešće interakcije minerala

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### Sažetak

Interakcije minerala sa lijekovima i drugim supstancama koje se unose u organizam putem prehrane rezultat su individualnih faktora vezanih za pacijente i pojedinačne supstance. Interakcije mogu promijeniti efikasnost lijeka ili izazvati neočekivane neželjene efekte. Cilj ovog rada jeste brza i efikasna edukacija populacije o interakcijama minerala do kojih najčešće dolazi u farmaceutskoj praksi, te preveniranje nastanka tih interakcija. Edukacija je zamišljena u vidu brošure. Tokom izrade samog rada i brošure, korišteni su: stručne knjige, naučni časopisi i članci, elektronske baze podataka (PubMed, Medline, Google Scholar), relevantne internet stranice. Jedan od ciljeva istraživanja bio je izrada kratke i koncizne brošure u kojoj bi bili predstavljeni podaci o interakcijama, sinergizmu i antagonizmu, te neželjenim reakcijama, ukoliko postoje, vezanim za najčešće korištene mineralne dodatke, a koja bi brzo i efikasno educirala ciljnu grupu o datoj temi. Ciljna grupa obuhvata stručnjake u praksi, odnosno magistre farmacije i farmaceutske tehničare zaposlene u različitim apotekama na području Kantona Sarajevo. Akcenat u izradi brošure stavljen je na pregledno predstavljanje podataka o interakcijama minerala sa lijekovima, kao i primamljiv estetski izgled. Pored navedenog, brošura sadrži podatke o antagonizmu i sinergizmu vitamina sa konkretnim mineralima. Smatramo da je ciljna grupa brošuru ocijenila pozitivno, te da bi upotreba informativnog materijala ovog tipa imala velike prednosti u svakodnevnom radu kako farmaceutskih, tako i medicinskih radnika generalno, pogotovo u današnjem vremenu, kada većina pacijenata pored lijekova propisanih od strane ljekara, samoinicijativno koristi dodatke prehrani u neadekvatnim dozama i bez bilo kakvog informisanja od strane zdravstvenih radnika.

Ključne riječi: *interakcije, sinergizam, antagonizam minerala, efikasna edukacija, dodaci prehrani*

### **The most common mineral interactions**

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### **Summary**

Interactions of minerals with drugs and other substances that are used in everyday diet are the result of individual factors related to patients and individual substances. Interactions may alter the effectiveness of the drug or cause unexpected side effects. The aim of this paper is to quickly and efficiently educate the population about the interactions of minerals that most often occur in pharmaceutical practice, and to prevent the occurrence of these interactions. The education is conceived in the form of a brochure. During the preparation of the paper and the brochure, the following were used: professional books, scientific journals and articles, electronic databases (PubMed, Medline, Google Scholar), relevant websites. One of the goals of the research was to create a short and concise brochure that would present data on interactions, synergies and antagonism, and adverse reactions, if any, related to the most commonly used mineral supplements, which would quickly and effectively educate the target group on the topic. The target group includes experts in practice, pharmacists and pharmaceutical technicians employed in various pharmacies in the Sarajevo Canton. Emphasis in the development of the brochure was placed on a clear presentation of data on the interactions of minerals with drugs, as well as an attractive aesthetic appearance. In addition to the above, the brochure contains information on the antagonism and synergism of vitamins with specific minerals. We believe that the target group evaluated the brochure positively, and that the use of information material of this type would have great advantages in the daily work of both pharmaceutical and medical workers in general, especially nowadays, when most patients use supplements on their own initiative. diet in inadequate doses and without any information from health professionals.

Keywords: *interactions, sinergism, antagonism of minerals, efficient education, dietary supplements*

## Uticaj prehrambenih navika i fizičke aktivnosti na hipertenziju

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### Sažetak

Prema izveštaju SZO, hipertenzija predstavlja veliki zdravstveni problem u većini zemalja zbog nedovoljno prevencije i loše kontrole bolesti. Promjena prehrambenih navika jedan je od dokazano glavnih faktora za uspješno liječenje hipertenzije, odnosno za snižavanje vrijednosti krvnog pritiska. Fizička aktivnost obično se preporučuje kao važna promjena načina života koja može pomoći u prevenciji hipertenzije. Cilj ovog rada bio je istražiti značaj prehrambenih navika i fizičke aktivnosti u regulisanju hipertenzije. Rad je urađen kao pregledni članak, za čiju izradu su korišteni radovi iz relevantnih baza podataka, koji su pretraživani unosom ključnih riječi. Relevantne baze koje su korištene za pretraživanje naučne literature su Google Scholar, PubMed, Medline. U literaturi se vezano uz promjenu prehrambenih navika najčešće spominje mediteranska prehrana kao najučinkovitija, a dijetetički pristup koji se koristi za prevenciju i liječenje hipertenzije je tzv. DASH dijeta, koja u kombinaciji s redovnom fizičkom aktivnošću i gubitkom tjelesne težine dovodi do smanjenja krvnog pritiska. Posebnost mediteranske prehrane ogleda se u visokom unosu svježeg voća i povrća, mlijeka i fermentiranih mliječnih proizvoda, ribe i cjelovitih žitarica, maslinovog ulja i crvenog vina. DASH dijetu karakterizira visok unos voća i povrća uz nizak unos natrija, odnosno visok unos vlakana i nizak unos masti i šećera. Smatra se da je smanjenje krvnog pritiska fizičkom aktivnošću posljedica slabljenja perifernog vaskularnog otpora, što može biti posljedica neurohormonalnih i strukturnih reakcija sa smanjenjem aktivnosti simpatičkih nerava i povećanjem promjera lumena arterija. Kako bi se spriječio razvoj hipertenzije od izuzetnog značaja je primjena dobrih prehrambenih navika i fizičke aktivnosti u cilju smanjenja krvnog pritiska.

Ključne riječi: *mediteranska prehrana, DASH dijeta, hipertenzija, fizička aktivnost*

## **The impact of dietary habits and physical activities on hypertension**

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### **Summary**

According to WHO hypertension is a big issue in many countries because of the lack of methods on prevention and because it is difficult to control the disease. One of the most successful ways to deal with hypertension (high blood pressure) is proven to be the adjustment of dietary habits. Another important way to help in prevention of hypertension is through physical activities which are recommended on everyday basis. Main aim of this paper was to do a research on the importance of dietary habits and physical activities in treating hypertension. The paper is written in an article form for which papers from relevant data bases were used applying the keyword method. The relevant data bases used are Google Scholar, PubMed, Medline. The research shows how Mediterranean food is most effective in dealing with hypertension and the dietary method used for prevention and treating hypertension is also known as the DASH diet. In combination with regular physical activity and losing weight it helps lowering the blood pressure. It is recommended 30 minutes of daily physical activity. What makes the Mediterranean diet so special is the high intake of fresh fruits and vegetables, milk and fermented dairy products, fish and whole grains, olive oil and red wine. The DASH diet is characterized by the great intake of fruits and vegetables and a lower intake of sodium, that is a bigger intake of fibre and a lower intake of fats and sugar. It is considered that physical activities cause reduction in peripheral vascular resistance, thus lowering the blood pressure, which occurs at the level of arterioles. The arterioles dilate and constrict in response to different neuronal and hormonal signals. Conclusion: In order to lower hypertension, it is crucial to stick to healthy dietary habits and physical activities.

Keywords: *Mediterranean food, DASH diet, hypertension, physical activities*

## **Znanje i stavovi žena fertile dobi o značaju folne kiseline za razvoj ploda**

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### **Sažetak**

Folna kiselina ima veliki značaj za razvoj ploda te je jako bitna svijest žena sa ciljem smanjenja posljedica u slučaju njenog manjka. Unos putem prehrane u periodu trudnoće nije dovoljan, pa se smjernicama preporučuje rutinska suplementacija za trudnice i žene fertile dobi. Mnoge studije pokazuju da žene ne provode preporučenu suplementaciju što je nerijetko posljedica neinformisanosti žena o potrebi za suplementacijom. Cilj anketiranja i našeg rada bio je da se ispita znanje i stavovi žena fertile dobi u BiH o značaju folne kiseline za razvoj ploda. Rezultate našeg istraživanja smo uporedili sa rezultatima studija u provedenih u drugim zemljama okruženja. Provedeno je *online* istraživanje među ženama fertile dobi i ukupno su anketirane 424 žene. Prva grupa pitanja sadržavala je opće podatke, dok se druga grupa odnosila na poznavanje folne kiseline i njenih uloga. Na osnovu ove ankete zaključili smo da postoji veliki udio žena koje nisu upoznate sa adekvatnom upotrebom folne kiseline tokom trudnoće, kao i prije nje. Isto tako, anketa je pokazala da veći udio ispitanih žena koristi folnu kiselinu, te da se u najvećem procentu upotrebljava na preporuku ljekara. Rezultati ove studije mogu biti pokazatelj svim zdravstvenim radnicima da uoče potrebu za edukacijom ili savjetovanjem žena, a sve u cilju što boljeg zdravstvenog ishoda za majke i bebe.

Ključne riječi: *folna kiselina, razvoj ploda, edukacija, savjetovanje*

### 3-O-21

#### **Knowledge and opinion of pregnant women about the importance of folic acid for fetal development**

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#### **Summary**

Folic acid has great importance for the development of the fetus while the awareness of women is an essential in order to lower the consequences in case of its shortage. Dietary intake during pregnancy is inadequate and supplements are required to regulate this deficiency. Many studies describe that women do not take the recommended supplementation, and this is often the consequence of women lacking the information about the supplementation significance. The aim of this survey and work is to examine the knowledge and opinion of pregnant women in Bosnia and Herzegovina about the importance of folic acid for fetal development, and to compare the results with a survey from Croatia.

An online survey of adult women was conducted and a total of 424 women were surveyed. The first group of questions contained general data, while the second group referred to the knowledge of folic acid and its roles. Based on this survey, we concluded that there is a large proportion of women who are not familiar with the overall use of folic acid during pregnancy, as well as before it. Also, the survey showed that a larger proportion of surveyed women use folic acid, while the rest do not, and that the largest percentage is used on the recommendation of a doctor.

The results of this study could be recommended to all health professionals in order to recognize the need for educating or advising the women, especially those who need it the most, all with the purpose of better health outcomes for mother and the baby.

Key words: *folic acid, fetal development, education, counseling*



## Kava – šalica zdravlja ili štetnosti?

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### Sažetak

Većina ljudi dan započinje, pa i završava šalicom kave. Kao takvo, ispijanje kave važan je dio modernog svakodnevnog života. Tijekom posljednjih nekoliko desetljeća, utjecaj kave na zdravlje u žarištu je istraživanja brojnih znanstvenika. Kroz sve dostupne radove konstantno se provlači pitanje koje je i predmet našeg istraživanja, je li kava dobra ili loša stvar za naš organizam? Neka istraživanja navode kavu i njezine sastojke kao nešto neophodno i jako dobro za naš organizam, pa čak i za dug život, mladost i zdravlje. Međutim, druga istraživanja su totalna suprotnost koji kavu stavljaju u rang sa alkoholom i cigaretama, tj. svrstavaju je na listu poroka koje treba izbjegavati. Cilj istraživanja je bio utvrditi učestalost konzumiranja kave, navike naših ispitanika, te dati odgovor na ključno pitanje; je li kava ide na listu dobrih ili pak loših napitaka. Istraživanje je provedeno nad oba spola i nad svim dobnim skupinama. Prilikom izrade rada korištena je anonimna anketa koja se sastoji od tri dijela, a sadrži ukupno dvadeset četiri pitanja. U ovom radu sudjelovalo je ukupno 500 ispitanika od kojih njih 460 (92%), konzumira kavu. Od ukupno 460 ispitanika koji konzumiraju kavu njih 209 (45.5%) konzumiraju kavu dva puta dnevno, a 154 (33.6%) tri ili četiri puta dnevno. Nadalje, na pitanje iz kojih razloga piju kavu 201 (44.1%) je odgovorilo; iz navike, a 113 (24.8%) ispitanika je odgovorilo da piju kavu kako im se ne bi spavalo. Što se tiče utjecaja kave na zdravlje 349 (76%) ispitanika koji konzumiraju kavu smatra da svakodnevno konzumacija kave ne utječe štetno na zdravlje, 301 (65.6%) ispitanik ujutro pije kavu na prazan želudac, a 257 (56.1%) ima glavobolje ako propuste popiti kavu ujutro. Stav naših ispitanika u odnosu kava – zdravlje je da kava nije štetan čimbenik koji utječe na naše zdravlje. Preporučan, maksimalan unos kave je 300 mg/dan, što je okvirno 2-3 šalice dnevno, čega se većina naših ispitanika i pridržava. Izgleda da je kava jedna od onih tema oko kojih se vječito lome koplja i koja je uvijek vrlo diskutabilna, sa podjeljenim mišljenjima i stavovima.

Ključne riječi: *kava, organizam, zdravlje, štetnost, navika*

## Coffee a cup of health or harm?

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### Summary

Most people start the day and even end it with a cup of coffee. As such, drinking coffee is an important part of modern daily life. Over the last few decades, the impact of coffee on health has been focus of research of numerous scientists. One question, which is also the subject of our research, is constantly running through all available research; Is coffee a good or a bad thing for our organism? Some researchers declare coffee and its ingredients as something necessary and very good for our body, and even claims that it is good for long life, youth and health. However, other researchers are total opposite and put coffee on a same page with alcohol and cigarettes, i.e. they put it on the list of vices that should be avoided. The aim of the research was to determine the frequency of coffee consumption, the habits of our respondents, and to answer the key question should coffee be included on the list of good or bad drinks and ultimately, should we put coffee consumption in the line of healthy habits, or on the margins as something harmful that should be avoided at all costs. The research was conducted on both sexes and on all age groups. During the preparation of the paper, an anonymous survey was used, which consists of three parts and contains a total of 24 questions. A total of 500 respondents participated in this study, of which 460 (92%) consumed coffee. Out of a total of 460 respondents who consume coffee, 209 (45.5%) consume coffee twice a day, and 154 (33.6%) three or four times a day. Furthermore, when asked for what reasons they drink coffee 201 (44.1%) answered; out of habit, and 113 (24.8%) respondents answered that they drank coffee in order not to fall asleep. Regarding the impact of coffee on health, 349 (76%) respondents who consume coffee believe that daily coffee consumption does not have a detrimental effect on health, 301 (65.6%) respondents drink coffee in the morning on an empty stomach, and 257 (56.1%) have headaches if they miss drinking coffee in the morning. The attitude of our respondents in relation to coffee - health is that coffee is not a harmful factor that affects our health.

Keywords: *coffee, organism, health, harmfulness, habit*

## Kozje mlijeko i njegovi benefiti u zdravlju ljudi

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### Sažetak

Svjetska populacija koza nastavlja rasti, a prvenstveno muznih koza. Najorganizovanije tržište kozjeg mlijeka nalazi se u Europi, osobito u Francuskoj. Iako krave muzare proizvode najveću svjetsku ponudu mlijeka, više ljudi pije kozje mlijeko nego bilo koje druge vrste u svijetu. Kozje mlijeko i njegovi proizvodi važni su svakodnevni izvori proteina, fosfata i kalcija za stanovnike zemalja u razvoju. Kozje mlijeko razlikuje se od kravljeg ili ljudskog mlijeka po većoj probavljivosti bjelančevina i masti, lužnatosti, puferskom kapacitetu i određenim terapijskim vrijednostima u medicini i prehrani ljudi. Pored hipoalergenog svojstva posebno važnog kod djece, kozje mlijeko posjeduje još mnoge važne benefite po zdravlje ljudi poput antimikrobnog i antikancerogenog dejstva, povoljno utiče na kardiovaskularni i gastrointestinalni trakt, podnose ga pacijenti sa netolerancijom na laktozu, posjeduje odličan probiotski i prebiotski učinak i mnogi drugi. Takva jedinstvena svojstva kozjeg mlijeka doprinose održivosti industrije mlijeka koza. Važno je napomenuti da cilj ovog rada jeste, upravo, informisati ljude koji žele da povedu brigu o svom zdravlju i načinu ishrane o, prethodno ukratko navedenim, osnovnim osobinama i važnim benefitima kozjeg mlijeka, koji će u daljnjem tekstu biti šire opisani, po cjelokupno zdravlje.

Ključne riječi: *mliječne koze, sastav kozjeg mlijeka, benefiti kozjeg mlijeka*

3-O-23

## **The goat milk and it's benefits for human health**

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### **Summary**

The world goat population continues to grow, primarily dairy goats. The most organized goat milk market is located in Europe, especially in France. Although dairy cows produce the world's largest supply of milk, more people drink goat's milk than any other species in the world. Goat's milk and its products are important daily sources of protein, phosphate and calcium for the inhabitants of developing countries. Goat's milk differs from cow's or human milk in terms of higher digestibility of proteins and fats, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition. In addition to hypoallergenic properties that is especially important for kids, goat's milk has many other important health benefits such as antimicrobial and anticancer effects, has a beneficial effect on the cardiovascular and gastrointestinal tract, is tolerated by patients with lactose intolerance, has excellent probiotic and prebiotic effect and many others. Such unique properties of goat milk contribute to the sustainability of the goat milk industry. It is important to note that the aim of this paper is to inform people who want to take care of their health and diet about, previously briefly, the basic characteristics and important benefits of goat's milk, which will be described below, for overall health.

Keywords: *dairy goats, ingredients of goat's milk, benefits of goat's milk*

## **Uloga farmaceuta u promociji zdravlja - istraživanje u BiH**

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### **Sažetak**

Nikada u svijetu nije postojala veća potreba za edukacijom ljudi o efektivnosti lijekova, a farmaceut je taj koji kao zdravstveni radnik ima edukativnu, savjetodavnu i informativnu ulogu u farmaceutskoj praksi. Tokom ovog istraživanja iznijeti su primjeri kako to farmaceut može da utiče na zdravlje pacijenta, kako može prevenirati i pomoći kod liječenja dijabetesa, astme, hipertenzije. Cilj ovog istraživanja je procjena farmaceutske prakse u aktivnosti promovisanja zdravlja, kao i ispitati na kojem nivou se u BiH trenutno nalazi komunikacija pacijent – farmaceut, ispitati stajališta magistra farmacije vezano za njihovu ulogu u promociji zdravlja, kao ispitati stajališta magistra farmacije o iskustvu sa pacijentima.

Anketa koja je provedena u toku ovog istraživanja, popunjavana je od strane magistara farmacije, a anketi se odazvalo 67 ispitanika (91% ispitanika iz FBiH, 6% iz RS, te 3% iz Distrikt Brčkog.) Prilikom ispunjavanja ove ankete magistri farmacije su imali priliku da iznesu svoje mišljenje kako poboljšati položaj farmaceuta u svakodnevnoj praksi, te da li smatraju da pacijenti imaju dovoljno povjerenja u farmaceute kao zdravstvene radnike.

Aktivnost promovisanja zdravlja i prevencije bolesti jako su bitan dio farmaceutske prakse, farmaceuti su ti koji bi trebali i prva i zadnja karika u zdravstvenom lancu, jer upravo su oni ti zdravstveni radnici koji mogu da utiču i na poboljšanje načina života, ali i da budu zadnja karika prilikom izdavanja nekog lijeka.

**3-O-24**

**The role of pharmacists in health promotion - research in Bosnia and Herzegovina**

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**Summary**

There has never been a greater need in the world to educate people about the effectiveness of drugs, and it is the pharmacist who, as a healthcare professional, has an educational, advisory and informative role in pharmaceutical practice. During this research, it has been examined how pharmacists can affect the patient's health, how they can prevent and help in the treatment of diabetes, asthma, hypertension. The aim of this research is to evaluate pharmaceutical practice in health promotion activities, as well as look into the level of patient-pharmacist communication in BiH, to examine the views of masters of pharmacy regarding their role in health promotion, and also to learn about the views of masters of pharmacy on experience with patients. The survey conducted during this research was completed by masters of pharmacy, and the survey was selected by 67 respondents (91% of respondents from FBiH, 6% from RS, and 3% from Brčko District.) When completing these surveys, masters of pharmacy had the opportunity to express their opinion on how to improve the position of pharmacists in everyday practice, whether they believe that patients have enough reliance in pharmacists as health professionals. The activity of health promotion and disease prevention is a very important part of pharmaceutical practice, pharmacists are the ones who should be the first and last link in the health chain, because they are the health workers who can advise and improve lifestyles, but also be the last link during the dispensing of the drug.

## Značaj folne kiseline u ishrani trudnica

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### Sažetak

Folna kiselina je esencijalni nutrijent koji je potreban za replikaciju DNK i kao supstrat za niz enzimskih reakcija uključenih u sintezu aminokiselina i metabolizam vitamina. U toku trudnoće rastu nutritivne potrebe kako bi se obezbjedio fetalni rast i razvoj i podržale povećane metaboličke potrebe majke. Potrebe za folnom kiselinom u trudnoći rastu kao odgovor na povećanu eritropoezu kod majke i razvoj fetusa i placente. Cilj ovog pregleda bio je predstaviti neke rezultate nedavnih istraživanja o značaju folne kiseline u ishrani trudnica. Na osnovu naučnog pregleda literature, došli smo do saznanja da su rezultati istraživanja zabilježili poboljšanja u prosječnoj porođajnoj težini beba čije su majke konzumirale folnu kiselinu u periodu trudnoće. Dnevni unos samo 400 µg folne kiseline tokom perioda začeća bio je povezan sa smanjenim rizikom od spontanog prijevremenog poroda. Uloga folne kiseline u organizmu je višestruka. Potrebna je za pravilno funkcioniranje mozga, mentalno i emocionalno zdravlje, te ima ulogu u kontroli razine homocisteina u krvi, u metabolizmu i stvaranju energije. Nedovoljan unos folne kiseline u trudnoći je povezan sa nekoliko negativnih ishoda uključujući rizik za spontani pobačaj, rupturu placente i defekt neuralne cijevi. Veliki broj znanstvenih rezultata doveo je do službenih preporuka za dodavanje folne kiseline trudnicama, kao i do niza obaveznih ili dobrovoljnih programa obogaćivanja kako bi se spriječio nedostatak folne kiseline. Kako bi se povećao unos dodataka folne kiseline u zemljama u kojima hrana nije obogaćena folnom kiselinom, efikasan pristup javnom zdravlju koji promovira promjenu navika u ishrani neophodan je ženama u reproduktivnoj dobi.

Ključne riječi: *folna kiselina, trudnice, ishrana, dodaci ishrani*

### 3-O-25

#### **Importance of folic acid in the diet of pregnant women**

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#### **Summary**

Folic acid is an essential nutrient needed for DNA replication and as a substrate for a number of enzymatic reactions involved in amino acid synthesis and vitamin metabolism. During pregnancy, nutritional needs increase in order to ensure fetal growth and development and support the increased metabolic needs of the mother. Folic acid requirements in pregnancy increase in response to increased maternal erythropoiesis and fetal and placental development. The aim of this review was to present some results of recent research on the importance of folic acid in the diet of pregnant women. Based on a scientific review of the literature, we found that the results of the study showed improvements in the average birth weight of babies whose mothers consumed folic acid during pregnancy. Daily intake of only 400 µg of folic acid during conception was associated with a reduced risk of spontaneous preterm birth. The role of folic acid in the body is multiple. It is needed for proper brain function, mental and emotional health, and has a role in controlling blood homocysteine levels, metabolism and energy production. Insufficient folic acid intake in pregnancy is associated with several negative outcomes including the risk of miscarriage, placental rupture, and neural tube defect. A large number of scientific results have led to official recommendations for the addition of folic acid to pregnant women, as well as to a series of mandatory or voluntary enrichment programs to prevent folic acid deficiency. In order to increase the intake of folic acid supplements in countries where foods are not fortified with folic acid, an effective approach to public health that promotes a change in eating habits is essential for women of reproductive age.

Keywords: *folic acid, pregnant women, diet, dietary supplements*



## Utjecaj pandemije COVID-19 na prehrambene navike

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### Sažetak

Mjere suzbijanja pandemije COVID-19 promijenile su način života. Shodno tome, može se pretpostaviti da postoje razlike u prehrambenim navikama prije i tokom pandemije, što smo pokušali istražiti anketom. Anketa, sprovedena online putem google obrasca je bila u potpunosti anonimna i dobrovoljna, a pitanja obuhvaćena u njoj su se odnosila na period od oktobra 2020. do oktobra 2021. U anketi je učestvovalo 200 ispitanika iz cijelog svijeta, od čega 103 žene, 96 muškarca i 1 “drugo”. Od ukupnog broja ispitanika, njih 88 je u starosnoj grupi 924 godine, 85 ispitanika u grupi između 25 i 40 godina, 19 ispitanika u grupi između 41 i 56 godina, te 8 ispitanika u grupi između 57 i 66 godina. Ispitanici su podijeljeni na osnovu kulturoloških razlika. Budući da je većina ispitanika (115) pripadala zapadnoj kulturi, detaljnija obrada podataka bila je posvećena njima.

Rezultati i zaključci ankete: Više ljudi priprema hranu kod kuće tokom nego prije pandemije; Prije i tokom pandemije ljudi su uglavnom konzumirali tradicionalnu hranu; Otprilike isti broj ljudi je unosilo više ili jednako kalorija prije i tokom pandemije, Stres je varirajuće utjecao na prehrambene navike; Tokom pandemije nešto više od polovine ispitanika je uzimalo suplemente, te je otprilike odnos ispitanika koji su tokom pandemije uzimali više suplemenata i ispitanika koji su prije i tokom pandemije uzimali jednaku količinu suplemenata jednak; Najviše su se uzimali vitamini C i D te multivitamini, cink, željezo, selen i multiminerali; Nešto više od polovine ispitanika je konzumiralo istu količinu voća prije i tokom pandemije; Pandemija je varirajuće utjecala na kvalitet prehrane.

Ključne riječi: *COVID-19, pandemija, ishrana*

3-O-26

## COVID-19 pandemic impact on nutrition habits

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### Summary

Suppression measures for COVID-19 pandemic have changed the way of living. Accordingly, it can be assumed that there are differences in nutrition habits before and during the pandemic, which we tried to investigate with a survey. The survey, conducted online via google forms, was completely anonymous and voluntary, and the questions covered in it referred to the period from October 2020 to October 2021. The survey included 200 participants from the entire world, 103 women, 93 men and 1 “other”. Among all interviewed participants, 88 participants were between 9 and 24 years old, 85 participants were between 25 and 40 years old, 19 participants were between 41 and 56 years old and 8 were participants between 57 and 66 years old. Participants were divided based on cultural spheres. Since most of the participants (115) belonged to Western culture, more detailed data analysis was dedicated to them.

Survey results and conclusions: More people prepare food at home during pandemic; Before and during the pandemic, people mostly consumed traditional food; Approximately the same number of people consumed more or the same amount of calories before and during the pandemic; Stress affected eating habits varying; During the pandemic, slightly more than half of the participants took supplements, and the ratio of participants who took more supplements during the pandemic and participants who took the same amount of supplements before and during the pandemic is approximately the same; Vitamins C and D, as well as multivitamins, zinc, iron, selenium and multiminerals were mostly taken; Slightly more than half of the participants consumed the same amount of fruit before and during the pandemic; The pandemic varying affected the quality of nutrition.

Keywords: *COVID-19, pandemic, nutrition*

### Promocija pravilne prehrane

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### Sažetak

Danas je sve više zastupljena promocija pravilne prehrane, koja omogućava stvaranje zdravog prehrambenog okruženja i omogućava usvajanje zdravih prehrambenih navika. Nezdrava prehrana i nedostatak fizičke aktivnosti stvaraju rizik za globalno zdravlje. Cilj našeg rada jeste da predstavimo mnogobrojne benefite pravilne i zdrave prehrane. Također, ukazali smo i na povoljna djelovanja pojedinih vrsta namirnica, te na koji način i u kojoj količini ih konzumirati. Kao izvore informacija za naš rad korišteni su različiti naučni i stručni članci, relevantne internet stranice, te elektronske baze podataka (PubMed). Voće i povrće predstavljaju važan dio zdrave prehrane. Tu smo postavili nekoliko osnovnih smjernica što se tiče konzumacije voća i povrća, kao i njihov povoljan uticaj na zdravlje čovjeka. Smanjenje količine ukupnog unosa masti pomaže u sprječavanju gomilanja masnih naslaga, te smanjuje rizik od nastanka drugih oboljenja. Unos šećera treba smanjiti na manje od 10% ukupnih kalorija, kako kod odraslih tako i kod djece. Pravilna prehrana za odrasle podrazumijeva unos najmanje 400 g voća i povrća dnevno; manje od 10% ukupnog unosa kalorija iz šećera; manje od 30% ukupnog unosa energije iz svih masti i oko jednu kašičicu soli dnevno. Zdrava prehrana je veoma bitna tokom prve dvije godine djetetovog života, jer ona potiče zdrav rast i poboljšava kognitivni razvoj. Prehrambene navike se razvijaju vremenom, pod utjecajem različitih socijalnih i ekonomskih faktora koji složeno djeluju kako bi oblikovali pojedinačne prehrambene obrasce.

Ključne riječi: *pravilna prehrana, šećeri, masti, voće i povrće*

### 3-P-1

#### **Promotion of proper nutrition**

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#### **Summary**

Today, the promotion of proper nutrition is increasingly prevalent, which enables the creation of a healthy eating environment and enables the incorporation healthy eating habits in everyday life. An unhealthy diet and lack of physical activity pose a risk to global health. The aim of our work is to present the numerous benefits of a proper and healthy diet. We also pointed out the beneficial effects of certain types of food, and in what way and in what quantity to consume them. Various scientific and professional articles, relevant websites, and electronic databases (PubMed) were used as sources of information for our work. Fruits and vegetables are an important part of a healthy diet. Here we have set a few basic guidelines regarding the consumption of fruits and vegetables, as well as their beneficial impact on human health. Reducing the amount of total fat intake helps prevent the accumulation of fat deposits, and reduces the risk of other diseases.

Sugar intake should be reduced to less than 10% of total calories in both adults and children. Proper nutrition for adults involves the intake of at least 400 g of fruits and vegetables per day; less than 10% of total caloric intake from sugar; less than 30% of total energy intake from all fats and about one teaspoon of salt per day. A healthy diet is very important during the first two years of a child's life because it promotes healthy growth and improves cognitive development. Eating habits develop over time, under the influence of various social and economic factors that work together to shape individual food patterns.

Keywords: *proper nutrition, sugars, fats, fruits and vegetables*

## Antikariogeni utjecaj prirodnih hranidbenih proizvoda

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### Sažetak

Zubni karijes predstavlja infektivno oboljenje koje uzrokuje patološku destrukciju tvrdih zubnih tkiva, nastaje kao posljedica metaboličke aktivnosti bakterija u zubnom biofilmu; ireverzibilne je prirode i progresivnog toka sa mogućim komplikacijama. Četiri faktora su potrebna za nastanak karijesa: zub, kariogene bakterije i rafinisani ugljikohidrati koji međudjeluju kroz vrijeme. Hrana osim kariogenog dejstva može imati i antikariogene osobine. Pored antikariogenog djelovanja hemijskih sredstava (fluoridi), dokazano je antikariogeno djelovanje prirodnih proizvoda (hrana, piće, biljke). Prema SZO 80% svjetske populacije se oslanja na biljne proizvode pri tretiranju oboljenja. Cilj ovog istraživanja je ukazati na antikariogenost prirodnih proizvoda u prevenciji zubnog karijesa. Pojedine biljke pored antibakterijskog djelovanja, često imaju i antioksidativni efekat zbog flavonoida i polifenola u svom sastavu. Kahva i čaj antikariogenu ulogu ostvaruju zahvaljujući hemijskom sastavu (melanoidini, polifenoli). Probiotici djeluju modifikacijom pH usne šupljine i inhibicijom rasta kariogenih bakterija. Kazeinfosfopeptidi kao sredstvo za remineralizaciju karijesnih lezija se upravo izoliraju iz kravljeg mlijeka. Pčelinji proizvodi (propolis, polen) zahvaljujući ekstraktu etanola i enzimima u njihovom sastavu pokazuju antikariogenost. Kariogenost/antikariogenost hrane ovisi od njenog oblika, ukupne količine, sastava, frekvence unosa, retencionog vremena i sposobnosti stimulacije lučenja pljuvačke tako da pri konzumaciji hrane trebamo obratiti pažnju na navedene stavke. Potrebni su dodatni naporu u dokazivanju antikariogenog dejstva prirodnih proizvoda a nanotehnologija će biti koristan alat u postizanju tog cilja.

Ključne riječi: *karijes, prirodni proizvodi, antikariogenost*

### 3-P-2

#### **Anticariogenic effects of natural food products**

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#### **Summary**

Dental caries is an infectious disease causing pathological destruction of dental hard tissue, as result of metabolic activity of dental biofilm bacteria; it has irreversible and progressive nature with possible complications. Four factors are required for the development of caries: tooth, cariogenic bacteria and refined carbohydrates, which interact through time. Besides its cariogenic effect, food can also have anticariogenic properties. Apart from anticariogenic effects of chemical agents (fluorides), the similar of natural products (food, beverages and herbs) has been proven. According to the WHO, 80% of the world's population rely on herbal products to treat some diseases. The aim of this research is to specify the anticariogenicity of natural products in the prevention of dental caries. Except from their antibacterial effect, some plants also show an antioxidative effect due to polyphenols and flavonoids in their composition. Coffee and tea play anticariogenic role thanks to their chemical composition (melanoidins, polyphenols). Probiotic can show dual anticariogenic effects: inhibit the growth of cariogenic species and modify the pH of the oral environment. Casein phosphopeptides, as means for carious lesions remineralization, are isolated from bovine milk. Bee products (propolis, pollen) show anticariogenic effects, due to ethanol extract and enzymes in its composition. The anticariogenicity/cariogenicity of food depends on its shape, total quantity, composition, frequency of intake, retention time and the ability to stimulate saliva secretion, so when consuming food we should pay attention to the listed items. Additional efforts are needed to prove the anticariogenic effect of natural products and nanotechnology will be a useful tool in achieving that goal.

Keywords: *caries, natural products, anticariogenicity*

4. DIJETOTERAPIJA  
DIETOTHERAPY





## Pravilna ishrana i fizička aktivnost kod osoba s

### Diabetes mellitusom tip 2

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### Sažetak

Diabetes mellitus je sindrom koji karakteriše hronično povišena vrijednost glukoze u krvi i poremećaji metabolizma ugljikohidrata, masti i bjelančevina, povezan sa apsolutnim ili relativnim deficitom insulinske sekrecije i/ili djelovanja insulina. Razlikujemo dva tipa, insulin zavisni ili Diabetes mellitus tip 1 i insulin nezavisni ili Diabetes mellitus tip 2. Iako bolest ima hroničan tok, na istu se kombinacijom pravilne ishrane i fizičkom aktivnošću može značajno povoljno uticati, odnosno bolest se može držati pod kontrolom. Cilj ovog rada je istražiti dejstvo pravilne ishrane i fizičke aktivnosti na zdravstveni ishod pacijenata oboljelih od Diabetes mellitusa tip 2. Rad je urađen kao pregledni članak, za čiju izradu su korišteni radovi iz relevantnih baza podataka, koji su pretraživani unosom ključnih riječi. Relevantne baze koje su korištene za pretraživanje naučne literature su Google Scholar, PubMed, Medline. Većina studija ukazuje da farmakološka terapija i terapija insulinom nisu dovoljne za poboljšanje zdravstvenog stanja oboljelih već je potrebna promjena načina života, prvenstveno u pogledu ishrane i fizičke aktivnosti. Promjena načina ishrane ima za cilj da promoviše i podrži zdrave obrasce ishrane, naglašavajući odgovarajuću energetska vrijednost namirnica u ishrani, veličine porcija kao i njihov sastav. Naglasak je na konzumiranju raznolikih namirnica visoke hranjive, a male kalorijske vrijednosti. Fizička aktivnost ima dokazane koristi u smanjenju inzulinske rezistencije, smanjenju krvnog pritiska, poboljšanju glikemijske kontrole, lipidnog profila, normalizaciji tjelesne mase i povećanju kardiorespiracijske sposobnosti. Pravilno balansirana ishrana i redovna fizička aktivnost temelj su za prevenciju nastanka komplikacija i dalje progresije Diabetes mellitusa tip 2.

Ključne riječi: *ishrana, fizička aktivnost, diabetes mellitus*

4-O-1

## **Proper nutrition and physical activity in patients with type 2 Diabetes mellitus**

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### **Summary**

Diabetes mellitus is a syndrome that is characterized by chronically increased glucose in the blood and impaired metabolism of carbohydrates, fatty acids and proteins. It is connected with absolute or relative deficiency of insulin secretion and/or insulin action. There are two types: Insulin dependent, Diabetes mellitus type one and insulin independent, Diabetes mellitus type two. Even though the disease is chronic, proper diet and regular physical activity can have positive impact and help keep the disease under control. Aim of this papaer was to do a research on how proper diet and physical activity impact health outcome of the patients with type 2 Diabetes mellitus. Research paper is done as a review article for which we used research papers from relevant databases that have been searched using keywords. Databases that we used are: Google scholar, Pub med and Medline. Most studies show that pharmacological therapy and insulin therapy are not enough for improvement of health state in patients with Diabetes mellitus. For this improvement to happen, these patients need change in lifestyle, starting from diet and physical activity. The goal of proper nutrition is to promote and support healthy eating patterns, portion size and its composition. The emphasis is on consuming a variety of foods of high nutritional and low caloric value. Physical activity has proven benefits on reducing insulin resistance, lowering blood pressure, improving glycemic control, lipid profile, normalization of body weight and increasing cardio respiratory capacity. Proper diet and regular physical activity are the basis for the prevention of complications and further progression of type 2 Diabetes mellitus.

Keywords: *nutrition, physical activity, Diabetes mellitus*

## Značaj primjene vitamina C i D u terapijskom tretiranju COVID-19 pacijenata

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### Sažetak

Pandemija koronavirusa 2019. (COVID-19), koja je započela krajem 2019. godine i brzo se proširila svijetom, uzrokovana je infekcijom SARS-CoV-2 virusom, članom porodice coronaviridae. Prehrambeni status i prehrana uopšte imaju važnu ulogu u očuvanju i oporavku zdravlja, te su od posebnog značaja i u trenutnoj COVID-19 pandemiji. Makronutrijenti, mikronutrijenti i bioaktivni spojevi pored toga što su neophodni za integritet imunološke barijere, važni su i za održavanje odgovarajuće tjelesne mase, obzirom da su i pothranjenost i pretilost povezani s lošijim ishodom kod pacijenata sa COVID-19. Vitamini su tvari koje su u našem organizmu potrebne za normalan rast i razvoj. Za normalno funkcionisanje organizma slobodne radikale je potrebno kontinuirano neutralizirati jer njihovim nagomilavanjem dolazi do uništenja odbrambenih ćelija i nastanka različitih bolesti. Cilj ovog rada je, na osnovu dosadašnjih istraživanja, procijeniti značaj vitamina C i vitamina D u terapiji COVID-19. Meta-analiza 12 istraživanja rađenih na ukupno 1766 pacijenata liječenih na intenzivnoj njezi je pokazala da je vitamin C skratio hospitalizaciju za 8%. Retrospektivna multicentrična studija rađena na 212 pacijenata sa laboratorijski potvrđenom COVID-19 infekcijom je dokazala da povećana koncentracija vitamina D može dovesti do poboljšanja kliničke slike ili čak ublažavanja teških do kritičnih ishoda bolesti. Prema navedenim rezultatima istraživanja zaključuje se da vitamin C i vitamin D imaju potencijalni terapijski značaj u liječenju COVID-19 pacijenata.

Ključne riječi: *COVID-19, vitamin C, vitamin D, terapija*

## 4-O-2

### **Significance of the use of vitamins C and D in the therapeutic treatment of COVID-19 patients**

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#### **Summary**

The 2019 coronavirus pandemic (COVID-19), which began in late 2019 and spread rapidly around the world, was caused by an infection with the SARS-CoV-2 virus, a member of the coronaviridae family. Nutritional status and nutrition in general play an important role in maintaining and recovering health, and are of particular importance in the current COVID-19 pandemic. Macronutrients, micronutrients, and bioactive compounds, in addition to being essential for the integrity of the immune barrier, are also important for maintaining adequate body weight, as both malnutrition and obesity are associated with poorer outcome in patients with COVID-19. Vitamins are substances that are needed in our body for normal growth and development. For the normal functioning of the organism, free radicals need to be continuously neutralized, because their accumulation leads to the destruction of defense cells and the appearance of various diseases. The aim of this study was to evaluate the significance of vitamin C and vitamin D in COVID-19 therapy based on previous research. A meta-analysis of 12 studies conducted on a total of 1,766 patients treated in intensive care showed that vitamin C shortened hospitalization by 8%. A retrospective multicenter study conducted on 212 patients with laboratory-confirmed COVID-19 infection proved that increased vitamin D concentrations can lead to an improvement in the clinical picture or even alleviation of severe to critical disease outcomes. According to the above research results, it is concluded that vitamin C and vitamin D have potential therapeutic significance in the treatment of COVID-19 patients.

Keywords: *COVID-19, vitamin C, vitamin D, therapy*

## **Efikasnost i sigurnost niskokaloričnih dijeta za brzi gubitak tjelesne mase**

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### **Sažetak**

Pretilost je postala epidemija koja neprestano raste u cijelom svijetu. Pretilost nije samo estetska bolest, već stanje povezano s povećanim rizikom od metaboličkih poremećaja, kardiovaskularne bolesti i raka. Trenutne prehrambene strategije imaju za cilj postići brzi gubitak tjelesne mase kroz ograničavanje unosa kalorija. Međutim, sadašnja znanstvena literatura sugerira da stvarna većina niskokaloričnih dijeta ne pokazuje zadovoljavajuće rezultate u pogledu dugoročnog održavanja tjelesne mase. Ovo se uveliko odnosi na biološki odgovor tijela koji ima za cilj napuniti iscrpljene rezerve energije nakon što dođe do odstupanja od „utvrđene“ mase. U ovom radu raspravljane su hormonalne, psihološke i metaboličke prilagodbe organizma na niskokalorične dijete uz preporuke za sigurno i uspješno smanjenje i dugoročno održavanje tjelesne mase.

Ključne riječi: *pretilost, gubitak tjelesne mase, niskokalorične dijete, dugoročno održavanje tjelesne mase*

## 4-O-3

### **Efficiency and safety of low-calorie diets for rapid weight loss**

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#### **Summary**

Obesity has become an epidemic that is growing steadily across the whole world. Obesity is not only an aesthetic disease but a condition associated with an increased risk of metabolic disorders, cardiovascular disease, and cancer. Current nutritional strategies aim for fast weight loss with calorie restriction. However, the present scientific literature suggests that the real majority of low-calorie diets do not show satisfactory results in terms of long-term weight maintenance. This largely relates to the body's biological response that aims to replenish depleted energy reserves once a deviation from an “established” weight occurs. In this paper, hormonal, psychological, and metabolic adaptations to low-calorie diets are discussed along with recommendations for a safe and successful reduction and long-term weight maintenance.

**Keywords:** *obesity, weight loss, low-calorie diets, long-term weight maintenance*

## **Kontrola kvaliteta dodataka prehrani – trenutno stanje u Evropi, problemi i moguća rješenja**

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### **Sažetak**

Dodaci prehrani predstavljaju hranu čija je svrha dopuniti uobičajnu prehranu, a koja predstavlja koncentrirane izvore hranjivih supstanci ili druge supstance prehranbenog ili fiziološkog učinka, pojedinačne ili u kombinaciji, na tržištu u doziranom obliku, odnosno oblicima kao što su kapsule, pastile, tablete, pilule, vrećice praha, ampule tekućine, bočice na kapaljku, te ostali slični oblici tečnosti i praha namijenjeni za uzimanje u odmjerenim malim količinama. Cilj ovog rada jeste upoznati se s pojmom dodataka prehrani, procesom kontrole kvaliteta i samom regulativom ovih proizvoda. Dodaci prehrani su namijenjeni ispravljanju prehranbeni nedostataka, održavanju odgovarajućeg unosa određenih hranjivih sastojaka ili podršci određenim fiziološkim funkcijama. Bitno je napomenuti da dodaci prehrani nisu medicinski proizvodi i kao takvi ne mogu vršiti farmakološko, imunološko ili metaboličko dejstvo. Nakon pregleda trenutno dostupne relevantne literature, a koja se odnosi na legislative i reguliranje prometovanja, označavanja i sigurnosti dodataka prehrani (suplemenata), mogli smo zaključiti da je Direktivom o dodacima prehrani donijetom od strane EU (2002. godine) ustanovljeno je da se svi postojeći zakoni o hrani primjenjuju i na dodatke prehrani. Također, donesena Direktiva propisuje niz specifičnih zahtjeva za označavanjem, međutim manjakava je kada su u pitanju zahtjevi za označavanje biljnih proizvoda, bioaktivnih supstanci, botaničkih pripravaka i slično. Direktiva je na detaljan i jasan način definisala dodatke prehrani i omogućila je prijavljivanje proizvoda vlastima prilikom stavljanja proizvoda na tržište.

*Ključne riječi: dodaci prehrani, kontrola kvaliteta, direktive, Evropska unija*

## **Quality control of food supplements - the current situation in Europe, problems and possible solutions**

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### **Summary**

Food supplements are foods intended to supplement the normal diet, as it is considered a concentrated source of nutrients or other substances with a nutritional or physiological effect, that can be taken alone or in combination. It can be found on the market in different 'dose' form such as capsules, lozenges, tablets, pills, powder bags, ampoules of liquid, dropper bottles, and other similar forms of liquid or powder designed for consumption in measured small unit quantities. The aim of this paper is to get acquainted with the concept of food supplements, the quality control process and the regulation of these products. Dietary supplements are intended to correct nutritional deficiencies, maintain an adequate intake of certain nutrients, or support certain physiological functions. It is important to note that dietary supplements are not medicinal products and as such cannot have pharmacological, immunological, or metabolic action. After reviewing the currently available relevant literature, which refers to the legislation and regulation of trade, labeling and safety of food supplements, we could conclude that the Directive on food supplements adopted by the EU (2002), found that all existing food laws also apply to dietary supplements. Also, the Directive defines several specific labeling requirements, but it is deficient when it comes to labeling requirements for herbal products, bioactive substances, botanical preparations and the like. The Directive defined food supplements in a detailed and clear way and made it possible to report products to the authorities when placing products on the market.

*Keywords: food supplements, quality control, directive, European Union*



## Uloga vitamina D i kalcija u prevenciji i liječenju osteoporoze

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### Sažetak

Prema podacima Svjetske zdravstvene organizacije osteoporoza je veliki društveno-ekonomski i javnozdravstveni problem s obzirom na to da zahvata 8 % do 10 % populacije, tako da se danas osteoporoza smatra najučestalijom metaboličkom bolešću u razvijenim zemljama. Ovaj pregledni članak za cilj ima istražiti uticaj vitamina D i kalcija kako u liječenju tako i u prevenciju osteoporoze, te ukratko opisati dijagnostiku i liječenje osteoporoze, kao i prevenciju za smanjen rizik od osteoporoze. Kao materijal za nastanak preglednog članka na datu temu, korištena je literatura pronađena na online bazama podataka kao što su Google Scholar, PubMed i MedLine. Utvrđeno je da maksimalna koštana masa stiže se do 30. godine i ovisi o genetskim i okolišnim čimbenicima, uključujući unos kalcija i vitamina D. Sa starenjem stanovništva očekuje se povećanje prevalencije osteoporoze. Tjelesna aktivnost (zbog zaštite zdravlja koštane mase) i zdrava ishrana dvije su mjere povezane sa smanjenim rizikom od osteoporoze. Dovoljan unos namirnica bogatih kalcijom, zajedno s dovoljnom razinom vitamina D, pokazao se kao dobra opcija za održavanje zdravog stanja kostiju. Također osteoporoza je znatno češća kod žena i znatan gubitak kosti počinje nakon menopauze. Kod žena u menopauzi zbog pada estrogena dolazi do ubrzane resorpcije koštanog tkiva koja rezultira smanjenjem koštane mase te nastankom osteoporoze. Uz unos kalcija i vitamina D, uvijek je neophodno i ciljano liječenje osteoporoze bez kojeg se ne može znatno smanjiti rizik od prijeloma. Stoga je potrebno što prije otkriti jer je u tom slučaju učinkovitost liječenja veća. Treba biti svjestan činjenice da zahtijeva dugogodišnje praćenje i liječenje, te pridržavanje zdrave ishrane (npr. hrana siromašna kalcijom, a prepuna soli, može da uzrokuje osteoporozu) i životnog stila.

Ključne riječi: *Osteoporoza, koštane bolesti, kalcij, vitamin D*

## **The role of vitamin D and calcium in the prevention and treatment of osteoporosis**

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### **Summary**

According to the World Health Organization, osteoporosis is a major socio-economic and public health problem given that it affects 8% to 10% of the population, so today osteoporosis is considered the most common metabolic disease in developed countries. This review article aims to investigate the impact of vitamin D and calcium in both the treatment and prevention of osteoporosis, and to briefly describe the diagnosis and treatment of osteoporosis, as well as prevention for a reduced risk of osteoporosis. As material for the creation of a review article on a given topic, literature found on online databases such as Google Scholar, PubMed and MedLine was used. Maximum bone mass has been found to be reached by age 30 and depends on genetic and environmental factors, including calcium and vitamin D intake. As the population ages, osteoporosis prevalence is expected to increase. Physical activity and proper nutrition are two measures associated with reduced risk of osteoporosis. Sufficient calcium intake, along with sufficient levels of vitamin D, has been shown to be a good option for maintaining healthy bone health. Also osteoporosis is significantly more common in women and how significant bone loss begins after menopause. In menopausal women, due to the drop in estrogen, there is an accelerated resorption of bone tissue, which results in a decrease in bone mass and the development of osteoporosis. In addition to calcium and vitamin D intake, targeted treatment of osteoporosis is always necessary, without which the risk of fractures cannot be significantly reduced. Therefore, it is necessary to detect as soon as possible because in this case the effectiveness of treatment is higher. One should be aware of the fact that it requires long-term monitoring and treatment, and adherence to a healthy diet (e.g., foods low in calcium, and full of salt, can cause osteoporosis) and lifestyle.

Keywords: *Osteoporosis, bone diseases, calcium, vitamin D*

## Uloga pravilne ishrane u kontroli i prevenciji diabetes mellitusa tip 2

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### Sažetak

Ishrana treba da ispunjava određene nutritivne i zdravstvene uslove, odnosno da zadovolji principe racionalne ishrane te da bude prilagođena uzrastu, polu, genetskim predispozicijama i zdravstvenom stanju svakog pojedinca. Diabetes mellitus tip 2 je posljedica smanjenog lučenja inzulina uz veću ili manju perifernu rezistenciju na inzulin s posljedičnom hiperglikemijom. Čak i do 90% slučajeva diabetes mellitusa tipa 2 se može spriječiti ukoliko pacijent prati zdrave životne navike. Gojaznost i fizička neaktivnost doprinose svaka sa po 25% varijacijama u inzulinskoj senzitivnosti, dok su genetski faktori odgovorni za dodatnih 50% u inzulinskoj senzitivnosti. Dijetoterapija je predstavljena kao vodič za sistematski i činjenično baziran pristup za upravljanje dijabetesom putem ishrane, a dokazana je i njena efikasnost, mada postoje poteškoće s obzirom da nekada pacijenti nisu dovoljno posvećeni praćenju režima ishrane. Pored kontrole dijabetesa tipa 2, prehrambene intervencije mogu pružiti veoma korisne pristupe u regulaciji glukoze i lipidnih parametara u krvi. Ovaj rad, pored svega, sumira nekoliko ispitivanja koja su provedena u cilju pronalaska odgovarajućih prehrambenih obrazaca koji su se pokazali efikasnim u liječenju dijabetesa tipa 2. Prehrambeni obrasci koji osiguravaju esencijalne mikro i makrohranjive tvari su uvijek neophodni za pacijente koji pate od ovog oboljenja, a poseban naglasak je potrebno dati ulozi mikronutrijenata kao što su elementi u tragovima i vitamini.

Ključne riječi: *diabetes mellitus tip 2, inzulin, dijetoterapija, nutrijenti*

## The role of a proper diet in control and prevention of diabetes mellitus type 2

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### Summary

Diet should fulfill a persons nutritional and health needs, it should satisfy the principals of a racional diet and it should be adapted by age, gender, genetic predispositions and the medical condition of every individual. Diabetes mellitus type 2 is a consequence of reduced secretion of insulin along with more or less peripheral resistance to insulin and with consequential hyperglycemia. Up to 90% of type 2 diabetes cases are potentially preventable if individuals follow a healthy diet and lifestyle. Obesity and physical inactivity contribute by 25% each in insulin sensitivity, while genetic factors are responsible with the remaining 50% in insulin sensitivity. Medical nutrition therapy was introduced to guide a systematic and evidence based approach to the management of diabetes through diet, and its effectiveness has been demonstrated, but difficulties remain because sometimes patients are not dedicated enough to follow the diet. Other than the control of diabetes type 2, diet interventions can provide very useful approaches to regulating glucose and lipid parameters in the blood. This work, also sums up a few testings that have been conducted in order to find the most suitable dietary patterns that have shown efficiency in treating diabetes type 2. Dietary patterns that ensure essential micro and macro nutrients are always necessary for patients that suffer from diabetes. Special attention is given to the role of micronutrients, such as elements in traces and vitamins.

Keywords: *diabetes mellitus type 2, insulin, medical nutrition, nutrients*

## Ishrana i fizička aktivnost osoba za inzulinskom rezistencijom

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### Sažetak

Inzulinska rezistencija (IR) predstavlja metabolički poremećaj organizma kod kojeg dolazi do slabljenja perifernog učinka inzulina i smanjene osjetljivosti organa na inzulina. Glavni zadatak inzulina je olakšavanje prelaska šećera, glavnog izvora energije, iz krvi u ciljane tkiva. U slučaju IR organizam ne reaguje na izlučeni inzulina, šećer se ne razgrađuje i pacijent ima povišen nivo inzulina a potom i šećera u krvi. Cilj rada je ustanoviti kakav utjecaj ishrana i fizička aktivnost imaju na IR. U sklopu istraživanja, anketirali smo 157 ispitanika sa potvrđenom dijagnozom IR, putem Google ankete. Na pitanje da li se pridržavaju posebnog plana ishrane, s mogućnosti označavanja više odgovora, 44,6% ispitanika je odgovorilo da nemaju poseban plan ishrane. Ostali odgovori su se odnosili na low carb/low carb high fiber režim (16,6%), keto ishranu (14,6%), kalorijski deficit (14%), podjednak postotak hrane ishranu i/ili autofagiju/intermittent fasting (12,7%), bezglutensku ishranu (11,5%), mediteransku (10,8%), a ostatak odgovora (>10%) se odnosio na ishranu bez laktoze/paleo/vegansku i vegetarijansku ishranu. Vežano za unos određenih namirnica, najveći broj ispitanika povrće unosi često (39,5%), voće umjereno (33,76%), bijelo brašno – rižu, tjesteninu ponekad (43,31%), slatkiše/rafinirane šećere ponekad (43,95%), sokove nikako (54,14%). Na pitanje da li su fizički aktivni, najveći broj ispitanika je odgovorilo da, i to 49,7% više puta sedmično, 15,9% jednom sedmično, 15,9% rjeđe od jednom sedmično, 18,5% nikako. Zaključno, pridržavajući se ovih navika, 51% ispitanika primjećuje smanjenje tjelesne težine, 45,2% kaže da se bolje osjeća (uredniji san, više energije), 31,2% tvrdi da ima urednije ljekarske nalaze.

Ključne riječi: *inzulin, inzulinska rezistencija, ishrana, fizička aktivnost*

## Diet and physical activity of people with insulin resistance

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### Summary

Insulin resistance (IR) is a metabolic disorder of the body in which the peripheral effect of insulin is weakened as well as the sensitivity of the organs to insulin. The main task of insulin is to facilitate the transfer of sugar, the main source of energy, from the blood to the targeted tissues. With IR, the organism does not react to the secreted insulin, the sugar does not break down and the patient has an elevated level of insulin followed up by increase in blood sugar levels. The aim of this paper is to determine the impact of diet and physical activity on IR. As part of the research, we surveyed 157 examinees with a confirmed diagnosis of IR, via Google survey. When asked whether they follow a special diet plan, with the possibility to select multiple answer, 44.6% of examinees answered negative. Other responses referred to low carb / low carb high fiber regime (16.6%), keto diet (14.6%), calorie deficit (14%), equal percentage referred to chrono diet and / or autophagy / intermittent fasting (12.7%), gluten-free diet (11.5%), Mediterranean diet (10.8%), and remaining answers (> 10%) referred to lactose-free / paleo / vegan and vegetarian diet. Regarding the intake of certain food groups, the majority of examinees reported consuming vegetables frequently (39.5%), fruits moderately (33.76%), white flour - rice, pasta occasionally (43.31%), sweets / refined sugars occasionally (43.95%) and juices nowise (54.14%). When asked whether they are physically active, the largest number of respondents answered affirmatively, the frequency varying between more than once per week (49.7%), once per week (15.9%), less than once per week (15.9%) and never (18.5%). In conclusion, adhering to previously mentioned habits, 51% of respondents noted weight loss, 45.2% reported feeling better (better sleep, more energy), 31.2% claim to have better laboratory findings.

Keywords: *insulin, insulin resistance, diet, physical activity*

## Kada i zašto primjenjivati *Lactobacillus reuteri* Protectis

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### Sažetak

Prema definiciji Svjetske zdravstvene organizacije probiotici su živi mikroorganizmi, tzv. "dobre bakterije", koje primijenjene u adekvatnoj količini imaju povoljne učinke na zdravlje domaćina. Probiotici su definirani svojim rodom, vrstom i podvrstom, te oznakom koja označava specifičan soj. Primjena probiotika se pozitivno odražava na naše zdravlje, ali samo u slučaju kada koristimo visoko kvalitetne proizvode na pravi način i u pravo vrijeme. Crijevna mikroflora važna je za sazrijevanje imunološkog sistema, razvoj normalnog izgleda crijevne sluznice, održavanje normalnog imunološkog odgovora na upalu, obranu od alergena kao i mogućih napada patogenih mikroorganizama. *L. reuteri* Protectis, zbog jedinstvenog sastava i porijekla je posebno dobro prilagođen ljudskom probavnom sistemu. Ovo je jedan od prvih sojeva koji se naseljava u zdravoj flori novorođenčeta, dok većina drugih sojeva bakterija, koji se unose putem hrane, samo privremeno naseljava probavni sistem. Tokom sezone prehlade i gripe probiotici štite ljudski organizam na više načina: Imunološki, aktivacijom lokalnih makrofaga povećavajući antigensku prezentaciju limfocitima B i produkciju imunoglobulina, kako lokalno tako i sistemski. Naučnici Američke asocijacije za srce (American Heart Association, AHA) su otkrili da svakodnevna primjena probiotika snižava razinu lošeg holesterola u krvi za 12%, koji dovodi do začepjenja krvnih sudova, zbog čega najčešće nastaje infarkt miokarda. Od posebnog značaja je povoljan učinak probiotika kod sportista, poput profesionalnih sportista, kao i osoba koje intenzivno treniraju, barem tri puta sedmično po sat vremena. Treninzi, bilo da se radi o vježbama izdržljivosti ili drugim vježbama, mogu utjecati na pojačanu propusnost crijeva što omogućuje ulazak molekula koje inače u zdravoj flori ne prolaze crijevnu barijeru.

#### **4-P-1**

### **When and why use *Lactobacillus reuteri* Protectis**

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#### **Summary**

According to the World Health Organization probiotics are living microorganisms and are known as "Good bacteria". If applied in adequate quantities they have useful effect on the health of the host. Probiotics are defined by their genus, species and subspecies, and by a label denoting a specific strain. The use of probiotics has a positive effect on our health, but only if we use high quality products in the right way and at the right time. The latest generation of probiotics contains *Lactobacillus Reuteri* DSM 17938 Protectis, a bacterial strain that is part of the normal microflora of healthy mothers milk and is the only probiotic isolated from breast milk. The intestinal microflora is important for the maturation of the immune system, the development of a healthy intestinal mucosa, the maintenance of a healthy immune response to the inflammation, defence against allergens as well as possible attacks by pathogenic microorganisms. *L. reuteri* Protectis, due to its unique composition and origin, is particularly well adapted to the human digestive system. This is one of the first strains to settle in the healthy flora of the newborn, while most other strains of bacteria, which are introduced through food, only temporarily inhabit the digestive system. During the cold and flu season probiotics can help protect the human body in several ways: Immunologically by activating local macrophages, increasing the antigen presence of B lymphocytes and the production of immunoglobulins, both locally and systemically. Scientists from the American Heart Association (AHA) have found that daily use of probiotics helps lowering the level of Low Density Cholesterol in blood by 12%, and as it is known, increased levels of LDC lead to blockage of blood vessels, which most often causes myocardial infarction. It has been proven that probiotics have great effect on professional athletes as well as people who train intensely at least three times a week for an hour. Training, whether it is endurance training or other types of training, can affect the increased permeability of the intestine, which allows the entry of molecules that do not normally cross the intestinal barrier in a healthy flora.



## **Kada i zašto primjenjivati proizvod koji sadrži lizozim**

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### **Sažetak**

Infektivne bolesti su produkt interakcije dva svijeta, svijeta mikroorganizama i svijeta humane fiziologije. Odbrambeni sistem imunokompetentnih osoba, sa svojim molekularnim i ćelijskim elementima, pruža relativno dobru zaštitu od infekcije. Vrlo značajan dio nespecifičnog odbrambenog sistema je sekretorni enzim lizozim, koji se nalazi u suzama, mlijeku, pljuvački, jetri i plazmi. Lizozim je enzim kojeg luče fagociti, monociti i makrofagi i predstavlja glavnog nositelja nespecifične ćelijske imunosti. Zahvaljujući svom enzimatskom, ali i dodatnom neenzimatskom djelovanju, lizozim ima širok antimikrobni spektar, tj. djeluje na bakterije, viruse i gljivice. Lizozim stabilizira membrane stanica koje sudjeluju u upalnoj reakciji, čime se sprečava oslobađanje tvari koje induciraju i promoviraju upalu te time oštećuju tkivo. Potiče obnovu epitelnih stanica i fibroblasta, a istovremeno smanjuje broj bakterijskih kolonija i infiltraciju tkiva upalnim stanicama. Stimulacija fagocita od strane lizozima pomaže pri zarastanju rana i povlačenju upalnih i nekrotičnih procesa. Imunomodulatorni efekti lizozima su direktni i indirektni; djeluje na stanice obrambenog sistema stimulacijom produkcije hemijskih posrednika visoke biološke i imune aktivnosti (interferoni, interleukini, faktori nekroze tumora). Lizozim potiče koordinaciju međusobnog djelovanja stanica imunog sistema, a uključen je u "čišćenje" organizma od štetnih komponenti imunog odgovora i toksičnih metabolita – proizvoda dezintegracije imunih kompleksa. Lizozim djeluje kao antioksidans jer sprečava nastanak slobodnih radikala i njihovo štetno djelovanje. Primjena preparata koji kao aktivnu komponentu sadrže lizozim se pozitivno odražava na naše zdravlje, ali samo u slučaju kada koristimo visoko kvalitetne proizvode na pravi način i u pravo vrijeme.

## **When and why to use products containing lysozyme**

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### **Summary**

Infectious diseases are the product of the interaction of two worlds, the world of microorganisms and the world of human physiology. The defense system of immunocompetent individuals, with its molecular and cellular elements, provides relatively good protection against infection. A very important part of the non-specific defense system is the secretory enzyme lysozyme, which can be found in tears, milk, saliva, liver and plasma of the human body. Lysozyme is an enzyme secreted by phagocytes, monocytes and macrophages and is a major carrier of nonspecific cellular immunity. Thanks to its enzymatic, but also additional non-enzymatic action, lysozyme has a wide antimicrobial spectrum, because it's effective on bacteria, viruses and fungi. Lysozyme stabilizes the membranes of cells involved in the inflammatory reaction, thus preventing the release of substances that induce and promote inflammation and damage tissue. Lysozyme stimulates the renewal of epithelial cells and fibroblasts, and at the same time reduces the number of bacterial colonies and tissue infiltration by inflammatory cells. Stimulation of phagocytes by lysozyme helps in wound healing and withdrawal of inflammatory and necrotic processes. The immunomodulatory effects of lysozyme are direct and indirect; its effect on the cells of the immune system is shown by stimulating the production of chemical mediators of high biological and immune activity (like interferon, interleukins, and tumour necrosis factors).

Lysozyme stimulates the coordination of the interaction of cells of the immune system, and is involved in 'cleansing' the body of harmful components of the immune response and toxic metabolites- products of disintegration of immune complexes. Lysozyme acts as an antioxidant because it prevents the formation of free radicals and their harmful effects. The use of preparations that contain lysozyme as an active component has a positive effect on our health, but only if we use high quality products containing lysozyme in the right way and at the right time.

## Uloga biljke noni (*Morinda citrifolia L.*) u tretmanu hipertenzije

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### Sažetak

U današnje vrijeme sve je više zastupljen fitoterapeutski pristup liječenju bolesti. Ono što je bitno naglasiti je da su to svakako veoma ispitane biljne droge koje svoje djelovanje ispoljavaju preko fitokomponenti i fitokompleksa. Biljka noni (*Morinda citrifolia L.*) je tropska biljka koja raste u dijelovima Azije, Australije i Polinezije. Izrazito je otporna na različite uslove kako klime, tako i tla, pa se može naći na različitim vrstama tla diljem ovih krajeva. Ono što je svima poznato je da ova biljka trenutno dolazi u prodaji kao noni sok. Benefiti ove biljke se ogledaju u raznim segmentima, a neki od njih su da ima analgetsko djelovanje, jača imunološki sistem, djeluje kao anitdepresiv, a najzanimljivije djelovanje ove biljke je antitumorsko. Manje poznat učinak nonija je antihipertenzivni i hipolipemični. Naučnici širom svijeta su radili istraživanja na grupama pacijenata sa početnim i prvim stadijima hipertenzije, te su pokazali da uspješno snižava sistolni i dijastolni pritisak. Ono što je bitno spomenuti je da preparat koji sadrži komponente nonija je korisno uzimati i zbog snižavanja holesterola, koji posljedično može uzrokovati probleme sa hipertenzijom.

Ključne riječi: *fitoterapija, noni, hipertenzija*

#### 4-P-3

### **The role of noni plant (*Morinda citrifolia* L.) in the treatment of hypertension**

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#### **Summary**

Nowadays the phytotherapeutic approach to the treatment of diseases is increasingly prevalent. What is important to emphasize is that there are certainly highly tested herbal drugs that exert their effects through phytochemicals and phytocomplexes. The noni plant (*Morinda citrifolia* L.) is a tropical plant found in parts of Asia, Australia, and Polynesia. It is extremely resistant to different conditions, both climate and soil, so it can be found on different types of soil throughout these regions. It is known that this plant is currently available as a noni juice. The benefits of this plant are reflected in various segments, and some of them are that it has an analgesic effect, strengthens the immune system and acts as an antidepressant, but the most interesting effect of this plant is antitumor. The lesser known effect of noni is antihypertensive and hypolipemic. Scientists around the world have done research on groups of patients with initial and early stages of hypertension, and have shown that it successfully lowers systolic and diastolic blood pressure. What is important to mention is that the product that contains the components of noni is useful to be taken because it lowers cholesterol, which can consequently cause problems with hypertension.

Keywords: *phytotherapy, noni, hypertension*

## Potencijalno djelovanje sulforafana iz brokule (*Brassica oleracea L. var. Italica*) na neurodegenerativna oboljenja

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### Sažetak

Brokule (*Brassica oleracea L. var. Italica*) su široko rasprostranjeno povrće u ishrani širom svijeta i kao i svo ostalo zeleno povrće imaju neupitan pozitivan efekat na ljudsko zdravlje. Novija istraživanja pokazala su kako sulforafan, komponenta izolovana iz brokule ima specifičan uticaj kada su u pitanju neurodegenerativna oboljenja, od kojih se posebno izdvajaju poremećaji iz autističnog spektra. Ovaj rad daje prikaz najnovijih istraživanja vezanih za uticaj sulforafana na prevenciju i tretman neurodegenerativnih oboljenja. Ciljevi ovog rada bili su dati uvid u potencijal daljeg istraživanja sulforafana, radi formuliranja efikasnijih dodataka prehrani, ali i mogućih novih lijekova. Sulforafan je predstavnik grupe izotiocijanata, a osim u brokuli nađen je i u drugom srodnom povrću kakvi su i karfiol i kupus. Istraživanja sulforafana provedena su *in vitro*, na eksperimentalnim životinjama ali i na kliničkim ispitanicima.

Ključne riječi: *sulforafan, brokula, izotiocijanati, neurodegenerativna oboljenja*

#### 4-P-4

### **Potential effects of sulforaphane from broccoli (*Brassica oleracea L. var. Italica*) on neurodegenerative diseases**

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#### **Summary**

Broccoli (*Brassica oleracea L. var. Italica*) is a widespread vegetable in the diet around the world and like all other green vegetables has an unquestionable positive effect on human health. Recent research has shown that sulforaphane, a component isolated from broccoli, has a specific effect when it comes to neurodegenerative diseases, of which disorders from the autism spectrum stand out. This paper presents the latest research related to the influence of sulforaphane on the prevention and treatment of neurodegenerative diseases. The objectives of this study were to provide insight into the potential for further research of sulforaphane, in order to formulate more effective dietary supplements, but also possible new drugs. In addition to broccoli, sulforaphane, representative of the isothiocyanate compounds, is also found in other related vegetables such as cauliflower and cabbage. Sulforaphane studies have been performed *in vitro*, on experimental animals but also on clinical subjects.

**Keywords:** *sulforaphane, broccoli, isothiocyanates, neurodegenerative diseases*

## Proizvodi bez glutena

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### Sažetak

Celijakija-Glutenska enteropatija je hronična autoimuna bolest koja se javlja kod genetski predisponiranih osoba, kada nakon unošenja glutena u organizam dolazi do oštećenja proksimalnog dijela tankog crijeva. Celijakna bolest je povezana i sa humanim leukocitnim antigenom (HLA sistemom), kao i sa non-HLA. Procjenjuje se da bolest zahvata jednog od stotinu ljudi širom svijeta. Kada osobe sa celijakijom unesu gluten u organizam, njihovo tijelo pokreće imuni odgovor i napada tanko crijevo. Ovi napadi vode do oštećenja resica, koje su zadužene za apsorpciju hrane. Kada se resice oštete nutrijenti ne mogu biti apsorbirani i kao posljedica se javlja malapsorpcija i malnutricija. Celijakija je nasljedna bolest i procjenjuje se da je rizik od pojave bolesti kod osoba u srodstvu 1:10.. Što se liječenja tiče, danas se još uvijek preporučuje striktno pridržavanje dijeta bez glutena. Brojne komplikacije bolesti mogu biti uspješno spriječene ranom dijagnozom bolesti i prelaskom na bezglutensku ishranu. Iako se dijagnoza zasniva na intestinalnoj biopsiji, serološki testovi su korisni kao skrining i dopuna su dijagnozi. Postoje kontradiktorni rezultati o vezi između saglasnosti sa dijetom i kvalitetom života. Posmatrajući adolescente, Wagner i saradnici su u istraživanju otkrili da loša saglasnost sa GlutenFreeDiet jeste glavni uzrok generalno niskog kvaliteta života. Adolescenti koji nisu u saglasnosti sa dijetom su imali više fizičkih problema, veći teret zbog bolesti, više su se osjećali bolesnima i imali su više porodičnih problema. Osim toga, kod ovih pacijenata, zakašnjela dijagnoza je bila povezana sa većim problemima u školi i društvenim aktivnostima. Pacijenti sa celijaknom bolešću moraju biti pažljivi prilikom konzumacije hrane koja nije pripremljena u domaćinstvu s obzirom na mogućnost prisustva glutena. Nedostupnost hrane bez glutena izvan domaćinstva i niska svijest o bolesti je predstavljala problem proteklih godina, iako se to sada brzo mijenja.

Ključne riječi: *celijakna bolest, gluten, food*

#### 4-P-5

### Gluten free products

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### Summary

Celiac disease-gluten sensitive enteropathy is a permanent intolerance to ingested gluten that results in immunologically mediated inflammatory damage to the small-intestinal mucosa. Celiac disease is associated with both human leukocyte antigen (HLA) and non-HLA genes and with other immune disorders, notably juvenile diabetes and thyroid disease.. It is estimated that the disease affects 1/100 people around the world. When people with celiac disease eat gluten, their body triggers the immune response and attacks the small intestine. These attacks lead to the damage of villi, which are responsible for food absorption. When the intestinal is damaged, nutrients cannot be absorbed, which results in the appearance of malabsorption and malnutrition. Celiac disease is hereditary and it is estimated that the risk of getting this disease in related persons is 1:10 The treatment of celiac disease is lifelong avoidance of dietary gluten. Complications of celiac disease occur but these can often be avoided by early diagnosis and compliance with a gluten-free diet. There are contradictory results on the relationship between diet and quality of life. Looking at adolescents, Wagner and colleagues found that poor compliance with GlutenFreeDiet is a major cause of the generally low quality of life. Adolescents who did not agree with the diet had more physical problems, a greater burden of illness, more feelings as they are sick, and more family problems. In addition, in these patients, the late diagnosis was associated with major problems in school and social activities. Patients with celiac disease must be careful when consuming food that is not prepared in the household, considering the possibility of presence of gluten. The unavailability of non-household gluten-free food and low awareness of the disease was a problem in recent years, although this is now changing rapidly.

Keywords: *celiac disease, gluten, food*



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



## **Mikrobiološka ispravnost proizvoda od mesa i briseva u maloprodajnim objektima na području Bosne i Hercegovine**

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### **Sažetak**

Meso kao namirnica obično sadrži određen broj mikroorganizama koji ga kontaminiraju u procesu klanja, obrade kao i tokom prometa i prodaje. Postoje brojni načini kontaminacije mesa i proizvoda od mesa, te je stoga važno pored mikrobiološke analize mesa uzeti u obzir utjecaj higijenskih uslova na finalni proizvod i to uzorkovanjem briseva ruku osoba, površina i opreme koja dolazi u kontakt s mesom. Cilj ispitivanja je bio utvrditi mikrobiološku ispravnost mesa i briseva radnih površina, opreme, ruku i odjeće radnika u maloprodajnim objektima na području Bosne i Hercegovine. U toku 2020.godine uzorkovano i ispitano je 337 briseva i 360 uzoraka mljevenog mesa i drugih proizvoda od mesa. Od ukupnog broja ispitanih uzoraka 20 briseva i 9 uzoraka mesa nije odgovaralo preporučenim mikrobiološkim kriterijima. Do septembra 2021. godine ispitano je 247 briseva i 258 uzoraka mesa od kojih je 22 brisa i 13 uzoraka mesa imalo povećan broj mikroorganizama u odnosu na dozvoljene vrijednosti. Provedeno istraživanje ukazuje da u ljetnom periodu dolazi do povećanog broja pozitivnih uzoraka, što povežujemo s povećanjem vanjske temperature. Prisutna je povezanost između higijenskog statusa maloprodajnih objekata i mikrobiološke ispravnosti mesa što govori o značajnosti provođenja mjera kontrole dobre higijenske i sanitarne prakse u cilju osiguranja zdravstveno ispravne hrane.

*Ključne riječi: mikrobiološka analiza, proizvodi od mesa, brisevi, zdravstvena ispravnost*

## 5-O-1

### **Microbiological status of meat and swab products in retail facilities in Bosnia and Herzegovina**

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#### **Summary**

Meat as a food also contains microorganisms that invade it during slaughter, processing, as well as during traffic and sales. Meat and meat products can be contaminated in many ways, so it is important to consider the effect of hygiene practices on the final product by examining the swabs of the hands of people, objects, and equipment entering the facility, products that come into contact with meat, as well as equipment that comes into contact with meat. The purpose of the study is to determine the microbiological integrity of meat and swabs from working surfaces, tools, hands, and clothing of retail workers in Bosnia and Herzegovina. During 2020, 337 swabs and 360 samples of minced meat and other meat products were collected and examined, of which 20 swabs and 9 meat samples did not meet the recommended microbiological criteria from the total number of samples examined. By September 2021, 247 swabs and 258 meat samples were collected, of which 22 swabs and 13 meat samples had an increased number of microorganisms compared to the allowed values. An increase in the number of positive samples is present in the summer period, which we associate with an increase in air temperature. There is a correlation between the cleanliness of retail facilities' hygiene standards and the microbiological integrity of meat, which emphasizes the importance of taking appropriate hygiene and sanitary practice surveillance measures to ensure health-correct food.

*Keywords: Microbiological analysis, meat products, swabs, food safety*

## Zastupljenost koagulaza pozitivnih stafilokoka (*Staphylococcus aureus*) u mladom kravljem siru

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### Sažetak

U ovom prospektivnom istraživanju rađeno je ispitivanje prisustva *Staphylococcus aureus* u mladom kravljem siru. Uzorke za analizu dostavljala je inspekcija u periodu august/septembar 2021. Na mikrobiološku analizu dostavljeno je ukupno 120 uzoraka mladog kravljeg sira iz 22 različita proizvodna pogona. Izolacija i identifikacija *Staphylococcus aureus* rađena je uz pomoć propisanih konvencionalnih kulturelnih metoda i biohemijskih testova. *Staphylococcus aureus* je potvrđen u 3 od 120 uzoraka mladog kravljeg sira što ukazuje da 2,5 % uzoraka nije zadovoljilo kriterije Pravilnika o mikrobiološkim kriterijima za hranu (Službeni glasnik BiH br.11/13, 79/16 i 64/18) i Smjernicama o mikrobiološkim kriterijima o hranu (Agencija za sigurnost hrane Bosne i Hercegovine-2013). Nalazi ovog istraživanja pomažu u identifikaciji *Staphylococcus aureus* i kontroli patogena mladog kravljeg sira domaćih proizvođača. Implementacija sistema.”Dobra proizvodna praksa u proizvodnji i preradi” i “Dobra higijenska praksa kod spravljenja sira” doprinosi mikrobiološkoj sigurnosti finalnih proizvoda što direktno djeluje na sigurnost konzumenata, odnosno potrošača.

Ključne riječi: *Staphylococcus aureus*, mladi kravljji sir, dobra proizvodna praksa, dobra higijenska praksa, mikrobiološka sigurnost hrane

## 5-O-2

### **Prevalence of coagulase positive staphylococci (*Staphylococcus aureus*) in young cow's cheese**

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### **Summary**

In this prospective study, the presence of *Staphylococcus aureus* in young cow cheese was examined. Samples for analysis were submitted by the inspection in the period August / September 2021. A total of 120 samples of young cow's cheese from 22 different production plants were submitted for microbiological analysis. Isolation and identification of *Staphylococcus aureus* was performed using prescribed conventional culture methods and biochemical tests. *Staphylococcus aureus* was confirmed in 3 out of 120 samples of young cow's cheese, which indicates that 2.5% of samples did not meet the criteria of the Ordinance on microbiological criteria for food (*Official Gazette of BiH No. 11/13, 79/16 and 64/18*) and the Guidelines on microbiological criteria on food (*Food Safety Agency of Bosnia and Herzegovina-2013*). The findings of this study help in the identification of *Staphylococcus aureus* and the control of pathogens of young cow's cheese from domestic producers. Implementation of the system. "Good production practice in production and processing" and "Good hygienic practice in cheese making" contribute to the microbiological safety of final products, which directly affects the safety of consumers and consumers.

Keywords: *Staphylococcus aureus*, young cow's cheese, good production practice, good hygiene practice, microbiological food safety

## Zastupljenost bakterija u svježem siru koji je namijenjen javnoj potrošnji

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### Sažetak

Sir čini najbrojniju skupinu mliječnih proizvoda na tržištu. Predstavlja fermentiran ili nefermentiran proizvod dobijen upotrebom različitih mliječnih kultura i sirila zgrušavanjem uz dejstvo enzima ili kiselina. Cilj istraživanja je bio provjeriti mikrobiološku ispravnost svježeg sira prikupljenog sa tržnica Kantona Sarajevo. U istraživanju je korišteno 40 uzoraka sira, a uzeto je po 10 uzoraka sa svake tržnice. Prilikom dokazivanja mikrobiološke ispravnosti svježeg sira, uzorci su istraženi na prisustvo sljedećih mikroorganizama: *Escherichia coli*, *Salmonella* spp., *Listeria monocytogenes*, koagulaza pozitivni stafilokok- *Staphylococcus aureus* te prisustvo kvasnica i plijesni. Za mikrobiološke pretrage korišteni su postupci opisani u ISO metodama kao i hranjive podloge-TBX agar, RVS, MKTT, SS-agar, DRBC agar, ALOA agar, Palcam agar, Oxford agar. Bez obzira na pasterizaciju mlijeka, u našem istraživanju, od 40 uzoraka sira, 27 ( 67,5%) uzoraka je bilo mikrobiološki ispravno, dok 13 (32,5%) uzoraka nije bilo mikrobiološki ispravno. Od 40 uzoraka sira, 24 su bila pripremljena od pasteriziranog, a 16 od nepasteriziranog mlijeka. Od 24 uzorka pripremljena od pasteriziranog mlijeka, 14 uzoraka je bilo mikrobiološki ispravno. Od 16 uzoraka pripremljenih od nepasteriziranog, 13 je bilo mikrobiološki ispravno. Od bakterija, najzastupljenije su bile: *Staphylococcus aureus*, *Escherichia coli*, a pored toga, u siru je dokazano i prisustvo kvasaca i plijesni ali u dozvoljenim koncentracijama. Nalaz na prisustvo *Listerie monocytogenes* i *Salmonelle* spp. je bio negativan. Stalna, redovita i stroga kontrola ili monitoring mikrobiološke ispravnosti mliječnih prerađevina na svim tržnicama se nameće kao imperativ u cilju podizanja kvalitete hrane i samim tim zaštite zdravlja konzumenata.

Ključne riječi: *svježi sir, mikrobiološka ispravnost, Escherichia coli, Staphylococcus aureus*

## 5-O-3

### **Bacteria representation in fresh cheese intended for public consumption**

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### **Summary**

Cheese is the largest segment of the dairy products market. It is a product that can be fermented or unfermented, derived from various dairy cultures and rennet by coagulation through enzyme or acid activities. The aim of the study was to conduct a microbiological examination in order to determine the safety of fresh cheese collected from local farmers' markets in Sarajevo Canton. In the research, 40 cheese samples were used, 10 samples from each market. When proving the microbiological validation of fresh cheese, samples were examined with the addition of the following microorganisms: *Escherichia coli*, *Salmonella* spp., *Listeria monocytogenes*, coagulase-positive staphylococci - *Staphylococcus aureus*, and the presence of yeast and molds. For microbiological tests, the processes described in ISO methods were used, as well as nutrient media. Regardless of milk pasteurization, out of 40 cheese samples that were used in our study, 27 samples (67.5%) were microbiologically correct, while 13 (32.5%) samples were microbiologically incorrect. Out of 40 cheese samples, 24 samples were prepared from pasteurized and 16 samples from unpasteurized milk. Moreover, out of those 24 samples made of pasteurized milk, 14 samples were microbiologically correct, whereas 13 out of 16 samples made of unpasteurized milk were correct. Our findings also confirm that the most common bacteria were *Staphylococcus aureus* and *Escherichia coli*, in addition to yeast and mold found in the samples, albeit in permitted concentrations. *Listeria monocytogenes* and *Salmonella* spp. were not detected in the samples.

**Keywords:** *fresh cheese, microbiological safety, Escherichia coli, Staphylococcus aureus*



## Mikrobiološko ispitivanje kurbanskog mesa

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### Sažetak

Svake godine, najveći broj trovanja hranom bilježi se za vrijeme Kurban-bajrama, a razlog je to što se klanje životinja uglavnom vrši bez higijensko-sanitarnog nadzora. Takav način klanja može biti opasan, posebno za djecu, trudnice, starije iznemogle ili bolesne osobe. U razvijenim europskim zemljama, zbog strožijih zakona, nije dozvoljeno klanje životinja ako nije obezbijeđeno adekvatno mjesto, kao i osoba koja će izvršiti samo klanje. U Bosni i Hercegovini, muslimani uglavnom organizuju klanja u svojim domaćinstvima. Naš cilj je bio izvršiti mikrobiološko ispitivanje ovčjih trupova neposredno nakon klanja kako bi se odredio nivo bakterijske kontaminacije. Istraživanje je rađeno u Visokom, Bosni i Hercegovini, a uzorci su analizirani na prisustvo šest različitih bakterija: *Salmonella spp.*, *Listeria spp.*, *E. coli*, *Enterobacteriaceae*, *Aerobic Mesophilic Bacteria* te *Staphylococcus aureus*. Korištene su ISO standard metode. Jedini mikroorganizam koji nije pronađen u 30 ispitanih uzoraka je *Salmonella spp.* Srednja i maksimalna vrijednost *Enterobacteriaceae* bila je viša od dozvoljene što znači da je potrebno poboljšanje higijenskih mjera i veterinarsko-sanitarnog nadzora prilikom klanja.

Ključne riječi: *Kurban, ovce, mikrobiološko ispitivanje, bakterije*

## Microbiological examination of sacrificial meat (Qurbani)

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### Summary

Every year, most cases of food poisoning are recorded at Eid-al-Adha and the reason is that animals are mostly slaughtered for Qurbani without prior health control and supervision. It can be dangerous and life threatening, especially for children, pregnant women or for older ill people. In the developed countries of Europe, because of stricter laws, it is not permitted to slaughter an animal if licensed Muslim slaughterman and licensed slaughterhouse are not provided. In Bosnia and Herzegovina, Muslims mostly organize private slaughters in their households. Our goal was to perform microbiological examination of sheep carcasses shortly after slaughter to determine the level of bacterial contamination. The research was done in Visoko, Bosnia and Herzegovina, and the samples were analyzed for the presence of six different bacteria: *Salmonella spp.*, *Listeria spp.*, *E. coli*, *Enterobacteriaceae*, *Aerobic mesophilic bacteria* and *Staphylococcus aureus*. The International Organization for Standardization (ISO) standard methods were used. The only microorganism that was not found in any of the 30 samples was *Salmonella spp.* The mean and max value of *Enterobacteriaceae* were higher than is allowed and that means that improvements in slaughter hygiene and review of process controls are needed.

Keywords: *Qurbani, sheep, microbiological examination, bacteria*

## Nalaz i dinamika zastupljenosti *Listeria* spp. tokom skladištenja bosanskog sudžuka

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### Sažetak

Kobasičarski proizvodi u toku proizvodnje i prerade mogu se kontaminirati sa bakterijama roda *Listeria* što utiče na trajnost i mikrobiološki status proizvoda, uzrokujući zdravstvene probleme kod potrošača. U odsustvu dobrih proizvodnih i higijenskih navika *Listeria* spp., a posebno *L. monocytogenes* može kontaminirati proizvodne pogone i proći kroz tehnološke faze proizvodnje i prerade mesa i narušiti higijensku ispravnost finalnih mesnih proizvoda. U Laboratoriju za mikrobiološka ispitivanja živežnih namirnica, stočne hrane i predmeta opće upotrebe, Veterinarskog fakulteta Univerziteta u Sarajevu, u periodu 2020/ 2021. godine, izvršena je mikrobiološka pretraga cca 100 uzoraka bosanskog sudžuka na zastupljenost *Listeria* spp. Uzorci su porijeklom iz šireg područja Bosne i Hercegovine. Mikrobiološka pretraga na zastupljenost *Listeria* spp. rađena je akreditovanom referentnom metodom BAS EN ISO 11290-1, Pravilnik o mikrobiološkim kriterijima za hranu (Službeni glasnik BiH br.11/13, 79/16 i 64/18) i Smjernice o mikrobiološkim kriterijima o hranu (Agencija za sigurnost hrane Bosne i Hercegovine-2013). Diferencijacija izoliranih *Listeria* spp. rađena je po navedenoj metodi. U ispitivanim uzorcima bosanskog sudžuka utvrđena je zastupljenost: *L. grayi* (3%) i *L. monocytogenes* (1%). Redukcija broja *Listeria* spp. u bosanskom sudžuku, tokom skladištenja, bila je obrnuto proporcionalna broju mliječno kiselinskih bakterija u ispitivanim uzorcima.

Ključne riječi: *bosanski sudžuk*, *Listeria* spp., *L. monocytogenes*

### **Findings and dynamics of *Listeria* spp. during the storage of Bosnian sausage**

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### **Summary**

Sausage products during production and processing can be contaminated with bacteria of the genus *Listeria*, which affects the durability and microbiological status of the product, causing health problems for consumers. In the absence of good production and hygiene habits, *Listeria* spp. and in particular *L. monocytogenes*, can contaminate production facilities and go through the technological stages of meat production and processing and impair the hygiene of final meat products. In the Laboratory for microbiological testing of food, animal feed and general use items, Faculty of Veterinary Medicine, University of Sarajevo, in the period 2020/ 2021, a microbiological examination of approximately 100 samples of Bosnian sausage for the presence of *Listeria* spp. The samples originate from the wider area of Bosnia and Herzegovina. Microbiological examination for the presence of *Listeria* spp. was done with the accredited reference method BAS EN ISO 11290-1, Rulebook on Microbiological Criteria for Food (Official Gazette of BiH No. 11/13, 79/16 and 64/18) and Guidelines on Microbiological Criteria on Food (Food Safety Agency of Bosnia and Herzegovina-2013). Differentiation of isolated *Listeria* spp. it was done according to the mentioned method. The presence of *L. grayi* (3%) and *L. monocytogenes* (1%) was found in the examined samples of Bosnian sausage. Reduction of the number of *Listeria* spp. in Bosnian sausage, during storage, was inversely proportional to the number of lactic acid bacteria in the tested samples.

Keywords: *Bosnian sausage*, *Listeria* spp., *L. monocytogenes*

## Mikrobiološka ispravnost svježeg kravljeg sira sa sarajevskih tržnica

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### Sažetak

Za mlijeko i mliječne proizvode može se reći da pripadaju grupi kompletnih namirnica jer sadrže glicide, lipide i proteine velikih bioloških vrijednosti, kao i široku skalu mineralnih soli i vitamina. U tom kontekstu svježi sirevi imaju vrlo važno mjesto u ishrani ljudi kako zbog visoke nutritivne vrijednosti i pogodnog uticaja na zdravlje ljudi tako i zbog tradicionalnog nasljeđa ishrane ovom namirnicom. Mikrobiološki status svježeg sira utiče na senzorne i fizikalno-hemijske karakteristike te na njegovu održivost. Zato u proizvodnji sira treba koristiti sve sisteme kontrole od “farme do stola”, a posebnu pažnju treba posvetiti implementaciji HACCAP Sistema. Uzorkovanje sireva na mikrobiološku ispravnost je obavljeno na sarajevskim tržnicama u period od 2020 do 2021. godine. Mikrobiološka analiza provedena je u skladu s odredbama važećeg Pravilnika i Smjernica<sup>2</sup> za mikrobiološke kriterije za hranu na sljedeće mikroorganizme: *Listeria monocytogenes*, *Salmonella* spp., *Escherichia coli*, *Staphylococcus aureus*, kvasce i plijesni. Rezultati su pokazali da od ukupno cca 100 analiziranih uzoraka, 8 nije zadovoljilo kriterije mikrobiološke ispravnosti. Od toga, 4 uzorka su imala povišen broj *E. coli*, 2 uzorka su sadržavala povećan broj *S. aureus* i 2 uzorka kvasce i plijesni u broju većem od dozvoljenog. Kontaminacija bakterijama *Salmonella* spp. i *L. monocytogenes* nije utvrđena ni u jednom ispitivanom uzorku. Na osnovu dobijenih rezultata može se zaključiti da monitoring mikrobiološke ispravnosti svježih sireva i drugih namirnica ukazuje na eventualne propuste u primarnoj proizvodnji i preradi odgovarajućih namirnica te da iz preventivnih razloga ova mjera treba biti implementirana kao stalni vid kontrole na mikrobiološku ispravnost hrane.

<sup>1</sup> Pravilnik o mikrobiološkim kriterijima za hranu (Službeni glasnik BiH br. 11/13, 79/16 i 64/84); <sup>2</sup> Smjernice o mikrobiološkim kriterijima o hrani (Agencija za sigurnost hrane Bosne i Hercegovine, 2013)

Ključne riječi: *mikrobiološka ispravnost, svježi sir, sigurnost konzumenata*

## Microbiological safety of fresh cow's cheese from Sarajevo markets

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### Summary

Milk and dairy products can be said to belong to the group of complete foods because they contain glycerides, lipids and proteins of great biological value, as well as a wide range of mineral salts and vitamins. Therefore, fresh cheeses have a very important place in human nutrition due to their high nutritional value and beneficial impact on human health, as well as due to the traditional heritage of eating this food. The microbiological status of fresh cheese affects the sensory and physico-chemical characteristics and its viability. Therefore, in cheese production, all control systems from "farm to table" should be used, and special attention should be paid to the implementation of the HACCP System. Sampling of cheeses for microbiological correctness was performed at Sarajevo markets in the period from 2020 to 2021. The microbiological analysis was carried out in accordance with the provisions of the current Ordinance<sup>1</sup> and Guideline<sup>2</sup> for microbiological criteria for food for the following microorganisms: *Listeria monocytogenes*, *Salmonella spp.*, *Escherichia coli*, *Staphylococcus aureus*, yeasts and molds. The results showed that out of a total of approximately 100 analyzed samples, 8 did not meet the criteria of microbiological correctness. Of these, 4 samples had an increased number of *E. coli*, 2 samples contained an increased number of *S. aureus* and 2 samples of yeast and mold in a number greater than allowed. Contamination with *Salmonella spp.* and *L. monocytogenes* was not detected in any of the tested samples. Based on the obtained results, it can be concluded that monitoring the microbiological safety of fresh cheeses and other foods indicates possible shortcomings in the primary production and processing of appropriate foods and that for preventive reasons this measure should be implemented as a permanent control of microbiological safety of food.

<sup>1</sup> Regulation on Microbiological Criteria for Food (Official Gazette of BiH No. 11/13, 79/16 and 64/84); <sup>2</sup> Guidelines on Microbiological Criteria on Food (Food Safety Agency of Bosnia and Herzegovina, 2013)

Keywords: *microbiological safety, cottage cheese, consumer safety*

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