XX kongres medicinske i laboratorijske medicine

sa međunarodnim učešćem

XX Congress of Medical Biochemistry and Laboratory Medicine

with international participation

Posterske sekcije/Poster Sessions
Apstrakti/Abstracts

UDK 577.1 : 61 **ISSN 1452-8258**

J Med Biochem 35: 202–236, 2016

Poster sessions
Posterske sekcije

P001
UTICAJ TELESNE TEŽINE TRUDNICA NA OKSIDATIVNI STATUS U TRUDNOĆI BEZ KOMPLIKACIJA

Daniela Ardalić[1], Aleksandra Stefanović[2], Jelena Kotur-Stevuljević[2], Slavica Spasić[2], Vesna Spasojević-Kalimanovska[2], Zorana Jelić-Ivanović[2], Vesna Mandić-Marković[1], Željko Miković[1], Nikola Cerović[1]

[1]Ginekološko akušerska klinika »Narodni Front«, Beograd, Srbija
[2]Institut za medicinsku biohemiju, Univerzitet u Beogradu, Beograd, Farmaceutski Fakultet, Srbija

Težina trudnice predstavlja značajan aspekt očuvanja oksidativnog balansa tokom trudnoće, a prekomerna težina doprinosi povećanju oksidativnog stresa i komplikacija u trudnoći i povećava rizik razvoja kardiovaskularnog oboljenja u kasnijem životu. Našim istraživanjem ispitan je uticaj dobijanja u težini tokom trudnoće na oksidativni status trudnica. Istraživanje je sprovedeno na grupi od 43 zdrave trudnice, kod kojih su trudnoća i porođaj prošli bez komplikacija, i to u prvom, drugom i trećem trimestru. Kontrolnu grupu činile su 42 zdrave negravidne žene uparene po godinama. Ispitane su promene parametara oksidativnog stresa: lipidni hidroperoksidi (LOOH), produkti oksidacije proteina (AOPP), tiobarbiturna kiselina reagujuće supstance (TBARS), prooksidativni-antioksidativni balans (PAB). Od parametara antioksidativne zaštite određeni su: superoksid dismutaza (SOD), sulfhidrilne grupe (SH) i paraoksonaza (PON1). Rezultati istraživanja pokazali su da postoji značajna pozitivna korelacija između procenta dobijanja u telesnoj težini tokom trudnoće i vrednosti PAB, AOPP i TBARS ($p<0,05$), kao i značajna pozitivna korelacija procenta dobijene telesne težine sa SOD, ali i značajna negativna korelacija sa aktivnošću PON1 u poređenju sa kontrolnom grupom. Takođe, među samim trudnicama, rizičniji oksidativni status pokazale su trudnice koje su imale veći procenat dobijanja u težini, što ukazuje da je telesna težina faktor rizika za razvoj komplikacija u trudnoći, pre svega preeklampsije i gestacijskog dijabetesa, te da tokom trudnoće dobijanje u težini treba da bude u okviru optimalnih preporučenih granica.

P001
THE INFLUENCE OF WEIGHT GAIN IN PREGNANT WOMEN ON OXIDATIVE STATUS IN PREGNANCY WITHOUT COMPLICATIONS

Daniela Ardalić[1], Aleksandra Stefanović[2], Jelena Kotur-Stevuljević[2], Slavica Spasić[2], Vesna Spasojević-Kalimanovska[2], Zorana Jelić-Ivanović[2], Vesna Mandić-Marković[1], Željko Miković[1], Nikola Cerović[1]

[1]Clinic of Gynecology and Obstetrics Narodni Front, Belgrade, Serbia
[2]Department of Medical Biochemistry, University of Belgrade, Belgrade, Faculty of Pharmacy, Serbia

The weight of pregnant women is an important aspect of oxidative balance preservation, whereas overweightness contributes to the increase in oxidative stress and complications during pregnancy and increases the risk of developing cardiovascular diseases later in life. Our research has been conducted on a group of 43 healthy pregnant women that went through pregnancy and labour without any complications and 42 healthy non-pregnant women paired according to their age as the control group. We monitored the changes in parameters of oxidative stress and antioxidative protection during pregnancy in 1st, 2nd and 3rd trimester. The parameters of oxidative stress that have been determined are the concentration of thiobarbituric acid reactive substance (TBARS), advanced oxidation protein products (AOPP), lipid peroxides (LOOH) and prooxidative/antioxidative balance (PAB). The antioxidative protection parameters that have been measured are the activity of enzyme superoxide dismutase (SOD), paraoxonase (PON1) and the concentration of sulfhydryl groups (SH). Weight gain during pregnancy leads to a significant increase in parameters of oxidative stress (TBARS, AOPP and PAB), antioxidative protection (SOD), and a significant decrease in PON1 enzyme value compared to the control group, and compared to pregnant women with lower weight in gain. Overweightness during pregnancy could be a risk factor for pregnancy complications such as preeclampsia and gestational diabetes, and weight gain during pregnancy should be kept within the optimal recommended limits.

P002
LIPOPROTEINI VELIKE GUSTINE I DRUGI ANTIOKSIDATIVNI PARAMETRI KOD SUBFERTILNIH ŽENA: PILOT STUDIJA

Bosa Mirjanić-Azarić[1], Darja Stojanović[2], Sanja Avram[1], Tanja Stojaković-Jelisavac[1]

[1]Univerzitetski klinički centar Republike Srpske, Banja Luka, Republika Srpska, BiH
[2]Dom zdravlja Laktaši, Laktaši, Republika Srpska, BiH

Neplodnost je značajan javno-zdravstveni problem i uloga antioksidativnih biokemijskih markera u ženskoj plodnosti je područje za istraživanje. Lipoproteini velike gustine (HDL) imaju mnoge biološke osobine: antioksidativne, antiapoptotičke, antiinflamatorne kao i kapacitet da izvlače holesterol iz ćelija. Cilj našeg istraživanja je da oceni antioksidativne parametre kod subfertilnih žena, jer u in vitro studijama i studijama na životinjama oksidativni stres je bio povezan sa smanjenjem fertiliteta. Takođe, analizirali smo i tireoidni stimulirajući hormon (TSH) i alfa-1 antitripsin, jer su oni vrlo važni za fertilitet žene. Uzeti su uzorci krvi od pacijenata na odgovarajući način i u serumu su izmerene vrijednosti za HDL-holesterol, apolipoprotein A-1, ukupni bilirubin, albumin, mokraćnu kiselinu (AU), TSH i alfa-1 antitripsin reagensima Roche Diagnostics (Roche Diagnostics, Mannheim, Njemačka). U pilot studiju su bile uključene 73 žene, njih 45 – subfertilne žene starosti 33,99±6,32 godina i 28, iste starosne dobi, zdrave žene. Vrijednosti antioksidativnih parametara subfertilnih žena naspram zdravih žena bile su: HDL-C (mmol/L), srednja vrijednost 1,46 vs. 1,72 (p=0,008); apolipoprotein A-1 (g/L), srednja vrijednost 1,51 vs. 1,65 (p=0,025); ukupni bilirubin (μmol/L), srednja vrijednost 6,89 vs. 5,82 (p=0,079); mokraćna kiseline (μmol/L), srednja vrijednost 246,84 vs. 219,63 (p=0,074); alfa-1 antitripsin (g/L) srednja vrijednost 1,34 vs. 1,56 (p=0,403); albumin (g/L), medijana 45,40 vs. 46,00 (p=0,365) i TSH (mIU/L), medijana 2,36 vs. 1,50 (p=0,001). HDL-holesterol je bio u korelaciji sa apolipoproteinom A-1 (r=0,868; p <0,001) i alfa-1-antitripsinom (r=0,391; p <0,009), a alfa-1 antitripsin, takođe, u korelaciji s apolipoproteina A-1 (r=0,508; p <0,001). Postojala je i korelacija između serumskih vrednosti TSH i AU (r=0,511; p <0,001). Naši rezultati ukazuju na mogući značaj HDL za fertilitet žena. Takođe, naša pilot studija zahtijeva daljnja istraživanja na većem broju žena.

P002
HIGH-DENSITY LIPOPROTEINS AND OTHER ANTIOXIDATIVE PARAMETERS IN SUBFERTILE WOMEN: A PILOT STUDY

Bosa Mirjanić-Azarić[1], Darja Stojanović[2], Sanja Avram[1], Tanja Stojaković-Jelisavac[1]

[1]University Clinical Centre of the Republic of Srpska, Banja Luka, Republic of Srpska, B&H
[2]The Health Center Laktasi, Laktasi, Republic of Srpska, B&H

Infertility is a significant public health problem and role of antioxidative biochemical markers in female fertility and it is an area for investigation. High-density lipoproteins (HDL) have many biological properties: antioxidative, anti-apoptotic, anti-inflammatory and they have the efflux capacity of cellular cholesterol. The aim of our study is to evaluate the antioxidative parameters in subfertile women because oxidative stress is associated with decreased female fertility in animal and in vitro models. Likewise, we investigated thyroid stimulating hormone (TSH) end alpha-1 antitrypsin because they are very important for fertility of women. Blood samples were taken from patients in appropriate way and levels in serum HDL-cholesterol, apolipoprotein A-1, total bilirubin, albumin, uric acid (AU), TSH end alpha-1 antitrypsin were determined by reagents from Roche Diagnostics (Roche Diagnostics, Mannheim, Germany). A total of 73 participants were enrolled in this pilot study, 45 subjects were subfertile women aged 33.99±6.32 years and 28 were age-matched healthy subjects. Serum levels antioxidative parameters of subfertile women vs. healthy women were: HDL-C (mmol/L), mean 1.46 vs. mean 1.72 (p= 0.008); apolipoprotein A-1 (g/L), mean 1.51 vs. mean 1.65 (p=0.025); total bilirubin (μmol/L), mean 6.89 vs. mean 5.82 (p=0.079); uric acid (μmol/L), mean 246.84 vs. mean 219.63 (p=0.074); alpha-1 antitrypsin (g/L) mean 1.34 vs. mean 1.56 (p=0.403); albumin (g/L), median 45.40 vs. median 46.00 (p=0.365) and TSH (mIU/L), median 2.36 vs. median 1.50 (p=0.001). The serum levels of HDL-C correlated with the apolipoprotein A-1 (r=0.868; p <0.001) and the alpha-1 antitrypsin (r=0.391; p <0.009), likewise, the alpha-1 antitrypsin correlated with apolipoprotein A-1 (r =0.508; p <0.001). There was correlated between the serum levels of TSH and AU (r=0.511; p <0.001). Our findings significantly strengthen importance of HDL in female fertility. Likewise, our pilot study requires further studies with a larger population.

P003
SKRINING SNIŽENE JAČINE GLOMERULSKE FILTRACIJE I PATOLOŠKOG ODNOSA ALBUMIN/ KREATININ U URINU KOD ADULTNE POPULACIJE U VOJVODINI

Velibor Čabarkapa, Mirjana Đerić, Branislava Ilinčić, Aleksandra Trifu, Maša Todorović, Mirko Šipovac

Klinički centar Vojvodine, Medicinski fakultet, Novi Sad, Institut za javno zdravlje, Novi Sad, Srbija

Procenjena jačina glomerulske filtracije (eJGF) i odnos albumin/kreatinin (A/C) u prvom jutarnjem urinu su testovi koji se mogu upotrebiti za identifikaciju osoba sa nedijagnostikovanom hroničnom bolesti bubrega (HBB). Cilj studije je skrining snižene eJGF (eJGF <60 mL/min/1,73 m^2), kao i patološkog odnosa A/C (PA/C>3 mg/mmol) u Vojvodini kod odrasle populacije. U studiju je uključeno 3151 muških i 429 ženskih odraslih ispitanika koji su bili na sistematskom pregledu u Institutu za javno zdravlje u Novom Sadu od januara do jula 2015. Svim ispitanicima je izvršen standardni pregled prvog jutarnjeg urina, kao i određivanje nivoa kreatinina, uree, mokraćne kiseline i glukoze u serumu. Odnos A/C je izračunat kod svih ispitanika sa prisutnim faktorima rizika za HBB i kod 1106 ispitanika bez prisutnih faktora rizika za HBB. eJGF je računata upotrebom CKD-EPI formule. eJGF <60 mL/min/1,73 m^2 je prisutna u 1,6%, dok je eJGF od 60–89 mL/min/ 1,73 m^2 prisutna u 43% ispitanika. Patološki A/C (>3 mg/mmol) prisutan je u 8,27% ispitanika (7,37% muškaraca i 0,9% žena) pri čemu je 85,6% ovih ispitanika imalo A/C od 3–30 mg/mmol. Kod ispitanika bez faktora rizika za HBB, sa normoglikemijom i urednim nalazom prvog jutarnjeg urina, kao i A/C <3 mg/mmol, A/C je bio značajno niži (p<0,01) kod muškaraca (0,49±0,41 (mediana 0,36) mg/mmol)) nego kod žena (0,61±0,51 (mediana 0,44) mg/mmol). Većina ispitanika (~75%) sa eJGF<60 mL/min/1,73 m^2 i/ili PA/C i/ili patološkim prvim jutarnjim urinom već ima postavljenu dijagnozu arterijske hipertenzije (HTA) i/ili dijabetes melitusa (DM). Može se zaključiti da je eJGF<60 mL/min/1,73 m^2 prisutna kod 1,6% odrasle populacije Vojvodine, dok je PA/C prisutan kod 8,27% odrasle populacije. Većina ispitanika sa eJGF<60 mL/min/1,73 m^2 i/ili PA/C boluje od HTA i/ili DM.

P003
SCREENING FOR DECREASED GLOMERULAR FILTRATION RATE AND PATHOLOGICAL URINARY ALBUMIN/CREATININE RATIO IN THE ADULT POPULATION OF VOJVODINA

Velibor Čabarkapa, Mirjana Đerić, Branislava Ilinčić, Aleksandra Trifu, Maša Todorović, Mirko Šipovac

Clinical Center of Vojvodina, Medical Faculty, Novi Sad, Institute of Occupational Health, Novi Sad, Serbia

Estimated glomerular filtration rate (eGFR) and albumin/creatinine ratio (A/C) in the first-void morning urine sample may be used as a tools for detect individuals with undiagnosed chronic kidney disease (CKD). The aim of the study was to screen for decreased eGFR values (eGFR <60 mL/min/1.73 m^2) and pathological A/C (PA/C>3 mg/mmol) in the adult population of the Vojvodina. The study included 3151 male and 429 female adult subjects who performed physical examinations in the Institute of Occupational Health in Novi Sad from January to July 2015. All the subjects underwent standard examination of first morning urine sample, as creatinine, blood urea nitrogen, uric acid and glucose serum levels. A/C ratio was determined in participants with risk factors for CKD, as well as in subjects without risk factors. eGFR was calculated using CKD-EPI formula. eGFR <60 mL/min/1.73 m^2 was present in 1.6%. Pathological A/C was present in 8.27% subjects (7.37% male and 0.9% female) and 85.6% of these subjects had A/C between 3–30 mg/mmol. In subjects without risk factors for CKD (n=1106), normoglycemia, normal first urine examination and A/C <3 mg/mmol, mean A/C were significantly lower (p<0.01) in men (0.49±0.41 (mediana 0.36) mg/mmol)) than in women (0.61±0.51 (mediana 0.44) mg/mmol). The most of subjects (~75%) with eGFR<60 mL/min/1.73 m^2 and/or PA/C and/or pathological result of first morning urine test have already had arterial hypertension (HTA) and/or diabetes (DM). In conclusion eGFR<60 mL/min/1.73 m^2 is present in 1.6% and PA/C in 8.27% in the adult population of Vojvodina. The most subjects with eGFR<60 mL/min/1.73 m^2 and/or PA/C have HTA and/or DM.

P004
KORELACIJA IZMEĐU SERUMSKOG NIVOA ANTI-MILEROVOG HORMONA I ODNOSA BAZALNOG FOLIKULO-STIMULIRAJUĆEG I LUTEINIZIRAJUĆEG HORMONA KOD SUBFERTILNIH ŽENA

Sanja Avram[1], Bosa Mirjanić-Azarić[1], Darja Stojanović[2], Tanja Stojakovic-Jelisavać[1]

[1]Univerzitetski klinički centar Republike Srpske, Banja Luka, Republika Srpska, BiH
[2]Dom zdravlja Laktaši, Laktaši, Republika Srpska, BiH

Anti-Milerov hormon (AMH) je pouzdan biohemijski marker za reproduktivni potencijal jajnika i on se koristi kao jedan od markera kod subfertilnih žena. Cilj ove studije je da proceni korelaciju između nivoa serumskog AMH i odnosa folikulo-stimulirajući (FSH): luteinizirajući hormon (LH) kod subfertilnih žena. Bazalni nivoi AMH, FSH i LH izmereni su kod 44 subfertilne žene 3. dana ciklusa, elektrohemijskim luminescentnim imuno određivanjem (ECLIA, Roche Diagnostics, Mannheim, Njemačka). Numerički podaci su izraženi kao medijana i interkvartilni opseg (IQR). Spirmanov koeficijent korelacije primenjen je za procenu odnosa između varijabli. Medijane serumskog nivoa AMH, FSH i LH bile su 2,13 ng/mL (0,55–4,05), 7,0 (4,7–8,88) mIU/ml and 6,55 (4,1–9,0) mIU/mL. Medijana odnosa FSH:LH bila je 1,25 (0,87–1,67) i medijana godina starosti bila je 35 (29,5–40,0). Nivo serumskog AMH je bio u negativnoj korelaciji sa godinama starosti (r=-0,569, p <0,001). Nivo AMH je pokazao negativnu korelaciju sa odnosom FSH: LH (r=0,459; p=0,002) i FSH (r=-0,396; p=0,008), ali ne i sa LH (p=0,292). Naši rezultati su značajna podrška za opravdanost kliničke upotrebe AMH kao specifičnog markera za predviđanje reproduktivnog potencijala jajnika kod žena. S druge strane, izgleda da bi AMH u kliničkoj praksi mogao biti ispred uobičajenih hormonskih markera za praćenje potencijala jajnika, jer nivo AMH u serumu ne zavisi od dana menstrualnog ciklusa.

P004
CORRELATION BETWEEN THE SERUM LEVEL ANTI-MÜLLERIAN HORMONE AND BASAL FOLLICLE-STIMULATING HORMONE: LUTEINIZING HORMONE RATIO IN SUBFERTILE WOMEN

Sanja Avram[1], Bosa Mirjanić-Azarić[1], Darja Stojanović[2], Tanja Stojakovic-Jelisavać[1]

[1]University Clinical Centre of the Republic of Srpska, Banja Luka, Republic of Srpska, B&H
[2]Health Centre Laktasi, Laktasi, Republic of Srpska, B&H

Anti-Müllerian hormone (AMH) has been acknowledged as a biochemistry marker of ovarian function and has commonly evaluated in women seeking pregnancy. The aim of this study is to evaluate the correlation between serum AMH levels and follicle-stimulating hormone (FSH):luteinizing hormone (LH) ratio in subfertile women. On cycle day 3, basal levels of AMH, FSH and LH were measured in 44 subfertile women by electrochemiluminescence immunoassay (ECLIA, Roche Diagnostics, Mannheim, Germany). Numerical data were expressed as the median and interquartile range (IQR). The relations between the variables were determined using the Spearman rank-order correlation test. Median serum levels of AMH, FSH and LH were 2.13 ng/mL (0.55–4.05), 7.0 (4.7–8.88) mIU/mL and 6.55 (4.1–9.0) mIU/mL. Median of FSH:LH ratio was 1.25 (0.87–1.67) and median age of women was 35 (29.5–40.0). The serum AMH level was inversely correlated with age (r=-0.569, p<0.001). The serum AMH levels were correlated with FSH:LH ratio (r=-0.459; p=0.002) and FSH (r=-0.396; p=0.008), but no with LH (p=0.292). Our results significantly strengthen the clinical evidence in support of AMH as an age-specific marker for predicting the ovarian reserve in women. On the other hand, in clinical practice AMH seems that it could be in front of conventional hormone markers because level of serum AMH does not depend on the day of the menstrual cycle.

P005
TERAPIJSKO PRAĆENJE KONCENTRACIJE INFLIKSIMABA: VAŽNOST UZORKOVANJA U STANJU RAVNOTEŽE

N. Nikolac[1], A. Pocrnja[1], N. Vrkić[1], L. Jukić Virović[2], V. Tomašić[2], F. Grubišić[3], S. Grazio[3]

[1]Klinički zavod za kemiju
[2]Zavod za gastroenterologiju i hepatologiju, Klinika za unutarnje bolesti
[3]Klinika za reumatologiju, fizikalnu medicinu i rehabilitaciju; Klinički bolnički centar Sestre milosrdnice, Zagreb, Hrvatska

Infliximab je protuupalni lijek koji inhibira nastanak čimbenika nekroze tumora alfa (engl. tumor necrosis factor). Primjenjuje se kod bolesnika s kroničnim upalnim bolestima crijeva, kože i reumatskim bolestima. Ciljane terapijske koncentracije lijeka iznose 3–7 μg/mL. Stabilna koncentracija se postiže 14 tjedna od započinjanja terapije. Koncentracije lijeka prije postizanja stanja ravnoteže su promjenjive i ne odražavaju pravu razinu infliximaba u krvi. Cilj ovog pilot-istraživanja je utvrditi koncentracije infliximaba kod bolesnika s kroničnim upalnim bolestima u ovisnosti o vremenu od započinjanja terapije. U razdoblju od listopada 2015 do siječnja 2016, 23 bolesnika su uključena u ovo prospektivno istraživanje. Prikupljeni su podaci o dijagnozi, dozi lijeka i vremenu započinjanja terapije. Krv je uzorkovana neposredno prije iduće doze u serumsku epruvetu s aktivatorom zgrušavanja (Vacuette, Grainer Bio-One, Kremsmünster, Austrija). Koncentracija infliximaba u serumu mjerena je ELISA testom (RIDASCREEN® IFX Monitoring, R-Biopharm AG, Darmstadt, Njemačka). Statistička obrada napravljena je u programu Medcalc (v11.5.1.0, Ostend, Belgija). Za 23 bolesnika zaprimljena su 42 uzorka seruma (za 19 bolesnika uzorkovanje je načinjeno prije dviju uzastopnih doza). Srednja koncentracija infliximaba iznosila je 4,6 (1,1–12,2) μg/mL. Nije pronađena korelacija između doze i koncentracije lijeka (r=-0,14; p=0,40), dok je pronađena negativna korelacija između koncentracije lijeka i tjedna od započinjanja terapije (r=-0,57; p<0,001). Kod bolesnika u inicijalnoj fazi liječenja (0–14 tjedan) koncentracija infliximaba bila je statistički značajno viša (14,2 (6,5–20,1) μg/mL) nego kod bolesnika kod kojih je postignuto stanje ravnoteže (nakon 14. tjedna) (2,47 (0,9–6,9) μg/mL; p<0,001). Za pravilnu interpretaciju rezultata terapijskog praćenja koncentracije infliximaba, neophodno je načiniti mjerenje nakon 14. tjedna kada su postignute stabilne koncentracije lijeka u krvi. Prerano uzorkovanje može dovesti do lažno pozitivnog nalaza i pogrešne interpretacije. Kako bi se olakšala interpretacija rezultata, laboratorijskom osoblju mora biti dostupan podatak o vremenu od započinjanja terapije.

P005
INFLIXIMAB THERAPEUTIC DRUG MONITORING: IMPORTANCE OF STEADY-STATE MEASUREMENT

N. Nikolac[1], A. Pocrnja[1], N. Vrkić[1], L. Jukić Virović[2], V. Tomašić[2], F. Grubišić[3], S. Grazio[3]

[1]University Department of Chemistry
[2]Department for Gastroenterology and Hepatology, Internal Diseases Clinic
[3]University Department of Rheumatology, Physical and Rehabilitation Medicine; Sestre Milosrdnice Clinical Hospital Centre, School of Medicine, Zagreb, Croatia

Infliximab is an anti-inflammatory TNF (tumor necrosis factor) inhibitor used for therapy of chronic inflammatory bowel disease, inflammatory skin disease and rheumatoid diseases. Target therapeutic concentrations range from 3 to 7 μg/mL. Steady-state concentration is reached 14 weeks after therapy initiation. Prior to that time, concentrations may vary and do not reflect accurate blood levels. The aim of this pilot-study is to determine infliximab concentration in patients with chronic inflammatory diseases according to the time since introduction of therapy. Form October 2015 till January 2016, 23 patients are included in this prospective research. Anamnesis data on diagnosis, dosage and time since the initiation of therapy are collected. In order to obtain trough concentrations, prior to the next dose blood is sampled in serum tube with clot activator (Vacuette, Grainer Bio-One, Kremsmünster, Austria). Infliximab concentration is measured using ELISA kit (RIDASCREEN® IFX Monitoring, R-Biopharm AG, Darmstadt, Germany). Statistical analysis is done using Medcalc software (v11.5.1.0, Ostend, Belgium). For 23 patients, 42 serum samples are obtained (for 19 patients sampling was done prior to two consecutive doses). Median infliximab concentration was 4.6 (1.1–12.2) μg/mL. There was no correlation between the drug concentration and dose (r=-0.14; p=0.40), while negative correlation between the drug concentration and week since initiation of therapy was observed (r=-0.57; p<0.001). Patients in the initial therapy phase (less than 14 weeks) had statistically higher infliximab concentration (14.2 (6.5–20.1) μg/mL) than patients in the steady-state (after 14 weeks) (2.47 (0.9–6.9) μg/mL; p<0.001). For the correct interpretation of therapeutic monitoring of infliximab, measurement should be done when steady state concentrations are obtained (after 14 weeks). Sampling prior to this time can result with falsely elevated concentration and incorrect therapeutic protocol. In order to facilitate interpretation of results, data on time since therapy introduction should be available to the laboratory staff.

P006
KRITIČNE VREDNOSTI LABORATORIJSKIH REZULTATA KAO POKAZATELJ KVALITETA RADA U LABORATORIJI BISTRICA DOMA ZDRAVLJA »NOVI SAD«

Biljana Vukelić, Vidosava Petrović, Ksenija Škorić, Dejana Prekajac, Irena Franković

Dom Zdravlja »Novi Sad«, Novi Sad, Srbija

Kritične vrednosti laboratorijskih nalaza predstavljaju laboratorijski rezultat koji je pokazatelj kritičnog, po život opasnog stanja pacijenta. Blagovremenim obaveštavanjem lekara, koji preduzima odgovarajuće terapijske mere sprečava se mogući letalni ishod. Evidentiranje i obaveštavanje o kritičnim vrednostima je jedan od pokazatelja kvaliteta rada u biohemijskim laboratorijama. Cilj ovog rada je bio da se utvrdi učestalost pojedinačnih kritičnih vrednosti u populaciji pacijenata, koje su određene, evidentirane i hitno javljene ordinirajućem lekaru, kako bi se pacijentu na vreme pružila neophodna medicinska pomoć. Ova retrospektivna studija je rađena u laboratoriji Bistrica od 01. 03. 2014. do 31. 12. 2015. godine. Svakodnevno smo evidentirali broj pacijenata, broj analiza i kritične vrednosti za određene biohemijske parametre poštujući »Proceduru za hitno izveštavanje o kritičnim vrednostima«. Procedura se koristi u Službi laboratorijske dijagnostike Doma zdravlja »Novi Sad« od akreditovanja ove ustanove 2012. godine. Praćene su kritične vrednosti za parameter krvne slike (hematokrit, hemoglobin, trombociti i leukociti), ukupni bilirubin, kreatinin, glukoza, mokraćna kiselina, urea, laktat dehidrogenaza, elektroliti (Na, K, Cl i Ca), a od parametara hemostaze fibrinogen i protrombinsko vreme. Tokom prikupljanja podataka u laboratoriju je primljeno 107 490 pacijenata, kojima je urađeno 912 794 analiza. Ukupan broj kritičnih vrednosti je bio 122, što čini 0,11% od ukupnog broja urađenih analiza. Od ukupnog broja evidentiranih kritičnih vrednosti najveću učestalost su imali parametri krvne slike: hematokrit 22,1%, hemoglobin 17,2%, leukociti 15,1% i trombociti 12,2%, a zatim glukoza 11,5%, pa kalijum 7,3%, kreatinin 5,7% i urea 4,9%. Ukupni bilirubin, laktat dehidrogenaza, mokraćna kiselina, protrombinsko vreme i fibrinogen su bili zastupljeni sa po 0,8%. U navedenom period evidentirano je 112 pacijenta sa kritičnim vrednostima, a evidentiranje i obaveštavanje o kritičnim vrednostima je samo jedan od pokazatelja kvaliteta rada čije praćenje propisuju važeće procedure u našoj laboratoriji. Poštujući proceduru o hitnom izveštavanju o kritičnim vrednostima ostvarena je i dobra saradnja sa ostalim službama doma zdravlja, a u cilju što bržeg zbrinjavanja ugroženog pacijenta.

P006
CRITICAL VALUE OF LABORATORY RESULTS AS AN INDICATOR OF THE QUALITY OF WORK IN THE LABORATORY BISTRICA IN PUBLIC HEALTH SERVICE »NOVI SAD«

Biljana Vukelić, Vidosava Petrović, Ksenija Škorić, Dejana Prekajac, Irena Franković

Public Health Service »Novi Sad«, Novi Sad, Serbia

Critical values of laboratory results is defined as a value which represents a pathophysiological state at such variance with normal expect values as to be life threatening unless something is done promptly and for which some corrective action could be taken. Timely notification to the physician who shall take appropriate therapeutic measures to prevent possible lethal outcome. Recording and notification of critical values is one of the indicators of quality of work in biochemical laboratories. The aim of this work was to determine the frequency of individual critical values in a population of patients that have been recorded and reported to the chosen doctor immediately in order to provide the patient necessary medical help on time. This retrospective study was done in the laboratory Bistrica from 1st of March 2014 until 31st of December 2015. Every day we recorded the number of patients, the number of analysis and critical values for certain biochemical parameters. Laboratory personal respect »Procedure for urgent notification of critical values«. The Procedure is being used in the laboratory Bistrica since the accreditation of this institution in year 2012. Critical values for parameters of blood count (Haematocrit, Haemoglobin, Platelets and White blood cell count), Total Bilirubin, Creatinine, Glucose, Uric Acid, Urea, Lactate Dehydrogenase, electrolytes (Sodium, Potassium, Calcium and Chlorides) and parameters of haemostasis (Fibrinogen, Prothrombin time) were being monitored. During data collection 107490 patients were admitted in the laboratory and 912794 analysis have been done. The total number of critical values were 122 which makes 0.11% of the total number of performed analysis. Of the total number of recorded critical values the highest incidence had the blood count parameters: Haematocrit 22.1%, Haemoglobin 17.2%, White blood cell count 15.1% and Platelet count 12.2% then Glucose 11.5%, Potassium 7.3%, Creatinine 5.7% and Urea 4.9%. Total Bilirubine, Lactat Dehydrogenase, Uric Acid, Prothrombin time and Fibrinogen were represented with 0.8% each. In the mentioned period 112 patients with critical values were recorded. Recording and notification of critical values is only one of the indicators of quality of work in our laboratory. By respecting the procedure for urgent notification of the critical values we have achieved good cooperation with other services at our health centre.

P007
ZNAČAJ ORALNOG TESTA OPTEREĆENJA GLUKOZOM KOD STARIJIH OSOBA

Milosava Đelkapić

Služba za laboratorijsku dijagnostiku, Zdravstveni centar Užice, Užice, Srbija

Porast godina života je praćen progresivnim rastom glikemije i čestom pojavom dijabetesa. Posle 65 godine života dijabetes je prisutan kod oko 20% populacije. Prema preporukama SZO, oralni test opterećenja glukozom (OGTT) je potrebno primeniiti kada je glikemija našte između 6,1 i 6,9 mmol/L, radi određivanja stanja glukozne tolerancije. Dijagnostički kriterijumi SZO stanje glikoregulacije klasifikuju kao normalno, oštećenjo po tipu intolerancije glukoze (IGT) ili kao dijabetes (DM). Cilj rada je bio da se OGTT otkriju pacijenti starije populacije koji imaju povećan rizik za pojavu DM. Istraživanjem je obuhvaćeno 123 pacijenta koji su upućeni za izvođenje OGTT, ali je kod njih 17 glikemija našte bila ≥ 7 mmol/L pa su isključeni iz daljeg testiranja. OGTT je podvrgnuto ukupno 106 osoba, 52 muškarca i 54 žene. Njih 65 (36 žena i 29 muškaraca) je svrstano u I grupu (≤ 65. godina), a 41 ispitanik (18 žena i 23 muškarca) u II (≥ 66. godina). Određivana je glikemija našte i glikemija u 120 minutu posle opterećenja sa 75 g glukoze, heksokinaza metodom, na biohemijskom analizatoru Dimension RxLMax, reagensima firme Siemens. Dobijeni podaci su statistički obrađeni preko Pirsonovog testa. Utvrđen je DM kod 6 (9.23%) ispitanika I grupe i kod 3 (5,88%) ispitanika II grupe, a IGT je utvrđena kod 12 (18,46%) ispitanika I grupe i 15 (29,41%) ispitanika II grupe. U grupi I je utvrđen DM kod 4 (11,11%) žene i 2 muškarca (6,89%), a IGT je utvrđena kod 3 (8,33%) žene i 9(31.04%) muškaraca. U II grupi je kod 2 (11,11%) žene i 1(4,34%) muškarca utvrđen DM, a IGT je utvrđena kod 7(38,88%) žena i kod 8 (34,78%) muškaraca. Kod II grupe ispitanika je češća IGT, nego kod I grupe ($p<0,05$), češća je kod žena II grupe ($p<0,01$) u odnosu na I grupu. Zaključeno je da OGTT otkrivamo oko trećine ispitanika starije populacije koji imaju povećan rizik za pojavu DM.

P007
THE IMPORTANCE OF ORAL GLUCOSE TOLERANCE TEST IN THE ELDERLY

Milosava Djelkapić

Department of Laboratory Diagnostics, Health Center Užice, Užice, Serbia

The increase in age is accompanied by a progressive increase in blood glucose and the frequent presence of diabetes. After 65 years of life diabetes is present in approximately 20% of the population. According to WHO recommendations, oral glucose tolerance test (OGTT) should be applied when the fasting glucose between 6.1 and 6.9 mmol and L to determine the state of glucose tolerance. WHO diagnostic criteria state glycoregulation classified as normal, damaged by type of impaired glucose tolerance (IGT) and diabetes mellitus (DM). The aim of this study was to detect older population patients, who are at increased risk for DM, using the OGTT test. The study included 123 patients who were referred to perform OGTT, but 17 patients had fasting glycaemia ≥ 7 mmol / L, so they are excluded from further testing. OGTT tested 106 people, 52 men and 54 women, and 65 of them (36 women and 29 men) were classified as group I (65 years), and 41 subjects (18 women and 23 men) as group II (≥ 66. years). Research determined fasting glucose and glucose in 120 minute after the load with 75 g of glucose, by hexokinase method using the biochemical analyzer Dimension RXL Max, with reagents of the firm Siemens. Data were statistically analyzed through Pearson's test. DM was found in 6 (23.9%) subjects in group I and in 3 (5.88%) patients in group II and IGT was found in 12 (18.46%) subjects in group I and 15 (29.41%) in group II. In the group I DM was found in 4 (11.11%) women and 2 men (6.89%), and IGT was found in 3 (8.33%) women and 9 (31.04%) men. In the second group DM was found in 2 (11.11%) women and 1 (4.34%) man and IGT was found in 7 (38.88%) women and in 8 (34.78%) men. In the second group of patients IGT is more frequent than in group I ($p<0.05$). Also, it is more common with women in group II ($p<0.01$) compared to group I. It was concluded that by using OGTT one third of the tested older population, who are at greater risk of DM, can be found.

P008
PRAĆENJE PRE-ANALITIČKIH GREŠAKA U BOLNIČKOJ LABORATORIJI

A. Marinković, M. Stanojković, L. Zvezdanović, V. Ćosić

Centar za medicinskubiohemiju, Klinički centar Niš, Niš, Srbija

Procenjeno je da pre i post-analitičke greške čine 93% odsvihgrešaka u laboratorijskom radu. Greške u bilo kojoj fazi procesa prikupljanja, testiranja i interpretiranja rezultata mogu da dovedu do ozbiljne greške u postavljanju dijagnoze pacijenta. Greške tokom procesa prikupljanja nisu neizbežne, ali mogu se sprečiti primenom kontrole kvaliteta, kontinuiranog obrazovanja i efikasnosti sistema za prikupljanje podataka. U ovom radu vršena je perspektivna analiza dobijenih rezultata iz Centra za medicinsku biohemiju, Kliničkog centra u Nišu, Srbija o greškama u preanalitičkoj fazi i izvršeno je sumiranje i obrada dobijenih podataka. Osoblje u laboratoriji je evidentiralo greške i sam prijem uzoraka koji su prihvaćani ili odbijani za dalju laboratorijsku analizu. Od 48328 pristiglih epruveta u laboratoriju za skrining u periodu od 8 meseci, pre analitičke greške su primećene kod oko 4,9% od ukupnog broja primljenih uzoraka. Zatim su izračunati procenti različitih tipova pre-analitičkih grešaka. Većina odbijenih uzoraka pristiglih na analizu u laboratoriju je usledila usled postojanja hemolize uzoraka, što čini 1,1% od ukupnog broja uzoraka pristiglih tokom ovog perioda. Količina krvi koje nije bilo dovoljno za potpunu analizu je činila 0,08% svih evidentiranih grešaka. Ukupno 0,4% od svih primljenih uzoraka sa odeljenja donošeno je u laboratoriju u pogrešnoj epruveti. Ljudska uloga u sakupljanju uzoraka krvi i drugih telesnih tečnosti može imati za cilj potpunu eliminaciju grešaka u vezi sa laboratorijskim ispitivanjima. Dobra praksa i usklađenost sa novim strategijama za sprečavanje grešaka može dovesti do značajnog smanjenja pre-analitičkih grešaka. Praksa vođenja evidencije o greškama u svim fazama analize i korektivne strategije za njihovu prevenciju može postepeno sprečiti laboratorije od postojanja takvih grešaka a samim tim i unaprediti kvalitet rada u biomedicinskim laboratorijama.

P008
IDENTIFICATION OF PRE-ANALYTICAL ERRORS IN THE HOSPITAL LABORATORY

A. Marinković, M. Stanojković, L. Zvezdanović, V. Ćosić

Center for Medical biochemistry, Clinical Center of Nis, Nis, Serbia

Pre- and post-analytical errors are estimated to constitute 93% of errors in the biomedical laboratory. Errors at any stage of the collection, testing and reporting process can potentially lead to a serious patient misdiagnosis. Errors during the collection process are not inevitable but can be prevented with a diligent application of quality control, continuing education and effective collection systems. A perspective analysis of the results obtained from the biomedical laboratory of Clinical Center of Nis, Serbia for errors of the preanalytical phase has been carried out to summarize data. Laboratory personel were asked to register rejections, and causes for rejection of wards. Out of the 48328 blood collection tubes screened over a period of 8 months, pre-analytical errors were observed in approximately 4.9% of the total number of samples received. The distribution of the different types of errors was then calculated. The majority of the rejected samples were hemolyzed, which accounts for 1.1% of the total number of samples received during this period. The amount of blood was insufficient for complete analysis in 0.08%. A total of 0.4% samples in the wards were accompanied by innapropriate requisition slips. The human role in samle collection makes complete elimination of errors associated with laboratory testing unrealistic. However, good practise and compliance with the new strategies for error prevention can lead to a substantial reduction in pre-analytical errors. A practice of keeping a record of the errors at all stages of analysis and then divising corrective strategies for their prevention can gradually free a laboratory from such errors.

P009
PRAĆENJE NIVOA SERUMSKE KREATIN KINAZE U IZRAŽENOJ I SUBKLINIČKOJ HIPOTIREOZI

M. Stanojković, A. Marinković, S. Madić, T. Đorđević

Centar za medicinsku biohemiju, Klinički centar Niš, Niš, Srbija

Cilj ovog istraživanja je da se utvrdi nivo serumske kreatinkinaze (CK) u izraženoj i subkliničkoj hipotireozi. Zatim da se istraži promena nivoa CK nakon primenjene hormonske terapije i da se proceni odnos između slobodnog trijodtironina (FT3), slobodanog tiroksina (FT4) i tireotropnog hormona (TSH), kao i stepen oštećenja skeletnih mišića. Drugi uzroci promene nivoa CK su bili isključeni. U istraživanje je bilo uključeno 26 pacijenata (24 žene i 2 muškarca, starosti 40,65 +/- 12,55 godina) sa izraženom hipotireozom, 36 pacineata (35 žena, 1 muškarac, starosti 41,55 +/- 10,45 godina) sa subkliničkom hipotireozom, kao i 30 kontrola (27 žena, 3 muškarca, uzrasta od 40,81 +/- 11,20 godina). U serumu su određivani sledeći biohemijski parametri: TSH, FT4, FT3, i CK. Povećan nivo serumske kreatin kinaze je pronađen kod 17 pacijenata (58%) sa izraženom hipotireozom i kod 4 pacijenta (10%) sa subkliničkom hipotireozom. Iako je pronađeno statistički značajno povećanje nivoa CK kod pacijenata sa izraženom hipotireozom u poređenju sa pacijentima sa subkliničkim hipotireozom i kontrolama (p=0,0001, p=0,01, respektivno), razlika je pronađena između subkliničke hipotireoze i kontrolne grupe (p=0,14). Kod hipotiroidnih pacijenata, utvrđena je pozitivna korelacija između CK i TSH (R=0,422; p=0,04), i negativna korelacija između CK i FT3 (R=0,526; p=0,002) i između CK i FT4 (r=0,437; p=0,04). Nivo serimske kreatin kinaze je smanjen na normalan nivo posle primene adekvatne hormonske terapije i funkcija štitne žlezde je normalizovana tretmanom. Oštećenje skeletnih mišića je bilo izraženije kod pacijenata sa izraženom hipotireozom.

P009
FOLLOWING THE SERUM LEVELS OF CREATINE KINASE IN OVERT AND SUBCLINICAL HYPOTHYROIDISM

M. Stanojković, A. Marinković, S. Madić, T. Đorđević

Center for Medical Biochemistry, Clinical Center of Nis, Nis, Serbia

The aim of this study was to determine serum levels of creatine kinase (CK) in overt and subclinical hypothyroidism. To investigate the change in CK levels with treatment and to evaluate the relationship between free triiodsothyronine (FT3), free thyroxine (FT4), and thyrotropin (TSH) levels and the degree of skeletal muscle involvement, as determined by serum CK levels. Patients with other causes of CK elevation were excluded. We included 26 patients (24 women and 2 men, ages 40.65 +/- 12.55 years) with overt hypothyroidism, 36 patients (35 women, 1 man, ages 41.55 +/- 10.45 years) with subclinical hypothyroidism, and 30 age- and gender-matched controls (27 women, 3 men, ages 40.81 +/- 11.20 years) in the study. Serum levels of TSH, FT4, FT3, and CK were measured in all subjects. Creatine kinase elevation was found in 17 patients (58%) with overt hypothyroidism and in 4 patients (10%) with subclinical hypothyroidism. Although a statistically significant elevation of CK levels was found in patients with overt hypothyroidism when compared with patients with subclinical hypothyroidism and controls (p=0.0001, p=0.01, respectively), no difference was found between the subclinical hypothyroidism and control groups (p=0.14). In hypothyroid (overt and subclinical) patients, a positive correlation was found between CK and TSH (r=0.422; p=0.04), and a negative correlation between CK and FT3 (r=0.526; p=0.002) and between CK and FT4 (r=0.437; p=0.04). Creatine kinase levels decreased to normal levels after thyroid function normalized with treatment. In conclusion, skeletal muscle is affected by hypothyroidism more profoundly in cases of overt hypothyroidism, less so when subclinical hypothyroidism is present.

P010
KORELACIJA CITOKINA I PRO-ANTIOKSIDATIVNIH ENZIMA KOD PACIJENATA SA SISTEMSKIM LUPUSOM ERITEMATODESOM

Lilika Zvezdanović[1], Vladan Ćosić[1], Tatjana Cvetković[2], Slavica Kundalić[1], Dragana Stanković-Ferlež[1]

[1]Centar za medicinsku biohemiju, Niš, Srbija
[2]Medicinski fakultet Niš, Niš, Srbija

Značajnu ulogu u regulaciji i indukciji sistemskog lupusa eritematodesa (SLE) pored citokina imaju i slobodni radikali koji posreduju u tkivnom oštećenju ciljnog organa. Razmenom poruka različitog smera pomoću faktora tumorske nekroze (TNF-α) nastaje aktivacija različitih metaboličkih puteva sa produkcijom snažnih generatora slobodnih radikala kiseonika kao što je enzim ksantin oksidaza (XO). Istovremeno nastaje i indukcija aktivnosti katalaze (CAT) kao antioksidativnog enzima. Za istraživanje su korišćeni uzorci plazme 55 ispitanika (47 žena i 8 muškaraca) obolelih od SLE u fazi akutne egzacerbacije bolesti. Pacijenti su podeljeni u četiri grupe: kožna (K-SLE),neurološka (N-SLE), zglobna (Z-SLE) i vaskularna (V-SLE) manifestacija bolesti. Kontrolnu grupu je sačinjavalo 20 zdravih osoba dobrovoljnih davaoca krvi. Aktivnost XO je određivana modifikovanom spektrofotometrijskom UV metodom Kalckar-a dok je aktivnost CAT merena u eritrocitima metodom po Beutler-u a u serumu metodom Goth-a. Koncentracija TNF-α je određivana ELISA metodom. Dobijeni rezultati pokazuju da je aktivnost XO značajno povišena u plazmi bolesnika sa K-SLE (9,67±1,99 U/l); N-SLE (9,36±1,75 U/l); Z-SLE (9,32±1,13 U/l) i V-SLE (9,78±1,81 U/l) i to sa istim stepenom značajnosti P<0,001 u odnosu na kontrolnu grupu (6,44±1,40 U/l). Katalaza ima značajne efekte u reduciji stvaranja slobodnih radikala, postoji povećanje aktivnosti enzima u eritrocitima i u plazmi u svim grupama P<0,001 u odnosu na kontrolne vrednosti zdravih. Zabeležena je pozitivna korelacija između koncentracije TNF-α i aktivnosti XO (r=0,61; P<0,001) i CAT u plazmi (r=0,45; P<0,05), što govori o uzajamnoj povezanosti proinflamatornih citokina i aktivnosti XO-prooksidansa i CAT kao antioksidativnog enzima. Uspostavljanje cirkulacije nakon primenjene antiinflamatorne terapije kod pacijenata sa akutnom egzacerbacijom bolesti rezultira reperfuzijom tkiva i oslobađanjem slobodnih radikala kiseonika što je praćeno intenzivnim povećanjem aktivnosti XO u plazmi bolesnika. Značajna je i pozitivna korelacija sa TNF-α kome se može pripisati i protektivna uloga. Povećanje aktivnosti CAT može biti kompenzatorni mehanizam ili rezultat indukcije njegove sinteze TNF-α citokinom.

P010
RELATION BETWEEN CYTOKINES AND PRO-ANTIOXIDATIVE ENZYMES IN PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATODES

Lilika Zvezdanović[1], Vladan Ćosić[1], Tatjana Cvetković[2], Slavica Kundalić[1], Dragana Stanković-Ferlež[1]

[1]Centre for Medical Biochemistry, Clinical Centre Niš, Serbia
[2]Institute of Biochemistry, Faculty of Medicine Niš, Serbia

In addition to cytokines, free radicals have a significant role in the regulation and induction of systemic lupus erythematosus (SLE) by way of their involvement in target organ damage. By the exchange of multidirectional messages assisted by tumour necrosis factor (TNF-α) there occurs the activation of various metabolic pathways with the production of potent free oxygen radical generators, such as the enzyme xanthine oxidase (XO). At the same time, the activity of catalase (CAT) as an antioxidant enzyme is induced. In the study, plasma samples from 55 SLE patients (47 women and 8 men) in acute disease exacerbation phase were used. The patients were divided into four groups: skin (S-SLE), neurological (N-SLE), joint (J-SLE), and vascular (V-SLE) disease. Twenty healthy blood donors made up our control group. XO activity was determined using modified spectrophotometric UV method by Kalckar, while CAT activity was measured in erythrocytes using the method by Beutler, and in serum using the method by Goth. TNF-α concentration was determined using the ELISA method. The results showed that XO activity was significantly elevated in the plasma of patients with S-SLE (9.67±1.99 U/L); N-SLE (9.36±1.75 U/L); Z-SLE (9.32±1.13 U/L), and V-SLE (9.78±1.81 U/L) with an identical degree of significance of P<0.001 related to controls (6.44±1.40 U/L). Catalase had marked effects in the reduction of creation of free radicals and there was increased activity of the enzyme in erythrocytes and plasma in all groups (P<0.001) related to controls. A positive correlation between TNF-α concentration and XO (r=0.61; P<0.001) and CAT (r=0.45; P<0.05) activity in the plasma was observed, indicating an association between proinflammatory cytokines and XO-prooxidant activity and CAT as an antioxidant enzyme. Establishing circulation after anti-inflammatory therapy in patients with acute disease exacerbation results in tissue reperfusion and release of free oxygen radicals, accompanied by elevated XO activity in the plasma. A positive correlation with TNF-α, a factor with possible protective role, is also significant. Increased CAT activity could be a compensatory mechanism or the result of induction of its synthesis by TNF-α.

P011
SMANJENJEM UČESTALIH NEPOTREBNIH PONAVLJANJA ODREĐIVANJA KONCENTRACIJE IMUNOGLOBULINA MOGUĆE SU ZNATNE FINANCIJSKE UŠTEDE

Marijana Miler, Nora Nikolac, Nada Vrkić

Klinički zavod za kemiju,
Klinički bolnički centar
Sestre milosrdnice, Zagreb, Hrvatska

Prema preporukama Društva za kliničku biokemiju i laboratorijsku medicinu te Kraljevskog udruženja patologa najmanje razdoblje između dva mjerenja koncentracije imunoglobulina (Ig) u serumu je 3 mjeseca za pacijente na supstitucijskoj terapiji ili 6 mjeseci kod ostalih bolesti. Zbog vremena poluživota, koncentraciju Ig ne bi trebalo određivati u razmacima manjim od mjesec dana. Kliničari često nepotrebno ponavljaju zahtjeve za određivanjem pretraga što može dovesti do povećane financijske potrošnje u laboratoriju. Ciljevi ovog istraživanja bili su ispitati ponavljaju li se mjerenja koncentracije Ig u preporučenim vremenskim intervalima te koliko je financijsko opterećenje zbog nepotrebnih ponavljanja. Retrospektivno istraživanje provedeno je od 1.1.2014. do 31.12.2015. u Kliničkom zavodu za kemiju Kliničkog bolničkog centra Sestre milosrdnice, Zagreb. Iz laboratorijskog informacijskog sustava izvađeni su podaci o zahtjevima za IgG, IgA i IgM. U Microsoft Excel programu (verzija 2007, Microsoft, SAD) izračunato je vrijeme u danima između dva mjerenja, a za ponavljanja unutar 30 dana izračunat je financijski trošak. U navedenom periodu zaprimljeno je 6880 zahtjeva za mjerenjem IgA, G i/ili M za ukupno 5498 pacijenata. Za 4849 pacijenata (88,2%) Ig su traženi samo jednom. Najviše je bilo 2 ponavljanja (N=407; 7,4%), a za 20 pacijenata određivanje je napravljeno više od 8 puta (za jednog pacijenta čak 21 put). Medijan između dva mjerenja iznosi 91 dan. Mjerenje je ponovljeno za manje od 30 dana 243 puta (17,7%), a49% ponavljanja bilo je za manje od 90 dana. Trošak reagensa za pacijente sa zadanim ponavljanjima u periodu manjem od 30 dana iznosio je oko 2% ukupnog mjesečnog budžeta što je iznos jednak dvjema kutijama reagensa za Ig. Liječnici se u velikoj mjeri ne pridržavaju preporuka za ponavljanje mjerenja koncentracije imunoglobulina u serumu što dovodi do nepotrebnog financijskog opterećenja laboratorija.

P011
SUBSTANTIAL SAVINGS OF THE LABORATORY BUDGET ARE POSSIBLE WITH REDUCING OF FREQUENT UNNECESSARY IMMUNOGLOBULIN RETESTING

Marijana Miler, Nora Nikolac, Nada Vrkić

University Department of Chemistry,
Sestre Milosrdnice Clinical Hospital Centre,
School of Medicine, Zagreb, Croatia

According to the guidelines of the Association for Clinical Biochemistry and Laboratory Medicine and Royal College of Pathologist minimum retesting interval for measuring immunoglobulin (Ig) concentration in serum is 3 months for patients on Ig replacement therapy or 6 months for other diseases. Because of its half-life, Ig concentration should not be repeatedly measured in periods less than one month. Clinicians usually unnecessary repeat tests which leads to higher financial expenses. The aims of this study were to investigate if clinicians are following recommendations for immunoglobulin retesting intervals and what is financial burden for unnecessary retesting.This retrospective study was performed from 1.1.2014 to 31.12.2015 in University Department of Chemistry, Sestre Milosrdnice Clinical Hospital Centre, Zagreb. Data about IgG, IgA and IgM requests were exported from laboratory information system. In Microsoft Excel program (version 2007, Microsoft, USA) we have calculated retesting interval (in days) and for retesting done in period less than 30 days, we have calculated the cost. In the 2 year period laboratory has received 6880 requests (for 5498 patients) for determination of IgA, G and/or M concentration. For 4849 (88.2%) patients immunoglobulins were measured only once. Tests were repeated mostly for 2 times (N=407; 7.4%) and for 20 patients retesting were done for more than 8 times (for one patient even 21 repeats). Median of retesting interval was 91 days. Even for 17.7% (N=243) of requests, retesting interval was less than 30 days, and for 49% less than 90 days. The reagents cost for measurements of immunoglobulin repeated in less than 30 days was about 2% of total laboratory monthly budget which corresponds to the amount for two immunoglobulin reagents packages. Physicians do not comply with the retesting intervals recommendations for serum immunoglobulin which leads to unnecessary financial burden of laboratory.

P012
ODREĐIVANJE GLUKOZE U KRVI KOD SPORTSKI AKTIVNE DECE UZRASTA OD 4 DO 14 GODINA

Jelena Trnavac, Danijela Ristovski-Kornic

Dom Zdravlja Plandište, Dom zdravlja Pančevo, Pančevo, Srbija

Diabetes mellitus je jedna od vodećih hroničnih bolesti u svetu, a dosta je povezana sa načinom života. Praćena je stanjem hronično visokih koncetracija glukoze u krvi, nakon gladovanja ili unošenja ugljenih hidrata u čijem slučaju se glukoza obično javlja i u urinu. Cilj ovog rada je bio da se utvrde vrednosti glikemije kod dece uzrasta od 4 do 14 godina, kao i opravdanost odredjivanja ovog parametra u okviru redovnih sistematskih pregleda sportske medicine. Grupu ispitanika je cinilo 65-oro dece uzrasta od 4 do 14 godina, koji se bave aktivno sportom. Uzorci su dobijeni u toku redovnog sistematskog pregleda sportskog lekara. Ispitanici su podeljeni u tri grupe. Prva grupa su bila deca starosti od 4 do 6 godina, u kojoj je bilo 8 dečaka i 6 devojčica. Dobijene su sledeće vrednosti (srednja vrednost ± standardna devijacija): GLU (4,71±0,29) za dečake i GLU (4,85±0,58) za devojčice. Druga grupa su bila deca starosti od 8 do 10 godina, u kojoj je bilo 12 dečaka i 4 devojčice. Dobijene su sledeće vrednosti (srednja vrednost ± standardna devijacija): GLU (4,69±0,41) za dečake i GLU (5,17±0,66) za devojčice. Treća grupa su bilča deca starosti od 11 do 14 godina, u kojoj je bilo 17 dečaka i 18 devojčica. Dobijene su sledeće vrednosti (srednja vrednost ± standardna devijacija): GLU (5,13±0,62) kod dečaka i GLU (5,20±0,54) kod devojčica. Vrednosti glukoze su određivana na biohemijskom analizatoru Beckman Coulter Au480 i reagensima od istog proizvođača. Svi dobijeni podaci su statistički obrađeni (Studentov t-test). Na osnovu obrađenih podataka i referentnih vrednosti od 3,3–5,6 mmol/L za decu do 8 godina i od 3,6–6,1 mmol/L za decu stariju od 8 godina, zaključeno je nije bilo statistički značajne razlike u koncentraciji glukoze između dečaka i devojčica u ovim uzrastnim grupama, kao i da su sve srednje vrednosti grupa bile u opsegu referentnih vrednosti glukoze za dati uzrast. Međutim praćenjem pojedinih vrednosti utvrdili smo da dvoje dece ima povišene vrednosti glikemije, jedno dete je imalo graničnu vrednost glikemije. Ove vrednosti su ponovljene i potvrđene. Time možemo izvesti zaključak da je određivanje glukoze u krvi kod sportski aktivne dece od krucijalnog značaja i da se u zakonskoj regulativi to mora ustaliti kao redovni deo sistematskog pregleda dece. To ipak ne znači da ta deca treba da prestanu da se bave sportom, naprotiv, treba da način svoje ishrane prilagode sportskim aktivnostima kojima se bave i time poboljšaju sopstveno zdravlje i kvalitet svog života. Takođe iz ovih podataka može se zaključiti da je period puberteta kritičan i da se tada posebno treba posvetiti pažnja na određene parametre kod dece tog uzrasta.

P012
GLUCOSE LEVELS IN SPORTS ACTIVE CHILDREN AGED 4 TO 14 YEARS

Jelena Trnavac, Danijela Ristovski-Kornic

Health Centre Plandište, Health Centre Pančevo, Pančevo, Serbia

Diabetes mellitus is one of the leading chronic diseases in the world, a lot of it is related to the way of life. Accompanied by a chronic state of high concentration of glucose in the blood after fasting or carbohydrate intake, in which case it usually occurs glucose and in urine. The aim is to determine the values of glycaemia in children aged 4 to 14 years, as well as justification of determining the parameters within regular systematic review of sports medicine. The study group included 65 – children, aged 4 to 14 years, who are engaged in active sports. Samples were obtained in the normal course of an examination of the sports physician. Subjects were divided into three groups. The first group consists of children aged 4 to 6 years, in which there were 8 boys and 6 girls. The obtained values were (mean ± standard deviation): GLU (4.71±0.29) for boys and GLU (4.85±0.58) for girls. The second group of children aged 8 to 10 years, in which there were 12 boys and 4 girls. The obtained values were (mean ± standard deviation): GLU (4.69±0.41) for boys and GLU (5.17±0.66) for girls. The third group consists of children aged 11 to 14 years, in which there were 17 boys and 18 girls. The obtained values were (mean ± standard deviation): GLU (5.13±0.62) in boys and GLU (5.20±0.54) in girls. Glucose levels were determined on a biochemical analyzer Beckman Coulter Au480 and reagents from the same manufacturer. All data were statistically analyzed. (Student's test). Based on the processed data and the reference value of 3.3–5.6 mmol/L for children up to 8 years and from 3.6 to 6.1 mmol/L for children older than 8 years old, it was concluded that there were no statistically significant differences in glucose concentration between boys and girls in these age groups, and all groups of mean values were in the range of reference glucose values for age. However monitoring of certain values we found that two children have elevated blood glucose levels, one child has a marginal value of glycaemia. These values are repeated and confirmed. Thus we can conclude that glucose levels in sports active children have crucial importance, and that the legislation needs to settle down as a regular part of a systematic review of children. This does not mean that children should stop participate in sports, but on the contrary, that way your sports nutrition adapt their activities and thereby improve their own health and their quality of life. Also from these data we can conclude that the critical period of puberty and then special attention should be paid to certain parameters in children of that age.

P013
PROCJENA TESTA ZA ODREĐIVANJE BIKARBONATA NA ANALIZATORU COBAS 501

J. Ćorić, E. Kučukalić, B. Hasanefendić, M. Panjeta, E. Begović

O.J. Klinička hemija i biohemija, Klinički centar Univerziteta u Sarajevu, Bosna i Hercegovina

Koncentracija bikarbonata u serumu ili plazmi je značajan pokazatelj disperzije elektrolita i deficita anjona. Zajedno sa određivanjem pH mjerenje bikarbonata se koristi u dijagnostici i tretmanu brojnih potencijalno opasnih poremećaja povezanih sa kiselinsko-baznom neravnotežom respiratornog i metaboličkog sistema. Koncentracije bikarbonata smo određivali enzimskom metodom na analizatoru Cobas 501 Roche. Bikarbonati reaguju sa fosfoenolpiruvatom (PEP) u prisustvu enzima fosfoenolpiruvat karboksilaze (PEPC) stvarajući oksalacetat i fosfat. Pad apsorpcije koja se mjeri na talasnoj dužini od 415 nm zbog smanjenja koncentracije NADH proporcionalan je koncentraciji bikarbonata u uzorku. Analitička procjena određivanja bikarbonata obuhvatila je ispitivanje nepreciznosti u seriji i iz dana u dan pomoću komercijalnih kontrolnih seruma. Koeficijent varijacije (KV) za Control Normal je iznosio 2,8%, a za Control Abnormal je iznosio 2,9% za nepreciznost u seriji (N=30). Za nepreciznost iz dana u dan (N=30) koeficijent varijacije je iznosio 4,8 % za Control Normal i 5,1% za Control Abnormal. Srednje vrijednosti za bikarbonate u serumu su bile značajno niže kod dijaliziranih pacijenata u odnosu na kontrolnu grupu (17,1 vs. 25,3 mmol/L, p<0,0001). Prikazani rezultati verifikacije metode određivanja bikarbonata na analizatoru Cobas 501 Roche su pokazali prihvatljivu tačnost i preciznost.

P013
EVALUATION OF BICARBONATE ASSAY ON THE COBAS 501 ROCHE ANALYZER

J. Ćorić, E. Kučukalić, B. Hasanefendić, M. Panjeta, E. Begović

Department of Clinical Chemistry, Clinical Centre University of Sarajevo, Bosnia and Herzegovina

The bicarbonate content of serum or plasma is a significant indicator of electrolyte dispersion and anion deficit. Together with pH determination, bicarbonate measurements are used in the diagnosis and treatment of numerous potentially serious disorders associated with acid-base inbalance in the respiratory and metabolic systems. We determined the concentrations of bicarbonate with enzymatic methods on Cobas 501 Roche analyser. Bicarbonate reacts with phosphoenolpyruvate (PEP) in the presence of phosphoenolpyruvate carboxylase (PEPC) to produce oxaloacetate and phosphate. The resultant consumption of NADH analogy causes a decrease in absorbance at 415 nm, which is proportional to the concentration of bicarbonate in the sample being assayed. Analytical assessment of bicarbonate determination comprised within-run and between-run imprecision. Coefficient of variation (CV) on the commercially controls for Control Normal is 2.8% and 2.9% for Control Abnormal for within-run imprecision (N=30). The between-day imprecision (N=30) coefficients of variation were 4.8% for Control Normal and 5.1% for Control Abnormal. Median values for serum bicarbonate were significantly low in dialysis patients compared to the control group (17.1 vs. 25.3 mmol/L, p<0.0001). The presented results of the verification methods for determination of bicarbonate on the Roche Cobas 501 analyser showed an acceptable accuracy and precision.

P014
MEĐUSOBNO POREĐENJE IMUNOHEMIJSKE I ELEKTROFORETSKE METODE ZA ODREĐIVANJE KOŠTANOG IZOENZIMA ALKALNE FOSFATAZE KOD PACIJENATA NA HEMODIJALIZI

Marija Sarić[1], Neda Milinković[1,2], Svetlana Pejanović[3], Milan Stošović[3], Radomir Naumović[3,4], Svetlana Ignjatović[1,2]

[1]Farmaceutski fakultet, Katedra za medicinsku biohemiju, Univerzitet u Beogradu, Srbija
[2]Centar za medicinsku biohemiju, Klinički centar Srbije, Beograd, Srbija
[3]Klinika za nefrologiju, Klinički centar Srbije, Beograd, Srbija
[4]Medicinski fakultet, Univerzitet u Beogradu, Srbija

Koštani izoenzim alkalne fosfataze (BALP) se izdvojio kao izrazito koristan biohemijski parametar za procenu metabolizma kostiju kod pacijenata sa krajnjim stadijumom bubrežne insuficijencije. U odnosu na ostale parametre mineralno-koštanog metabolizma, BALP pokazuje prednost kao direktni pokazatelj koštanog prometa, zbog čega danas predstavlja parametar izbora za dijagnozu i praćenje renalne osteodistrofije kod pacijenata na hemodijalizi. Za razliku od elektroforetske metode, koja se koristi kao skrining tehnika za procenu relativnog udela BALP u odnosu na aktivnost ukupne alkalne fosfataze, imunohemijskom metodom moguće je izmeriti tačnu koncentraciju BALP. Cilj ovog rada bio je analiziranje analitičkih karakteristika i međusobno poređenje navedenih metoda za određivanje BALP kod pacijenata na hemodijalizi. Ispitivanjem je obuhvaćen 71 pacijent na hroničnom programu hemodijalize, 44 muškaraca i 27 žena, prosečne starosti 56±14,6 godina. Pacijenti se leče na Klinici za nefrologiju Kliničkog centra Srbije, a prosečno trajanje hemodijalize iznosi 5 godina i 17 meseci. U radu su analizirane vrednosti masene koncentracije i aktivnosti BALP primenom komercijalnog imunohemijskog testa firme Beckman-Coulter (Access Ostase) i zonske elektroforeze, firme Sebia (HYDRAGEL ISO-PAL), prema uputstvu proizvođača. Praktičan rad je sproveden u Centru za laboratorijsku medicinu Farmaceutskog fakulteta u Beogradu i Centra za medicinsku biohemiju, Kliničkog centra Srbije. Prema uputstvu proizvođača, redom su navedene analitičke karakteristike imunohemijske i elektroforetske metode: analitička osetljivost (0,1 μg/L i 2−3 IU/L), dinamički opseg (0,1−120 μg/L i 50−600 IU/L) i preciznost (CV < 6,5% i CV < 8,1% unutar gela i CV < 4,1% između gelova). Neparametarskom korelacionom analizom dobijen je statistički značajan koeficijent korelacije (ρ= 0,783,

P014
COMPARISON OF IMMUNOASSAY AND ELECTROPHORETIC METHOD FOR BONE-SPECIFIC ALKALINE PHOSPHATASE ISOENZYME DETERMINATION IN HEMODIALYSYS PATIENTS

Marija Sarić[1], Neda Milinković[1,2], Svetlana Pejanović[3], Milan Stošović[3], Radomir Naumović[3,4], Svetlana Ignjatović[1,2]

[1]Faculty of Pharmacy, Department of Medical Biochemistry, University of Belgrade, Serbia
[2]Center of Medical Biochemistry, Clinical Center of Serbia, Belgrade, Serbia
[3]Clinic for Nephrology, Clinical Center of Serbia, Belgrade, Serbia
[4]Faculty of Medicine, University of Belgrade, Serbia

Bone-specific alkaline phosphatase isoenzyme (BALP) has proved to be a particularly useful biomarker for the assessment of bone metabolism in patients with end-stage renal disease. In comparison to the other parameters of bone and mineral metabolism, BALP demonstrates the advantage as a direct indicator of bone turnover. For this reason, it represents today the biomarker of choice for the diagnosis and monitoring of renal osteodystrophy in hemodialysis patients. In contrast to the electrophoretic method, which is used as a screening technique to assess the relative BALP concentration, immunoassay gives us a possibility to measure the absolute concentration of BALP. This study aimed to evaluate the analytical performance and to compare the above listed methods for the determination of BALP in patients undergoing hemodialysis. The study enrolled 71 patients (44 men and 27 women) undergoing maintenance hemodialysis (mean age 56±14.6 years). Patients were treated at the Institute of Urology and Nephrology, Clinical Center of Serbia. The average hemodialysis vintage was 5 years and 17 months. In this study, we measured the BALP activity and mass concentration with two different methods (Beckman-Coulter Access Ostase commercial immunoassay and Sebia HYDRAGEL ISO-PAL zone electrophoresis), according to the manufacturers' instructions. Practical work was conducted at the Center for Laboratory Medicine, Faculty of Pharmacy, University of Belgrade and the Center of Medical Biochemistry, Clinical Center of Serbia. The analytical performance characteristics of the immunoassay and electrophoresis are listed respectively: analytical sensitivity (0.1 μg/L and 2–3 IU/L), dynamic range (0.1 to 120 μg/L and 50–600 IU/L) and precision (CV < 6.5 % and CV < 8.1 % within gel and CV < 4.1% between gels), according to the manufacturers. Nonpara-

p<0,01), što ukazuje na linearnu povezanost ispitivanih metoda. Daljom primenom Passing Bablok regresione analize, dobili smo sledeću jednačinu prave: y=2,94+0,50x (95% CI za odsečak je 0,73−4,20, 95% CI za nagib je 0,42−0,58). Dobijene vrednosti granica pouzdanosti od 95% za odsečak i nagib upućuju na postojanje konstantnog i proporcionalnog odstupanja u merenju, odnosno sistematske razlike između ove dve metode. Cusum-ovim testom linearnosti nije utvrđeno značajno odstupanje od linearnosti (p=0,66). Na osnovu prikazanih podataka može se zaključiti da imunohemijska metoda pokazuje bolju osetljivost i preciznost u odnosu na elektroforetsku tehniku, ali da uporedna upotreba ispitivanih metoda nije moguća i da su potrebna dalja ispitivanja u cilju standardizacije i uvođenja referentne metode za određivanje BALP.

metric correlation analysis showed a statistically significant correlation coefficient (ρ=0.783, p<0.01), indicating a linear relationship between the methods. However, comparison of methods using Passing-Bablok regression analysis gave the following equation for the regression line y = 2.94+0.50x (95% CI for intercept is 0.73−4.20; 95% CI for slope is 0.43−0.58). The obtained confidence intervals of 95% of intercept and slope indicate the existence of constant and proportional differences in measurement and systematic bias between performed methods. Cusum test for linearity demonstrated no significant deviation from linearity (p=0.66). According to data presented in the study, we can conclude that the immunoassay demonstrates better precision and sensitivity than the electrophoretic technique, but that the simultaneous use of these methods is not recommended. Further studies in this field are required for BALP assay standardization and the development of a reference method.

P015
POREMEĆENA FUNKCIONALNOST HDL ČESTICA KOD PACIJENATA SA SARKOIDOZOM

Jasmina Ivanišević[1], Jelena Vekić[1], Aleksandra Zeljković[1], Aleksandra Stefanović[1], Jelena Kotur Stevuljević[1], Zorana Jelić-Ivanović[1], Vesna Spasojević-Kalimanovska[1], Slavica Spasic[1], Jelica Videnović-Ivanov[2], Violeta Vučinić-Mihailović[2]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija
[2]Klinika za plućne bolesti i tuberkulozu, Klinički Centar Srbije, Beograd, Srbija

Sarkoidoza je inflamatorna bolest povezana sa povećanim oksidativnim stresom i poremećajima u raspodeli lipoproteina visoke gustine (HDL). Paraoksonaza 1 (PON1) je enzim lokalizovan na HDL česticama koji poseduje anti-inflamatorne i antioksidativne osobine. U stanjima inflamacije i oksidativnog stresa, može doći do poremećenog sazrevanja i povećanog katabolizma HDL čestica kada dolazi do gubitka njihovih protektivnih funkcija. Cilj naše studije je bio da se odrede raspodela HDL subčestica, PON1 aktivnost, oksidativno-stresni status i njihova povezanost kod pacijenata sa sarkoidozom. HDL-holesterol (HDL-c), serumski amiloid A (SAA), totalni oksidantni status (TOS), sulfhidrilne (SH) grupe, paraoksonazna (POazna) i diazoksonazna (DZOazna) aktivnost PON1 i relativni udeli HDL3 i HDL2 čestica su određeni kod 77 pacijenata sa sarkoidozom i 139

P015
DEFECTIVE HDL PARTICLES FUNCTIONALITY IN SARCOIDOSIS PATIENTS

Jasmina Ivanišević[1], Jelena Vekić[1], Aleksandra Zeljković[1], Aleksandra Stefanović[1], Jelena Kotur Stevuljević[1], Zorana Jelić-Ivanović[1], Vesna Spasojević-Kalimanovska[1], Slavica Spasic[1], Jelica Videnović-Ivanov[2], Violeta Vučinić-Mihailović[2]

[1]Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia
[2]Clinic for Pulmonary Diseases and Tuberculosis, Clinical Centre of Serbia, Belgrade, Serbia

Sarcoidosis is an inflammatory disease associated with elevated oxidative stress and disturbances in high-density lipoprotein (HDL) subclass distribution. Paraoxonase 1 (PON1) is an enzyme located on HDL particles reported to have anti-inflammatory and antioxidant properties. Under inflammatory and oxidative stress conditions, defective maturation and increased catabolism of HDL particles may occur leading to loss of their protective properties. The aim of our study was to evaluate HDL subclass distribution, PON1 activity, oxidative stress status, and their associations in sarcoidosis patients. HDL-cholesterol (HDL-c), serum amyloid A (SAA), total oxidant status (TOS), sulfhydryl (SH) groups, paraoxonase (POase) and diazoxonase (DZOase) activities of PON1 and relative proportions of HDL3 and HDL2 particles were determined in 77 sarcoidosis patients and 139

zdravih ispitanika. Koncentracije SAA, TOS (P<0,001) i udeli HDL 3a i HDL 2a čestica (P<0,01) su bile značajno veće dok su HDL-c (P<0,05), SH grupe, POazna aktivnost i dominantni HDL dijametar (P<0,001) bili značajno niži kod pacijenata u odnosu na kontrolnu grupu. Kod pacijenata, POazna aktivnost je bila u značajnoj pozitivnoj korelaciji sa koncentracijom HDL-c, udelom HDL 2a čestica (P<0,05) i TOS (P<0,01), a u negativnoj sa udelom HDL 3c čestica (P<0,05). DZOazna aktivnost je bila u značajnoj inverznoj korelaciji sa SAA, PAB i udelom HDL 3c čestica (P<0,05). Multipla linearna regresiona analiza je pokazala da su TOS i udeo HDL 3c čestica (P<0,01) nezavisno povezani sa POaznom aktivnošću. Poremećena funkcionalnost HDL čestica je evidentna kroz njihovu izmenjenu raspodelu, sniženu PON1 aktivnost i povećan oksidativni stres.

healthy controls. SAA, TOS concentrations (P<0.001) and proportion of HDL 3a and HDL 2a particles (P<0.01) were significantly higher whereas HDL-c (P<0.05), SH groups, POase activity and dominant HDL diameter (P<0.001) were significantly lower in sarcoidosis when compared with controls. We found that in patients POase was in significant positive correlation with HDL-c concentration, proportion of HDL 2a particles (P<0.05) and TOS (P<0.01), while it was in significant inverse correlation with proportion of HDL 3c particles (P<0.05). DZOase associated inversely with SAA, PAB and proportion of HDL 3c particles (P<0.05). Multiple linear regression analysis showed that TOS and proportion of HDL 3c (P<0.01) were independently associated with POase activity. Impaired HDL particles functionality was evident through their altered distribution, dysregulated PON1 activity and excessive oxidative stress.

P016
ODREĐIVANJE AKTIVNOSTI BCL-2 I KASPAZE-3 KOD PACIJENATA SA ISHEMIJSKOM BOLEŠĆU SRCA

Tatjana Ristić[1], Vidosava B. Đorđević[2], Marina Deljanin-Ilić[3], Slavica Kundalić[1], Vladan Ćosić[1], Predrag Vlahović[1]

[1]Centar za medicinsku biohemiju, Klinički centar, Niš, Srbija
[2]Institut za biohemiju, Medicinski fakultet, Niš, Srbija
[3]Institut za kardiovaskularne i reumatske bolesti, Niška Banja, Srbija

Smrt ćelija apoptozom ima značajnu ulogu u raznim kardiovaskularnim oboljenjima, pogotovu u oboljenjima koje se razvijaju na terenu ateroskleroze. Cilj ove studije je poređenje aktivnosti kaspaze-3 i vrednosti Bcl-2 proteina u serumima pacijenata sa različitim oblicima ishemijske bolesti srca, i koreliranje ovih markera sa inflamatornim i lipidnim parametrima. Proučavali smo 30 pacijenata sa hroničnom stabilnom anginom pektoris (SAP), 27 sa nestabilnom anginom pektoris (NSAP), 39 sa akutnim infarktom miokarda sa elevacijom ST-segmenta (STEMI) i 27 zdravih dobrovoljaca (kontrolna grupa). Aktivnost kaspaze-3 određivana je kolorimetrijskim komercijalnim testom dok je koncentracija Bcl-2 proteina određivana komercijalnim imunoesejima (ELISA). Aktivnost kaspaze-3 bila je značajno viša samo u NSAP grupi (0,122±0,062 μmol/mg proteina, p<0,05) u poređenju sa kontrolnom grupom (0,092±0,022 μmol/mg proteina). Koncentracija Bcl-2 proteina bila je značajno viša kod pacijenata sa

P016
THE DETERMINATION OF BCL-2 AND CASPASE-3 ACTIVITY IN ISCHEMIC HEART DISEASE PATIENTS

Tatjana Ristić[1], Vidosava B. Đorđević[2], Marina Deljanin-Ilić[3], Slavica Kundalić[1], Vladan Ćosić[1], Predrag Vlahović[1]

[1]Centre for Medical Biochemistry, Clinical Centre, Nis, Serbia
[2]Institute of Biochemistry, Medical Faculty, Nis, Serbia
[3]Institute for Cardiovascular and Rheumatic Diseases, Niska Banja, Serbia

Apoptotic cell death may play a critical role in a variety of cardiovascular diseases, especially in those developing on the basis of atherosclerosis. The goal of this study was to compare the activity of caspase-3 and values of Bcl-2 protein in sera in patients with various forms of ischemic heart disease, and to correlate these markers with inflammatory and lipid parameters. We studied 30 patients with chronic stable angina pectoris (SAP), 27 with unstable angina pectoris (USAP), 39 with acute ST-elevation myocardial infarction (STEMI) and 27 age-matched healthy volunteers (Control group). Caspase-3 activity was determined by a colorimetric commercially available method while serum Bcl-2 concentrations were determined using commercially available immunoassays (ELISA). Caspase-3 was significantly higher only in the USAP group (0.122±0.062 μmol/mg protein, p<0.05) in comparison with the control group (0.092±0.022 μmol/mg protein). Concentrations of Bcl-2 were significantly higher in patients with SAP

SAP (0,310±0,075 ng/mL) i NSAP (0.329±0.102 ng/mL) u poređenju sa zdravim osobama (0.250± 0.069 ng/mL, p<0.01) i STEMI (0,266±0,041 ng/mL, p<0.01) grupom. Analiza ROC kriva pokazuje da Bcl-2 ima najbolje karakteristike kod pacijenata sa SAP i NSAP i predstavlja najbolji indikator aktivnosti aterosklerotičnog plaka. Međutim, Bcl-2 ne može biti marker za stratifikaciju pacijenata jer nema statistički značajne razlike između površina Bcl-2 kriva ove dve grupe pacijenata. Ovi rezultati pokazuju da istovremeno određivanje aktivnosti kaspaze-3u limfocitima i koncentracije Bcl-2 u serumu može ukazati na evoluciju aterosklerotičnog plaka iz stabilnog u nestabilan. Ispitivani markeri apoptoze predstavljaju vredne parametre u proceni aktivnosti aterosklerotičnog plaka i novi target za terapiju lekovima.

(0.310±0.075 ng/mL) and USAP (0.329±0.102 ng/mL) compared to healthy (0.250±0.069 ng/mL, p<0.01) and the STEMI (0.266±0.041 ng/mL, p<0.01) groups. ROC curve analysis showed that Bcl-2 had the best characteristics in patients with SAP and USAP and represents the best indicator of atherosclerotic plaque activity. However, Bcl-2 could not be a marker of patients' stratification because there was no significant difference between areas of Bcl-2 curves of these two patient groups. These results suggest that simultaneous determination of caspase-3 activity and Bcl-2 can indicate plaque evolution from stable to unstable one. The studied markers of apoptosis present valuable parameters in evaluation of atherosclerotic plaque acivity and a new targets for drug therapy.

P017
PRAĆENJE PROMJENA U LIPIDNOM STATUSU TOKOM POSTA

Aleksandra Pejčić, Goran Bojanić, Milanka Živanić-Bajić

Služba Laboratorijske dijagnostike, Odjeljenje za unutrašnje bolesti JZU Bolnica Gradiška, RS, BiH

Post podrazumijeva strogo izbjegavanje bilo kakve hrane životinjskog porijekla u trajanju od 6 nedjelja. Studija je imala za cilj da pokaže do kakvih promjena dolazi u lipidnom statusu nakon promjena režima ishrane. U studiji je učestvovalo 25 zdravih ispitanika, starosti od 30–55 godina, podjeljenih u 3 grupe (fizički aktivna grupa; grupa sa patološkim lipidnim statusom u prvom mjerenju i fizički neaktivna grupa). Lipidni status je odrađen na početku posta, kao i na kraju, sa adekvatnom pripremom ispitanika za određivanje istog. Istovremeno određivani su parametri funkcije jetre, kao i glikemija na tašte. Parametri lipidnog statusa, glukoza i parametri funkcije jetre su određivani Disays reagensima,na automatskom biohemijskom aparatu BT 2000. Metode za određivanje: ukupni holesterol: »CHOD-PAP«, Tgc: kolorimetrijski enzimatski test; HDL: imuno precipitaciona tehnika sa anithuman β-lipoproteinima, LDL: direktna metoda sa selektivno determinirajućom enzimatskom reakcijom, AST i ALT: IFCC-modif, glukoza: GOD-PAP. Rezultati pokazuju da je kod svih ispitanika došlo do pada ukupnog holesterola, Tgc, HDL, AST, ALT, glukoze. Ali, LDL kao i odnos LDL/HDL je smanjen jedino u fizičko aktivnoj grupi ispitanika. Dobijeni rezultati ukazuju da isključivim izbjegavanjem hrane životinjskog porijekla može doći do smanjena ukupnog holesterola, ali da LDL i odnos LDL/HDL kao faktor rizika za kardiovaskularna oboljenja se ne može smanjiti bez fizičke aktivnosti. Dakle, buduće studije sa većim brojem ispitanika trebale bi da potvrde ovu studiju.

P017
MONITORING CHANGES OF LIPID STATUS DURING THE FASTING

Aleksandra Pejčić, Goran Bojanić, Milanka Živanić-Bajić

Department of Labaroratory Diagnostic, Departmnet of Internal Medicine General Hospital Gradiška, BiH RS

Fasting means strict avoidance of food of animal orgins during the six weeks.The staudy was aimed to show changes in the lipid status after this diet. The study included 25 healthy volunteers in the age of 30–55 years,divided in the 3 groups (a group with phisically active people, then without physically activity, and a group of a patological range of blood lipids from the start exsamination). The lipid status was determineted from the beginig of the diet, and end of the diet after 6 weeks, whit a propriete preparation volunteers for determination of blood lipids. At the same time were mesured parameters for liver function and level of blood glucose. All parameters were measured whit Diasys reagents in biochemical analyzer BT-2000. The methods that have been used are: Total cholesterol: CHOD-PAP, Tgc: colorimetric enzymatic test, HDL: precipitation methods with antihuman lipoprotein, LDL: directly, selectively determined in color producing enzymatic reaction, glucosa: GOD-PAP, AST, ALT: IFCC modify. The obtained results indicated that strict avoidance of food of animal orgins decrease Total cholesterol, Tgc, AST, ALT and HDL. But LDL, and LDL/HDL ratio as a risk factor for cardiovascular diseases it was reduced only in group with phisical activity during this diet. Therefore, forther prospective studies whit larger number of volunteers are required to strengthen the observations of the present study.

P018
OKSIDATIVNI STRES, SUPEROKSID DIZMUTAZA, KATALAZA I GLUTATION PEROKSIDAZA KOD NESTABILNE ANGINE PEKTORIS

Slavica Kundalić, Jasen Kundalić, Ksenija Madić, Vladan Ćosić, Lilika Zvezdanović, Snežana Madić, Tanja Đorđević

Centar za kliničku biohemiju, Klinički centar Niš
Naučnoistraživački centar za biomedicinu, Medicinski fakultet, Univerzitet u Nišu, Niš, Srbija

Nestabilna angina pektoris često dovodi do akutnog infarkta miokarda. Pošto se smatra da oksidativni stres može biti uzrok hroničnih i akutnih dešavanja kod ateroskleroze i koronarnih bolesti, merili smo superoksid dizmutazu, glutation peroksidazu i katalazu kod 38 pacijenata sa koronarnom bolešću i uporedili ih sa odgovarajućom kontrolnom grupom. Osamnaest konsekutivnih bolesnika sa stabilnom anginom pektoris (SAP) i 20 konsekutivnih pacijenata sa nestabilnom anginom pektoris (NAP) su proučavani i poređeni sa 35 klinički zdravim osobama. Masti krvi uključujući holestrol, trigliceride i HDL-c su merene enzimskom metodom, a LDL-c je određivan korišćenjem Fridvaldove formule. Za merenje superoksid dizmutaze, glutation peroksidaze i katalaze se koristila heparinska krv metodom spektrofotometrije. Pacijenti su imali značajno veći nivoholestrola, triglicerida i LDL-c a niže vrednosti HDL-c u odnosu na kontrolu. Rezultati su pokazali da su aktivnost SOD, GPX i katalaze značajno niži kod nestabilne angine pektoris kada se porede sa pacijentima sa SAP ($p<0,05$) i kontrolom ($p<0,01$). Kod pacijenata sa NAP oksidativni stres je indikator porasta celularnog oštećenja i smanjenja antioksidativne zaštite zbog nastale ishemije, hipoksije i reperfuzije miokarda. Može se smatrati da su ovi rezultati pokazatelj oksidativnog oštećenja kod NAP pacijenata.

P018
OXIDATIVE STRESS, SUPEROXIDE DISMUTASE, CATALASE, AND GLUTATHIONE PEROXIDASE IN UNSTABLE ANGINA PECTORIS

Slavica Kundalić, Jasen Kundalić, Ksenija Madić, Vladan Ćosić, Lilika Zvezdanović, Snežana Madić, Tanja Đorđević

Centre for Clinical Biochemistry, Clnical Centre Niš
Biomedical Science Research Centre, Faculty of Medicine, University of Niš, Serbia

Unstable angina pectoris often leads to acute myocardial infarction. Since oxidative stress is thought to be causally related to chronic and acute events in atherosclerosis and coronary artery disease, we measured superoxide dismutase, glutathione peroxidase and catalase in 38 patients with coronary artery disease and compared them to a matched control group. Eighteen consecutive patients with stable angina pectoris SAP and 20 consecutive patients with unstable angina pectoris UAP were studied and compared to 35 clinically healthy individuals. Blood fats including cholesterol, triglyceride and HDL-c were determined through the enzymatic method, but the LDL-c was determined using Friedewald formula. The heparinized blood was used to measure superoxide dismutase, glutathione peroxidase, and catalase to determine through spectrophotometric method. As expected, patients had significantly higher cholesterol, triglyceride and LDL-C a values and lower HDL-C values than controls. Results showed that SOD, GPX and catalase activities were significantly lower in the unstable group as compared to patients with SAP ($p<0.05$) and to controls ($p<0.01$). In UAP patients, oxidative stress, the indicator of cellular injury increased and the antioxidant defense system diminished due to the ischemia, hypoxia and reperfusion of myocardium. These results may be regarded to reflect oxidative injury in UAP patients.

P019
UKUPNI SALIVARNI ANTIOKSIDATIVNI KAPACITET I PARODONTOPATIJA KOD PACIJENATA SA DIJABETESOM MELITUSOM

Jasen Kundalić, Braca Kundalić

Naučnoistraživački centar za biomedicinu, Medicinski fakultet, Univerzitet u Nišu, Niš, Srbija

Dijabetes melitus (DM) je usko povezan s oksidativnim stresom i smanjenom antioksidativnom odbranom. Utvrđena je veza i između dijabetesa i parodontopatije. Cilj ovog istraživanja je bio da se uporedi ukupni antioksidativni kapacitet pljuvačke (TAC) kod pacijenata sa DM i zdravih ispitanika sa ili bez parodontopatije. Od ukupno 60 ispitanika, 20 je bilo sa DM i parodontopatijom, 20 sa DM i bez parodontopatije, 20 zdravih ispitanika bez parodontopatije. Nakon uzimanja uzoraka i kliničkog merenja, utvrđen je ukupni antioksidativni kapacitet pljuvačke kod pacijenata s DM i zdravih ispitanika. Promena koncentracija TAC je određivana u uzorcima pljuvačke dobijenih od pacijenata s DM i odgovarajućih ispitanika po zdravlju, polu i godinama u kontrolnoj grupi. Osnovne karakteristike, uključujući godine, pol, starost, pušenje i dužina pušenja su ubeležena preko upitnika koje su ispitanici popunjavali. U rezultatima, TAC je bio značajno smanjen kod pacijenata s DM nego kod zdravih ispitanika ($p<0,001$). Kako je trajanje DM duže kod pacijenata, tako se nivo ukupnih antioksidanata smanjuje. Na osnovu rezultata istraživanja i podataka iz literature, postoje značajni dokazi da oksidativni stres može biti važan faktor u patogenezi dijabetesa i parodontopatije. S kliničkog stanovišta, opravdano se može zaključiti da pljuvačni TAC može biti koristan marker procene oksidativnog stresa, kao indikator progresije dijabetesa melitusa.

P019
SALIVARY TOTAL ANTIOXIDANT CAPACITY AND PERIODONTAL DISEASE IN PATIENTS WITH DIABETES MELLITUS

Jasen Kundalić, Braca Kundalić

Biomedical Science Research Centre, Faculty of Medicine, University of Niš, Niš, Serbia

Diabetes mellitus (DM) has been linked to oxidative stress and decreased antioxidant defense. A connection has been established between diabetes and periodontal disease. The aim of present study was to compare salivary total antioxidant capacity (TAC) of DM patients and healthy subjects with and without periodontal disease. A total of 60 subjects consisting of 20 DM patients with periodontal disease; 20 DM patients without periodontal disease; 20 healthy subjects without periodontal disease were included in the study. After clinical measurement and samplings, total antioxidant capacity in saliva of diabetic and healthy subjects were determined. The changes in the status of TAC were evaluated in saliva samples obtained from DM patients and apparently healthy sex- and age-matched subjects as control group. Baseline characteristics including age, sex, smoking and duration of exposure were recorded via questionnaire to the subjects. The TAC was significantly depleted in the diabetic group compared to healthy donors ($p<0.001$). As the duration of diabetes mellitus increases, the level of total antioxidants decreases. Based on the results from the present study and data available from the literature, there is increasing evidence that oxidative stress may be an important contributing factor in the pathogenesis of diabetes and periodontal disease. From the clinical standpoint, it may be reasonable to conclude that salivary TAC can be a useful marker to assess the oxidative stress, as an indicator of progression of diabetes mellitus.

P020
VALIDACIJA METODE ZA ODREĐIVANJE BIOMARKERA SINTEZE I APSORPCIJE HOLESTEROLA GASNOM HROMATOGRAFIJOM (GC-FID)

Tamara Gojković[1], Sandra Vladimirov[1], Vesna Spasojević-Kalimanovska[1], Aleksandra Zeljković[1], Jelena Vekić[1], Miloš Dejanović, Đorđe Salai, Ivana Đuričić[2], Slađana Šobajić[2], Zorana Jelić-Ivanović[1]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija
[2]Katedra za bromatologiju, Farmaceutski fakultet, Univerzitet u Beogradu, Beograd, Srbija

Homeostaza holesterola predstavlja ravnotežu između sinteze i apsorpcije holesterola. Poremećaj homeostaze dovodi do nastanka dislipidemije i razvoja bolesti u čijoj se patogenezi ona nalazi. Za procenu sinteze holesterola koriste se intermedijeri sintetskih puteva (desmosterol i latosterol), a za procenu apsorpcije, fitosteroli (kampesterol, stigmasterol i β-sitosterol), zbog istog mehanizma apsorpcije kao i holesterol. Cilj rada je bio validacija metode za određivanje neholesterolskih sterola (NCS), u plazmi i serumu GC-FID metodom. Trimetil-silil derivati markera sinteze i apsorpcije holesterola su kvantifikovani primenom temperaturnog gradijenta na HP-5 GC koloni. Dobijeni koeficijenti varijacije unutar serije u serumu i plazmi za NCS su: dezmosterol 4,30%, 4,02%; latosterol 4,54%, 3,41%; kampesterol 4,26%, 3,09%; stigmasterol 5,72%, 9,55%; β-sitosterol 3,39%, 2,75%, dok su koeficijenti varijacije između serija iznosili: dezmosterol 7,86%, 7,70%; latosterol 10,97%, 6,88%; kampesterol 3,05%, 7,75%; stigmasterol 7,07%, 5,80%; β-sitosterol 5,15%, 5,98%, sukcesivno. Metodom standardnog dodatka (recovery test) dobijeni koeficijenti korelacije za sve NCS su bili veći od 0,99, a vrednosti procentualne greške u serumu i plazmi su iznosili: dezmosterol b=0,976, b=0,934; latosterol b=1,069, b=1,057; kampesterol b=1,044, b=1,009; stigmasterol b=0,875, b=1,029; β-sitosterol b=1,055, b=1,005. Stabilnost derivatizovanih uzoraka je 15 dana na -20 °C. Freeze-thaw ciklus je izveden sa i bez dodatka antioksidansa. Statistički značajno smanjenje koncentracija NCS dobijeno je nakon prvog ciklusa, u uzorcima bez antioksidansa i nakon četvrtog ciklusa u uzorcima obogaćenim antioksidansom. Dobijeni koeficijenti varijacije unutar i između serija za obe vrste biološkog materijala su zadovoljavajući, što ukazuje na to da je metoda reproducibilna.

P020
VALIDATION OF GAS CHROMATOGRAPHIC METHOD (GC-FID) FOR ANALYSIS OF CHOLESTEROL SYNTHESIS AND ABSORPTION MARKERS

Tamara Gojković[1], Sandra Vladimirov[1], Vesna Spasojević-Kalimanovska[1], Aleksandra Zeljković[1], Jelena Vekić[1], Miloš Dejanović, Đorđe Salai, Ivana Đuričić[2], Slađana Šobajić[2], Zorana Jelić-Ivanović[1]

[1]Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia
[2]Department of Bromatology, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia

Cholesterol homeostasis represents balance between cholesterol synthesis and absorption. Homeostasis disorders may cause dyslipidaemia, contributing to the development of different pathologies. Cholesterol synthesis pathway intermediates (desmosterol and lathosterol) are used for cholesterol synthesis assessment, whereas phytosterols (campesterol, stigmasterol and β-sitosterol), having the same absorption mechanism, represent cholesterol absorption markers. The aim of this study was to validate the method for non-cholesterol sterols (NCS) in serum and plasma by gas chromatography with flame-ionization detection (GC-FID). Synthesis and absorption trimethylsilyl derivatives were quantified by applying the temperature gradient on HP-5 GC column. Intra-assay variability for NCS was as follows: desmosterol 4.30%, 4.02%; lathosterol 4.54%, 3.41%; campesterol 4.26%, 3.09%; stigmasterol 5.72%, 9.55%; β-sitosterol 3.39%, 2.75%, while inter-assay variability was: desmosterol 7.86%, 7.70%; lathosterol 10.97%, 6.88%; campesterol 3.05%, 7.75%; stigmasterol 7.07%, 5.80%; β-sitosterol 5.15%, 5.98% for serum and plasma, respectively. The recovery studies showed correlation coefficients which exceeded 0.99 for all NCS, whereas the percentage error values for each NCS were: desmosterol b=0.976, b=0.934; lathosterol b=1.069, b=1.057; campesterol b=1.044, b=1.009; stigmasterol b=0.875, b=1.029; β-sitosterol b=1.055, b=1.005 for serum and plasma, respectively. Derivatized samples were stable up to15 days at -20 °C. Freeze-thaw cycles were carried with and without antioxidant addition. Statistically significant reduction in the NCS concentration was obtained after the 1st cycle, in the samples without antioxidant, and after the 4th cycle in the samples enriched with the antioxidant. The variability coefficients for serum and plasma were satisfactory suggesting that the method is reproducible.

P021
PRAĆENJE MARKERA INFLAMACIJE KOD PACIJENATA SA STABILNOM I NESTABILNOM ANGINOM PEKTORIS

Lenka Radulović Tomović

Medicinski fakultet Univerziteta Crne Gore,
Katedra za kliničku biohemiju,
Podgorica, Crna Gora

Markeri inflamacije, C-reaktivni protein određen visoko osetljivim metodama (hsCRP) i citokin IL-6, su prediktori kardiovaskularnih komplikacija. Određivane su i poređene koncentracije hsCRP, IL-6 i mijeloperoksidaze kod pacijenata sa stabilnom anginom pektoris i negativnim rezultatima testa koronarne angiografije i kod pacijenata sa nestabilnom anginom pektoris sa pozitivnim rezultatima testa koronarne angiografije. U studiju je uključeno 50 pacijenata sa ishemijskom bolešću srca koji su bili podeljeni u dve grupe. U prvoj grupi nalazilo se 25 pacijenata sa stabilnom anginom pektoris (11 muškaraca i 14 žena). Drugu grupu činilo je 25 pacijenata sa nestabilnom anginom pektoris (14 muškaraca i 11 žena). Pre procedure koronarne angiografije, pacijentima je izvađena krv za određivanje koncentracija hsCRP, IL-6 i mijeloperoksidaze u serumu, nefelometrijskim i hemiluminiscentim testovima. Prosečna starost pacijenata sa stabilnom anginom bila je 61,12±7,79, a u grupi pacijenata sa nestabilnom anginom 59,08± 8,01. Koncentracija hsCRP kod pacijenata sa nestabilnom anginom bila je 4,43±4,55 mg/L, a kod pacijenata sa stabilnom anginom pektoris 1,26±0,5 mg/L. Razlika je bila statistički značajna (P<0,01). Koncentracija IL-6 kod pacijanata sa nestabilnom anginom bila je 11,03±3,34 pg/mL, a kod pacijenata sa stabilnom anginom pektoris 4,57±1,12 pg/mL. I u ovom slučaju razlika je bila statistički značajna (P<0,01). Koncentracija mijeloperoksidaze kod pacijenata sa nestabilnom anginom pektoris bila je 127,71±76,09 pmol/L, a kod pacijenata sa stabilnom anginom pektoris bila je 95,80±38,50 pmol/L. Razlika je bila statistički značajna (P<0,01). Pacijenti sa nestabilnom anginom pektoris su imali više koncentracije hsCRP, IL-6 i mijeloperoksidaze u serumu u poređenju sa pacijentima sa stabilnom anginom pektoris.

Ključne reči: markeri inflamacije, praćenje, angina pektoris

P021
MONITORING OF INFLAMMATORY MARKERS IN PATIENTS WITH STABLE AND ANSTABLE ANGINA PECTORIS

Lenka Radulović Tomović

Medical Faculty of the University Montenegro,
Department of Clinical Biochemistry,
Podgorica, Montenegro

High sensitivity C reactive protein (hsCRP) andcytokine IL-6 as inflammatory markers, are predictors of cardiovascular events. Measurement and comparison concentration hsCRP, IL-6 and myeloperoxidase were made between patients with stable angina pectoris which have negative coronary angiography test and patients with unstable angina pectoris which have positive coronary angiography test. The study includes 50 patients with ischaemic heart disease who are divided in two groups. The first group consisted of 25 patients with stable angina pectoris (11 male and 14 female). The second group consisted of 25 patientswith unstable angina pectoris (14 male and 11 female). Before a procedure, the coronary angiography, blood samples of patients were collected for serum hsCRP, IL-6 and myeloperoxidase and quantitavely measured by nephelometry and chemiluminescence assay. The mean age for group patient with stable angina pectoris was 61.12±7.79 and the group patients with unstable angina pectoris was 59.08±8.01. Concentration of hsCRP at patients with unstable angina pectoris was 4.43±4.55 mg/L and concentration patients with stable angina pectoris was 1.26±0.5 mg/L. A statistically significant difference was p <0.01. Concertation of IL-6 at patients with unstable angina pectoris was 11.03± 3.34 pg/mL and concertation of IL-6 at patient with stable angina pectoris was 4.57±1.12 pg/mL. A statistically significant difference was p <0.01. Concertation of myeloperoxidase at patients with unstable angina pectoris was 127.71±76.09 pmol/L and concertation of myeloperoxidase at patient with stable angina pectoris was 95. 80±38.50 pmol/L. A statistically significant difference was p <0.05. Patients with unstable angina pectoris had higher serum concetracions of hsCRP, IL-6 andmyeloperoksidase than patients with stable angina pectoris.

Keywords: inflammatory markers, angina pectoris

P022
STATUS ENZIMA PARAOKSONAZE 1 I RASPODELA AKTIVNOSTI ENZIMA NA HDL SUBFRAKCIJAMA PRE I POSLE HEMODIJALIZE

Milica Miljkovic[1], Aleksandra Stefanovic[1], Jelena Vekic[1], Aleksandra Zeljkovic[1], Tamara Gojkovic[1], Natasa Bogavac-Stanojevic[1], Sanja Simic-Ogrizovic[2], Vesna Spasojevic-Kalimanovska[1], Zorana Jelic-Ivanovic[1], Jelena Kotur-Stevuljevic[1]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija
[2]Klinika za nefrologiju, Klinički Centar Srbije, Beograd, Srbija

Kardiovaskularne bolesti predstavljaju glavni uzrok smrtnosti kod pacijenata sa oštećenjem bubrega. Paraoksonaza 1 (PON1), enzim vezan za apo A-I na lipoproteinu velike gustine (high density lipoprotein-HDL) ima antioksidativnu i antiaterogenu ulogu, koja doprinosi smanjenju rizika za razvoj ateroskleroze. Kod bubrežnih pacijenata smanjena aktivnost PON1, može predstavljati dodatni faktor rizika za razvoj kardiovaskularnih bolesti. Cilj rada je bio da se utvrdi uticaj hemodijalize na aktivnost i koncentraciju PON1, kao i da se proveri da li je proces dijalize uticao na preraspodelu aktivnosti enzima između HDL 2 i HDL 3 subklasa lipoporoteina. Kod 25 bubrežnih pacijenata pre i posle procesa dijalize određena je koncentracija PON1 ELISA metodom, dok je PON1 aktivnost određena zimogenom metodom, koja kombinuje gradient gel elektroofrezu za razdvajanje HDL subklasa i merenje aktivnosti enzima PON1. Uklanjanje uremičnih toksina tokom procesa hemodijalize značajno je doprinelo poboljšavanju aktivnosti enzima PON1 ($p<0,01$) koja se povećala za 17,6%. Takođe, proces hemodijalize je praćen i povećanom sintezom enzima, čemu u prilog govori i statistički značajno ($p<0,05$) viša koncentracija enzima PON1 posle dijalize. HDL subklase se nisu značajno razlikovale pre i posle dijalize. Proces dijalize nije doveo do promene u raspodeli aktivnost enzima na HDL 2 i HDL 3 subklase. Kod bubrežnih pacijenata, i pre i posle dijalize pronađena je statistički značajno veća aktivnost PON1 na HDL 2 subklasi lipoproteina ($p<0,001$). Pored pozitivnog efekta hemodijalize na aktivnost PON1, dobijeni rezultati ukazuju da se aktivnost i koncentracija enzima PON1 ne mogu objasniti samo na osnovu HDL, već da značajan uticaj imaju i inhibitori koji su prisutni u krvi pacijenata na hemodijalizi.

P022
STATUS OF PARAOXONASE 1 ENZYME AND DISTRIBUTION OF ENZYME ACTIVITY AT HDL SUBCLASSES BEFORE AND AFTER HEMODIALYSIS

Milica Miljkovic[1], Aleksandra Stefanovic[1], Jelena Vekic[1], Aleksandra Zeljkovic[1], Tamara Gojkovic[1], Natasa Bogavac-Stanojevic[1], Sanja Simic-Ogrizovic[2], Vesna Spasojevic-Kalimanovska[1], Zorana Jelic-Ivanovic[1], Jelena Kotur-Stevuljevic[1]

[1]Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia
[2]Clinic of Nephrology, Clinical Centre of Serbia, Belgrade, Serbia

Cardiovascular diseases are the major cause of mortality in patients with renal failure. Paraoxonase 1 (PON1), an enzyme associated with Apo A-I at high-density lipoprotein (high density lipoprotein HDL) has antioxidant and anti-atherogenic role, which contributes to reducing the risk of atherosclerosis. Decreased PON1 activity in renal patients, can presents an additional risk factor for cardiovascular disease. The aim of this study was to determine the effect of haemodialysis on PON1 activity and concentration, as well as to check whether the process of dialysis affected the redistribution of enzyme activity between the HDL 2 and HDL 3 lipoprotein subclasses. In 25 renal patients before and after dialysis we determined concentration of PON1 using ELISA method, while the activity is determined by PON1 zymogen method, which combines gradient gel electrophoresis for separating HDL subclasses and measuring the enzyme activity of PON1. Removal of uremic toxins during the haemodialysis has contributed significantly to improving the PON1 enzyme activity ($p<0.01$), which increased by 17.6%. Also, haemodialysis process is accompanied by increased synthesis of the enzyme, statistically significant PON1 concentration was found after dialysis ($p<0.05$). HDL subclasses did not differ significantly before and after dialysis. The process of dialysis did not lead to changes in the distribution of enzyme activity in the HDL 2 and HDL 3 subclasses. In renal patients, before and after dialysis was found significantly higher PON1 activity in the HDL 2 subclasses ($p<0.001$). In addition to the positive effect of haemodialysis on the PON1 activity and concentration, these results have shown that activity and concentration of PON1 can't be explained only with HDL, it is largely influenced by inhibitors that are present in the blood of patients at haemodialysis.

P023
ODREĐIVANJE MARKERA SINTEZE I APSORPCIJE HOLESTEROLA KOD KARDIOVASKULARNIH PACIJENATA I ZDRAVIH ISPITANIKA

Đorđe Salai, Miloš Dejanović, Tamara Gojković[1], Sandra Vladimirov[1], Aleksandra Zeljković[1], Jelena Vekić[1], Vesna Spasojević-Kalimanovska[1], Zorana Jelić-Ivanović[1]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija

Homeostaza holesterola predstavlja balans između sinteze i apsorpcije holesterola. Poremećaj homeostaze dovodi do nastanka dislipidemije i posledično razvoja kardiovaskularnih bolesti. Određivanjem markera sinteze i apsorpcije holesterola, moguće je utvrditi mehanizam nastanka dislipidemije. Cilj ovog rada je bio da se utvrde razlike u nivoima markera homeostaze holesterola između pacijenata sa kardiovaskularnim bolestima i zdravih ispitanika. U studiji su učestvovali pacijenti sa koronarnom arterijskom bolešću (n=75) i zdravi ispitanici (n=27) prosečne starosti 60±11,2 i 43±9,7 godina, sukcesivno. Kao markeri sinteze korišćeni su prekursori u sintezi holesterola (dezmosterol i latosterol), dok su biljni steroli korišćeni kao surogat markeri apsorpcije holesterola (kampesterol, stigmasterol i β-sitosterol). Ovi neholesterolski steroli (NCS) određivani su u plazmi, metodom gasne hromatografije sa plameno-jonizacionom detekcijom (GC-FID). U kontrolnoj grupi (KG) vrednosti markera sinteze su iznosile za: dezmosterol 9,1 (7,8–10,3) μmol/L i latosterol 6,8 (5,7–8,2) μmol/L; a za markere apsorpcije: kampesterol 17,7 (15,5–20,3) μmol/L, stigmasterol 4,1 (2,6–6,4) μmol/L i β-sitosterol 8,0 (7,3–8,8) μmol/L. Kod pacijenata su uočene značajno više vrednosti dezmosterola 12,7(11,6–13,9; p<0,001) i latosterola 10,4 (9,6–11,2; p<0,001), u odnosu na KG, dok su koncentracije stigmasterola 2,2 (2,0–2,4; p<0,05) i β-sitosterola 6,7 (6,3–7,1; p<0,01). Kampesterol se nije značajno razlikovao između grupa. Rezultati su pokazali da se koncentracije markera sinteze i apsorpcije holesterola kod kardiovaskularnih pacijenata značajno razlikuju u odnosu na zdrave ispitanike što ukazuje na vezu između poremećaja homeostaze holesterola, razvoja dislipidemije i kardiovaskularnih bolesti.

P023
CHOLESTEROL SYNTHESIS AND ABSORPTION MARKERS IN CARDIOVASCULAR DISEASE PATIENTS AND HEALHTY INDIVIDUALS

Đorđe Salai, Miloš Dejanović, Tamara Gojković[1], Sandra Vladimirov[1], Aleksandra Zeljković[1], Jelena Vekić[1], Vesna Spasojević-Kalimanovska[1], Zorana Jelić-Ivanović[1]

[1]Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia

Cholesterol homeostasis is determined by the balance between cholesterol synthesis and absorption. Disorders of cholesterol homeostasis lead to dyslipidemia and consequently to cardiovascular disease. By determining cholesterol absorption and synthesis marker levels it is possible to identify the mechanism of dyslipidemia development. The goal of this study was to determine the differences in cholesterol homeostasis in cardiovascular disease patients and healthy individuals. The study included coronary artery disease patients (n=75) and healthy individuals (n=27) aged 60±11.2 and 43±9.7 respectively. Cholesterol synthesis precursors (desmosterol and lathosterol) were used as markers of synthesis while plant sterols (campesterol, stigmasterol and β-sitosterol) were used as surrogate markers of cholesterol absorption. Plasma concentrations of non-cholesterol sterols (NCS) were determined by gas chromatography with flame-ionization detection (GC-FID). The synthesis marker concentrations in the control group (CG) were as follows: desmosterol 9.1 (7.8–10.3) μmol/L and lathosterol 6.8 (5.7–8.2) μmol/L; and for the absorption markers: campesterol 17.7 (15.5–20.3) μmol/L, stigmasterol 4.1 (2.6–6.4) μmol/L and β-sitosterol 8.0 (7.3–8.8) μmol/L. Cardiovascular patient group showed significantly higher values of desmosterol 12.7 (11.6–13.9; p<0.001) and lathosterol 10.4 (9.6–11.2; p<0.001), compared to CG, while the levels of stigmasterol 2.2 (2.0–2.4; p<0.05) and β-sitosterol 6.7 (6.3–7.1; p<0.005) were significantly lower. The results show that a significant difference exists in the levels of NCS of cardiovascular disease patients and healthy individuals which suggests there is a relationship between cholesterol homeostasis disorders, dyslipidemia development and cardiovascular disease.

P024
LONGITUDINALNE PROMJENE KONCENTRACIJE LEPTINA I ADIPONEKTINA TOKOM NORMALNE NEKOMPLIKOVANE TRUDNOĆE

Tamara Antonić, Milica Ostojić, Aleksandra Stefanović[1], Milica Miljković[1]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija

Leptin i adiponektin su adipocitokini, bioaktivni peptidi koje sekretuju adipociti. Leptin je u pozitivnoj korelaciji sa stepenom gojaznosti i koncentracijom proaterogenih lipidnih markera. Zaslužan je za održavanje energetskog balansa u organizmu. Ima važnu ulogu u transportu makronutrimenata na nivou placente. Odgovoran je za sve bitne događaje u razvoju fetusa i funkcionisanju placente. Koncentracija adiponektina je u negativnoj korelaciji sa indeksom tjelesne mase (ITM), kao i insulinskom rezistencijom, nezavisno od ITM. Smatra se da adiponektin ima ulogu u razvoju insulinske rezistencije tokom trudnoće. Cilj ovog rada je praćenje promjena koncentracije leptina i adiponektina tokom nekomplikovane trudnoće. Glukoza, insulin, parametri lipidnog statusa, leptin i adiponektin su određeni u serumu 38 zdravih trudnica. Leptin i adiponektin su određeni ELISA testom. Serum je prikupljen u pet tačaka: na sredini 1, 2. i 3. trimestra, pred porođaj, i nekoliko nedelja nakon porođaja. HOMA – indeksi su izračunati i analizirani kao surogat markeri insulinske rezistencije. Analiza varijanse ponovljenih mjerenja je pokazala statistički značajan porast u koncentraciji leptina u drugom i trećem trimestru i pred porođaj, sa statistički značajnim padom koncentracija nakon porođaja u odnosu na drugu polovinu trudnoće ($p<0,05$). Nije dokazan statistički značajan pad koncentracije adiponektina tokom trudnoće, do trenutka poslije porođaja kada su koncentracije bile značajno niže u odnosu na prvi i drugi trimestar ($p<0,05$). Možemo zaključiti da su promjene u koncentraciji leptina tokom trudnoće značajne, što je u skladu sa metaboličkim promjenama karakterističnim za trudnoću. Uočen je postepeni pad koncentracije adiponektina, što je i očekivano, s obzirom da je trudnoća stanje praćeno razvojem insulinske rezistencije.

P024
LONGITUDINAL CHANGES IN LEPTIN AND ADIPONECTIN CONCENTRATION DURING NORMAL UNCOMPLICATED PREGNANCY

Tamara Antonić, Milica Ostojić, Aleksandra Stefanović[1], Milica Miljković[1]

[1]Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia

Leptin and adiponectin are adipocytokins, bioactive peptides secreted by adypocytes. Leptin is in positive correlation with the degree of obesity and pro-atherogenic lipid markers concentration. It is responsible for energy balance maintanance. Leptin is inroled in macronutrients transport through placenta, as well as in every important event in fetus development and placenta functioning. Adiponectin levels are negativly correlated with body mass index (BMI) and insulin resistance, independently of the BMI. A role for adiponectin in the insulin resistance development was implied in pregnancy. The aim of this work is monitoring leptin and adiponectin concentration changes during uncomplicated pregnancy. Glucose, insulin, lipid status parameters, leptin and adiponectin were measured in sera of 38 healthy pregnant women. Leptin and adiponectin were determined by ELISA. The sera were collected at midpoint of 1st, 2nd and 3rd trimester, before delivery, and few weeks postpartum. HOMA indices were calculated and analysed as surrogate markers of insulin resistance. Repeated measures analysis of variance showed statistically significant increase in concentration of leptin in second, third trimester and before delivery, with statistically significant decrease postpartum compared to 2nd half of pregnancy ($p<0.05$). Changes in adiponectin concentrations did not reach statistical significance until after delivery, when it was significantly lower compared to the values in first and second trimester ($p<0.05$). In conclusion, in accordance to pregnancy associated metabolic alterations, changes in leptin concentrations during pregnancy were significant. Gradual decrease in adiponectin levels was observed, as expected, considering the fact that pregnancy is a physiological condition followed by insulin resistance development.

P025
ISPITIVANJE SMEŠE ANTIOKSIDANASA U BIOLOŠKOM MATERIJALU

Tamara Janković, Branko Subošić, Jelena Kotur-Stevuljević, Milica Miljković

Katedra za Medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Beograd, Srbija

Oksidativni stres je pojava koju u atmosferi punoj kiseonika ne možemo izbeći, ali možemo nastojati da ga smanjimo. Upravo kao pojava normalnog aerobnog ćelijskog metabolizma jeste nastajanje slobodnih radikala, tj prooksidanasa. Antioksidansi, bilo enzimski ili neenzimski, su ti koji mogu da umanje sve štetne efekte do kojih dovode prooksidansi kao što su oštećenje DNK, proteina i lipida. Cilj rada je bio da se utvrdi antioksidativni potencijal u uslovima in vitro indukovanog oksidativnog stresa kombinacije antioksidanasa koja se sastoji od: α-liponske kiseline, koenzima Q, vitamina C i dihidrokvercetina, kao i poređenje sa vitaminom E.Oksidativni stres je u uzorcima serumskog pula zdravih osoba indukovan dodatkom 0,5 mmol/L terc-butil hidroperoksida (TBH), a zatim je analiziran uticaj različitih koncentracija kombinacije antioksidanasa na parametre oksidativnog stresa: totalnog antioksidativnog statusa (TAS), totalnog oksidativnog statusa (TOS), ukupan sadržaj sulfhidrilnih grupa (SH) i pooksidativno antioksidativni balans (PAB), i na oksidativno-stresni indeks (OSI, gde je OSI=TAS/TOS). Koristili smo neparametarski test parova da bismo poredili oksidativno-stresni status uzoraka sa vitaminom E i kombinacije 4 antioksidansa. Naši rezultati pokazuju postojanje značajne razlike u antioksidativnoj aktivnosti kombinacije antioksidanasa i vitamina E. U uzorcima inkubiranim 2h sa različitim koncentracijama antioksidanasa bez dodatka TBH dobijene su značajne razlike u oksidativno-stresnom indeksu kombinacije antioksidanasa 132,3 (118,9–134,67) i vitamina E 69,3 (62,5–73,0) (p=0,068), kao i u uzorcima sa dodatkom TBH, gde je oksidativno-stresni indeks kombinacije antioksidanasa 49,2 (48,5-54,0) veći u poređenju sa vitaminom E 20,7 (19,3–23,2) (p=0,068). Uočavamo da se povećane OSI vrednosti nalaze kod kombinacije antioksidanasa u poređenju sa vitaminom E. Pored toga što se u kombinaciji antioksidanasa nalaze antioksidansi koji razliičitim mehanizmom uspevaju da suzbiju oksidativni stres, možemo predpostaviti da se javlja sinergistički efekat upravo zbog istovremene primene više antioksidanasa.

P025
ANTIOXIDANTS MIXTURE ANALYSIS IN BIOLOGICAL MATERIAL

Tamara Janković, Branko Subošić, Jelena Kotur-Stevuljević, Milica Miljković

Department of Medical Biochemistry, Faculty of Pharmacy, Belgrade University, Belgrade, Serbia

Oxidative stress is a phenomenon that in atmosphere full of oxygen canžt be avoided. Free radicals (pro-oxidants) are formed as product of normal aerobic cellular metabolism. Antioxidants (AO), either enzymatic or non-enzymatic, are the ones that can reduce any adverse effects which pro-oxidants can lead to, such as damage of DNA, proteins and lipids. The aim of this study was to determine the antioxidant potential in vitro induced oxidative stress of 4 antioxidants combination that include: α-lipoic acid, coenzyme Q, vitamin C and dihydroquercetin, and compare it with vitamin Oxidative stress was induced in serum samples of healthy individuals with 0.5 mmol/L tert-butyl hydroperoxide (TBH), and then we monitored the effects of various concentrations of 4 AO on oxidative stress parameters: total antioxidant status (TAS), total oxidant status (TOS), total activity of sulfhydryl group (SH) and pro-oxidants antioxidants balance (PAB), and oxidative-stress index (OSI, where OSI=TAS/TOS). We used non-parametric test to compare oxidative-stress status of samples with vitamin E and a combination of 4 antioxidants. Our results showed significant difference between the combination of antioxidants and vitamin E. In samples that were incubated for 2h with different concentrations of antioxidants (without TBH), there were significant differences in oxidative-stress index, a combination of antioxidants 132.3 (118.9–134.7) and vitamin E 69.3 (62.5–72.0) (p=0.068), as well as in samples with TBH addition, where OSI is in combinations of antioxidants 49.2 (48.5–54.0), and vitamin E 20.7(19.3–23.2) (p=0.068). Oxidative-stress index is a parameter that speaks in favor of a better antioxidant ability of a compound. We noticed that the value of OSI is increased in combination antioxidants compared to vitamin E. This can be explained by the fact that, in the combination of antioxidants are antioxidants that have different mechanism which can suppress oxidative stress, and also there is a synergistic effect, because of the simultaneous application of compound of antioxidants.

P026
ISPITIVANJE IN VITRO ANTIOKSIDATIVNE AKTIVNOSTI ČETIRI RAZLIČITE SUPSTANCE

Branko Subošić, Tamara Janković, Jelena Kotur-Stevuljević, Milica Miljković

Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija

Oksidativni stres predstavlja stanje narušene ravnoteže između prooksidanasa i endogenih sistema antioksidativne zaštite. Upravo su antioksidativni sistemi zaštite čuvari biomolekula, sprečavaju njihovo oštećenje tako što oni bivaju oksidovani od strane prooksidanasa. Cilj rada je bio da se ustanovi koja od 4 supstance poseduje najbolju sposobnost antioksidativne zaštite. Ispitivali smo: vitamin C, koenzim Q, dihidrokvercetin i alfa-liponsku kiselinu. Korišćen je serumski pul zdravih osoba koji je tretiran sa odgovarajućim razblaženjima antioksidansa ili sa smešom antioksidansa i 0,5 mmol/L terc-butil hidroperoksida (prooksidans koji je imao za cilj da izazove oksidativni stres u uzorku). Procenu antioksidativne sposobnosti ovih supstanci smo izvodili određivanjem koncentracija parametara: totalnog antioksidativnog statusa (TAS), totalnog oksidativnog statusa (TOS), prooksidativno-antioksidativnog balansa (PAB) i ukupnih sulfhidrilnih grupa (SH). Računanjem odnosa koncentracija TAS i TOS dobili smo novi parametar – oksidativno-stresni indeks (OSI). Vrednosti OSI indeksa u uzorcima koji su sadržali i antioksidans i prooksidans, ukazali su da je dihidrokvercetin ispoljio najbolju antioksidativnu zaštitu OSI=80,3(34,0–121,5), zatim alfa-liponska kiselina OSI=78,5(35,2–122,9), dok je najslabiju antioksidativnu sposobnost pokazao koenzim Q OSI=70,8 (29,6–109,8). Obradom rezultata uočeno je da postoji statistički značajna razlika OSI indeksa koenzima Q u odnosu na dva pomenuta antioksidansa ($r<0,05$ u odnosu na gore pomenute antioksidanse). U uzorcima samo sa antioksidansom najvišu vrednost OSI indeksa pokazuju dihidrokvercetin OSI=121,4 (120,0–122,9) i alfa-liponska kiselina OSI=121,9 (119,0–134,4), dok je statistički značajnu najnižu vrednost pokazao koenzim Q OSI=109,2(106,1–110,8, $r=0,068$ u odnosu na dva pomenuta antioksidansa). Vrednostima OSI indeksa zaključujemo da najbolju antioksidativnu zaštitu postiže dihidrokvercetin. Rezultat se može objasniti prisustvom flavonoidne strukture čime ostvaruju direktnu antioksidativnu zaštitu. Flavonoidi sadrže polifenolnu građu, koja čini izvor elektrona koji se mogu predati prooksidansu i time ostvariti antioksidativnu zaštitu. Dodatno, dihidrokvercetin je jedan od najboljih antioksidanasa koji pomaže u regeneraciji endogenih antioksidativnih sistema što se jasno videlo po visokoj vrednosti OSI indeksa.

P026
TESTING IN VITRO ANTIOXIDANT ACTIVITIES OF FOUR DIFFERENT ANTIOXIDANT SUBSTANCES

Branko Subošić, Tamara Janković, Jelena Kotur-Stevuljević, Milica Miljković

Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia

Oxidative stress is the condition of the body when there is imbalance between pro-oxidants and the components of antioxidant system. Antioxidant system is very important because antioxidants become oxidized instead of biomolecules and thus protect them. The aim of the study was to determine which one of these 4 substances has the best antioxidant activity. The substances were: vitamin C, coenzyme Q, dihydroquercetin and alpha-lipoic acid. We used serum pool of healthy people which had antioxidant in different concentrations or combination of antioxidants and 0,5 mmol/L tert-butyl hydroperoxide (pro-oxidant which had role to increase oxidative stress). The antioxidant potential of this 4 substances was estimated by determining concentration of total antioxidant status (TAS), total oxidant status (TOS), balance between pro-oxidants and antioxidants (PAB) and total activity of sulfhydryl groups (SH). We also estimated value of TAS and TOS ratio (OSI index). The values of OSI index in samples which had antioxidant and pro-oxidant showed that dihydroquercetin has the best antioxidant capability OSI=80.3 (34.0–121.5), the second best was alpha-lipoic acid OSI=78.5(35.2–122.9) and the weakest antioxidant protection had coenzyme Q OSI=70.8 (29.6–109.8). There was statistically significant difference between OSI index of coenzyme Q and other two antioxidants ($p<0.05$ both cases). In samples which had only antioxidant the highest value of OSI index had dihydroquercetin (OSI: 120.007–122.933) and alpha-lipoic acid (OSI: 119.097–134.440). The lowest value of OSI index had coenzyme Q (OSI: 106.105–110.872, $p=0.068$ both cases). Values of OSI index showed us that dihydroquercetin evinced the best antioxidant protection. The reason for convincing antioxidative capabilities of DHQ lays down in its flavonoide structure. Flavonoids contains polyphenolic chemical substructure that prevents oxidation by acting as a scavenger of pro-oxidants. Also, dihydroquercetin has capability to preserve activity of other antioxidants, which is clear from its highest OSI values.

P027
KOMPARATIVNA ANALIZA INDIKATORA KVALITETA ZDRAVSTVENE ZAŠTITE NA PRIMARNOM NIVOU SRBIJE, EVROPSKE UNIJE, SJEDINJENIH AMERIČKIH DRŽAVA I KANADE

Nevena Marković, Ljiljana Tasić

Katedra za socijalnu farmaciju i farmaceutsko zakonodavstvo, Farmaceutski fakultet Univerziteta u Beogradu, Beograd, Srbija

Komparativna analiza indikatora kvaliteta zdravstvene zaštite na primarnom nivou je jedan od osnovnih načina kojim se može direktno evaluirati kvalitet zdravstvene zaštite (usluga i zdravlja) i funkcionisanje zdravstvenog sistema. Kvalitet zdravstvene zaštite je od velikog značaja i uticaja na zdravlje populacije, a on se uspostavlja kroz strukturu, procese i ishode svih sistema i podsistema, što se evaluira adektvatnim idikatorima i metodama analiza. Neposredni cilj istraživanja je bio da se utvrde sličnosti/razlike u indikatorima za merenje kvaliteta primarne zdravstvene zaštite (PZZ) komparativnom analizom odabranih indikatora Republike Srbije (RS), zemalja članica Evropske Unije, Sjedinjenih Američkih Država (SAD) i Kanade. Posredni cilj je bio da se sagleda/uporedi razvijenost PZZ. U istraživanje su bili uključeni indikatori strukture (19 indikatora), indikatori procesa (10 indikatora) i indikatori ishoda (6 indikatora) PZZ u okviru sistema zdravstvenih zaštita RS, zemalja članica Evropske Unije, SAD i Kanade. Za analizu su korišćena dokumenta: Pravilnik o pokazateljima kvaliteta zdravstvene zaštite RS, izveštaji Svetske Zdravstvene Organizacije o kvalitetu ZZ (EU region), vodiči, uputstva i izveštaji agencija i Ministarstava zdravlja SAD i Kanade (2013–2015). U okviru indikatora kvaliteta strukture PZZ kao dela sistema zdravstvene zaštite, nisu uočene značajne razlike između posmatranih zemalja (indikatori kvaliteta kadrova, politika, pokrivenost ZZ). U okviru indikatora kvaliteta procesa i ishoda PZZ uočene su značajne razlike između sistema zdravstvene zaštite RS, zemalja članica EU, SAD i Kanade. Posebno su uočljive razlike u grupi naprednih indikatora evaluacije procesa i ishoda ZZ hroničnih bolesnika (dijabetičara, kardiovaskularnih bolesnika, rani skrining karcinoma). Indirektna analiza ishodnih pokazatelja je pokazala da je PZZ Kanade značano bolja od RS. Rezultati ovog istraživanja su pokazali da postoji razlika u indikatorima (procesa i ishoda) kojima se evaluira kvalitet PZZ zdravstvenih sistema RS, zemalja članica EU, SAD i Kanade. Kvalitet i stanje PZZ Kanade je značajno bolje od RS.

Ključne reči: indikator, kvalitet, primarna zdravstvena zaštita, zdravstveni sistem, RS, EU, SAD, Kanada

P027
COMPARATIVE ANALYSIS OF HEALTH CARE QUALITY INDICATORS AT PRIMARY HEALTH CARE OF SERBIA, THE EUROPEAN UNION, UNITED STATES AND CANADA

Nevena Marković, Ljiljana Tasić

Department of Social Pharmacy and Pharmaceutical Legislation, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia

Comparative analysis of health care quality indicators at the primary level is one of basic ways that can directly evaluate the quality of health care (services and health) and functioning of the health system. Health care quality has great importance and impact on health of population, and it is found trough the structure, processes and outcomes of all systems and subsystems, what could be evaluated by adequate indicators and methods of analysis. Direct objective of this study was to identify similarities / differences in indicators for measuring of the primary health care quality (PHC) by comparative analysis of selected indicators of the Republic of Serbia (RS), the member states of the European Union, the United States of America (USA) and Canada. The indirect aim was to examine / compare the development of PHC. The study involved structure indicators (19 indicators), process indicators (10 indicators) and outcome indicators (6 indicators) of PHC within the system of health care of RS, members of the EU, the USA and Canada. For analysis were used next documents: Rulebook on indicators of health care quality Republic of Serbia, reports of World health Organization on the quality of health care (EU region), guides, manuals and reports of agencies and Ministries of health of Canada and the USA (2013–2015). In framework of quality PHC structure indicators as part of the healthcare system, were not observed significant differences between the countries (indicators of the quality of personnel, policy, and coverage of health care). Within the quality indicators of the process and outcomes of PHC were observed significant differences between the health care system of RS, EU countries, USA and Canada. Particularly notable are differences in the group of advanced indicators for evaluation of processes and outcomes of chronic patients health care (diabetes, cardiovascular patients, early cancer screening). Indirect analysis of outcome indicators showed that the Canada PHC is significantly better than RS. Results of this study showed that there are a differences in the indicators (process and outcome) that evaluate the quality of PHC health systems RS, EU countries, USA and Canada. Quality and state of Canada PHC is significantly better than the RS.

Keywords: indicator, quality, primary health care, health system, RS, EU, USA, Canada

P028
ZNAČAJ ODREĐIVANJA GENSKE EKSPRESIJE IZOENZIMA SUPEROKSID-DISMUTAZE KOD PACIJENATA SA HRONIČNOM BUBREŽNOM INSUFICIJENCIJOM NA HEMODIJALIZI

Biljana Savić[1], Anastasja Vukoje[1], Ana Ninić[1], Miron Sopić[1], Jelena Munjas[1], Jelena Kotur-Stevuljević[1], Nataša Bogavac-Stanojević[1], Aleksandra Stefanović[1], Milica Miljković[1], Sanja Simić-Ogrizović[2], Vesna Spasojević-Kalimanovska[1], Zorana Jelić-Ivanović[1]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija
[2]Klinika za nefrologiju, Klinički Centar Srbije, Beograd, Srbija

Hronična bubrežna insuficijencija, a posebno terminalna faza renalne bolesti (ESRD), predstavljaju ozbiljan zdravstveni problem povezan sa visokom stopom mortaliteta. Kao posledica uremije nastaju izraženi oksidativni stres (OS) i inflamacija. Istraživanje je urađeno u cilju ispitivanja genske ekspresije enzima antioksidativne zaštite superoksid-dismutaze, Cu/Zn SOD i Mn SOD, u mononuklearnim ćelijama periferne krvi (M PK) pacijenata na hemodijalizi, i utvrđivanja povezanosti ekspresije ovih izoenzima sa parametrima OS, antioksidativne zaštite (AOZ) i inflamacije. U istraživanju su učestvovala 33 pacijenta na hemodijalizi (55,33 ±15,31 godina) i 33 zdrava ispitanika (45,33± 8,96 godina). U M PK određivani su nivoi informacione ribonukleinske kiseline (iRNK) izoenzima SOD metodom lančane reakcije polimeraze u realnom vremenu (Real time PCR). Pored parametara genske ekspresije određivani su i osnovni parametri lipidnog statusa, C-reaktivni protein visoke senzitivnosti (hsCRP), totalni antioksidantni status (TAS) i tiobarbituratna kiselina reagujuće supstance (TBKRS). Nivoi iRNK oba izoenzima SOD su bili statistički značajno viši kod hemodijaliznih pacijenata nego kod kontrolne grupe. Takođe, pokazane su statistički značajno više vrednosti TBKRS (p<0,001) i hsCRP (p<0,001), a značajno niže vrednosti TAS (P<0,001) kod pacijenata u odnosu na kontrolnu grupu. Postojala je statistički značajna negativna korelacija između Cu/Zn SOD i sledećih parametara: TBKRS (r=-0,388; p<0,005), TAS (r=-0,391; p<0,05) i hsCRP (r=-0,583; p 0,001). Pozitivna korelacija uočena je između Cu/Zn SOD i Mn SOD (r=0,694; p 0,001). Analizom kovarijanse je pokazano da je nivo iRNK Cu/Zn SOD nezavisan od koncentracije TBKRS (F=22,23; p<0,001), a zavisan od

P028
SUPEROXIDE DISMUTASE ISOENZYMES' GENE EXPRESSION DETERMINATION IN PATIENTS WITH CHRONIC RENAL FAILURE ON HEMODIALYSIS

Biljana Savić[1], Anastasja Vukoje[1], Ana Ninić[1], Miron Sopić[1], Jelena Munjas[1], Jelena Kotur-Stevuljević[1], Nataša Bogavac-Stanojević[1], Aleksandra Stefanović[1], Milica Miljković[1], Sanja Simić-Ogrizović[2], Vesna Spasojević-Kalimanovska[1], Zorana Jelić-Ivanović[1]

[1]Department of Medical biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia
[2]Clinic of Nephrology, Clinical Center of Serbia, Belgrade, Serbia

Chronic renal failure, especially end stage renal disease (ESRD) are serious health problems associated with a high mortality rate. Uremic syndrom leads to increased oxidative stress (OS) and inflammation. The purpose of this study was to examine superoxide dismutase isoenzymes' (Cu/Zn SOD and Mn SOD) gene expressions in peripheral blood mononuclear cells (PBMC) of patients on hemodialysis, compared to healthy population, and to determine associations between SOD's gene expressions and OS and antioxidative protection (AOP) parameters. This study included 33 patients on hemodialysis (55.33±15.31 years) and 33 healthy persons (45.33± 8.96 years). SOD isoenzymes' information ribonucleic acid (mRNA) levels were measured in PBMC using real time polymerase chain reaction (Real time PCR). Lipid status parameters, C-reactive protein high sensitivity (hsCRP), total antioxidant status (TAS) and thiobarbituric acid reactive substances (TBARS) were also determined. mRNA SOD isoenzymes' levels were significantly higher in patients on hemodialysis than in control group. Significantly higher levels of TBARS (p<0.001), hsCRP (p<0.001) and significantly lower levels of TAS (p<0.001) were shown in patients on hemodialysis than in control. There were significant negative correlations between Cu/Zn SOD and following parameters: TBARS (r= -0.388; p<0.005), TAS (r=-0.391; p<0.05) and hsCRP (r= -0.583; p<0.001). Significant positive correlation was found between Cu/Zn SOD i Mn SOD (r=0.694; p<0.001). Analysis of covariance showed that mRNA Cu/Zn SOD levels were independent of TBARS concentration (F=22.23; p<0.001), but dependent of TAS (F=2.40; p=0.127). This kind of analysis also showed that Cu/Zn SOD gene expression levels sig-

TAS-a (F=2,40; p=0,127). Analizom kovarijanse je pokazano da na nivo ekspresije Mn SOD značajno utiče ekspresija Cu/Zn SOD (F=0,039; p=0,845).

Zaključak: Rezultati ovog istraživanja su pokazali da je genska ekspresija oba izoenzima superoksid-dismutaze bila povećana u M PK, verovatno kao odbrambeni mehanizam organizma na povećan OS i oslabljenu AOZ.

P029
ZNAČAJ ODREĐIVANJA GENSKE EKSPRESIJE IZOENZIMA SUPEROKSID-DISMUTAZE KOD PACIJENATA SA SRČANOM BOLEŠĆU

Jelena Pavlović[1], Dimitrije Mitrović[1], Ana Ninić[1], Miron Sopić[1], Jelena Munjas[1], Jelena Kotur-Stevuljević[1], Nataša Bogavac-Stanojević[1], Aleksandra Stefanović[1], Milica Miljković[1], Dimitra Kalimanovska-Oštrić[2], Vesna Spasojević-Kalimanovska[1], Zorana Jelić-Ivanović[1]

[1]Katedra za Medicinsku biohemiju, Univerzitet u Beogradu – Farmaceutski fakultet
[2]Klinički centar Srbije, Univerzitet u Beogradu – Medicinski fakultet, Beograd, Srbija

Srčana bolest je najvažniji uzrok mortaliteta i morbiditeta u razvijenim zemljama. Pored dislipidemije i povećane inflamacije, prekomerna produkcija slobodnih radikala i neadekvatna antioksidativna zaštita (AOZ) mogu uzrokovati endotelnu disfunkciju, aterosklerozu i posledično srčanu bolest. Cilj ovog istraživanja je bio da se ispita genska ekspresija enzima antioksidativne zaštite, Cu/Zn-superoksid-dismutaze (Cu/Zn SOD) i Mn-superoksid dismutaze (Mn SOD) kod pacijenata sa srčanom bolešću u odnosu na zdravu populaciju, kao i da se utvrdi povezanost ekspresije izoenzima sa parametrima oksidativnog stresa (OS) i AOZ. U istraživanje je bilo uključeno 79 pacijenata sa srčanom bolešću (51,82±11,35 godina) i 33 zdrave osobe (45,33±8,95 godina). U okviru kliničkih parametara određivani su osnovni parametri lipidnog statusa, S-reaktivni protein visoke senzitivnosti (hs CRP), totalni antioksidantni status (TAS) i tiobarbiturna kiselina-reagujuće supstance (TBKRS). Nivoi informacione RNK (iRNK) izoenzima SOD su mereni u mononuklearnim ćelijama periferne krvi metodom lančane reakcije polimeraze u realnom vremenu (Real time PCR).Nivoi iRNK Cu/Zn SOD su bili statistički značajno viši kod osoba sa srčanom bolešću u odnosu na zdravu populaciju (p<0,05), nificantly affected Mn SOD expression levels (F=0.039; p=0.845). Results of this study showed that gene expression levels of both isoenzymes were higher in patients than in controls probably as organism's defensive mechanism to increased OS and weakened AOP.

P029
SUPEROXIDE DISMUTASE ISOZYMES' GENE EXPRESSION DETERMINATION IN PATIENTS WITH HEART DISEASE

Jelena Pavlović[1], Dimitrije Mitrović[1], Ana Ninić[1], Miron Sopić[1], Jelena Munjas[1], Jelena Kotur-Stevuljević[1], Nataša Bogavac-Stanojević[1], Aleksandra Stefanović[1], Milica Miljković[1], Dimitra Kalimanovska-Oštrić[2], Vesna Spasojević-Kalimanovska[1], Zorana Jelić-Ivanović[1]

[1]Department of Medical Biochemistry, University of Belgrade – Faculty of Pharmacy
[2]Clinical center of Serbia, University of Belgrade – Faculty of Medicine, Belgrade, Serbia

Heart disease is the most important cause of mortality and morbidity in developed countries. In addition to dyslipidemia and increased inflammation, excessive production of free radicals and inadequate antioxidant protection (AOP) may induce endothelial dysfunction, atherosclerosis and consequently heart disease. The aim of this study was to test antioxidative enzymes', Cu/Zn superoxide dismutase (Cu/Zn SOD) and Mn-superoxide dismutase (Mn SOD), gene expressions in patients with heart disease compared to healthy population, as well as to establish relationships between SOD isoenzymes' expressions with oxidative stress (OS) and AOP parameters. The study included 79 patients with heart disease (51.82 ± 11.35 years) and 33 healthy controls (45.33 ± 8.95 years). Basic lipid status parameters, C-reactive protein high sensitivity (hs CRP), total antioxidant status (TAS) and thiobarbituric acid-reacting substances (TBARS) were determined. mRNA SOD isoenzymes' levels were measured in peripheral blood mononuclear cells (PBMC) using real time polymerase chain reaction (Real time PCR). mRNA Cu/Zn SOD levels were significantly higher in patients with heart disease than in healthy population (p<0.05), while Mn SOD mRNA levels remained unchanged between tested

dok se nivoi iRNK Mn SOD nisu značajno promenili (p>0,05). Uočene su statistički značajno više vrednosti hs CRR-a (p<0,001) i TBKRS (p<0,001), a statistički značajno niže vrednosti holesterola u lipoproteinima visoke gustine (HDL-h) (p<0,001) i TAS-a(p<0,001) kod pacijenata sa srčanom bolešću. Takođe, uočene su pozitivne korelacije između TBKRS i nivoa iRNK Mn SOD (r=0,419, p<0,001) i nivoa iRNK Cu/Zn SOD i iRNK Mn SOD (r= 0,243, p=0,033) kod pacijenta sa srčanom bolešću. Nivoi iRNK Cu/Zn SOD i koncentracija TBKRS su imale ulogu prediktivnih faktora za nivoe iRNK Mn SOD (p=0,004 i p=0,022, respektivno). Rezultati ovog istraživanja su pokazali da je kod pacijenata sa srčanom bolešću povećana genska ekspresija izoenzima Cu/Zn SOD verovatno nastala kao posledica poremećenog balansa između OS i AOZ.

populations (p>0.05). We found significantly higher hs CRP (p<0.001) and TBARS (p<0.001) levels, and significantly lower high density lipoprotein (HDL-c) (p<0.001) and TAS (p<0.001) levels in patients with heart disease than in controls. There were significant positive correlations between TBARS and mRNA Mn SOD levels (r=0.419, p<0.001) and mRNA Cu/Zn SOD and mRNA Mn SOD (r= 0.243, p=0.033) in patients with heart disease. mRNA Cu/Zn SOD and TBARS levels were independent predictive parameters for mRNA Mn SOD levels in PBMC (p=0.004 and p=0.022, respectively). Results of this study showed that Cu/Zn SOD gene expression levels were increased in patients with heart disease, probably as the result of OS and AOP disbalance.

P030
ZNAČAJ ODREĐIVANJA CIKLOFILINA A KOD PACIJENATA SA KOLOREKTALNIM KARCINOMOM

Jovana Milosavljević, Branko Pavlović, Aleksandra Zeljković, Tamara Gojković

Katedra za medicinsku biohemiju, Univerzitet u Beogradu – Farmaceutski fakultet, Beograd, Serbija

Kolorektalni karcinom (CRC) predstavlja jednu od najčešćih malignih bolesti kod oba pola, a učestalost raste sa godinama. Ranije je pokazano da ciklofilin A ima ulogu u patogenezi različitih tipova malignih bolesti. Ciklofilin A pripada familiji imunofilina i predstavlja peptidil prolil cis-trans izomerazu. Osim u malignim bolestima, ima ulogu i u mnogim drugim inflamatornim stanjima. S obzirom da je ciklofilin A ranije doveden u vezu sa drugim tipovima kancera, upoređivali smo njegovu koncentraciju kod pacijenata sa CRC i zdravih osoba i procenjivali njegovu vrednost kao markera za otkrivanje CRC. Takođe, ispitivali smo i postojanje korelacija ciklofilina A sa različitim biohemijskim parametrima kod ovih ispitanika. Učestvovalo je ukupno 48 ispitanika, od kojih 30 sa CRC i 18 zdravih, starosti između 54 i 73 godine. Pored ciklofilina A, svim ispitanicima su određivani i indeks telesne mase (eng. body mass index, BMI), koncentracije albumina, ukupnog holesterola, glukoze, ukupnih proteina, triglicerida, holesterola u česticama lipoproteina visoke gustine (eng. high-density lipoprotein, HDL) i niske gustine (eng. low-density lipoprotein), uree, kreatinina i mokraćne kiseline. Dobijena je statistički značajna razlika za koncentraciju ciklofilina A između kontrolne (m=8,76 ng/mL, interkvartilni raspon 5,06–12,12) i test grupe (m=14,77 ng/mL, interkvartilni raspon 5,77–20,50), pri p<0,05. Ciklo-

P030
SIGNIFICANCE OF CYCLOPHILIN A TESTING IN PATIENTS WITH COLORECTAL CANCER

Jovana Milosavljević, Branko Pavlović, Aleksandra Zeljković, Tamara Gojković

Department of Medical Biochemistry, Faculty of Pharmacy University of Belgrade, Belgrade, Serbia

Colorectal cancer is one of the most common malignancies in both genders, with greater incidence in older age. It was previously shown that cyclophilin A plays a role in pathogenesis of different malignant diseases. Cyclophilin A is a member of the immunophilin family and has peptidyl-prolyl cis-trans isomerase activity, shown to be a circulating marker. It also has a role in many inflammatory states. Considering that cyclophilin A was previously linked to other type of cancer, we compared its concentration in patients with colorectal cancer and healthy subjects and assessed its value as a marker for diagnosing colorectal cancer. We also examined correlations of cyclophilin A with different biochemical parameters in these subjects. There were 48 participants, age 54 to 73, of which 30 with colorectal cancer and 18 healthy. Aside from cyclophilin A, all participants underwent measuring for BMI (body mass index) and laboratory testing for glucose levels, albumin, total cholesterol, high-density lipoprotein cholesterol (HDL-cholesterol), low-density lipoprotein cholesterol (LDL-cholesterol), triglycerides, total protein, urea, creatinine and uric acid. We found statistically significant difference between concentrations of cyclophilin A in control group (m=8.76 ng/mL, interquartile range= 5.06–12.12) and test group (m=14.77 ng/mL, interquartile range 5.77–20.50), with p<0.05. We linked

filin A je doveden u vezu i sa koncentracijom kreatinina (r=0,355, p<0,05). ROC analizom dobijena je osetljivost od 0,7 i specifičnost od 0,65 za vrednost ciklofilina 10,0 ng/mL, odnosno osetljivost 0,6 i specifičnost 0,8 za vrednost ciklofilina 12,5 ng/mL. Negativna prediktivna vrednost iznosi 100% za vrednosti preko 17,4 ng/mL. Dobijeni rezultati ukazuju na povezanost povišene koncentracije ciklofilina A i kolorektalnog karcinoma. Ciklofilin A bi mogao da posluži kao tumorski marker, ali tumačenje rezultata treba sprovoditi oprezno, kao i za ostale tumorske markere, a dodatna istraživanja su neophodna.

cyclophilin A with creatinine levels (r=0.355, p<0.05). ROC analysis showed a sensitivity of 0.7 and specificity of 0.65 for cyclophilin A concentration of 10 ng/mL and a sensitivity of 0.6 and specificity of 0.8 for cyclophilin A concentration of 12.5 ng/mL. Negative predictive value was 100% for cyclophilin A concentrations over 17.4 ng/mL. Our results show a connection between higher cyclophilin A levels and colorectal cancer. Cyclophilin A could be used as a tumor marker but results must be interpreted with caution, as is for all tumor markers. Still, further research is needed.

P031
ODREĐIVANJE MARKERA SINTEZE I APSORPCIJE HOLESTEROLA METODOM TEČNE HROMATOGRAFIJE – TANDEM MASENE SPEKTROMETRIJE KOD PACIJENATA SA KOLOREKTALNIM KARCINOMOM

Mirjana Crnogorac, Bojana Krivokuća, Aleksandra Zeljković, Jelena Vekić, Sandra Vladimirov

Katedra za medicinsku biohemiju, Farmaceutski fakultet Univerziteta u Beogradu, Beograd, Srbija

Homeostaza holesterola regulisana je njegovom apsorpcijom, endogenom sintezom i izlučivanjem putem žuči. Detekcija i evaluacija jedinjenja koja služe kao endogeni markeri ovih procesa može pružiti važne informacije o metaboličkom statusu organizma, posebno u bolestima koje se povezuju sa gojaznošću i poremećajem metabolizma lipida. U ovom radu ispitivali smo da li postoje razlike u koncentracijama markera sinteze (dezmosterol, 7-dehidroholesterol) i apsorpcije holesterola (stigmasterol, β-sitosterol, kampesterol) kod pacijenata obolelih od kolorektalnog karcinoma (CRC). Markere sinteze i apsorpcije holesterola određivali smo u 14 uzoraka plazme pacijenata obolelih od CRC. Metoda kojom smo određivali ove markere bila je tečna hromatografija–tandem masena spektroskopija (HPLC-MS/MS). Koncentracije ukupnog, holesterola u lipoproteinima niske (LDL) i visoke gustine (HDL) i triglicerida određene su standardnim laboratorijskim metodama. Koncentracija β-sitosterola je bila značajno viša kod žena sa CRC (P<0,05), dok se vrednosti ostalih markera sinteze i apsorpcije holesterola nisu značajno razlikovale po polu. Koncentracija kampesterola pokazala je značajnu korelaciju sa koncentracijama ukupnog (r=0,710; P<0,01), HDL (r=0,763; P<0,01), LDL holesterola (r=0,763; P<0,05) i triglicerida (r=0,560; P<0,05). Takođe, značajna pozitivna korelacija je

P031
DETERMINATION OF SYNTHESIS AND ABSORPTION MARKERS OF CHOLESTEROL BY LIQUID CHROMATOGRAPHIC METHOD – TANDEM MASS SPECTROMETRY IN COLORECTAL CANCER PATIENTS

Mirjana Crnogorac, Bojana Krivokuća, Aleksandra Zeljković, Jelena Vekić, Sandra Vladimirov

Department of Medical Biochemistry, University of Belgrade – Faculty of Pharmacy, Belgrade, Serbia

Homeostasis of cholesterol is regulated by absorption, endogenous synthesis and elimination by bile acids. Detection and evaluation compounds which we use as endogenous markers of this processes can give important informations about metabolic status of organism, especially in diseases which are linked with obesity and disturbed lipid metabolism. In this study we investigated whether exist difference in concentration of synthesis markers (desmosterol, 7-dehydrocholesterol) and absorption markers of cholesterol (stigmasterol, β-sitosterol, campesterol) in patients diseased of colorectal cancer (CRC).We determinated synthesis and absorption markers in 14 plasma samples of colorectal patients. Method which we used to determinate this markers was liquid chromatography – tandem mass spectrometry (HPLC-MS/MS). Concentrations of total, cholesterol in low density lipoproteins (LDL) and high density lipoproteins (HDL) and triglycerides were determined with standard laboratory methods. β-sitosterol concentration was significantly higher at women with CRC (P<0.05), while the value of other synthesis and absorption markers of cholesterol did not differ significantly by gender. Campesterol concentration showed a significant correlation with the total concentration (r=0.710; P <0.01), HDL (r=0.763; P <0.01), LDL

utvrđena između koncentracija β-sitosterola i vrednosti ukupnog (r=0,633; P<0,05), HDL (r=0,653; P<0,05) i LDL holesterola (r=0,552; P<0,05). Od analiziranih markera sinteze samo je koncentracija dezmosterola značajno korelirala sa koncentracijom ukupnog holesterola (r=0,740; P<0,05). Promene na nivou sinteze i apsorpcije holesterola utiču na celokupan lipidni status pacijenata sa CRC, što može biti od značaja pri razmatranju terapijskih mogućnosti. Efikasnija apsorpcija fitosterola mogla bi biti povezana sa manjom učestalošću CRC kod žena.

P032
ODREĐIVANJE AKTIVNOSTI LECITIN-HOLESTEROL ACIL TRANSFERAZE(LCAT) I HOLESTEROL-ESTAR TRANSFERNOG PROTEINA (CETP) KOD PACIJENATA SA KOLOREKTALNIM KANCEROM

Jovana Jovanović, Marija Petrović, Tamara Gojković, Sandra Vladimirov, Vesna Spasojević-Kalimanovska, Aleksandra Zeljković, Jelena Vekić

Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija

Lecitin-holesterolaciltransferaza (LCAT) je enzim plazme koji vrši esterifikaciju slobodnog holesterola u holesterol estre, dok holesterol-estartransferni protein (CETP) ima ulogu u razmeni holesterolestara i triglicerida između lipoproteina visoke gustine (HDL) i lipoproteina bogatih trigliceridima u procesu reverznog transporta holesterola. Studija je obuhvatala 30 zdravih (KG) i 79 osoba sa dijagnostifikovanim kolorektalnim karcinomom (CRC). Aktivnost LCAT enzima dobijena je matematičkim proračunom kao razlika koncentracija slobodnog (FC) i esterifikovanog holesterola (EC) pre i nakon inkubacije od 2h na 37 °C, dok je aktivnost CETP-a određena kao razlika između brzine smanjenja koncentracije FC u plazmi i povećanja koncentracije EC u HDL česticama pre i nakon inkubacije od 2h na 37 °C. Koncentracija FC i EC određivana je kolorimetrijskom metodom na automatskom analizatoru ILAB 300$^+$. Aktivnosti enzima LCAT su statistički značajno bile veće u KG (100,5; 70, 62–125,67) μmol/L/h u odnosu na CRC pacijente (67,0; 44,33–92,67) μmol/L/h (p>0,05), dok je CETP-a aktivnost bila statistički značajno veća kod pacijenata 39,29 (-14,19–74,31) μmol/L/h u

cholesterol (r=0.763; P<0.05) and triglycerides (r=0.560; P<0.05). Also, a significant positive correlation was found between plasma β-sitosterol and the total value (r=0.633; P<0.05), HDL (r=0.653; P<0.05) and LDL cholesterol (r=0.552; P<0 05). From the analysed markers of synthesis only desmosterol concentration correlated with the concentration of total cholesterol (r=0.740; P<0.05). Changes in the level of synthesis and absorption of cholesterol affect the overall lipid profile of patients with CRC, which may be of importance when considering treatment options. Efficient absorption of phytosterols could be associated with a lower incidence of CRC in women.

P032
DETERMINATION OF LECITHIN-CHOLESTEROL ACYLTRANSFERASE (LCAT) AND CHOLESTEROL-ESTER TRANSFER PROTEIN (CETP) ACTIVITY IN PATIENTS WITH COLORECTAL CANCER

Jovana Jovanović, Marija Petrović, Tamara Gojković, Sandra Vladimirov, Vesna Spasojević-Kalimanovska, Aleksandra Zeljković, Jelena Vekić

Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia

Lecithin-cholesterol acyltransferase (LCAT) is a plasma enzyme that performs the esterification of free cholesterol to cholesterol esters while cholesterol ester transfer protein (CETP) enables the exchange of cholesterol esters and triglycerides between HDL and triglyceride-rich lipoproteins in reverse transport of cholesterol. The study included 30 healthy people (KG) and 79 patients that have been diagnosed with colorectal cancer (CRC). LCAT activity is obtained by mathematical calculation of the difference between free (FC) and esterified cholesterol (EC) concentration before and after a 2-hour incubation of the samples at 37 °C, while the CETP-mediated transfer of cholesterol esters was measured as the difference between the rate of decrease in FC in the whole plasma and the rate of EC increase in HDL during 2 hours of incubation at 37 °C. Concentrations of FC and EC were determined by colorimetric method with automatic analyser ILAB 300$^+$. LCAT activities were statistically significantly higher in healthy subjects 100.5 (70.62 to 125.67) mmol/L/h compared to patients with CRC and 67.0 (44.33 to 92.67) μmol/L/h (r>0.05). It has been found that there is a positive correlation between the

poređenju sa KG 10,17 (-33,14–54,58) μmol/L/h, ($p<0,05$). Utvrđeno je da postoji pozitivna korelacija između aktivnosti LCAT i koncentracije ukupnog holesterola ($\rho=0,276$, $p<0,05$) i holesterola sadržanog u česticama lipoproteina niske gustine (LDL) ($\rho=0,236$, $p<0,05$) kod pacijenata sa CRC. U KG dobijena je negativna korelacija između aktivnosti CETP-a i nivoa HDL holesterola ($\rho=-0,446$, $p<0,05$). Rezultati ovog istraživanja su pokazali da postoji značajna razlika u aktivnostima LCAT i CETP između KG i CRC pacijenata, što bi moglo da ukaže na poremećaj aktivnosti ovih enzima i posledično poremećaj u reverznom transportu holesterola kod CRC pacijenata.

P033
ODREĐIVANJE MASENE KONCENTRACIJE LIPOPROTEINSKE FOSFOLIPAZE A2 KOD ZDRAVIH ISPITANIKA I PACIJENATA SA KARDIOVASKULARNOM BOLEŠĆU

Aleksandra Tijanić, Tamara Gojković[1], Sandra Vladimirov[1], Vesna Spasojević-Kalimanovska[1], Milica Miljković[1], Aleksandra Stefanović[1], Aleksandra Zeljković[1], Jelena Vekić[1], Zorana Jelić-Ivanović[1]

[1]Katedra za medicinsku biohemiju, Farmaceutski fakultet, Univerzitet u Beogradu, Srbija

Lipoproteinska fosfolipaza A2 (Lp-PLA2) je enzim koji katalizuje hidrolizu acetil grupe u položaju 2 trombocitnog faktora aktivacije i oksidovanih fosfolipida. U aterosklerotskom plaku, ovaj enzim hidrolizuje oksidovane lipoproteinske čestice male gustine (LDL) do lizofosfatidilholina i oksidovanih, neesterifikovanih masnih kiselina, koje imaju važnu ulogu u aterogenezi. Zahvaljujući ovoj ulozi, Lp-PLA2 predstavlja specifičan marker vaskularne inflamacije. Cilj ovog rada bio je da se utvrdi da li postoji značajna razlika u koncentracijama Lp-PLA2 između zdravih ispitanika (KG) i pacijenata sa kardiovaskularnom bolešću, sa ili bez terapije statinima. 79 kardiovaskularnih pacijenata i 30 KG je uključeno u studiju. Koncentracija Lp-PLA2 je određena imunohemijskim sendvič testom (ELISA – Enzyme Linked immuno Sorbent Assay). Koncentracija Lp-PLA2 kod pacijenata bez terapije statinima iznosila je 260,2±99,40 ng/ml, na terapiji statinima 197,7±90,52 ng/ml, a u KG iznosile 186,0±54,22 ng/ml. Utvrđena je značajna razlika u koncetracijama Lp-PLA2 kod pacijenata sa i bez terapije statinima ($p<0,05$), kao i između pacijenata koji nisu na terapiji i KG ($p<0,05$). U KG su dobijene pozitivne korelacije između vrednosti Lp-PLA2 i LDL holesterola ($r=0.494$, $p<0,01$) i

activity of LCAT enzyme and the concentration of total cholesterol ($\rho=0.276$, $p<0.05$) and cholesterol in low density lipoproteins (LDL) ($\rho=0.236$, $p<0.05$) in patients with CRC. Plasma CETP activity in patients with CRC was significantly higher 39.29 (-14.19–74.31) mmol/L /h, compared to the control group -10.17 (-33.14–54.58) mmol/L/h, ($p<0.05$). Correlation between CETP activity and HDL cholesterol levels was negative in the KG ($\rho=-0.446$, $p<0.05$). The results of this study showed that there were significant differences in the activities of LCAT and CETP between the KG and patients with CRC, which could indicate the activity disturbance of this enzyme and the consequent disruption in the process of reverse cholesterol transport in patients with CRC.

P033
DETERMINATION OF PHOSPHOLIPASE A2 CONCENTRATIONS IN HEALTHY SUBJECTS AND CARDIOVASCULAR PATIENTS

Aleksandra Tijanić, Tamara Gojković[1], Sandra Vladimirov[1], Vesna Spasojević-Kalimanovska[1], Milica Miljković[1], Aleksandra Stefanović[1], Aleksandra Zeljković[1], Jelena Vekić[1], Zorana Jelić-Ivanović[1]

[1]Department of Medical Biochemistry, Faculty of Pharmacy, University of Belgrade, Serbia

Lipoprotein-associated phospholipase A2 (Lp-PLA2) is an enzyme which catalyses hydrolysis of the acetyl group at the sn-2 position of platelet activating factor (PAF) and oxidized phospholipids. In atherosclerotic plaque, this enzyme hydrolyses oxidized low-density lipoprotein particles to generate lysophosphotidylcholine and oxidized non-esterified fatty acids, which have a significant role in atherogenesis. Considering its role, Lp-PLA2 is a specific marker of vascular inflammation. The aim of this paper was to determine whether there is a significant difference in Lp-PLA2 concentrations between healthy subjects and statin-treated and statin-naïve cardiovascular patients. 30 healthy subjects (control group-CG) and 79 cardiovascular patients were enrolled. Lp-PLA2 concentrations were determined using Enzyme Linked Immuno-Sorbent Assay (ELISA). Lp-PLA2 concentrations in statin-naïve patients were 260.2±99.40 ng/ml, in statin-treated 197.7±90.52 ng/ml and in CG 186.0±54.22 ng/ml. A significant difference was found in Lp-PLA2 concentrations between statin-treated and statin-naïve patients ($p<0.05$), as well as between statin-naïve patients and CG ($p<0.05$). There was no significant statistical difference between Lp-PLA2 concentrations in statin-treated patients and CG. In CG

triglicerida (r=0,573, p<0,01), a negativna korelacija sa holesterolom u česticama lipoproteina velike gustine (HDL) (r=-0, 454, p<0,05). Kod pacijenata sa i bez terapije, dobijene su pozitivne korelacije sa vrednostima ukupnog holesterola (r=0,458, p<0,01), (r=0,418, p<0,05) i LDL holesterola (r=0,470, p<0,01), (r=0,507, p<0,01), sukcesivno. Dobijeni rezultati mogu da ukažu na povezanost koncetracije Lp-PLA2 i razvoja dislipidemije, kao i na dodatni, pozitivan, efekat statina na koncentraciju enzima Lp-PLA2.

P034
PROCENA PARAMETARA NUTRITIVNOG STATUSA, OKSIDATIVNOG STATUSA I INFLAMACIJE KOD PACIJENATA SA HRONIČNOM RENALNOM INSUFICIJENCIJOM

Jovana Aranđelović, Marija Banićević, Aleksandra Stefanović, Milica Miljković

Katedra za medicinsku biohemiju, Univerzitet u Beogradu – Farmaceutski fakultet, Beograd, Srbija

Hronična bubrežna insuficijencija (HRI) nastaje propadanjem nefrona koje nastaje kao posledica različitih patofizioloških procesa. Karakteriše se poremećajem parametara lipidnog statusa, nutritivnog statusa, oksidativnog stresa, antioksidativne zaštite i inflamacije. U ovoj studiji je ispitivan odnos ovih parametara kod pacijenata u terminalnoj fazi bubrežne bolesti koji su preživeli i onih koji su umrli nakon godinu dana od uzimanja uzorka. Lipidni status, parametari nutritivnog statusa (ukupni proteini, albumin, prealbumin, retinol-vezujući protein), visoko osetljiv C-reaktivni protein (hsCRP) su određivani rutinskim automatizovanim metodama. Prooksidativni – antioksidativni balans (PAB), totalni oksidacioni status (TOS) i aktivnost superoksid dizmutaze (SOD) određivani su spektrofotometrijski, a rezistin ELISA testom. Utvrđeno je da nije postojala statistički značajna razlika u vrednostima parametara lipidnog i oksidativnog statusa i inflamacije između dve grupe, osim za koncentracije PAB-a i hsCRP-a koje su bile više u grupi preminulih. Parametri nutritivnog statusa, osim ukupnih proteina, su značajno niži kod umrlih pacijenata. Dokazana je značajna pozitivna korelacija prealbumina sa ukupnim holesterolom i LDL-holesterolom kod obe grupe, i sa trigliceridima u grupi preživelih pacijenata. Koncentracija prealbumina je bila u negativnoj korelaciji sa PAB-om i hsCRP-om kod preživelih, a

there were positive correlations between Lp-PLA2 and LDL-cholesterol levels (r=0.494, p<0.01) and between Lp-PLA2 and triglyceride levels (r=0.573, p<0.01) and negative correlation between Lp-PLA2 and HDL-cholesterol (r=0.454, p<0.05). In both patient groups, statin-treated and statin-naïve, Lp-PLA2 concentrations showed positive correlation with total cholesterol levels (r=0.458, p<0.01), (r=0.418, p<0.05) and LDL-cholesterol (r=0.470, p<0.01), (r=0.507, p<0.01), respectively. Results of this paper can indicate a connection between Lp-PLA2 concentration and dyslipidaemia development, as well as an additional positive effect of statin use on Lp-PLA2 concentration.

P034
ESTIMATES OF THE PARAMETERS OF NUTRITIONAL STATUS, OXIDATIVE STATUS AND INFLAMMATION IN PATIENTS WITH CHRONIC RENAL INSUFFICIENCY

Jovana Aranđelović, Marija Banićević, Aleksandra Stefanović, Milica Miljković

Department for Medical Biochemistry, Pharmacy Faculty of University of Belgrade, Belgrade, Serbia

Chronic renal failure (CRF) occurs after the destruction of nephrons due to various etiologies. It is characterized by changes in lipid status, nutritional status, oxidative stress, antioxidant protection and inflammation parameters. In this study, we investigated the relationship of these parameters in hemodialysis patients who survived and those who died one year after sampling. Lipid status, nutritional status parameters (total protein, albumin, prealbumin, retinol-binding protein), high sensitive C-reactive protein (hsCRP) were determined by routine automatized methods. The prooxidant-antioxidant balance (PAB), total oxidative status (TOS) and activity of superoxide anion dismutase (SOD) were determined by spectrophotometry, and resistin by ELISA. There were no significant differences in lipid, oxidative status and inflammation parameters between two groups, except for the concentration of PAB and hsCRP-which were higher in the group of patients who died one year after sampling. The parameters of nutritional status, were significantly lower in the patients who died. A significant positive correlation of prealbumin with total cholesterol and LDL-cholesterol was proven in both groups, but positive correlation between prealbumin and triglycerides was only proven in the group of survived patients. Prealbumin concentration was negatively correlated with PAB and hsCRP concentra-

sa rezistinom kod umrlih pacijenata. Na osnovu dobijenih rezultata može se zaključiti da su se pacijenati koji su umrli nalazili u stanju intenzivnijeg oksidativnog stresa i inflamacije u odnosu na preživele pacijente i stepen uhranjenosti im je bio niži. Uočena je značajana povezanost koncentracija rezistina i prealbumina kod umrlih pacijenata, što ukazuje na to da bi rezistin mogao potencijalno biti parametar koji bi povezivao malnutriciju i inflamaciju u HRI.

tion in survivors, and with resistin in patients who died. Based on these results, we can conclude that the patients who died were in a state of more intense oxidative stress and inflammation, compared to surviving patients and their nutritional status was worse. A significant correlation of prealbumin and resistin concentrations was observed in patients who died one year after sampling, suggesting that the resistin could potentially be an association of malnutrition and inflammation in HRI patients.

P035
PROCENA PARAMETARA OKSIDATIVNOG STATUSA KOD PACIJENATA SA KOLOREKTALNIM KARCINOMOM

Marija Banićević, Jovana Aranđelović, Aleksandra Stefanović, Milica Miljković

Katedra za medicinsku biohemiju, Univerzitet u Beogradu – Farmaceutski fakultet, Beograd, Srbija

Kolorektalni karcinom (CRC) je najčešći oblik kancera gastrointestinalnog trakta. Nastaje malignom transformacijom epitelijalnih ćelija kolona i rektuma. Predloženo je nekoliko mehanizama nastanka genetski neuslovljenog CRC-a, u čijoj osnovi se nalaze nepravilne životne navike (npr. loša ishrana, pušenje) koji izazivaju oksidativni stres. Smatra se da progresiji ove bolesti doprinosi i smanjena antioksidativna zaštita. Cilj ovog rada je da se utvrdi da li postoji promena u parametrima oksidativnog stresa i antioksidativne zaštite kod pacijenata sa CRC-om u odnosu na zdravu populaciju. Lipidni status, nukupni proteini, albumin, nivo glukoze u krvi, totalni antioksidativni status (TAS), totalni oksidativni status (TOS), paraoksonaza 1 (PON) i slobodne sulfhidrilne grupe su određivani spektrofotometrijskim metodama. Budući da je razlika u godinama između kontrolne grupe i grupe pacijenata sa CRC-om statistički značajna, urađena je korekcija za godine. Nakon ANCOVA testa, utvrđeno je da je postojala statistički značajna razlika u vrednostima glukoze u krvi (viša kod pacijenata $p<0,001$), HDL-holesterola i LDL-holesterola (niže vrednosti su u grupi obolelih, $p<0,001$). Ukupni proteini se nisu razlikovali, ali je nivo albumina statistički značajno viši kod kontrolne grupe ($p<0,001$). Parametar oksidativnog stresa, TOS, značajno je viši u grupi obolelih ($p<0,001$), a parametri antioksidativne zaštite, TAS i enzim paraoksinaza, niži ($p<0.05$), kod obolelih u odnosu na kontrolnu grupu. Razlika u vrednostima slobodnih sulfhidrilnih grupa nije pokazala statistički značajnu razliku. Na osnovu dobijenih rezultata može se zaključiti da su pacijenti koji su oboleli od CRC-a u stanju intenzivnijeg oksidativnog stresa u odnosu na zdravu populaciju. Stepen antioksidativne zaštite kod pacijenata je niži.

P035
ESTIMATES OF THE PARAMETERS OF OXIDATIVE STATUS IN PATIENTS WITH COLORECTAL CANCER

Marija Banićević, Jovana Aranđelović, Aleksandra Stefanović, Milica Miljković

Department for Medical Biochemistry, Pharmacy Faculty of University of Belgrade, Belgrade, Serbia

Colorectal cancer (CRC) is the most common form of gastrointestinal cancers. It occurs after malignant transformation of the epithelial cells which line the colon and rectum. Several different mechanisms of genetic unconditioned CRC were proposed. They are based on bad lifestyle (poor diet, smoking) which causes oxidative stress. It is believed that the progression of the disease contributes to decreased antioxidant protection. The aim of this study was to determine whether there is a change in the parameters of oxidative stress and antioxidative protection in patients with CRC compared to healthy population. Lipid status, total protein, albumin, blood glucose, total antioxidative status (TAS), total oxidative status (TOS), paraoxonase 1 (PON) and free sulfhydryl groups were determined by spectrophotometric methods. Since the age was significantly different between the control group and the group of patients with CRC, correction was done. After ANCOVA test, a statistically significant difference in the values of glucose (higher in patients, $p<0.001$), HDL-cholesterol and LDL-cholesterol (lower values in group of patients with CRC, $p<0.001$) was found. The protein levels were not different, and the albumin level was significantly higher in controls compared with patients ($p<0.001$). TOS was significantly higher in the group of patients ($p<0.001$) compared to the control group. TAS and paraoxonase 1 were lower ($p<0.05$) than in the control group. The difference in the values of free sulfhydryl groups have not showed a statistically significant difference. Based on these results it could be concluded that patients suffering from CRC were in a state of intensive oxidative stress, compared to the healthy population. The level of antioxidant protection for patients was lower.