# C
# LIPIDI I LIPOPROTEINI

# LIPIDS AND LIPOPROTEINS

UC 577,1; 61 ISSN 0354-3447

*Jugoslov Med Biohem 2004: 23 (Suppl 3) 87–98*

*Posterske sekcije*
*Poster sessions*

## C27

## OSOBENOSTI ATEROGENIH I PROTEKTIVNIH PARAMETARA LIPIDNOG STATUSA KOD DUGOGODIŠNJIH VEGETARIJANACA

*M. Đerić, D. Ivanov, Lj. Lepšanović*

*Institut za laboratorijsku medicinu, Klinički centar Novi Sad, Novi Sad*

Manji mortalitet, manja učestalost gojaznosti, hipertenzije i nekih ređih malignih oboljenja, a naročito smanjeni rizik ishemijske bolesti srca kod vegetarijanaca, dovodi se u vezu s povoljnijim efektima pretežno biljne hrane, prvenstveno na parametre lipidnog statusa. Uticaj vegetarijanske ishrane na aterogene i protektivne parametre lipidskog statusa ispitan je kod 60 osoba oba pola, 30 muškaraca i 30 žena, srednje životne dobi 37 godina, koji su najmanje 5 godina na režimu vegetarijanske ishrane (prosečno 23 godine), i u kontrolnoj grupi od 59, odnosno 213 za procenu Lp(a), zdravih osoba oba pola koje su na režimu standardne mešovite ishrane (nevegetarijanci). Kao aterogene parametre određivan je ukupni holesterol (H), trigliceride i LDL-H (standardne biohemijske metode), apolipoprotein B i lipoprotein Lp(a) (RID), te protektivne, HDL-H (Burstein i sar.) i apolipoprotein A-I. Takođe, izračunati su i odnosi: ukupni H/HDL-H, LDL-H/HDL-H i apo B/A-I. Ustanovljeno je da kod vegetarijanaca postoji značajno povišenje nivoa apo B (11%, $p<0,05$) i lipoproteina Lp(a) (73%, $p<0,001$) od aterogenih parametara. Uz to, prisutna je i veća učestalost povišenih nivoa Lp(a) (27% vs 12,7%) kako umereno (17% vs 10,3%, tako i izrazito (10% vs 2,4%). Nađeno je sniženje HDL-H (10%, $p<0,01$) i apo A-I (24%, $p<0,0005$). Pri tome, značajno rastu i odnosi LDL-H/HDL-H (17%, $p<0,005$) i apo B/A-I (50%, $p<0,0005$). Rezultati ispitivanja upućuju na zaključak da vegetarijanstvo nema povoljan uticaj na Lp(a) i apo B. Sniženje HDL-H moglo bi biti posledica niže produkcije čestica u crevima, a apo A-I zbog bržeg katabolizma, što bi mogao biti kompenzatorni odgovor organizma na snižen unos zasićenih masti i holesterola, a time smanjenu potrebu za uklanjanjem holesterola sa periferije.

## C27

## DISTINCTIVE FEATURES OF ATHEROGENIC AND PROTECTIVE PARAMETERS OF LIPID STATUS IN TIME-CONSUMING VEGETARIANS

*M. Đerić, D. Ivanov, Lj. Lepšanović*

*Institute of Laboratory Medicine, Novi Sad Clinical Centre, Novi Sad*

Lower mortality, and lower frequency of obesity, hypertension and some rare malignant diseases, and particularly a lower risk of ischaemic heart disease in vegetarians, are brought into connection with the favorable effects of the prevailing vegetable food on the lipid status of these persons. A study of the possible effect of vegetarian diet on atherogenic and protective parameters of lipid status was conducted in 60 middle-aged (average age 27 years), subjects of both sexes, 30 males and 30 females, who have been on vegetarian diet for at least 5 years (average 23 years), and in control group of 59 persons (213 for the estimation of Lp(a) lipoprotein) of both sexes on standard mixed food diet. We evaluated atherogenic parameters such as total cholesterol (CH), triglycerides and LDL-CH (standard biochemical methods), apo-B and lipoprotein Lp(a) (RID) and protective HDL-CH (Burstein et al) and apo A-I. In addition, we measured the ratio: total CH/HDL-CH, LDL-CH/HDL-CH and apo B/A-I. Vegetarians had a significantly higher apo B (11%, $P<0.05$) and Lp(a) levels (73%, $P<0.001$) of atherogenic parameters. At the sametime, frequency of elevated levels of Lp(a) was much higher (27% vs 12.7%): both moderately high (17% vs 10.3%) and extremely high (10% vs 2.4%). Surprisingly, we observed a significant decrease in protective HDL-CH (10%, $P<0.01$) and apo A-I values (24%, $P<0.0005$). Values of atherogenic ratio LDL-CH/HDL-CH (17%, $P<0.005$) and apo B/A-I (50%, $P<0.0005$) ratio are significantly higher. The results suggest that vegetarian diet has no beneficial effect on serum apo B and Lp(a) levels. Decrease in HDL-CH levels might be in connection with the smaller production of particles in the intestine, and faster turnover of apo A-I, that might be compensatory to lower content of saturated acid and cholesterol in a diet and smaller need for removal of cholesterol from the perifery.

## C28

## ASOCIJACIJA GENETSKOG POLIMORFIZMA APOLIPOPROTEINA E, PUŠENJA I VREDNOSTI LIPIDNIH PARAMETARA U POPULACIJI SRBIJE

*S. Stanković[1], N. Majkić-Singh[1], D. Alavantić[2]*

*[1]Institut za medicinsku biohemiju, Klinički centar Srbije, Beograd*
*[2]VINČA – Institut za nuklearne nauke, Laboratorija za radiobiologiju i molekularnu genetiku, Beograd*

Geni koji se smatraju suspektnim za različite bolesti kod ljudi (aterosklerozu, kancer) povećavaju rizik od dobijanja ovih bolesti promenom metaboličke aktivacije egzogenih (npr. karcinogena) i endogenih (npr. holesterol) jedinjenja. Funkcije ovih gena i odgovarajući rizik mogu biti pod uticajem odgovarajućih polimorfizama. Jedan od takvih polimorfizama je polimorfizam gena za apolipoprotein E (apoE). Da bi se protumačilo kako polimorfizam apoE i pušenje kao jedan od najznačajnih ne-lipidnih faktora rizika za koronarnu arterijsku bolest, interaguju u determinisanju koncentracije lipida u plazmi, ispitano je 622 osobe (422 muškarca, 200 žena, prosečne starosne dobi 39,74 ± 13,50 godina, pušača 48,2%). Genotipovi apoE određeni su restrikcionom tipizacijom/MADGE, a koncentracije lipida u serumu izmerene su standardnim laboratorijskim metodama. Utvrđeno je da pušači imaju veće vrednosti ukupnog, LDL-holesterola i triglicerida i manje vrednosti HDL-holesterola u odnosu na nepušače. Ova razlika je statistički značajna za vrednosti HDL-holesterola i triglicerida kod žena. Analizom varijanse pokazano je da se polimorfizmom apoE objašnjava 1,31% varijabilnosti u ukupnom holesterolu i 1,97% varijabilnosti u LDL-holesterola u celokupnoj ispitivanoj populaciji nepušača oba pola, kao i 2,0% i 2,85% varijabilnosti u ukupnom i LDL-holesterolu kod muškaraca nepušača. Takođe, apoE polimorfizam objašnjava 4,64% varijabilnosti HDL-holesterola kod muškaraca pušača. Muškarci pušači nosioci alela *E2* imaju statistički značajno veće vrednosti HDL-holesterola u odnosu na muškarce pušače nosioce alela *E3* (p=0,00) i alela *E4* (p=0,02). Utvrđivanje interakcija gen-faktori sredine veoma je važna, jer osim toga što doprinosi boljem razumevanju mehanizama uključenih u regulaciju gena, može biti iskorišćena i u terapijske svrhe na ciljnim podgrupama u populaciji.

## C28

## ASSOCIATION OF APOLIPOPROTEIN E GENE DNA POLYMORPHISM, SMOKING AND LIPID LEVELS IN SERBIAN HEALTHY POPULATION

*S. Stanković[1], N. Majkić-Singh[1], D. Alavantić[2]*

*[1]Institute of Medical Biochemistry, Clinical Centre of Serbia, Belgrade*
*[2]VINČA Institute of Nuclear Sciences, Laboratory of Radiobiology and Molecular Genetics, Belgrade*

Suspected genes of human diseases (e.g., cancer and atherosclerosis) increase the disease risk by altering the metabolic activation of exogenous (e.g., carcinogens) and endogenous (e.g., cholesterol) compounds. The function of these genes and subsequent risk can be adversely affected by polymorphisms. One such potential polymorphism is in apolipoprotein E (apoE) gene. To elucidate how apoE polymorphism and smoking, one of the most important non-lipid risk factor of coronary artery disease, interact in explaining plasma lipid levels, we have studied 622 subjects (422 males, 200 females, mean age 39.74 ± 13.50 years, smokers 48.2%). Apolipoprotein E genotypes were determined by restriction isotyping/MADGE, and serum lipid levels were measured by standard laboratory methods. Generally, it was found that smokers had higher levels of total cholesterol, LDL-cholesterol and triglycerides, and lower levels of HDL-cholesterol compared with non-smokers. This was statistically significant for values of HDL-cholesterol and triglycerides in women. The analysis of variance showed that apoE polymorphism explained 1.31% of total variance in total cholesterol and 1.97% of total variance LDL-cholesterol in non-smokers of both sexes, and 2.0% and 2.85% of total variance in total and LDL-cholesterol respectively in men-non-smokers. Also, apoE polymorphism explained 4.64% of total variance of HDL-cholesterol in men-smokers. Men-smokers who have *E2* allele had a statistically significant higher HDL-cholesterol than men-smokers with *E3* (P = 0.00) and *E4* allele (P = 0.02). The identification of such gene-environment interactions is crucial since, besides providing a better understanding of the mechanisms involved in gene regulation, it may help to focus therapeutic strategies on target subgroups of the population.

## C29

## POLIMORFIZAM APOLIPOPROTEINA E MODULIRA ASOCIJACIJU VREDNOSTI INDEKSA TELESNE MASE I KONCENTRACIJA LIPIDA U SERUMU

*S. Stanković[1], N. Majkić-Singh[1], D. Alavantić[2]*

*[1]Institut za medicinsku biohemiju, Klinički centar Srbije*
*[2]VINČA – Institut za nuklarne nauke, Laboratorija za radiobiologiju i molekularnu genetiku, Beograd*

Dok su efekti apoE polimorfizma na lipide dobro proučeni u različitim populacijama, samo mali broj studija bavio se ispitivanjem njegovih interakcija sa modifikujućim faktorima. Jedan od razloga može biti veliki broj uzoraka potrebnih za detektovanje ovakvih interakcija. Cilj ovog rada bio je da se utvrdi da li je efekat indeksa telesne mase (BMI) na vrednosti lipida u serumu moduliran polimorfizmom apoE. Ispitivano je ukupno 591 zdravih dobrovoljaca oba pola, starosne dobi između 18 i 81 godine. Ispitanicima su izmerene visina, težina i izračunat BMI (telesna težina izražena u kilogramima podeljena sa kvadratom visine izražene u metrima). Koncentracije lipida u serumu određene su standardnim laboratorijskim metodama. Genotipovi apoE utvrđeni su PCR/MADGE određivanjem uz korišćenje restrikcionog enzima *Hha*I. Ispitanici su podeljeni u tri grupe prema vrednostima BMI (BMI<25 kg/m$^2$, 25–28 kg/m$^2$, >28 kg/m$^2$) i u tri grupe genotipova apoE (E2: E2/3 i E2/3, E3:E3/3 i E4:E3/4 i E4/4). Osobe čiji je BMI<25 kg/m$^2$ imale su statistički značajno manje koncentracije ukupnog, LDL-holesterola i triglicerida, a veći HDL-holesterol u odnosu na gojazne osobe ($p>0,05$). ApoE polimorfizmom može se objasniti 2,59% varijabilnosti u ukupnom holesterolu i 4,80% varijabilnosti u LDL-holesterolu kod osoba čiji je BMI 25–28 kg/m$^2$ ($p<0,05$). Osobe sa genotipom E3/3 imaju značajno manju koncentraciju triglicerida u odnosu na osobe nosioce alela E4 ($p = 0,04$) u grupi ispitanika sa BMI <25 kg/m$^2$ i manju koncentraciju ukupnog holesterola ($p = 0,05$) ukoliko im je BMI>28 kg/m$^2$. Nosioci alela E2 čiji je BMI 25–28 kg/m$^2$ imali su statistički značajno niži LDL-holesterol u poređenju sa ispitanicima u drugim BMI grupama. Gojazni muškarci, nosioci alela E4 imali su statistički značajno veće koncentracije LDL-holesterola ($p<0,05$) u poređenju sa ispitanicima pripadnicima drugih grupa apoE genotipova. Takođe osobe nosioci alela E4 sa BMI <25 kg/m$^2$ imali su statistički značajno veće vrednosti HDL-holesterola u odnosu na ispitanike u drugim BMI grupama ($p=0,00$; $p=0,04$). Može se zaključiti da genotip apoE može modifikovati povezanost BMI i vrednosti serumskih lipida. Ovi rezultati nisu neočekivani, s obzirom da polimorfizam apoE utiče na metabolizam lipida i gojaznost.

## C29

## APOLIPOPROTEIN E POLYMORPHISM MODULATES THE ASSOCIATION BETWEEN BODY MASS INDEX AND SERUM LIPID LEVELS

*S. Stanković[1], N. Majkić-Singh[1], D. Alavantić[2]*

*[1]Institute of Medical Biochemistry, Clinical Centre of Serbia*
*[2]VINČA Institute of Nuclear Sciences, Laboratory of Radiobiology and Molecular Genetics, Belgrade*

Very few studies have addressed the issue of the interaction between modifiable factors and apoE genotype effects on lipids. One of the reasons might be that a very large sample size is required for having an acceptable power of detection of such interactions. The aim of this study was to examine whether the effect of body mass index (BMI) on serum lipids was modulated by apoE polymorphism. Five hundred and ninety one male and female healthy volunteers, aged between 18–81 years, have been studied. Height and weight were measured, and BMI (weight in kilograms divided by height in meters squared) was calculated. Serum lipid concentrations were measured by standard laboratory methods. ApoE genotypes were determined by PCR-MADGE assay and with *Hha*I restriction enzyme. Individuals were divided into three groups according the BMI values (BMI<25 kg/m$^2$, 25–28 kg/m$^2$, >28 kg/m$^2$) and also in three apoE genotype groups (E2-, E3-, and E4-containing genotypes). Individuals with BMI<25 kg/m$^2$ had significantly lower total, LDL-cholesterol and triglycerides than other BMI groups, and higher HDL-cholesterol compared with obese persons ($P>0.05$). ApoE polymorphism explained about 2.59% of variation in total cholesterol and 4.80% of variation in LDL-cholesterol in individuals with BMI 25–28 kg/m$^2$ ($P<0.05$). Individuals with E3/3 genotype had significantly lower triglycerides compared with E4 allele possessors ($P = 0.04$) in BMI <25 kg/m$^2$ group and lower total cholesterol ($P = 0.05$) if they had BMI>28 kg/m$^2$. ApoE2 allele possessors with BMI between 25 and 28 kg/m$^2$ had significantly lower LDL-cholesterol compared with other BMI groups. Obese men, E4 allele possessors had significantly higher LDL-cholesterol compared with the other apoE genotype groups ($p<0.05$). Also, individuals with allele E4 and BMI <25 kg/m$^2$ have a statistically significant higher HDL-cholesterol in comparison to other BMI groups ($P = 0.00$; $P = 0.04$). It can be concluded that apoE genotypes might modify the relationship of BMI and serum lipid levels. These results are not unexpected, since apoE polymorphism primarily affects lipid metabolism and adiposity as a major metabolic factor.

## C30

## LIPIDNI STATUS RADNO SPOSOBNE POPULACIJE OPŠTINE GRADIŠKA U KORELACIJI SA TJELESNOM MASOM

*B. Mirjanić-Azarić[1], M. Đerić[2], M. Vrhovac[1], S. Uletilović[3], B. Ilić[4]*

*[1]Odjeljenje laboratorijske dijagnostike, Dom zdravlja, Banjaluka*
*[2]Zavod za laboratorijsku medicinu, Klinički centar, Novi Sad*
*[3]Medicinski fakultet Banjaluka*
*[4]Dom zdravlja, Gradiška*

Brojne epidemiološke studije ukazale su na povezanost između poremećaja metabolizma lipida i lipoproteina i gojaznosti. Kod osoba sa visceralnim tipom gojaznosti dolazi do smanjenog klirensa hilomikrona, povećanja koncentracije lipoproteina bogatih triglyceridima, postojanje malih, gustih i izrazito aterogenih LDL čestica, te sniženje HDL-holesterola, posebno na štetu $HDL_2$-holesterola, koji ima zaštitno dejstvo. Cilj rada bio je da se utvrdi povezanost između indeksa tjelesne mase (Body Mass Index – BMI) i vrijednosti parametara lipidnog statusa (holesterola, triglicerida, HDL-holesterola, LDL-holesterola, indeksa ateroskleroze i odnosa ukupnog i HDL-holesterola) radno sposobne populacije opštine Gradiška. Istraživanja su obavljena u grupi 250 osoba, 109 muškaraca i 141 žena. Serumska koncentracija holesterola, triglicerida i HDL-holesterola određivana je na biohemijskom analizatoru Hitachi 902 (Roche Diagnostic), a ostali parametri su dobijeni računskim putem. Vrijednosti BMI su dobijene antropometrijskim mjerenjima i formulom za izračunavanje BMI. Ispitanici su podijeljeni u tri grupe prema vrijednostima BMI (49,2% u grupi 18–25 kg/m$^2$, 40,0% od 26–30 kg/m$^2$ i 10,8% u grupi od 31–45 kg/m$^2$). Rezultati su pokazali da ne postoji statistički značajna veza između BMI i ukupnog holesterola ($p>0,05$), dok postoji statistički visoko značajna veza između BMI i serumskih triglicerida ($p<0,01$). Takođe statistički je značajna povezanost između BMI i HDL-holesterola ($p<0,05$) i BMI i LDL-holesterola ($p<0,05$) kao i BMI i indeksa ateroskleroze ($p<0,05$) i odnosa ukupni/HDL-holesterol ($p<0,01$). Rezultati našeg rada su saglasni sa rezultatima sličnih studija i upućuju na potrebu da se uvedu preventivne mjere u smislu redukcije tjelesne mase u cilju normalizovanja vrijednosti lipidnog statusa i prevencije aterosklerotske bolesti.

## C30

## LIPID STATUS OF WORKING CAPABLE POPULATION IN GRADIŠKA MUNICIPALITY IN CORRELATION WITH BODY MASS

*B. Mirjanić-Azarić[1], M. Đerić[2], M. Vrhovac[1], S. Uletilović[3], B. Ilić[4]*

*[1]Department of Laboratory Diagnosis, Health Centre, Banjaluka*
*[2]Department of Laboratory Medicine, Clinical Centre, Novi Sad*
*[3]University School of Medicine, Banjaluka*
*[4]Health Centre, Gradiška*

Numerous epidemical surveys have shown that there is a correlation between lipid and lipoprotein metabolism disorders and obesity. In persons with visceral type obesity provokes decrease in chilomicrons clearance and increase in concentration of triglycerides rich lipoproteins, existence of small, dense and atherogenic LDL particles, as well decrease in concentration of HDL-cholesterol, especially $HDL_2$ cholesterol, which acts protective. All these phenomena are observed in the studied population. The aim of the study was to determine the correlation between body mass index (BMI) and values of lipid status parameters (cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol, atherosclerosis index and total cholesterol/HDL-cholesterol rate) in working capable population in Gradiška municipality. We conducted this study on 250 persons, 109 men and 141 women. Cholesterol, triglycerides and HDL-cholesterol concentrations in sera were determined on biochemical analyzer Hitachi 902 (Roche Diagnostics), and other parameters were calculated. BMI values were determined anthropometrically with formula for BMI. All persons regarding BMI were classified in three groups (49.2% in group I: 18–25 kg/m$^2$, 40.0% in group II: 26–30 kg/m$^2$ and 10.8% in group III: 31–45 kg/m$^2$, respectively). The results showed that there was no statistically significant correlation between BMI and total cholesterol concentration ($P>0.05$), while there was a strong statistically significant correlation between BMI and serum triglycerides concentration ($P<0.01$). Also, there was a statistically significant correlation between BMI and HDL-cholesterol ($P<0.05$), BMI and LDL-cholesterol ($P<0.05$), BMI and atherosclerosis index ($P<0.05$) and total/HDL cholesterol rate ($P<0.05$). The results of our study suggest a strong need for preventive measures regarding body mass reduction in order to normalize lipid status parameters values and to prevent atherosclerotic disease in these persons.

## C31

## VREDNOST NEKIH PARAMETARA LIPIDNOG STATUSA I GLUKOZE U ABO SISTEMU KRVNIH GRUPA KOD DECE

*Lj. Bogavac, M. Jovetić, Z. Lemić, L. Petrović, M. Vitković*

*ZC »Studenica«, Kraljevo*

U toku studije JUSAD obrađeno je na teritoriji opštine Kraljevo, u Zdravstvenom centru Studenica, u službi biohemijske labotorije i transfuzije 428 dečaka i devojčica uzrasta 9–10 godina (1997. godine), a zatim, 2003. godine obrađena su ista dece starosti 14–15 godina. U toku studije deci je pored lipidnog statusa (ukupni holesterol, trigliceridi, HDL-holesterol i LDL-holesterol) i glukoze, određena i krvna grupa i Rh faktor. Za mali broj bolesti postoje čvrsti dokazi da su češće kod osoba određenih krvnih grupa. S obzirom da su u studiji određivani prekursori ateroskleroze, cilj rada je bio utvrđivanje postojanja razlike ovih parametara kod određenih krvnih grupa. Kod 428 dece u 45,09% (193) utvrđena je krvna grupa A, u 17,29% (74) krvna grupa B, u 30,84% (132) krvna grupa 0, i u 6,77% (29) krvna grupa AB. U radu su obrađivani podaci dece uzrasta 14–15 godina (2003. godina). Nivo glukoze prema krvnim grupama se kretao u vrednostima: krvna grupa 0: 4,54 ± 0,52 mmol/L; krvna grupa A: 4,58 ± 0,57 mmol/L; krvna grupa AB: 4,45 ± 0,89 mmol/L; krvna grupa B: 4,48 ± 0,64 mmol/L. Nivo ukupnog holesterola za isti uzrast prema krvnim grupama se kretao u vrednostima: krvna grupa 0: 3,81 ± 0,66 mmol/L; krvna grupa A: 3,91 ± 0,67 mmol/L; krvna grupa AB: 3,78 ± 0,71 mmol/L; krvna grupa B: 3,73 ± 0,67 mmol/L. Nivo HDL-holesterola za isti uzrast prema krvnim grupama se kretao u vrednostima: krvna grupa 0: 1,48 ± 0,36 mmol/L; krvna grupa A: 1,45 ± 0,34 mmol/L; krvna grupa AB: 1,44 ± 0,38 mmol/L; krvna grupa B: 1,44 ± 0,40 mmol/L. Nivo LDL-holesterola za isti uzrast prema krvnim grupama se kretao u vrednostima: krvna grupa 0: 1,99 ± 0,60 mmol/L; krvna grupa A: 2,06 ± 0,62 mmol/L; krvna grupa AB: 2,03 ± 0,62 mmol/L; krvna grupa B: 1,96 ± 0,59 mmol/L. Nivo triglicerida za isti uzrast prema krvnim grupama se kretao u vrednostima: krvna grupa 0: 0,71 ± 0,29 mmol/L; krvna grupa A: 0,74 ± 0,43 mmol/L; krvna grupa AB: 0,67 ± 0,30 mmol/L; krvna grupa B: 0,66 ± 0,25 mmol/L. Za statističku obradu podataka korišćen je neparametarski t-test (*Mann-Whitney U*-test, p = 0,05). Rezultati ukazuju da postoji statistički značajna razlika ukupnog holesterola ($p<0,05$) između grupe dece sa krvnom grupom A i grupe dece sa krvnom grupom B. Nije nađena statistički značajna razlika za nivoe ostalih parametara u odnosu na krvne grupe. Iz rezultata se takođe vidi da grupa dece sa krvnom grupom A ima najviše srednje vrednosti ukupnog holesterola, LDL-holesterola i triglicerida, dok su kod grupe dece sa krvnom grupom B srednje vrednosti tih parametara najniže.

## C31

## VALUE OF CERTAIN PARAMETERS IN LIPID STATUS AND GLUCOSE LEVEL IN BLOOD TYPES ABO SYSTEM IN CHILDREN

*Lj. Bogavac, M. Jovetić, Z. Lemić, L. Petrović, M. Vitković*

*Studenica Medical Centre, Kraljevo*

Within YUSAD study carried on the territory of Kraljevo Municipality in 1997, 428 boys and girls, aged 9–10 years, were treated in the Studenica Medical Centre (Ward of biochemical laboratory and transfusion), and then in 2003 the same children, now aged 14–15 years. During the study, besides the lipid status (total cholesterol, triglycerides, HDL-cholesterol and LDL-cholesterol) and glucose level, blood types and Rh factor were also determined in children. There is a solid proof that certain diseases occur more often in individuals with specific blood types for only a few diseases. As the study was aimed at detection of precursors of arteriosclerosis, the real goal was to determine the existence of differences in these parameters in specific blood types. Of 428 children, 45.09% (193) had A blood type, 17.29% (74) B blood type, 30.84% (132) O blood type and 6.77% (29) AB blood type. The study processed data obtained in children aged 14–15 years (2003). The level of glucose per blood types ranged from 4.54 ± 0.52 mmol/L for 0 blood type; 4.58 ± 0.57 mmol/L for A blood type; 4.45 ± 0.89 mmol/L for AB blood type, 4.48 ± 0.64 mmol/L for B blood type. The level of total cholesterol per blood types ranged from: 3.81 ± 0.66 mmol/L for 0 blood type; 3.91 ± 0.67 mmol/L for A blood type; 3.78 ± 0.71 mmol/L for AB blood type; 3.73 ± 0.67 mmol/L for B blood type. The level of HDL-cholesterol per blood types ranged from: 1.48 ± 0.36 mmol/L for 0 blood type; 1.45 ± 0.34 mmol/L for A blood type; 1.44 ± 0.38 mmol/L for AB blood type; 1.44 ± 0.40 mmol/L for B blood type. The level of LDL-cholesterol per blood types ranged from: 1.99 ± 0.60 mmol/L for 0 blood type; 2.06 ± 0.62 mmol/L for A blood type; 2.03 ± 0.62 mmol/L for AB blood type; 1.96 ± 0.59 mmol/L for B blood type. The level of triglycerides per blood types ranged from: 0.71 ± 0.29 mmol/L for 0 blood type; 0.74 ± 0.43 mmol/L for A blood type; 0.67 ± 0.30 mmol/L for AB blood type; 0.66 ± 0.25 mmol/L for B blood type. Data were statistically processed by using the non-parametric t-test (Mann-Whitney's U-test, P = 0.05). The results indicate the existence of statistically significant difference in total cholesterol value ($P < 0.05$) among children with A and children with B blood type. No statistically significant difference was found for other parameter values regarding blood types. The results also suggest that A blood type children have the highest average value of total cholesterol, LDL-cholesterol and triglycerides, while B blood type children have the lowest average value of these parameters.

## C32

## VREDNOSTI NEKIH PARAMETARA LIPIDNOG STATUSA I GLUKOZE KOD DEVOJČICA I DEČAKA STAROSNE DOBI 10 I 15 GODINA

*Lj. Bogavac, M. Jovetić, Z. Lemić, L. Petrović, S. Vukašinović*

*ZC »Studenica«, Kraljevo*

Studija o prekursorima ateroskleroze (JUSAD) obuhvatila je 428. dece školskog uzrasta u opštini Kraljevo. Studija je početa 1997. godine (deca starosti 10 godina) a ponovljena 2003. godine (ista deca sada starosti 15 godina). Studijom je obuhvaćeno 213 devojčica i 215 dečaka. U ovom radu prikazani su rezultati za neke od parametara lipidnog statusa u krvi (ukupni holesterol, HDL-holesterol, LDL-holesterol i trigliceridi) i glukoze. Ispitivano je da li postoji različitost ovih parametara kod dečaka i devojčica u starosnom dobu 10 godina i istih dečaka i devojčica 5 godina kasnije. Rezultati su analizirani Student-t testom za nivo značajnosti p = 0,05. U starosnom dobu 10 godina između dečaka i devojčica opštine Kraljevo utvrđena je statistički značajna razlika u vrednostima triglicerida (devojčice: 0,93 ± 0,48 mmol/L; imaju više vrednosti od dečaka: 0,84 ± 0,41 mmol/L) i u vrednostima HDL-holesterola (dečaci: 1,62 ± 0,31 mmol/L imaju više vrednosti od devojčica: 1,55 ± 0,30 mmol/L). U vrednostima ukupnog holesterola (devojčice: 4,58 ± 0,76 mmol/L; dečaci 4,51 ± 0,71 mmol/L), LDL-holesterola (devojčice: 2,61± 0,70 mmol/L; dečaci 2,51 ± 0,61 mmol/L) i glukoze (devojčice: 5,14 ± 0,59 mmol/L; dečaci 5,20 ± 0,66 mmol/L) nije nađena statistički značajna razlika između ove dve grupe. U starosnom dobu od 15 godina između dečaka i devojčica ispitivane grupe postoji stastički značajna razlika u vrednosti holesterola, triglicerida, HDL-holesterola i LDL-holesterola. Holesterol: devojčice (4,00 ± 0,69 mmol/L) imaju više vrednosti od dečaka (3,68 ± 0,62 mmol/L); trigliceridi: devojčice (0,75 ± 0,38 mmol/L) imaju više vrednosti od dečaka: 0,68 ± 0,32 mmol/L), HDL-holesterol: dečaci (1,41 ± 0,36 mmol/L) imaju niže vrednosti od devojčica (1,51 ± 0,36 mmol/L), LDL-holesterol: dečaci (1,91 ± 0,58 mmol/L) imaju niže vrednosti od devojčica (2,13 ± 0,62 mmol/L). Nije nađena statistički značajna razlika kod vrednosti glukoze (devojčice 4,49 ± 0,58 mmol/L; dečaci 4,60 ± 0,61 mmol/L). Upoređujući vrednosti ovih parametara kod devojčica 1997. godine i istih devojčica 2003. godine ustanovljena je statistički značajna razlika ($p<0,05$) za dati period vremena kod vrednosti za ukupan holestrol, trigliceride, LDL-holesterol i glukozu. Vrednost holesterola 1997. godine (4,58 ± 0,76 mmol/L) je viša u odnosu na ispitivanje rađeno 2003. godine (4,00 ± 0,69 mmol/L), vrednost triglicerida 1997. godine (0,93 0,48 mmol/L) je viša u odnosu na ispitivanje rađeno 2003. godine (0,75 ± 0,38 mmol/L), vrednost LDL-holesterola 1997. godine (2,61 ± 0,70

## C32

## VALUE OF CERTAIN PARAMETERS IN LIPID STATUS AND GLUCOSE LEVEL IN BOYS AND GIRLS AGED FROM 10 TO 15 YEARS

*Lj. Bogavac, M. Jovetić, Z. Lemić, L. Petrović, S. Vukašinović*

*Studenica Medical Centre, Kraljevo*

The study of precursors of arteriosclerosis (JUSAD) performed on the territory of Kraljevo Municipality involved 428 school age boys and girls. The study started in 1997 (children at the age of 10 years) and was repeated in 2003 (the same children, now 15 years old). The study included 213 girls and 215 boys. The paper deals with the results of some parameters of the lipid composition in blood (total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides) and glucose. The study was focused on determination whether these parameters differed between boys and girls 10 years old and 5 years later. The results were analyzed with Student't test the significance of the level P = 0.05. At the age of 10 years, a statistically significant difference in triglycerides value was established (girls: 0.93 ± 0.48 mmol/L had higher values than boys: 0.84 ± 0.41 mmol/L), HDL-cholesterol values (boys: 1.62 ± 0.31 mmol/l had higher values than girls: 1.55 ± 0.30 mmol/L). Total cholesterol value (girls: 4.58 ± 0.76 mmol/L, boys: 4.51 ± 0.71 mmol/L), LDL-cholesterol values (girls: 2.61 ± 0.70 mmol/L, boys: 2.51 ± 0.61 mmol/L) and glucose value (girls: 5.14 ± 0.59 mmol/L; boys: 5.20 ± 0.66 mmol/L) were not statistically different between these two groups. At the age of 15 years there was a statistically significant difference in cholesterol value, triglycerides value, HDL-cholesterol and LDL-cholesterol between boys and girls. Cholesterol: girls (4.00 ± 0.69 mmol/L) had higher values than boys (3.68 ± 0.62 mmol/L); triglycerides: girls (0.75 ± 0.38 mmol/L) had higher values than boys (0.68 ± 0.32 mmol/L); HDL-cholesterol: boys (1.41 ± 0.36 mmol/L) had lower values than girls (1.51 ± 0.36 mmol/L); LDL cholesterol: boys (1.91 ± 0.58 mmol/L) had higher values than girls (2.13 ± 0.62 mmol/L). No statistically significant difference in glucose value was found (girls 4.49 ± 0.57 mmol/L, boys 4.60 ± 0.61 mmol/L). Comparing the values of these parameters in girls between 1997 and 2003, a statistically significant difference was established ($P<0.05$) for total cholesterol, triglycerides, LDL-cholesterol and glucose. The value of cholesterol in 1997 (4.58 ± 0.76 mmol/L was higher compared to that in 2003 (4.00 ± 0.69 mmol/L), the value of triglycerides in 1997 (0.93 ± 0.48 mmol/L) was higher than in 2003 (0.75 ± 0.38 mmol/L), the value of LDL-cholesterol in 1997 (2.61 ± 0.70 mmol/L) was higher than in 2003 (2.13 ± 0.62 mmol/L), the value of glucose in 1997 (5.14 ± 0.59 mmol/L) was higher than in 2003 (4.49 ± 0.57 mmol/L). No statistically significant difference was

mmol/L) je viša u odnosu na ispitivanje rađeno 2003. godine (2,13 ± 0,62 mmol/L), vrednost glukoze je 1997. godine (5,14 ± 0,59 mmol/L) bila viša u odnosu na ispitivanje rađeno 2003. godine (4,49 ± 0,57 mmol/L). Nije nađena statistički značajna razlika (p>0,05) u koncentraciji HDL-holesterola u ispitivanju koje je rađeno 1997. godine (1,55 ± 0,30 mmol/L) u odnosu na ispitivanje rađeno 2003. godine (1,51 ± 0,36 mmol/L). Kod dečaka postoji statistički značajna razlika za sve ispitivane parametre (p< 0,05). Grupa dečaka od 10 godina je imala više vrednosti za ukupan holesterol (4,51 ± 0,71 mmol/L), trigliceride (0,84 ± 0,41 mmol/L), HDL-holesterol (1,62 ± 0,31 mmol/L), LDL-holesterol (2,51 ± 0,61 mmol/L), i glukozu (5,20 ± 0,66 mmol/L) od grupe dečaka starosti 15 godina: ukupan holesterol (3,68 ± 0,62 mmol/L), trigliceridi (0,68 ± 0,32 mmol/L), HDL-holesterol (1,41 ± 0,36 mmol/L), LDL-holesterol (1,91 ± 0,58 mmol/L), glukoza (4,60 ± 0,61 mmol/L). Dobijeni podaci ukazuju da u uzrastu 10 godina nema značajne razlike u koncentraciji ukupnog holesterola, LDL-holesterola i glukoze između dečaka i devojčica a razlika postoji u vrednostima HDL-holesterola i triglicerida. Kod devojčica i dečaka uzrasta 15 godina postoji razlika u koncentraciji ukupnog holesterola, HDL-holesterola, LDL-holesterola i triglicerida. Vrednosti ukupnog holesterola, LDL-holesterola, HDL-holesterola, triglicerida i glukoze su i kod dečaka i kod devojčica uzrasta 15 godina niži u onosu na vrednosti koje su imali u starosnom dobu 10 godina.

found (P>0.05) in HDL-cholesterol concentration in 1997 (1.55 ± 0.30 mmol/L) compared to 2003 (1.51 ± 0.36 mmol/L). In boys there was a statistically significant difference in all determined parameters (P<0.05). In 10-year old boys total cholesterol values (4.51 ± 0.71 mmol/L), triglycerides values (0.84 ± 0.41 mmol/L, HDL-cholesterol values (1.62 ± 0.31 mmol/L, LDL-cholesterol values (2.51 ± 0.61 mmol/L) and glucose values (5.20 ± 0.66 mmol/L) were higher than in15-year old boys (total cholesterol (3.68 ± 0.62 mmol/L), triglycerides (0.68 ± 0.32 mmol/L), HDL-cholesterol (1.41 ± 0.36 mmol/L), LDL-cholesterol (1.91 ± 0.58 mmol/L), glucose (4.60 ± 0.61 mmol/L). The obtained data indicate that there was no significant difference in concentrations of total cholesterol, LDL-cholesterol, and glucose between boys and girls at the age of 10 years, while the difference existed in values of HDL-cholesterol and triglyceride. In boys and girls aged 15 years there was a difference in concentrations of total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides. The values of total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides and glucose were lower in boys and girls at the age of 15 years in comparison to the age of 10 years.

**C33**

## VREDNOSTI LIPIDNIH I NELIPIDNIH FAKTORA RIZIKA ZA NASTANAK ATEROSKLEROZE U POPULACIJI ŠKOLSKE DECE UZRASTA 10 GODINA SA PODRUČJA JUŽNOG BANATA

*D. Dželajlija*

*Dom zdravlja, Kovačica*

Ateroskleroza je složen patološki proces, koji zavisi od mnogih faktora rizika uključujući i poremećaje u metabolizmu lipoproteina. Ateroskleroza počinje u detinjstvu i postoje mnogi dokazi o povezanosti nivoa lipida kod dece i razvijanja koronarne srčane bolesti (KSB) u kasnijem životu. Još uvek ne postoji dovoljno informacija o vrednostima ovih faktora rizika kod zdrave dece različitog uzrasta. Ove informacije su neophodne da bi se napravili i sproveli interventni programi zdravog načina života. Pošto postoji tendencija rasta KSB u razvijenim zemljama, kao i povezanost lipida i KSB, koncept prihvatljivih vrednosti serumskih lipida napravljen je na osnovu njihove povezanosti sa KSB. Cilj ovog rada je da se kod školske dece uzrasta 10

**C33**

## VALUES OF LIPID AND NONLIPID RISK FACTORS OF ATHEROSCLEROSIS IN 10-YEAR-OLD SCHOOLCHILDREN IN SOUTH BANAT

*D. Dželajlija*

*Health Centre, Kovačica*

Atherosclerosis is a pathological process depending on many factors, including disorders if lipid metabolism. Although atherosclerosis begins in childhood and although there is evidence of linking serum lipids in children and subsequent coronary heart disease (CHD), a few national data on lipid levels in healthy children are available. Such information is essential in establishing healthy lifestyle programmes. Due to the high prevalence of CHD in developed countries and the existing relationship between lipids and CHD, a concept of reference values for serum lipids levels is determined by a disease association. The aim of the study was to present current data on serum lipids and nonlipid risk factors for the onset of CHD in school-

godina, sa područja Južnog Banata, odrede vrednosti lipida u serumu, kao i nelipidnih parametara koji mogu da utiču na nastanak KSB u kasnijem životu. Kod 111 dece (68 dečaka i 43 devojčice) određene su vrednosti ukupnog holesterola, HDL-holesterola, triglicerida i fibrinogena. Vrednosti LDL-holesterola, ne-HDL-holesterola, indeksa ateroskleroze i indeks telesne mase (BMI) su izračunate. Ukupni holesterol, HDL-holesterol i trigliceridi određeni su testovima firme »Biomerieux« na biohemijskom analizatoru BT-2000 (Biotecnica Instruments, Roma, Italy) a fibrinogen je određen metodom po Fowellu na spektrofotometru Screen Master, Seac, Firenca, Italy). Dobijene su sledeće vrednosti: (srednja vrednost ± Sd): ukupan holesterol 4,26 ± 0,85 mmol/L, trigliceridi 1,04 ± 0,67 mmol/L, HDL-holesterol 1,29 ± 0,28 mmol/L, LDL-holesterol 2,47 ± 0,76 mmol/L, ne-HDL-holesterol 2,94 ± 0,88 mmol/L, fibrinogen 3,22 ± 0,46 g/L, LDL/HDL 2,04 ± 0,95, HOL/HDL 2,82 ± 2,82 i BMI 19,3 ± 2,4 kg/m$^2$. Između dečaka i devojčica nije nađena statistički značajna razlika za posmatrane faktore rizika.

children aged 10 years in South Banat, which could be implicated in their later CHD. Total cholesterol, HDL-cholesterol, triglycerides and fibrinogen were estimated and LDL-cholesterol, non-HDL cholesterol, indices of atherosclerosis and body mass index (BMI) were calculated in 111 children (68 boys and 43 girls). Total cholesterol, HDL-cholesterol, triglycerides were examined using Biomerieux reagents on the automated BT-2000 analyser (Biotecnica Instruments, Roma, Italy); fibrinogen was estimated using Fowell's metod (spectrophotometer Screen Master Seac, Firenca, Italy). The obtained values were: (mean ± standard deviation): total cholesterol 4.26 ± 0.85 mmol/L, triglycerides 1.04 ± 0.67 mmol/L, HDL-cholesterol 1.29 ± 0.28 mmol/L, LDL-cholesterol 2.47 ± 0.76 mmol/L, non-HDL cholesterol 2.94 ± 0.88 mmol/L, fibrinogen 3.22 ± 0.46 g/L, LDL/HDL 2.04 ± 0.95, TC/HDL 2.82 ± 2.82 and BMI 19.3 ± 2.4 kg/m$^2$. No statistically significant difference was found between gender regarding the estimated risk factors.

## C34

## DIJAGNOSTIČKA ZNAČAJNOST LIPIDNOG STATUSA STUDENTSKE POPULACIJE: ULOGA POVEĆANOG HDL-HOLESTEROLA

*D. Pap, M. Šefčić*

*Zavod za zdravstvenu zaštitu studenata, Služba laboratorijske dijagnostike, Novi Sad*

Niske koncentracije lipoproteina velike gustine (HDL-holesterol), povećani plazma nivoi malondialdehida (MDA), modifikovanog LDL-holesterola i oksidovanog LDL-holesterola su udružene sa povećanim rizikom za nastanak ateroskleroze, koronarne bolesti (KB), nestabilne angine i akutnog infarkta miokarda (AIM). Cilj ovog rada je bio da se ispita dijagnostička značajnost i uticaj poremećenog metabolizma lipida koji je pogodan za procenu prediktivnog koronarnog rizika. Trideset zdravih ispitanika starosti od 30–35 godina i 30 studenata starosti od 20–25 godina, oba pola je izabrano za ovu studiju. U svim uzorcima su urađene sledeće analize: ukupni holesterol (UH), trigliceridi (TG), HDL-holesterol, lipoproteini male gustine (LDL-holesterol), lipoproteini vrlo male gustine (VLDL-holesterol), indeks ateroskleroze (IA) i utvrđeni su faktori rizika (FR). UH i TG su određeni standardnim enzimskim metodama. HDL-holesterol je određen u supernatantu nakon precipitacije plazme sa magnezijum hloridom i fosfovolframovom kiselinom. LDL-holesterol je izračunavan pomoću Friedewald-ove formule. Nivoi VLDL-holesterola, IA (LDL-holesterol/HDL-holes-

## C34

## DIAGNOSTIC RELEVANCE OF LIPID STATUS IN STUDENTS POPULATION: ROLE OF HIGH LEVELS OF HDL-CHOLESTEROL

*D. Pap, M. Šefčić*

*Students Health Institute, Department of Laboratory Diagnosis, Novi Sad*

Low concentrations of high density lipoprotein cholesterol (HDL-c), increased plasma levels of malondialdehyde (MDA), modified LDL-c and oxidized LDL-c have long been associated with increased risk of atherosclerosis, coronary heart disease (CHD), CAD, unstable angina and acute myocardial infarction (AMI). The purpose of this study was to examin the diagnostic relevance and influence of disturbances in lipid metabolism which is suitable for predictive coronary risk assessment. Thirty healthy subjects (15 males and 15 females, mean age 32.16 ± 1.33 years) and 30 students (22 males and 8 females, mean age 22.46 ± 1.21 years) were selected for our study. The following determinations are performed on all samples: levels of total cholesterol (TCH), triglycerides (TG), HDL-c, low density lipoprotein cholesterol (LDL-c), very low density lipoprotein cholesterol (VLDL-c), index of atherosclerosis (IA) and risk factors (RF). TCH and TG levels were measured with standard enzymatic methods. HDL-c levels were determined in a supernatant after the plasma precipitation with $MgCl_2$ and phosphotungstic acid. LDL-c was estimated by Friedewald's formula. VLDL-c,

terol) i FR (LH/HDL-holesterol) su dobijeni računskim putem. Statistička obrada podataka urađena je pomoću *Statgraphics Plus*, softverskog programa. Rezultati su pokazali da je postojala statistički značajna razlika između kontrolne grupe ispitanika i eksperimentalne grupe studentske populacije u pogledu pojedinih ispitivanih parametara. Dok su vrednosti HDL-holesterola bile značajno više u studentskoj populaciji ($p<0,05$), LDL-holesterol vrednosti su bile značajno niže ($p<0,05$) u grupi studenata u odnosu na zdrave ispitanike. U odnosu na kontrolnu grupu zdravih ispitanika vrednosti TG i VLDL-holesterola su bile slične vrednostima u studentskoj populaciji, dok su u pogledu UH vrednosti značajno veće u poređenju sa studentskom populacijom. Indeksi ateroskleroze i utvrđeni faktori rizika nisu ukazivali na povećani aterogeni rizik u studentskoj populaciji. Na ispitivane parametre u obe grupe nije uticao pol ispitanika. Dobijeni rezultati ukazuju da studentska populacija nema povećani rizik za nastanak ateroskleroze i koronarne bolesti i ukazuju da je povećani nivo HDL-holesterol dobar zaštitni faktor protiv nastanka, progresije ateroskleroze i komplikacije KB, kao što je AIM.

IA (LDL-c/HDL-c) and established RF (TCH/HDL-c) were calculated mathematically. Clinical interpretation of lipids values recommended by the European Atherosclerosis Society and the Yugoslav Lipid Commission were used as the reference values. Statistical analysis was performed using *Statgraphics Plus* software package. The results showed that statistically significant differences were established between controls and students regarded some examined parameters. While HDL-c was found to be significantly higher in students ($P<0.05$), LDL-c was significantly lower ($P<0.05$) in students than in controls. In comparison to control group the values of TG and VLDL-C were similar to values in students, but TCH values were significantly higher in comparison to that of students ($P<0.05$). Values of IA and RF indicated no high risk of atherosclerosis in students. Sex had no influence on these results in both groups. These data suggest that there is no high risk of atherosclerosis and CAD in students population. At the same time they suggest that increased HDL-c is a protective factor against development and progression of atherosclerosis and complication of CAD such as AMI.

**C35**

## PRISUSTVO ATEROGENOG RIZIKA KOD DAVALACA PLAZME S POVIŠENIM VREDNOSTIMA ALANIN AMINOTRANSFERAZE

*B. Marković, D. Šimunović, S. Pelević*

*Institut za transfuziju krvi Srbije, Beograd*

Plazmafereza je skup postupaka koji omogućavaju odvajanje plazme, tj. tečnog dela krvi od ostalih delova krvi. U postupku plazmafereze, davaocu se reinfuzijom vraćaju svi ćelijski elementi krvi, kao autologni (sopstveni). Svi davaoci podvrgavaju se kontroli zdravstvenog stanja. Kontrola ukupnih proteina, albumina i alanin aminotransferaze (ALT) se vrši prilikom svakog davanja plazme, a na 8–10 davanja (svaka četiri meseca), određuju se biohemijski testovi za funkcionalno ispitivanje jetre, bubrega i testovi za poremećaj metabolizma. Cilj rada je bio ispitivanje aterogenog rizika kod davalaca na programu plazmafereze, koji imaju povišene vrednosti ALT. Određivani su: ukupni holesterol, HDL-holesterol, LDL-holesterol i trigliceridi. Navedeni parametri određivani su u serumu, standardnim biohemijskim metodama. Testirano je 313 davalaca plazme. Kod 17 davalaca, dobijene su sledeće srednje vrednosti ± Sd (mmol/L) za holesterol 7,09 ± 0,3 za HDL-holesterol 1,03 ± 0,06, za LDL holesterol 5,02 ± 0,4, a vrednosti za ALT (U/L) su iznosile 58,4 ± 14,2. Dobijeni rezultati ukazuju na prisustvo aterogenog rizika kod 17 davalaca plazme kod kojih su povišene vred-

**C35**

## PRESENCE OF ATHEROGENIC RISK IN PLASMA DONORS WITH ELEVATED ALT LEVELS

*B. Marković, D. Šimunović, S. Pelević*

*Blood Transfusion Institute of Serbia, Belgrade*

Plasmapheresis is a sophisticated procedure that enables separation of liquid phase (human plasma) from whole blood. The procedure consists of back return of all blood cells to the donor blood stream. All donors were checked-up in a medical centre. Total proteins, albumin, and ALT were estimated during every plasma donation but biochemical tests of functional surveillance of the liver and kidneys and metabolic disorders were performed every four months (or during every 10-th donation). The final aim of the study was the determination of atherogenic risk in donors on plasmapheresis programme, in whom ALT concentrations were estimated. Total cholesterol (Tch), HDL cholesterol (HDL-ch), LDL cholesterol (LDL-ch), triglycerides (TG) and alanin aminotransferases (ALT) were estimated. Lipid parameters were controlled in serum samples by standardized biochemical methods; 313 samples were tested. In 17 donors the estimated cholesterol values were (average ± SD, mmol/L) 7.09 ± 0.3; HDL cholesterol values 1.03 ± 0.06; LDL cholesterol values 5.02 ± 0.4; (TG) values 3.11 ± 0.79, and ALT values (U/L) 58.4 ± 14.2. The obtained results

nosti za ALT. Privremeno je obustavljeno dalje uzimanje plazme kod 17 davalaca uz primenu dijetetskog režima i kardiološke kontrole.

suggest the presence of atherogenic risk in 17 plasma donors in whom ALT concentrations were measured. These donors were temporary dismissed from this programme, were treated by dietetic regimen and were under permanent cardiovascular surveillance.

## C36

## RAZLIKE IZMEĐU UTICAJA AKUTNE I HRONIČNE PRIMENE NATRIJUM-MONOKETOHOLNE KISELINE NA LIPIDNI STATUS PACOVA

*S. Kojić-Damjanov[1], M. Đerić[1], M. Mikov[2], A. Rašković[2], K. Kuhajda[3], S. Kevrešan[4]*

*[1]Klinički centar, Institut za laboratorijsku medicinu, Novi Sad*
*[2]Medicinski fakultet, Zavod za farmakologiju, toksikologiju i kliničku farmakologiju, Novi Sad*
*[3]PMF Novi Sad, Institut za hemiju, Novi Sad*
*[4]Poljoprivredni fakultet, Novi Sad*

Poremećaji metabolizma lipida zahtevaju dugotrajnu, često i doživotnu medikamentoznu terapiju, zbog čega se od novih potencijalnih hipolipidemijskih jedinjenja, kao što je i natrijum-monoketoholna kiselina (MKHA), očekuje i jednostavniji dozni režim. Ovo ispitivanje izvedeno je u cilju ustanovljavanja razlika između akutnog i hroničnog delovanja MKHA na lipidni status pacova. Ispitivan je uticaj jednokratne i sedmodnevne peroralne (*p.o.*), supkutane (*s.c.*) i intravenske (*i.v.*) primene MKHA (2 mg/kg TT) u grupi zdravih (n=30) i dijabetičnih (n=30; intraperitonealna aplikacija 100 mg/kg TT aloksana®) pacova muškog pola, soja »Wistar«, na standardizovanom režimu ishrane. Parametri lipidnog statusa određivani su standardnim biohemijskim metodama, iz uzorka krvi dobijenog intrakardijalnom punkcijom. Hronična, u odnosu na akutnu primenu MKHA, u grupi zdravih životinja izazvala je statistički značajno sniženje ukupnog holesterola (TC) samo nakon *i.v.* (p<0,01; –27,68%) i porast triglicerida (TG) seruma nakon *s.c.* primene (p<0,01; 120,27%). Vrednosti HDL holesterola (HDL-C) bile su snižene nakon sva tri načina aplikacije, značajno nakon *s.c.* (p<0,05; –27,27%). LDL holesterol (LDL-C) bio je znatno snižen nakon *s.c.* (–64,29%) i *i.v.* (–50,00%) tretmana, ali bez statističke značajnosti. Kod dijabetičnih pacova, ustanovili smo značajno sniženje TC nakon *p.o.* (p<0,01; –35,29%) i *s.c.* (p<0,05; –23,33%) primene, LDL-C nakon sva tri načina davanja (*p.o.* –p<0,05; –84,21%, *s.c.* –p< 0,02; –92,00%, *i.v.* – p< 0,001; –93,02%), a HDL-C nakon *p.o.* aplikacije (p<0,05; –19,09%), dok TG značajno rastu nakon *s.c.* primene (p<0,02; 60,61%). Potvrđeno je da

## C36

## DIFFERENCES BETWEEN INFLUENCE OF ACUTE AND CHRONIC TREATMENT WITH SODIUM MONOKETOCHOLATE ON LIPID STATUS OF RATS

*S. Kojić-Damjanov[1], M. Đerić[1], M. Mikov[2], A. Rašković[2], K. Kuhajda[3], S. Kevrešan[4]*

*[1]Clinical Centre, Institute of Laboratory Medicine, Novi Sad*
*[2]University School of Medicine, Institute of Pharmacology, Toxicology and Clinical Pharmacology, Novi Sad*
*[3]PMF Novi Sad, Institute of Chemistry, Novi Sad*
*[4]University School of Agriculture, Novi Sad*

Lipid metabolism disorders require a long, usually lifelong, medical therapy. Therefore, potential new hypolipidaemic drugs, and sodium monoketocholate (MKHA), are expected to have a simpler dosage. The aim of the study was to examine the difference between acute and chronic effect of MKHA on lipid status of rats. We examined the effect of an one-day dose and a seven-day peroral (*p.o.*), subcutaneous (*s.c.*) and intravenous (*i.v.*) administration of MKHA (2 mg/kg body weight) in a group of healthy (N=30) and a group of diabetic (N=30 intraperitoneal administration of 100 mg/kg body weight of Aloxane®) male »Wistar« rats fed with standardized laboratory animal food. Parameters of lipid status were determined using standard biochemical methods, on the basis of an intracardial by taken blood sample. Chronic versus acute administration of MKHA in the group of healthy animals provoked a significant decrease in total cholesterol concentration (TC) after *i.v.* administration (P<0.01; –27.68%) only, and increase in serum triglycerides (TG) after *s.c.* (P<0.01; 120.27%) administration. Values of HDL cholesterol (HDL-C) were decreased after all three types of administration and significantly after *s.c.* use (P<0.05; –27.27%). LDL cholesterol (LDL-C) level was considerably decreased after *s.c.* (– 64.29%) and *i.v.* (–50.00%) treatment, but without statistical significance. In diabetic rats, we established significant decrease in TC *p.o.* (P<0.01; –35.29%) and *s.c.* (P<0.05; –23.33%) administration; LDL-C after all three types of administration (*p.o.* – P<0.05; –84.21%, *s.c.* – P< 0.02; –92.00%, *i.v.* – P<0.001; –93.02%); HDL-C after *p.o.* use (P<0.05; –19.09%), while TGs were sig-

hronična primena MKHA, u odnosu na akutnu, ima izraženiji uticaj na parametre lipidnog statusa, naročito kod dijabetičnih pacova. Ovi rezultati upućuju na potrebu daljih ispitivanja uloge enterohepatične recirkulacije u cilju postizanja komfornijeg načina doziranja sintetskih soli žučnih kiselina.

nificantly increased after *s.c.* treatment (P<0.02; 60.61%). We confirmed that chronic, as opposed to acute administration of MKHA, has more expressive influence on parameters of lipid status, especially in diabetic rats. These results point to the need for further examination of the role of enterohepatic recirculation, in order to achieve a more appropriate dosage of synthetic salts of bile acids.

## C37

## UTICAJ NATRIJUM-MONOKETOHOLNE KISELINE NA LIPIDNI STATUS DIJABETIČNIH PACOVA

*S. Kojić-Damjanov[1], M. Đerić[1], M. Mikov[2], O. Horvat[2], K. Kuhajda[3], S. Kevrešan[4]*

*[1]Klinički centar, Institut za laboratorijsku medicinu, Novi Sad*
*[2]Medicinski fakultet, Zavod za farmakologiju, toksikologiju i kliničku farmakologiju, Novi Sad*
*[3]PMF Novi Sad, Institut za hemiju, Novi Sad*
*[4]Poljoprivredni fakultet, Novi Sad*

Žučne kiseline su poslednjih godina farmakološki veoma interesantne kao transporteri i stimulatori dejstva lekova. Međutim, njihova značajna uloga u metabolizmu holesterola ukazuje i na mogućnost direktnog hipolipidemijskog efekta. Cilj ovog istraživanja bio je da se ispita uticaj natrijum-monoketoholne kiseline (MKHA) (2 mg/kg TT) nakon akutnog (jednokratnog) i hroničnog (sedmodnevnog) tretmana, na lipidni status dijabetičnih mužjaka (n=30) pacova soja »Wistar«, hranjenih standardizovanom ishranom za laboratorijske životinje. *Diabetes mellitus* indukovan je hemijskim putem, intraperitonealnom aplikacijom aloksana (100 mg/kg TT). Eksperimentalne grupe (n=5) primale su MKHA peroralno (*p.o.*), supkutano (*s.c.*) i intravenski (*i.v.*), a poređenje je vršeno u odnosu na odgovarajuće kontrolne grupe zdravih pacova (n=30). Parametri lipidnog statusa određivani su standardnim biohemijskim metodama, iz uzorka krvi dobijenog intrakardijalnom punkcijom. Akutna primena MKHA izazvala je samo značajno sniženje vrednosti LDL holesterola (LDL-C) (p<0,02; –54,76%) i indeksa ateskleroze (p<0,02; –58,54%) nakon *p.o.* primene. Hronična primena MKHA dovela je do sniženja ukupnog holesterola (TC) i LDL-C seruma nakon sva tri načina aplikacije, statistički značajno za TC nakon *s.c.* (p<0,05; –10,97%), a za LDL-C nakon *p.o.* (p<0,05; –93,88%) i *i.v.* (p<0,01; –88,00%) primene. Triglicerid seruma bili su značajno sniženi samo nakon *s.c.* primene (p<0,02; –34,97%). Povišenje vrednosti serum-

## C37

## INFLUENCE OF SODIUM MONOKETOCHOLATE ON LIPID STATUS OF DIABETIC RATS

*S. Kojić-Damjanov[1], M. Đerić[1], M. Mikov[2], O. Horvat[2], K. Kuhajda[3], S. Kevrešan[4]*

*[1]Clinical Centre, Institute of Laboratory Medicine, Novi Sad*
*[2]University School of Medicine, Institute of Pharmacology, Toxicology and Clinical Pharmacology, Novi Sad*
*[3]PMF Novi Sad, Institute of Chemistry, Novi Sad*
*[4]University School of Agriculture Faculty, Novi Sad*

In the recent years, bile acids have been pharmacologically very interesting as transporters and stimulators of drug effects, but their significant role in cholesterol metabolism points to a possible of direct hypolipidaemic effect. The aim of the study was to determine the influence of sodium monoketocholate (MKHA) (2 mg/kg body weight) on lipid status of diabetic (N=30) male »Wistar« rats fed with standardized laboratory animal food after acute (one dose) and chronic (seven-day) treatment. *Diabetes mellitus* was induced chemically by intraperitoneal administration of Aloxane (100 mg/kg body weight). Experimental groups (N=5) received MKHA by peroral (*p.o.*), subcutaneous (*s.c.*) and intravenous (*i.v.*), way, and they were compared to corresponding control groups of healthy rats (N=30). Parameters of lipid status were determined using standard biochemical methods on the basis of intracardially taken blood sample. Acute administration of MKHA caused significant decrease in values of LDL cholesterol (LDL-C) (P<0.02; –54.76%) and LDL/HDL-cholesterol ratio (P<0.02; –58.54%) after p.o. administration. Chronic treatment with MKHA led to decrease in total serum cholesterol (TC) and LDL-C after all three types of application, statistically significant in TC after *s.c.* use (P<0.05; –10.97%), and in LDL-C after *p.o.* (P<0.05; –93.88%) and *i.v.* (P<0.01; –88.00%) administration. Serum triglycerides were significantly decreased after *s.c.* treatment (P<0.02; –34.97%). Increase in serum HDL choles-

skog HDL holesterola nije bilo značajno ni kod jednog načina aplikacije žučne soli. Hipolipidemijski efekat MKHA, ispoljen naročito nakon hronične primene, ukazuje na lokalno delovanje hiperglikemije u smislu inhibicije stimulacijskog efekta žučnih kiselina na crevnu resorpciju lipida, čime je omogućeno ispoljavanje eventualnih direktnih hipolipidemijskih efekata ove sintetske žučne soli. Ostvareno hipolipidemijsko dejstvo moglo bi biti od značaja za terapijsku primenu žučnih soli, posebno u populaciji dijabetečnih bolesnika.

terol values was not statistically significant after all three types of administration of bile salt. Hypolipidaemic effect of MKHA, especially after chronic treatment, points to the local effect of hyperglycaemia in the sense of inhibition of bile acids stimulating effect on resorption of lipids in gut, which enables expression of possible direct hypolipidaemic effects of this synthetic bile salt. The achieved hypolipidaemic effect could be important for therapeutic use of bile salts, especially in patients with diabetes.

**C38**

## KLINIČKA EVALUACIJA ATEROSKLEROZE: DA LI HIPERURIKEMIJA IMA ULOGU?

*D. Pap[1], G. Prtenjak[2], V. Canić[3]*

*[1]Zavod za zdravstvenu zaštitu studenata, Služba laboratorijske dijagnostike, Novi Sad*
*[2]Institut za onkologiju, Sremska Kamenica*
*[3]Dom zdravlja Sokobanja, Sokobanja*

Kardiovaskularne bolesti su vodeći uzrok mortaliteta i morbiditeta u svetu. Ateroskleroza je glavni uzrok koronarne bolesti. U cilju prevencije vaskularnih komplikacija bolesti srca veoma je važno dijagnostikovati i lečiti hipertenziju, gojaznost, dislipidemije, *Diabetes Mellitus* i druge faktore rizika. Cilj ovog rada je bio ispitivanje uloge lečenja hiperurikemije sa stanovišta vaskularnih komplikacija i pokušaj da se ustanovi hiperurikemija kao mogući marker za aterosklerozu. Ispitanici su bili kontrolna grupa (50 pacijenata sa degenerativnim oboljenjima zglobova) i eksperimentalna grupa (50 pacijenata obolelih od gihta). Ispitivane su vrednosti serumskih nivoa mokraćne kiseline, koncentracije glukoze i lipidnog statusa (ukupni holesterol, trigliceridi, LDL-holesterol, HDL-holesterol, indeks ateroskleroze i faktor rizika) u obe grupe. Svi ispitivani biohemijski parametri određeni su standardnim laboratorijskim metodama. Dobijeni rezultati su pokazali da pacijenti sa gihtom imaju višu frekvenciju nastanka hipertenzije (78%), zatim simptome koronarne i cerebralne ateroskleroze (60%) i simptome hipertrigliceridemije u 88%. Dobijeni rezultati ukazuju na moguću ulogu mokraćne kiseline u patogenezi ateroskleroze i važnu ulogu lečenja hiperurikemije s činjenicom da ona predstavlja marker za prisustvo drugih faktora rizika za aterosklerozu i progresiju koronarne bolesti.

**C38**

## DOES HYPERURICAEMIA PLAY A ROLE IN CLINICAL EVALUATION OF ATHEROSCLEROSIS?

*D. Pap[1], G. Prtenjak[2], V. Canić[3]*

*[1]Students Health Institute Novi Sad, Department of Laboratory Diagnosis, Novi Sad*
*[2]Institute of Oncology, Sremska Kamenica*
*[3]Health Centre, Sokobanja*

Cardiovascular diseases are the leading cause of mortality and morbidity worldwide. Atherosclerosis is the major cause of coronary heart disease. In order to prevent vascular complications in the heart, it is important to detect and treat hypertension, obesity, dyslipidaemias, *Diabetes Mellitus* and other risk factors. The aim of the study was to analyze role of the treatment of hyperuricaemia from the view of vascular complications and to established hyperuricaemia as a marker of atherosclerosis. The studied subjects were a control group (50 patients with degenerative disease of joints) and an experimental group (50 patients with gout). We examined the value of serum levels of uric acid, glucose concentrations, and lipid status (total cholesterol, triglycerides, LDL-cholesterol, HDL-cholesterol, index of atherosclerosis and risk factors) in both groups. All determined biochemical parameters were measured by standard laboratory methods. Our study demonstrates that patients with gout have more frequently hypertension (78%), symptoms of coronary and cerebral atherosclerosis (60%) and symptoms of hypertrygliceridaemia (88%). The results suggest a possible role of uric acid in pathogenesis of atherosclerosis and importance of treatment of hyperuricaemia which is a marker of presence of other risk factors of atherosclerosis and coronary artery diseases.