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Komora medicinsko-laboratorijskih dijagnostičara FBiH

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MAGISTRI MEDICINSKO – LABORATORIJSKE DIJAGNOSTIKE U HRVATSKOJ – JESMO LI STIGLI BUDUĆNOST

Katja Puljčan, Darko Mijatović

U posljednjih dvadeset godina došlo je do dramatičnih promjena u medicinsko – laboratorijskoj dijagnostici. Da bi se odgovorilo na povećanu složenost zdravstvene skrbi, zbog starenja stanovništva, liječenja kroničnih bolesti, brojnih novih tehnologija i skupih postupaka, povećana je važnost bolje izobrazbe svih zdravstvenih djelatnika. Minimalna razina potrebna za obavljanje prakse je sveučilišni stupanj prvostupnika (engl. *bachelor*). Aktualna europska stajališta su da magistarski stupanj predstavlja narednu, drugu stepenicu sveučilišnog obrazovanja. Među prioritetima je i prepoznatljivost magistarske razine obrazovanja što je u skladu s europskom strategijom rasta: Europa 2020. te sa Strategijom obrazovanja, znanosti i tehnologije Republike Hrvatske iz 2014.g. Glavni ciljevi strategije su kvalitetno obrazovanje dostupno svima pod jednakim uvjetima a u visokom obrazovanju unaprijeđenje studijskih programa i dosljedno provođenje postavke bolonjske reforme. Međutim, selektivno se primjenjuju navedene strategije, uključujući i primjenu Direktive EK 2005/36, dok se preporuke Europskog krovnog udruženja za zanimanja u biomedicinskoj znanosti, EPBS (European Association for Professions in Biomedical Science) odbijaju bez utemeljenog razloga. Implementira se samo ono što je prihvatljivo određenim interesnim skupinama. Svjedoci smo sustavne diskriminacije prema medicinsko – laboratorijskoj djelatnosti od strane resornih ministarstava. U RH je prisutna diskrepancija između kompetencija, standarda zanimanja, standarda kvalifikacija, srednjoškolskog curricula i studijskih programa za medicinsko laboratorijsku djelatnost te zdravstvenog sustava ali i tržišta rada. Također, postoje diskrepancije između Europskog kvalifikacijskog okvira (EKO) i Hrvatskog kvalifikacijskog okvira (HKO). S obzirom da su magistri medicinsko – laboratorijske dijagnostike interdisciplinarno obrazovani stručnjaci u znanstvenim područjima te da posjeduju visoku razinu znanja i vještina te odgovornosti za samostalno obavljanje svih analitičkih postupaka različite razine složenosti u dijagnostičkim laboratorijima u sustavu zdravstva te u znanstveno – istraživačkim laboratorijima iz područja biomedicine i zdravstva, postavlja se pitanje jesmo li zaista sustigli budućnost.

Ključne riječi: magistar medicinsko – laboratorijske dijagnostike, Strategija Europa 2020.; Strategija obrazovanja, znanosti i tehnologije RH; EPBS; EKO; HK

MASTERS OF MEDICAL- LABORATORY DIAGNOSTICS IN CROATIA - HAVE WE REACHED THE FUTURE?

Puljčan K, Mijatović D

In the last twenty years, there have been dramatic changes in medical-laboratory diagnostics. In order to respond to the increased complexity of health care, due to the aging of the population, the treatment of chronic diseases, numerous new technologies and expensive procedures, the importance of better training of all health professionals has increased. The minimum level required for practice is a bachelor's degree. Current European views are that the master's degree represents the next, second step of university education. Among the priorities is the recognizability of the master's level of education, which is in line with the European growth strategy: Europe 2020 and with the Education, Science and Technology Strategy of the Republic of Croatia from 2014. The main goals of the strategy are quality education available to all under equal conditions, and in higher education, improvement of study programs and consistent implementation of the Bologna reform. However, the aforementioned strategies are selectively applied, including the application of EC Directive 2005/36, while the recommendations of the European umbrella association for professions in biomedical science, EPBS (European Association for Professions in Biomedical Science), are rejected without a valid reason. Only what is acceptable to certain interest groups is implemented. We are witnessing systematic discrimination against medical-laboratory activities by the relevant ministries.

In the Republic of Croatia, there is a discrepancy between competencies, occupational standards, qualifications standards, high school curriculum and study programs for medical and laboratory activities and the health system, as well as the labor market. Also, there are discrepancies between the European Qualification Framework (EQF) and the Croatian Qualification Framework (HKO). Since masters of medical-laboratory diagnostics are interdisciplinary experts in scientific fields and possess a high level of knowledge and skills and responsibility for independently performing all analytical procedures of various levels of complexity in diagnostic laboratories in the healthcare system and in scientific-research laboratories in the field of biomedicine and healthcare, the question is whether we have really caught up with the future.

Keywords: master's degree in medical - laboratory diagnostics, Europe 2020 strategy; Education, Science and Technology Strategy of the Republic of Croatia; EPBS; ECO; HKO

MJESTO, ULOGA I ZNAČAJ MEDICINSKO-LABORATORIJSKOG DIJAGNOSTIČARA U ZDRAVSTVENOM SISTEMU BOSNE I HERCEGOVINE

Nedeljka Šljivo, Fatima Bilajac

Stručnjak ovog profila je osposobljen za rad na složenim analitičkim postupcima što mu omogućava samostalno izvođenje pretraga iz slijedećih područja: Kliničke hemije/kemije, Laboratorijske hematologije, Bakteriologije, Parazitologije, Virologije, Mikologije, Imunologije i Imunogenetike, Citologije, Histopatologije, Transfuziologije, Tipizacije tkiva, Nuklearne, Eksperimentalne medicine i ostala područja u sklopu laboratorijske medicine. Organizator medicinsko-laboratorijske službe, Zaštite na radu, Menadžer i rukovodioc medicinsko-dijagnostičkih laboratorija u društvenom i privatnom sektoru. Procjenjuje se da se 60 do 70 posto svih odluka koje se tiču pacijentove dijagnoze, liječenja, prijema u bolnicu i otpusta temelje na laboratorijskim rezultatima koje provode medicinsko laboratorijski dijagnostičari. Prema Klasifikaciji zanimanja u F BiH (2016.) pod šifrom 2269.003 je Inženjer medicinsko-laboratorijske dijagnostike. Kadar se obrazuje na Fakultetima u F BiH i u Republici Srpskoj. U BiH postoje regulirane profesije, ali ne postoji regulirano (uređeno) obrazovanje.

Tokom obrazovanja na Fakultetu zdravstvenih studija student medicinsko-laboratorijske dijagnostike, prvog ciklusa odsluša i položi BIOHEMIJE → P: 150 sati + VJ: 45 sati + KL. Vj: 60 + Kl.prakse 75 sati + stručne prakse 200 sati i Mikrobiologije P: 90 sati + Vj: 90 sati + KP: 125 sati.

Zakon o zdravstvenoj zaštiti F BiH i Zakon o zdravstvenoj zaštiti RS ne tretiraju jednako medicinsko-laboratorijske dijagnostičare. Onemogućeno mu je dalje napredovanje u vidu specijalizacije i neophodno je da se nepravilnosti otklone i omogući pozicija i značaj koji pripadaju medicinsko-laboratorijskim dijagnostičarima.

Ključne riječi: inženjer medicinsko-laboratorijske dijagnostike, Fakultet zdravstvenih studija, Zakon o zdravstvenoj zaštiti

THE PLACE, ROLE, AND IMPORTANCE OF THE MEDICAL LABORATORY DIAGNOSTICIAN IN THE HEALTH SYSTEM OF BOSNIA AND HERZEGOVINA

Šljivo N, Bilajac F.

An expert of this profile is trained to work on complex analytical procedures, which enables them to perform tests in the following areas independently: Clinical chemistry, Laboratory hematology, Bacteriology, Parasitology, Virology, Mycology, Immunology and Immunogenetics, Cytology, Histopathology, Transfusiology, Tissue typing, Nuclear, Experimental medicine and other areas within laboratory medicine. They are also an organizer of medical-laboratory services, Occupational Safety, Manager, and head of medical-diagnostic laboratories in the public and private sectors. It is estimated that 60 to 70 percent of all decisions regarding a patient's diagnosis, treatment, hospital admission, and discharge are based on laboratory results performed by medical laboratory diagnosticians.

Engineer of medical and laboratory diagnostics is under the code 2269.003 according to the Classification of Occupations in the Federation of Bosnia and Herzegovina (2016). The staff is educated at the Faculties in the Federation of Bosnia and Herzegovina and the Republic of Srpska. There are regulated professions in Bosnia and Herzegovina, but no regulated education exists.

During education at the Faculty of Health Studies, a student of medical-laboratory diagnostics, in the first cycle, takes and passes BIOCHEMISTRY □ T: 150 hours + P: 45 hours + CP: 60 + Class practice 75 hours + Professional practice 200 hours and Microbiology T: 90 hours + P: 90 hours + CP: 125 hours.

The Law on Health Care of the FBiH and the Law on Health Care of the RS do not treat medical-laboratory diagnosticians equally. They are prevented from further advancement in the form of specialization, and it is necessary to remove the irregularities and enable the position and importance belonging to medical-laboratory diagnosticians.

Keywords: engineer of medical-laboratory diagnostics, Faculty of Health Studies, Law on Health Care

POTREBE ZA DODATNIM EDUKACIJAMA I DODATNIM KOMPETENCIJAMA LABORATORIJSKIH STRUČNJAKA U SKLADU SA NOVIM TEHNOLOŠKIM IZAZOVIMA

Enver Ivanković

Razvoj i primjena automatizacije i informacionih tehnologija, a odnedavno i korištenje "kobota" (kolaborativni robot), u zajedničkom radnom prostoru u laboratorijskoj medicini otvorili su brojna pitanja.

Buduća upotreba robota i potpuna automatizacija laboratorija je sasvim izvjesna, kao i primjena umjetne inteligencije u laboratorijskoj medicini.

Ove promjene će pomoći u optimiziranju radnog toka, skraćivanju TAT-a, povećanju kvaliteta rada, smanjenju cijene testa, te efikasnijeg korištenja reagenasa u cilju pridonošenja zelenijoj praksi.

Promjena tehnologije u laboratoriju će, neminovno, zahtijevati i promjenu uloge laboratorijskih stručnjaka.

Promijenjena uloga laboratorijskih stručnjaka u trendovima digitalne transformacije društva (4. industrijske revolucije) zahtijevaće drugačiju vrstu obrazovanja u skladu sa novim tehnološkim izazovima.

Cilj rada: Utvrditi potrebe za dodatnim edukacijama osoblja u skladu sa stepenom tehnoloških promjena u laboratoriju.

Sporedni ciljevi:

- podstaći akademsku zajednicu (fakulteti) na prilagođavanje studijskih programa za buduće laboratorijske stručnjake
- podstaći stručna udruženja da surađuju sa akademskom zajednicom na praviljenju adekvatnih obrazovnih programa
- podstaći nadležne institucije (ministarstvo obrazovanja i nauke, ministarstvo zdravstva, ministarstvo rada i zapošljavanja) da daju svoj doprinos u skladu sa svojim misijama
- podstaći poslodavce da daju podršku laboratorijskim stručnjacima u neophodnim usavršavanjima

Metodologija istraživanja

Ovo istraživanje temelji se na pregledu dostupne literature (časopisi, knjige, web stranice) koja obrađuje ovu temu ili druge bliske teme. Pregledani su i razni zakonski, podzakonski akti povezani sa temom, kao i postojeće strategije i izvršena istraživanja nadležnih institucija.

Rezultati: Laboratorijski stručnjaci, da bi ispunili zahtjeve koji će se pred njih postaviti, trebat će dodatne edukacije iz računarske sigurnosti i sigurnosti podataka, robotike, kibernetičke sigurnosti, o zakonskim osnovama obrade podataka i zaštite ličnih podataka. Tu je još dijagnostička validacija testova i znanje tumačenja, kao i potrebna znanja iz integracije između kliničkih informacija i laboratorijskih podataka, i.dr.

Zaključak: Visoki stepen automatizacije, usavršavanje i uvođenje robota u laboratoriju će promijeniti ulogu laboratorijskog stručnjaka. Laboratorijski stručnjaci će morati naučiti raditi zajedno sa robotima koji posjeduju umjetnu inteligenciju. Za rad u takvom okruženju morati će steći nova znanja i nove potrebne kompetencije.

**THE NEEDS FOR ADDITIONAL EDUCATION AND FURTHER
COMPETENCES OF LABORATORY EXPERTS IN ACCORDANCE
WITH NEW TECHNOLOGICAL CHALLENGES.**

Ivanković E.

Introduction:

The development and application of automation and information technologies, and since recently also using "cobots" (collaborative robots), in a shared workspace in laboratory medicine, have opened numerous questions. The future use of robots and complete automation of laboratories is quite certain, as is the application of artificial intelligence in laboratory medicine.

These changes will help in optimizing the workflow, shortening TAT, increasing the quality of work, reducing the cost of the test, and more efficient use of reagents in order to contribute to a greener practice. The change of technology in the laboratory will, inevitably, require a change in the role of laboratory experts.

The changed role of laboratory experts in the trends of digital transformation of society (4th industrial revolution) will demand a different kind of education in accordance with new technological challenges.

Objective: Determine the needs for additional staff training in accordance with the level of technological changes in the laboratory.

Secondary objectives:

- Encourage the academic community (faculties) to adapt study programs for future laboratory experts
- Encourage professional associations to cooperate with the academic community on creating adequate educational programs
- Encourage competent institutions (Ministry of Education and Science, Ministry of Health, Ministry of Labor and Employment) to contribute in accordance with their missions
- Encourage employers to support laboratory experts in the necessary training

Research methodology

This research is based on a review of the available literature (magazines, books, websites), which deals with this topic or other related topics. Various legal and by-laws related to the topic were also reviewed, as well as existing strategies and research carried out by competent institutions.

Results: Laboratory experts, in order to fulfill the requirements that will be placed before them, will need additional education in computer security and data security, robotics, cyber security, and on the legal basis of data processing and personal data protection. There is also diagnostic validation of tests and knowledge of interpretation, as well as the necessary knowledge of integration between clinical information and laboratory data, etc.

Conclusion: A high level of automation, improvement and introduction of robots in the laboratory will change the role of the laboratory specialist. Laboratory experts will have to learn to work together with robots that possess artificial intelligence. To work in such an environment, they will have to acquire new knowledge and new necessary competencies.

PROMJENE U DIFERENCIJALNOJ KRVNOJ SLICI KOD PROFESIONALNO IZLOŽENIH OSOBA DJELOVANJU BENZENA

Burgić Esad

Pozadina

Korištenjem diferencijalne krvne slike (DKS) – optička metoda, kao parametra u sistematskom pregledu radnika koji rade na proizvodnji benzena i njegovih homologa, možemo procijeniti napredovanje mijelosupresije uzrokovane benzenom i njegovim homologima tokom određenog vremenskog perioda.

Cilj

Utvrđiti prisustvo elemenata diseritrocitopoeze, disgranulocitopoeze, distrombocitopoeze u perifernom razmazu krvi kod profesionalno izloženih osoba djelovanju benzena.

Metode

Kao materijal za istraživanje je uzeta puna krv sa EDTA u laboratoriju JZU DZ Lukavac za vrijeme sistematskog pregleda radnika koji rade sa sirovim benzenom u Global Ispat koksoj industriji Lukavac, i uzorci krvi nastavno osoblja Javne ustanove Gimnazija Lukavac, kao kontrolni. Uzorcima krvi uzete sa EDTA po standardiziranom postupku je urađena optička diferencijalna krvna slika (periferni razmaz),bojena po metodi May Grüenvald – Giemsa i preparati analizirani na mikroskopu Leica 1000 pod povećanjem 100/1,25.

Rezultati

Kod radnika u proizvodnji benzena su promjene u diferencijalnoj krvnoj slici signifikantno češće nego kod kontrolne grupe ispitanika, što dokazuje mielosupresivno dejstvo benzena i njegovih homologa. Promjene u DKS ispitivane grupe se registruju od najkraće do najduže ekspozicije, stim da je u skupini sa akspozicijom >20 godina broj najveći.Promjene u DKS ispitivane grupe u periodu 2008 – 2011, pokazuje veću učestalost u periodu 2011. 2008 je bilo 11 ili 27,5% patološki nalaza, a 2011 je bilo 32 ili 80% patoloških nalaza, što je dokaz postepenog mielosupresivnog dejstava benzena.

Zaključak

Preporučuje se uvođenje optičke diferencijalne krvne slike u obavezni program pretraga prilikom sistematskog pregleda radnika koji rade na proizvodnji benzena i njegovih homologa.

Ključne riječi: Diferencijalna krvna slika, Benzen, mijelosupresija.

CHANGES IN THE DIFFERENTIAL BLOOD PICTURE IN PERSONS OCCUPATIONALLY EXPOSED TO BENZENE

Burgić E.

Background

By using the differential blood count (DKS) - an optical method, as a parameter in a systematic examination of workers working on the production of benzene and its homologues, we can assess the progression of myelosuppression caused by benzene and its homologues over a certain period of time.

Goal

To determine the presence of elements of dyserythrocytopoiesis, dysgranulocytopoiesis, and dysthrombocytopoiesis in the peripheral blood smear of persons professionally exposed to the effects of benzene.

Methods

As material for research, whole blood with EDTA was taken in the laboratory of JZU DZ Lukavac during a systematic examination of workers who work with raw benzene in the Global Ispat coke industry Lukavac, and blood samples from the teaching staff of the Public Institution Gimnazija Lukavac, as a control. Blood samples taken with EDTA according to a standardized procedure were subjected to an optical differential blood count (peripheral smear), stained according to the May Grünvald - Giemsa method, and the preparations were analyzed on a Leica 1000 microscope under a magnification of 100/1.25.

The results

Among workers in the production of benzene, changes in the differential blood count are significantly more frequent than in the control group of subjects, which proves the myelosuppressive effect of benzene and its homologues. Changes in the DKS of the examined group are registered from the shortest to the longest exposure, with the largest number in the group with exposure >20 years. Changes in the DKS of the examined group in the period 2008 - 2011, shows a higher frequency in the period of 2011. In 2008, there were 11 or 27.5% of pathological findings, and in 2011 there were 32 or 80% of pathological findings, which is evidence of the gradual myelosuppressive effect of benzene.

Conclusion

It is recommended to introduce the optical differential blood count in the mandatory examination program during the systematic examination of workers who work on the production of benzene and its homologues.

Keywords: Differential blood count, Benzene, myelosuppression.

DOBRA LABORATORIJSKA PRAKSA KOD MOGUĆIH INTERFERENCIJA REZULTATA NA SPECIFIČNE IgE ZA POJEDINE ALERGENE

Nermin Kotorić

Dijagnoza alergije određivanjem alergen-specifičnog IgE komplicirana je klinički irelevantnim IgE antitijelima, od kojih je najistaknutiji primjer IgE protiv unakrsno reaktivnih ugljikohidratnih determinanti (CCD), koje se javljaju na alergenima iz biljaka i insekata. Iako nemaju nikakav klinički značaj, u dijagnostici alergija in vitro, pojava ovih antitijela otežava interpretaciju pozitivnih rezultata. Inhibicija CCD-ova predložena je kao lijek. U ovom smo radu prikazali naša iskustva u rješavanju problema koje u dijagnostici alergija donose CCD, kao i namjeru da sumnjive rezultate potvrdimo ili isključimo kao lažno pozitivne. Od 2010 godine služba za laboratorijsku dijagnostiku u Općoj bolnici Tešanj radi in vitro testiranje alergija. Kroz rad smo se neizbježno susretali sa „sumnjivim“ pozitivnim rezultatima, sumnjajući na unakrsnu reakciju ugljikohidrata i poduzimajući mjere za njihovo rješenje. Od 2021. godine CCD blokatore uvodimo u rutinsku obradu sumnjivih rezultata. U istoj godini smo kod 388 uzorka ispitali preosjetljivost na inhalatorne i alergene hrane a kod 43 pacijenta smo izrazili sumnju na reaktivnost CCD. Izdvojeni uzorci su podvrgnuti CCD testu inhibicije i ponovo testirani a rezultati upoređeni sa prethodnim. Ovaj rad je rezultat našeg iskustva sa „šarenim“ rezultatima za specifične IgE i njihovo tretiranje sa CCD blokatorima. Utvrđena je statistički značajna razlika u vrijednostima alergena hrane po klasama prije i nakon davanja blokatora. Međutim kod inhalatornih alergena i alergena gljivica i epitela životinja nije pronađena statistički značajna razlika u vrijednostima klasa prije i nakon davanja blokatora. Eliminacija CCD-specifičnih IgE antitijela pomoću sintetičkog CCD blokatora drastično je smanjila broj lažno pozitivnih rezultati in vitro testova bez ugrožavanja osjetljivosti na relevantne IgE interakcije. Stoga, CCD-blokator predstavlja vrijedan alat za povećanje specifičnosti testa rutinske in vitro dijagnoze alergije.

Ključne riječi: unakrsno reaktivne determinante, CCD blokatori, specifični IgE, alergeni.

GOOD LABORATORY PRACTICE FOR POTENTIAL INTERFERENCES OF RESULTS ON SPECIFIC IgE FOR CERTAIN ALLERGENS

Kotorić N.

Allergy diagnosis by determination of allergen-specific IgE is complicated by clinically irrelevant IgE antibodies, the most prominent example of which is IgE against cross-reactive carbohydrate determinants (CCD) that occur on allergens from plants and insects. Although they have no clinical significance, in the diagnosis of allergies in vitro, the appearance of these antibodies makes it difficult to interpret positive results. Inhibition of CCDs has been proposed as a remedy. In this paper, we presented our experiences in solving problems caused by CCDs in allergy diagnostics and the intention to confirm or reject suspicious results as false positives. Since 2010, the laboratory diagnostics service at Tešanj General Hospital has been doing in vitro allergy testing. During our work, we inevitably encountered "suspicious" positive results, suspecting the cross-reaction of carbohydrates and taking measures to solve them. Since 2021, we have been introducing CCD blockers into the routine processing of suspicious results. In the same year, we examined hypersensitivity to inhalant and food allergens in 388 samples, and in 43 we expressed suspicion of CCD reactivity. Separated samples were subjected to CCD inhibition test and retested and the results were compared with the previous ones. This paper is the result of our experience with "colorful" results for specific IgE and their treatment with CCD blockers. A statistically significant difference was found in the values of food allergens by a class before and after the administration of the blocker. However, in the case of inhalant allergens and allergens of fungi and animal epithelium, no statistically significant difference was found in the class values before and after administration of the blocker. Elimination of CCD-specific IgE antibodies using a synthetic CCD blocker drastically reduced the number of false-positive in vitro test results without compromising sensitivity to relevant IgE interactions. Therefore, the CCD-blocker represents a valuable tool to increase the specificity of the routine in vitro allergy diagnosis test.

Keywords: cross-reactive determinants, CCD blockers, specific IgE, allergens.

ZNAČAJ ODREĐIVANJA INR-a (INTERNATIONAL NORMALIZED RATIO)

Emina Muftić

Zgrušavanje ili koagulacija krvi jeste zaštitni mehanizam organizma protiv krvarenja. Kada dođe do oštećenja krvnog suda, događa se niz reakcija koje uključuju supstance koje se prirodno nalaze u krvi i koje su poznate pod nazivom faktori zgrušavanja ili faktori koagulacije. Obično zgrušavanje započinje spontano onda kada dođe do manjeg ili većeg krvarenja iz oštećenog krvnog suda. Međutim, postoji nekoliko stanja koja mogu uzrokovati stvaranje krvnih ugrušaka u odsustvu aktivnog krvarenja. Kada se to dogodi, osoba može biti izložena povećanom riziku od tromboembolijske bolesti. Kod tromboembolijske bolesti, fragmenti krvnih ugrušaka se odvajaju i cirkulišu u krvi, što potencijalno ometa krvne sudove u plućima i izaziva plućnu emboliju, ili sudove u srcu kada izaziva srčani udar, ili u mozgu kada izaziva moždani udar. Svaka od ovih komplikacija je potencijalno fatalna. Stoga, kada je osoba izložena velikom riziku prethodno pomenutih stanja (npr. raniji moždani udar ili srčani udar), koriste se antikoagulansi (lijekovi koji razrjeđuju krv i smanjuju stvaranje ugrušaka) kako bi se rizik od formiranja krvnih ugrušaka smanjio. Ljudi kojima je iz nekog razloga potrebna dugotrajna antikoagulantna terapija, obično se propisuje antikoagulantni lijek (npr. varfarin) koji se može uzimati u obliku tableta umjesto injekcije. Ovaj način antikoagulacije se često naziva oralna antikoagulantna terapija.

INR- je laboratorijski određeno vrijeme koje je potrebno krvi da se formira ugrušak. Ovim testom se prati antikoagulantna terapija kao i otkrivanje poremećaja zgrušavanja krvi. Cilj ovog rada je djelovanje antikoagulantne terapije kod pacijenata sa fibrilacijom atrijske ili koji imaju vještačke zaliske. Kod ovakvih pacijenata INR treba da bude između 2-3. Vrijednost iznad 3 ukazuje na to da je krv previše razrijeđena, te to sa sobom nosi rizik od krvarenja, dok vrijednost od 4,5 mogu izazvati masivna krvarenja. S druge strane INR ispod 2 pokazuje da je krv gušća nego što bi trebala biti, pa takvo stanje povećava rizik od embolije pluća, srčanog ili moždanog udara. U ovom istraživanju pacijentima smo radili INR na mjesečnom nivou i postigli željeni rezultat u 67% slučajeva. Pacijenti vremenom nauče šta utiče na antikoagulantnu terapiju kao što je ishrana bogata zelenim povrćem, suplementi, antibiotici, statini...

THE SIGNIFICANCE OF DETERMINING INR (INTERNATIONAL NORMALIZED RATIO)

Muftić E.

Blood clotting or coagulation is the body's protective mechanism against bleeding. When a blood vessel is damaged, a series of reactions takes place involving substances that occur naturally in the blood and are called clotting factors. Normally, clotting starts spontaneously when there is minor or major bleeding from the damaged blood vessel. However, there are a number of conditions that can lead to the formation of blood clots without active bleeding. In this case, there is an increased risk of thromboembolic disease. In thromboembolic disease, fragments of blood clots break off and circulate in the blood, which can block blood vessels in the lungs, leading to pulmonary embolism, or vessels in the heart, if a heart attack occurs, or in the brain, if a stroke occurs. Each of these complications is potentially fatal. Therefore, if a person is at high risk for the above conditions (e.g., previous stroke or heart attack), anticoagulants (medications that thin the blood and reduce the formation of blood clots) are used to reduce the risk of blood clots. People who need long-term anticoagulant therapy for any reason are usually prescribed an anticoagulant medication (such as warfarin) that can be taken in tablet form rather than as an injection. This method of anticoagulation is often called oral anticoagulation therapy.

INR- is a laboratory-determined time it takes for the blood to form a clot. This test is used to monitor anticoagulant therapy and detect blood clotting disorders. The aim of this work is to study the effect of anticoagulant therapy in patients with atrial fibrillation or with artificial heart valves. In these patients, the INR value should be between 2-3. A value above 3 means that the blood is too thin, which carries the risk of bleeding, while a value of 4.5 can lead to massive bleeding. An INR value below 2, on the other hand, means that the blood is thicker than it should be, so this condition increases the risk of pulmonary embolism, heart attack, or stroke. In this study, we determined the INR level in patients monthly and achieved the desired result in 67% of cases. Over time, patients learn what influences anticoagulant therapy, such as a diet high in green vegetables, supplements, antibiotics, statins....

ODNOS FPSA I TPSA U BOLESTIMA PROSTATE

Nemanja Jovičić

Karcinom prostate spada među najčešće maligne bolesti kod muškaraca. Bolest se javlja u starijoj životnoj dobi te se 75% dijagnosticira kod muškaraca starijih od 65 godina. Pad u mortalitetu od karcinoma prostate u posljednjoj dekadi može biti rezultat boljeg

tretmana bolesti i uvođenja prostata specifičnog antigena u dijagnostiku. U otkrivanju karcinoma prostate važno mjesto ima određivanje koncentracije tumorskih markera u serumu.

Danas se većina karcinoma prostate otkriva s porastom koncentracije prostata specifičnog antigena (PSA), što predstavlja ujedno i jedan od parametara skring pregleda. Dijagnostička osjetljivost i specifičnost u ranom otkrivanju bolesti prostate povećavaju se određivanjem ukupne i slobodne razine PSA u usporedbi s upotrebom PSA kao samostalnog tumorskog markera.

Dijagnostička obrada pacijenata sa sumnjom na karcinom prostate uključuje određivanje vrijednosti serumskog PSA (ukupnog sa omjerom slobodnog i vezanog), PV (volume prostate), analizu urina, digitorektalni pregled (DRP), te ultrazvučni pregled prostate. U slučaju patološkog nalaza DRP sa ili bez abnormalnosti vrijednosti PSA, preporučuje se biopsija prostate.

Ključne riječi: Rak prostate, tumorski markeri, prostata specifični antigen.

THE RELATIONSHIP OF FPSA AND TPSA IN PROSTATE DISEASES

Jovičić N.

Prostate cancer is one of the most common malignant diseases in men, 75% of which are diagnosed in men over 65 years of age. The decrease in mortality from prostate cancer in the last decade may be the result of better treatment of the disease and the introduction of prostate-specific antigen in diagnostics. Determination of the concentration of tumor markers in the serum plays an important role in the detection of prostate cancer.

Today, most prostate cancers are detected with an increase in the concentration of prostate-specific antigen (PSA), which is also one of the screening parameters. Diagnostic sensitivity and specificity in the early detection of prostate disease are increased by determining total and free PSA levels compared to the use of PSA as an independent tumor marker. Diagnostic treatment of patients with suspected prostate cancer includes determination of serum PSA (total with the ratio of free to bound), PV (prostate volume), urinalysis, digitorectal examination (DRP), and ultrasound examination of the prostate. In the case of a pathological finding of DRP with or without PSA abnormalities, a prostate biopsy is recommended.

Keywords: prostate cancer, tumor markers, prostate-specific antigen.

ANEMIJA, ANEMIJSKI INDEKSI I SPECIFIČNOST ISHRANE POPULACIJE STUDENATA SARAJEVSKOG UNIVERZITETA

Sanela Hajro

Studija na temu "Anemija, anemijski indeksi i specifičnost ishrane studentske populacije sarajevskog Univerziteta" je prospektivna, deskriptivno-analička, komparativna i klinička. Cilj studije je ispitati i analizirati hematološke parametre krvi (ukupan broj Erc-a, Hgb, Hct, MCV, MCH) i serumske koncentracije željeza (Fe) i feritina (F), uporediti sa referentnim vrijednostima, po preporukama usvojenim prema standardima WHO-a, da li pokazuju prisustvo anemije kod studentske populacije. Istraživali smo i prehrambene navike studenata i specifičnosti ishrane, konzumaciju štetnih tvari (alkohol i cigarete), kao i provođenje fizičkih aktivnosti u svakodnevnicu. Istraživanjem je obuhvaćeno 200 ispitanika, koji su na osnovu kriterija za uključivanje podjeljeni u 3 skupine. Prvoj skupini pripadaju ispitanici koji su živjeli u studentskom domu 53% (n = 106), drugu skupinu ispitanika čine ispitanici koji su živjeli u ličnom domaćinstvu stan ili kuća 20% (n = 40), dok su trećoj skupini pripadali ispitanici koji su živjeli kao podstanari 27% (n = 54). Rezultati kompletne krvne slike su određeni na Hematološkom analizatoru; Abbott Cell Dyn 3700. Koncentracije željeza su urađene na Erba Automatic Biochemistry Analyser XL-200, a koncentracije feritina na Olympus AU 2700 Chemistry Analyzeru. Studentska populacija u sve tri grupe nije ispoljila prisustvo anemije. Ispitanici koji su živjeli u studentskim domovima imali su statistički značajno veću vrijednost hemoglobina, hematokrita i MCH u odnosu na ispitanike koji su živjeli u ličnom domaćinstvu i podstanarima ($p < 0.05$). Nije bilo statički signifikantnih razlika u koncentracijama željeza i feritina. Statistički značajna korelacija, između ukupnog broja eritrocita, koncentracije željeza i feritina, nađena je kod studenata iz doma i studenata koji su živjeli u ličnom domaćinstvu. Kod studenta koji su živjeli kao podstanari nije bilo statistički značajne korelacije između ovih parametara. U odnosu na prehrambene navike, specifičnost ishrane ne pokazuje pozitivnu korelaciju sa anemijom, izuzev u pogrdi redovitosti obroka.

**ANEMIA, ANEMIA INDICES AND SPECIFICITY OF DIET OF SARAJEVO
UNIVERSITY STUDENT POPULATION**

Hajro S.

The study on "Anemia, anemic indexes and dietary specificity of the student population of the University of Sarajevo" is prospective, descriptive-analytical, comparative and clinical. The aim of the study is to examine and analyze hematological blood parameters (total Erc, Hgb, Hct, MCV, MCH) and serum concentrations of iron (Fe) and ferritin (F), compare with reference values, according to recommendations adopted according to WHO standards, whether they show the presence of anemia in the student population. We researched the eating habits of students, and the specifics of the diet, consumption of harmful substances (alcohol and cigarettes), as well as conducting physical activities in everyday life. The survey included 200 respondents, who were divided into 3 groups based on inclusion criteria. The first group includes respondents who lived in a dormitory 53% (n = 106), the second group of respondents consists of respondents who lived in a personal household apartment or house 20% (n = 40), while the third group included respondents who lived as tenants 27% (n = 54). Complete blood count results were determined on a hematological analyzer; Abbott Cell Dyn 3700. Iron concentrations were done on Erba Automatic Biochemistry Analyzer XL-200, and ferritin concentrations on Olympus AU 2700 Chemistry Analyzer. Student population in all three groups did not show the presence of anemia. Subjects living in dormitories had a statistically significantly higher value of hemoglobin, hematocrit and MCH compared to subjects living in personal household and tenants ($p < 0.05$). There were no statically significant differences in iron and ferritin concentrations. Statistically significant correlation, between the total number of Erc, the concentration of iron and ferritin, was found in students from the dormitory of students who lived in a personal household. In students who lived as tenants, there was no statistically significant correlation between these parameters. In relation to eating habits, the specificity of the diet does not show a positive correlation with anemia, except in terms of regularity of meals.

ZNAČAJ PRAĆENJA REZISTENTNIH SOJEVA *ESCHERICHIA COLI* - SADAŠNJOST I BUDUĆNOST

Rusmira Hasandić Mehmedagić

Escherichia coli, članica bakterijske porodice Enterobacteriaceae, najrašireniji je komenzalni stanovnik gastrointestinalnog trakta ljudi i toplokrvnih životinja, ali ujedno i jedan od najvažnijih patogena koji uzrokuje mnoge bolesti. *Escherichia coli* čest je uzročnik po život opasnih infekcija krvotoka i drugih uobičajenih infekcija, poput infekcija mokraćnog sistema. Otpornost *E. coli* na antibiotike u stalnom je porastu od ranih 2000-ih uprkos pokušajima da se konroliše, pokazuju nove studije i predstavlja globalni, javnozdravstveni problem. Vjeruje se da je otpornost na antibiotike isključivi rezultat ljudske aktivnosti i terapije antibioticima. Tokom proteklih desetljeća razvijene su i primijenjene nove molekularne dijagnostičke tehnike za klasifikaciju patogena i otkrivanje otpornosti. Ove metode značajno su unaprijedile kliničku dijagnostiku. S obzirom da rutinske metode nisu uvijek prikladni i pridonose daljnjem povećanju antimikrobne rezistencije, danas se koriste neke nove tehnike poput Ramanove spektroskopije. Strategije za prevenciju i kontrolu širenja *E. coli* trebale bi uključivati pristup sigurnoj vodi, dobru praksu rukovanja kako bi se smanjio rizik od kontaminacije hrane, sanitarne mjere, javno obrazovanje i vakcinaciju.

THE SIGNIFICANCE OF MONITORING RESISTANT STRAINS OF ESCHERICHIA COLI - PRESENT AND FUTURE

Hasandić Mehmedagić R.

Escherichia coli, a member of the bacterial family Enterobacteriaceae, is the most widespread commensal inhabitant of the gastrointestinal tract of humans and warm-blooded animals, but also one of the most important pathogens that causes many diseases. *Escherichia coli* is a common cause of life-threatening bloodstream infections and other common infections, such as urinary tract infections. Antibiotic resistance in *E. coli* has been on the rise since the early 2000s despite efforts to control it, new studies show, and is a global public health problem. Antibiotic resistance is believed to be the sole result of human activity and antibiotic therapy. Over the past decades, new molecular diagnostic techniques have been developed and applied to classify pathogens and detect resistance. These methods significantly improved clinical diagnostics. Considering that routine methods are not always suitable and contribute to the further increase of antimicrobial resistance, some new techniques such as Raman spectroscopy are used today. Strategies to prevent and control the spread of *E. coli* should include access to drinking water, good handling practices to reduce the risk of food contamination, sanitation, public education, and vaccination.

**PROCJENA SAZNAJNA O INFEKCIJI HPV-OM KAO FAKTORA RIZIKA
ZA NASTANAK PREKANCEROZA KOD STUDENATA
UNIVERZITETA U SARAJEVU**

Edina Dubrić

Humani papiloma virus (HPV) je virus koji često pogađa muškarce i žene diljem svijeta, a 50- 80% spolno aktivnih muškaraca i žena zaraze se HPV-om u nekom trenutku svoga života. Utvrđeno je da je infekcija onkogenim tipovima HPV-a nužan uzročnik ne samo karcinoma cerviksa, nego i niza drugih karcinoma. Uglavnom je bolest mlađih žena, a najveća prisutnost je u dobi između 35. i 55. godine života. Spolna aktivnost jedan je od glavnih faktora rizika za HPV infekciju. Mogući kofaktori (poput pušenja cigareta i dugotrajne primjene oralnih kontraceptiva) mogu pridonijeti progresiji infekcije onkogenim tipom HPV-a do karcinoma cerviksa. Primarna prevencija (vakcinacija) usmjerena je na sprječavanje infekcije onkogenim tipom HPV-a, dok se sekundarnom prevencijom (npr. Papa testom) otkrivaju i liječe cervikalne abnormalnosti te nastoji spriječiti progresija bolesti. Ciljevi ovog istraživanja jesu ispitati saznanja i stavove o infekciji HPVom, laboratorijskoj dijagnostici HPV-a te vakcinaciji protiv HPV-a s obzirom na spol, dob (godinu studija) i bračni status, kao i izvršiti procjenu analize istih, među studentima fakulteta zdravstvenih grupacija i studentima fakulteta drugih usmjerenja Univerziteta u Sarajevu. Istraživanje je deskriptivno-analitička, prospektivna studija presjeka. Radi se o originalnom istraživačkom radu. U ovoj studiji se koristio anonimni i dobrovoljni anketni upitnik. Istraživanje je obuhvatilo 220 studenata Univerziteta u Sarajevu, od toga 110 studenata fakulteta zdravstvenih grupacija, i 110 studenata fakulteta drugih usmjerenja Univerziteta u Sarajevu. U uvodnom dijelu anketnog upitnika studenti su bili upoznati sa ciljevima i svrhom ovog istraživanja, te samoj koristi odnosno benefitu ovog istraživanja. Kao podaci su se koristili rezultati dobiveni sa anketnog upitnika. Rezultati dobiveni ovim istraživanjem pokazuju nam da nema statistički signifikantne razlike u procjeni saznanja studenata, kada je u pitanju infekcija HPV-om, laboratorijska dijagnostika HPV-a i vakcinacija protiv HPV-a, obzirom na spol, dob (godinu studija) i bračni status. Međutim, kada je riječ o fakultetskom usmjerenju, možemo reći da postoji značajna statistički signifikantna razlika u znanju između studenata fakulteta zdravstvenih grupacija i studenata fakulteta drugog usmjerenja Univerziteta u Sarajevu.

ASSESSMENT OF KNOWLEDGE ABOUT HPV INFECTION AS A RISK FACTOR FOR THE DEVELOPMENT OF PRECANCER AMONG STUDENTS OF THE UNIVERSITY OF SARAJEVO

Dubrić E.

Human papilloma virus (HPV) is a virus that often it guesses men and women throughout world, and 50-80% sexually active tomboy and woman they become infected with HPV in someone moment of his own of life. It was found to be an infection oncogenic necessary for HPV types of the causative agent not only cancer of the cervix, but and string other carcinomas. It's mostly a disease younger one a woman, and the biggest presence is in age between the ages of 35 and 55 of life. Sexual activity is one of the main one's factor risks for HPV infection. Possible cofactors (such as smoking cigarettes and long-term applications oral contraceptives) can contribute progression infections oncogenic HPV type to cancer cervix. Primary prevention (vaccination) is aimed at prevention infections oncogenic type of HPV, while secondary through prevention (e.g., Pap test) they detect and treat cervical abnormalities and strives prevent progression diseases. Goals this one research they are examine knowledge and attitudes about infection HPV, laboratory HPV diagnosis and vaccination against HPV with respect on gender, age (year study) and marital status, as well as execute assessment analysis of the same, among to student's faculty of health groups and student's faculty other directions University of Sarajevo. The research is descriptive-analytical, prospective study section. It's about the original research work. In this one the study was used anonymous and voluntary survey questionnaire. The research included 220 students University of Sarajevo, of which 110 student's faculty of health group, and 110 student's faculty other directions University of Sarajevo. In the introduction part survey questionnaire students are where familiar with the goals and purpose this one research, and itself uses respectively benefit this one research. As data were used _ the results obtained from the survey of the questionnaire. the results obtained this research show we don't have any statistically significant differences in assessment findings students, when it comes to HPV infection, laboratory HPV diagnosis and vaccination against HPV, considering on gender, age (year study) and marital status. However, when it comes to faculty direction, we can say there is significant statistically significant difference in knowledge between student's faculty of health groups and student's faculty the other directions University of Sarajevo.

KLINIČKE MANIFESTACIJE I LABORATORIJSKE OSOBITOSTI

DENGA GROZNICE

Mirjana Stupnišek

Denga groznica (engl. Dengue) je akutna bolest s vrućicom, glavoboljom, mialgijom i osipom. Uzrokovana je virusom dengue (DENV), RNA virusom koji pripada rodu Flavivirusa iz porodice Flaviviridae. Rizik od infekcije postoji u 129 zemalja s procjenom od 390 milijuna infekcija DENV godišnje (284-528 milijuna), od kojih se 96 milijuna (67-136 milijuna) manifestira klinički. Infekcija DENV može rezultirati s nekoliko kliničkih oblika: obična vrućica, klasična denge groznica, denge hemoragijska groznica i denge sindrom šoka. Vektori su uglavnom komarci iz roda *Aedes aegypti* i *Aedes albopictus*. Ljudi su glavni domaćini virusa. Inkubacija denge groznice je 3-14 dana, najčešće 4-7 dana. Ne postoji specifično liječenje. Kod težih oblika bolesti potrebna je hospitalizacija. Rano otkrivanje napredovanja bolesti povezanog s teškim oblikom denge groznice i pristup odgovarajućoj medicinskoj skrbi snižava stope smrtnosti od teškog oblika denge groznice na ispod 1%.

Humoralni imunološki odgovori tijekom primarnih i sekundarnih DENV-infekcija dobro su istraženi. Međutim, utjecaj DENV-infekcije na podskupove B stanica nedovoljno je opisan. B stanice igraju bitnu ulogu tijekom DENV-infekcije. Malo se zna o poliklonalnoj plazmacitozi periferne krvi u bolesnika zaraženih DENV-om. Usporedili smo kliničke simptome i hematološke parametre te ispitali incidenciju plazmacitoze u bolesnika zaraženih DENV-om liječenih u Klinici za infektivne bolesti "Dr. Fran Mihaljević" u Zagrebu. Provedenim istraživanjem je utvrđeno da uz trombocitopeniju, leukocitopeniju i limfocitopeniju te manifestirane kliničke simptome, plazmacitoza je jedan od ključnih pokazatelja DENV-infekcije. Najizraženija je u akutnoj fazi tijekom prvog tjedna bolesti i potpuno nestaje u roku 14 dana od pojave simptoma. Plazmacitoza tijekom DENV-infekcije je vjerojatno podcijenjena jer je prolazna i prepoznaje se samo pažljivim mikroskopskim pregledom krvnog razmaza.

Zaključak: Poznavanje hematoloških osobitosti denge groznice važno je kako bi se izbjegla pogrešna dijagnoza ili nepotrebna obrada hematološke neoplazme. Za postavljanje točne i brze dijagnoze denge, potrebna je pažljiva klinička procjena pacijenta i laboratorijsko testiranje, kako bi se mogla razlikovati od drugih bolesti, kao i druge flavivirusne infekcije.

Ključne riječi: denge groznica; DENV; virus dengue; hematološke osobitosti; klinički simptomi; plazmacitoza

CLINICAL MANIFESTATIONS AND LABORATORY CHARACTERISTICS OF DENGUE FEVER

Stupnišek M.

Dengue fever is an acute disease with fever, headache, myalgia and rash. It is caused by the dengue virus (DENV), an RNA virus belonging to the *Flavivirus* genus of the *Flaviviridae* family. The risk of infection exists in 129 countries with an estimated 390 million DENV-infections per year (284-528 million), of which 96 million (67-136 million) manifest clinically. DENV-infection can result in several clinical forms: common fever, classic dengue fever, dengue hemorrhagic fever and dengue shock syndrome. The vectors are mainly mosquitoes from the genus *Aedes aegypti* and *Aedes albopictus*. Humans are the main hosts of the virus. Incubation of dengue fever is 3-14 days, most often 4-7 days. There is no specific treatment. In case of more severe forms of the disease, hospitalization is required. Early detection of disease progression associated with severe dengue and access to appropriate medical care lowers death rates from severe dengue to below 1%.

Humoral immune responses during primary and secondary DENV-infections have been well investigated. However, the impact of DENV-infection on B cell subsets is insufficiently described. B cells play an important role during DENV-infection. Little is known about peripheral blood polyclonal plasmacytosis in DENV-infected patients.

We compared clinical symptoms and hematological parameters and examined the incidence of plasmacytosis in patients infected with DENV, treated at the University Hospital for Infectious Diseases in Zagreb. The conducted research determined that along with thrombocytopenia, leukocytopenia and lymphocytopenia and manifested clinical symptoms, plasmacytosis is one of the key indicators of DENV-infection. It is most pronounced in the acute phase during the first week of the disease and disappears completely within 14 days from the onset of symptoms. Plasmacytosis during DENV-infection is probably underestimated because it is transient and can only be recognized by careful microscopic examination of the blood smear.

Conclusion: Knowing the hematological features of dengue fever is important to avoid misdiagnosis or unnecessary treatment of hematological neoplasms. Accurate and rapid diagnosis of dengue requires careful clinical assessment of the patient and laboratory testing to differentiate it from other diseases, as well as other flavivirus infections.

Keywords: dengue fever; dengue virus; DENV; clinical symptoms; laboratory characteristics; plasmacytosis

UČESTALOST INFEKCIJE MYCOBACTERIUM TUBERCULOSIS PRIJE I TOKOM PANDEMIJE SARS-COV-2 U SREDNJOBOSANSKOM KANTONU, 2019-2021"

Amra Varupa Grabus

Tuberkuloza predstavlja hroničnu infekciju humanim sojem *Mycobacterium tuberculosis* uz pojavu karakterističnog imunološkog odgovora organizma. Pojavom pandemije virusa SARS-CoV-2 sva oboljenja, pa tako i TB padaju u drugi plan. Naše istraživanje provedeno je Bolnici za plućne bolesti i tuberkulozu, Travnik, specijalizovanoj za rad sa TB i liječenje oboljelih od TB na području Srednjobosanskog kantona (SBK), dok je u vrijeme pandemije COVID-19 bila jedan od glavnih trijažnih centara za pacijente sa sumnjom na infekciju virusom SARS-CoV-2. Istraživanje obuhvata dva petnaestomjesečna perioda, gdje se prati i poredi učestalost pojave infekcije *M. tuberculosis* u periodu preCOVID-19 i COVID-19 na području SBK. Ispitano je ukupno 2862 uzorka upućena pod sumnjom na tuberkulozu, od čega su 74 uzorka pozitivna na TB. U preCOVID-19 periodu, broj uzoraka zaprimljenih u laboratoriju bio je 2109, dok je u COVID-19 periodu broj znatno manji (753).

Tokom perioda istraživanja (01.01.2019. - 30.06.2021.) najučestaliji uzorak poslat na analizu bio je uzorak sputuma, u preCOVID-19 (87.2%), a u COVID-19 periodu (80.4%). U toku perioda pandemije bilo je više pozitivnih razmaza sputuma 22/33, dok je u preCOVID-19 periodu bilo svega 17/41. Postoji statistički signifikantna razlika u vrsti analiziranih uzoraka između preCOVID-19 i COVID-19 perioda, $p < 0.001$. Pozitivni rezultati sputuma su bili učestaliji u COVID-19 periodu (66.7%) u odnosu na preCOVID-19 (41.5%), što je prikazano signifikantnom razlikom između dva perioda ($p = 0.031$). Istraživanjem lokalizacije bolesti utvrdili smo veću zastupljenost pulmonalne TB u odnosu na ekstrapulmonalnu tokom cijelog perioda istraživanja (70.7% vs. 29.3% preCOVID-19 i 81.8% vs. 18.2% - COVID-19 period). U preCOVID-19 periodu učestalost bolesti je bila najniža u grupi 55-64 godine (9.8%) u odnosu na 36.4% iste grupe u COVID-19 periodu. U grupi >64 god. učestalost je izrazito viša u preCOVID-19 u odnosu na COVID-19 period (24.4% naspram 0%). Kod učestalosti bolesti prema spolu između preCOVID-19 i COVID-19 perioda, postoji statistički signifikantna razlika ($p = 0.047$). U preCOVID-19 periodu, bolest je bila češća kod muškaraca (68.3% vs. 31.7%) u odnosu na COVID-19 period, gdje je učestalost bila viša kod žena (54.5% vs. 45.5%).

Rezultati pokazuju korelaciju između broja testiranih pacijenata na SARS-CoV-2 (*real-time* RT-PCR) i broja pacijenata testiranih na TB, te je pronađena statistički signifikantna negativna korelacija ($p = 0.046$), što znači da postoji tendencija da sa povećanjem broja testiranja na SARS-CoV-2 opada broj testiranja na TB i obrnuto.

Ključne riječi: tuberkuloza, SARS-CoV-2, COVID-19, direktna mikroskopija.

FREQUENCY OF MYCOBACTERIUM TUBERCULOSIS INFECTION BEFORE AND DURING THE SARS-COV-2 PANDEMIC IN THE CENTRAL BOSNIA CANTON, 2019-2021"

Varupa Grabus A

Tuberculosis is a chronic infection caused by human strain *Mycobacterium tuberculosis* accompanied by a characteristic immune response of the organism. With the appearance of the SARS-CoV-2 pandemic, all diseases, including TB, fall into the background. Our research was conducted at the „Bolnica za plućne bolesti i tuberkulozu, Travnik“, which specializes in working with TB and treating TB patients in Central Bosnia Canton (CBC), while at the time of the COVID-19 pandemic it was one of the main triage centers for patients with suspected SARS-CoV-2 infection. The study covers two fifteen-month periods, where the frequency of *M. tuberculosis* infection in the preCOVID-19 and the COVID-19 period in the CBC is monitored and compared. A total of 2862 suspected samples were examined, of which 74 samples were positive for TB. In the preCOVID-19 period, the number of samples received in the laboratory was 2109, while in the COVID-19 period the number of samples received was significantly lower (753).

During the research period (January 1, 2019 - June 30, 2021), the most frequent sample sent for analysis was the sputum, in preCOVID-19 (87.2%), and in COVID-19 period (80.4%). During the pandemic period, there were more positive sputum smears (22/33), while in the preCOVID-19 period there were only 17/41. There was a statistically significant difference in the type of analyzed samples between preCOVID-19 and COVID-19 periods, $p < 0.001$. Positive results of sputum were more frequent in the COVID-19 period (66.7%) compared to preCOVID-19 (41.5%), which is shown by a significant difference between the two periods ($p=0.031$). A higher prevalence of pulmonary TB was found in comparison to extrapulmonary TB during the entire study period (70.7% vs. 29.3% preCOVID-19 and 81.8% vs. 18.2% - COVID-19 period). In the preCOVID-19 period, the incidence of the disease was the lowest in the 55-64 years age group (9.8%) compared to 36.4% of the same group in the COVID-19 period. In the group > 64 years, the frequency was significantly higher in preCOVID-19 compared to the COVID-19 period (24.4% vs. 0%). In the incidence of disease by sex between the preCOVID-19 and COVID-19 periods, there was a statistically significant difference ($p=0.047$). In the preCOVID-19 period, the disease was more common in men (68.3% vs. 31.7%) compared to the COVID-19 period, where the incidence was higher in women (54.5% vs. 45.5%).

The results showed a correlation between the number of patients tested for SARS-CoV-2 (*real-time* RT-PCR) and the number of patients tested for TB. Statistically significant negative correlation was found ($p=0.046$), which means that there is a tendency to increase testing for SARS-CoV-2 decreases the number of tests for TB and vice versa.

Key words: tuberculosis, *Mycobacterium tuberculosis*, SARS-CoV-2, COVID-19, direct microscopy.

ŠTA TREBAMO ZNATI O CERVICALNOJ INTRAEPITELNOJ NEOPLAZIJI I HPV-U

Emina Smajić

Karcinom grlića maternice drugi je najčešći rak u žena u svijetu, a rano otkrivanje može igrati ključnu ulogu u smanjenju povezanog morbiditeta. Svake godine broj umrlih od karcinoma grlića maternice se povećava, posebno u dobnoj skupini iznad 30. godina. Godišnje u prosjeku imamo 12 000 novih dijagnoza karcinoma grlića maternice. Karcinom nastaje preko svojih predstadija, odnosno preko cervikalne intraepitelne neoplazije. Kao glavni faktor rizika navodi se infekcija Humanim papiloma virusom. Godišnje imamo 6 miliona novih infekcija ovim virusom, što predstavlja globalni javno zdravstveni problem. Papa test je najbolji skrining test za karcinom grlića maternice i svaka spolno aktivna žena bi trebala da ga sprovodi jednom godišnje. Uz papa test, molekularna djagnostika Humanog papiloma virusa je neizbježna u detekciji cervikalne intraepitelne neoplazije i karcinoma grlića maternice. Preporuka da se HPV test doda uz citologiju bi trebala započeti za žene u dobi od 30. godina jer je prisutnost slučajne infekcije HPV-om tako česta u dobnoj skupini ispod 30 godina. To se temelji na spoznaji da se gotovo svi slučajevi infekcije HPV-om izliječe pomoću imunološkog sistema u 1 do 2 godine bez izazivanja neoplastičnih promjena. Laboratorijski profesionalci imaju nezamjenjivo mjesto u ranoj prevenciji karcinoma grlića maternice, kao i u otkrivanju infekcije Humanim papiloma virusom. Bosna i Herecegovina je u deficitu sa laboratorijskim profesionalcima – citotehnologima i kao rezultat toga provedba nacionalnog skrininga na karcinom grlića maternice je otežana, da ne kažemo nemoguća. Neophondna nam je ciljana edukacija laboratorijskih profesionalaca u toj oblasti, informisanje javnosti o značaju prevencije i vakcinacije protiv Humanog papiloma virusa.

Ključne riječi: Cervikalna intraepitelna neoplazija, karcinom grlića maternice, humani papiloma virus, laboratorijski profesionalci.

WHAT WE NEED TO KNOW ABOUT CERVICAL INTRAEPITHELIAL NEOPLASIA AND HPV

Smajić E.

Cervical cancer is the second most common cancer in women worldwide, early detection can play a key role in reducing the associated morbidity. Every year, the number of deaths from cervical cancer increases, especially in the age group over 30. Annually, we have an average of 12,000 new diagnoses of cervical cancer. Cancer arises through its precursors, i.e. through cervical intraepithelial neoplasia. Human papillomavirus infection is cited as the main risk factor. Annually, we have 6 million new infections with this virus, which represents a global public health problem. A pap smear is the best screening test for cervical cancer and every sexually active woman should have it done once a year. Along with the pap test, molecular diagnostics of the Human Papillomavirus is inevitable in the detection of cervical intraepithelial neoplasia and cervical cancer. The recommendation to add HPV cotesting with cytology should begin for women at age 30 because the presence of an incidental HPV infection is so common in the under-30 age group. This is based on the knowledge that nearly all cases of HPV infection are cleared by the immune system in 1 to 2 years without causing neoplastic changes. Laboratory professionals have an irreplaceable place in the early prevention of cervical cancer, as well as in the detection of human papilloma virus infection. Bosnia and Herzegovina has a deficit of laboratory professionals - cytotechnologists, and as a result, the implementation of national cervical cancer screening is difficult, if not impossible. We need targeted education of laboratory professionals in that area, informing the public about the importance of prevention and vaccination against the Human Papillomavirus.

Key words: Cervical intraepithelial neoplasia, cervical cancer, human papillomavirus, laboratory professionals.

BIOHEMIJSKI PARAMETARI PACIJENATA POZITIVNIH NA KORONAVIRUS SA I BEZ KOMORBIDITETA

Pobrić Ehlimana, Hasković Edhem

Koronavirus, pored pluća, napada i druge organske sisteme. Kod pacijenata sa umjerenom i teškom kliničkom slikom uočavaju se brojne abnormalnosti u laboratorijskim nalazima. Usljed nastanka akutne bubrežne insuficijencije mogu se uočiti povišene vrijednosti uree i kreatinina, dok kod oštećenja jetre dolazi do porasta aspartat aminotransferaze (AST) i alanin aminotransferaze (ALT).

Ciljevi istraživanja: Utvrditi vrijednosti ispitivanih biohemijskih parametara u odnosu na spol, analizirati dobijene vrijednosti biohemijskih parametara u odnosu na prisustvo/odsustvo komorbiditeta, utvrditi eventualnu statističku sig-nifikantnost dobijenih rezultata ispitivanih biohemijskih parametara kod pacijena-ta sa i bez komorbiditet, u odnosu na spol i dob ispitanika

Materijal i metode: U radu je provedena studija presjeka u periodu mart – okto-bar 2021. godine. Ukupni uzorak čini 334 pacijenata pozitivna na koronavirus. Laboratorijsko testiranje i biohemijske analize rađene su u Službi za labora-torijsku dijagnostiku Opće bolnice Tešanj. Ispitanici su podjeljeni u tri starosne grupe. Prva grupa od 18 – 40 godina, druga od 41 -64 godine i treća preko 65 godina starosti.

Rezultati: Broj muških ispitanika u istraživanju je 176, od toga u starosnoj dobi od 18 – 40 godina 13 (7,4%), u starosnoj dobi od 41 – 64 godine 89 (50,6%), a u starosnoj grupi preko 65 godina 74 (42%) pacijenata. Broj ženskih ispitanika je 158, od toga u prvoj grupi 5 (3,2%), u drugoj 80 (50,6%) i u trećoj 73 (46,2%). Povišene vrijednosti biohemijskih parametara kod oba spola su utvrđene u vrijednosti GUK-a (muški M=9,3, žene M=10,2), AST-a (muški M=60,6, žene M=53,6), ALT-a (muški M=58,6, žene M=43,2), LDH-a (muški M=712,3, žene M=675,8), CK-a (muški M=438,3, žene M=199,1) i CRP-a (muški M=101,6, žene M=80). Nije utvrđena statistički značajna razlika u biohemijskim paramet-rima u odnosu na spol ($p>0,05$). U odnosu na prisustvo/odsustvo komorbidite-ta utvrđena je statistički značajna razlika po starosnim grupama u sljedećim biohemijskim parametrima (GUK, uree, kreatinina, acidum uricum, albumina) ($p<0,05$). Srednje vrijednosti GUK-a, uree, kreatinina i acidum uricum su bile značajno višije kod pacijenata sa prisutnim komorbiditetima, a vrijednosti al-bumina značajno niže.

Zaključak: Najveći broj pacijenata je u starosnoj dobi od 41 – 64 godine, ukup-no 169. Po spolnoj strukturi, vrijednosti iznad referentnog opsega kod muških i ženskih ispitanika su utvrđene kod GUK-a, AST-a, ALT-a, LDH-a, CK-a i CRP-a. Statistički značajne višije vrijednosti biohemijskih parametara GUK-a, uree, kreatinina i acidum uricum su utvrđene kod ispitanika sa prisutnim komorbid-itetom, kao i snižene vrijednosti albumina.

Ključne riječi: koronavirus, biohemijski parametri, pacijenti

BIOCHEMICAL PARAMETERS CORONAVIRUS POSITIVE PATIENTS WITH AND WITHOUT COMORBIDITY

Pobrić E, Hasković E.

In addition to the lungs, the coronavirus also attacks other organ systems. In patients with a moderate and severe clinical picture, numerous abnormalities in laboratory findings are observed. As a result of acute renal failure, elevated values of urea and creatinine can be observed, while in case of liver damage there is an increase in aspartate aminotransferase (AST) and alanine aminotransferase (ALT).

Aim: To determine the values of the examined biochemical parameters in relation to gender, to analyze the obtained values of biochemical parameters in relation to the presence/absence of comorbidities, to determine the possible statistical significance of the obtained results of the examined biochemical parameters in patients with and without comorbidities, in relation to the sex and age of the subjects

Material and methods: In the paper, a cross-sectional study was conducted in the period March - October 2021. The total sample consists of 334 patients positive for the coronavirus. Laboratory testing and biochemical analyzes were performed in the Laboratory Diagnostic Service of General Hospital Tešanj. The respondents were divided into three age groups. The first group is 18-40 years old, the second is 41-64 years old and the third is over 65 years old.

Results: The number of male respondents in the research is 176, of which 13 (7.4%) are in the age group of 18-40 years, 89 (50.6%) are in the age group of 41-64 years, and in the age group over 65 years 74 (42%) patients. The number of female respondents is 158, of which 5 (3.2%) in the first group, 80 (50.6%) in the second and 73 (46.2%) in the third. Elevated values of biochemical parameters in both sexes were found in the values of GUK (male M=9.3, female M=10.2), AST (male M=60.6, female M=53.6), ALT (male M=58.6, female M=43.2), LDH (male M=712.3, female M=675.8), CK (male M=438.3, female M=199.1) and CRP (male M=101.6, female M=80). No statistically significant difference was found in biochemical parameters in relation to gender ($p>0.05$). In relation to the presence/absence of comorbidities, a statistically significant difference was determined by age group in the following biochemical parameters (GUK, urea, creatinine, uric acid, albumin) ($p<0.05$). Mean values of GUK, urea, creatinine and uric acid were significantly higher in patients with comorbidities, and albumin values were significantly lower.

Conclusion: The largest number of patients is between the ages of 41 and 64, a total of 169. According to the gender structure, values above the reference range in male and female subjects were determined for GUK, AST, ALT, LDH, CK and CRP. Statistically significant higher values of the biochemical parameters of GUK, urea, creatinine and uric acid were found in subjects with comorbidities, as well as decreased albumin values.

Key words: *coronavirus, biochemical parameters, patients*

NISKE VRIJEDNOSTI SERUMSKOG ŽELJEZA U TOKU UPALNIH PROCESA

Merima Špica

Željezo je najrasprostranjeniji prijelazni metal u ljudskom tijelu. Organizam prosječno sadrži od 4 do 5 g željeza. Fiziološki se veže u velikomolekularni proteinski spoj pa stoga nema ekskretornog organa za željezo. Održavanje se vrši ravnotežom apsorpcije, transporta i skladištenja. Hepcidin je peptidni hormon koji se stvara u jetri, i glavni je regulator homeostaze željeza. Identifikovan je kao akutno-fazni protein s antimikrobnom i regulatornom funkcijom željeza. Hipoferemija predstavlja smanjene vrijednosti serumskog željeza. Može biti posljedica bolesti, smanjene apsorpcije, ali i posljedica upalnih procesa izazvanih različitim agensima. Kao posljedica hipoferemije u nekim slučajevima prisutne su niske vrijednosti hemoglobina, te promjene u veličini i izgledu eritrocita. Međutim ovi parametri mogu biti sasvim uredni, a da je u serumu izrazito snižena vrijednost željeza. Prvi dokazi o povezanosti hepcidina s anemijama u upalnim stanjima otkriveni su u laboratoriju „Nancy Andrews“ u Bostonu. Homeostaza željeza u organizmu regulirana je interakcijom hepcidina i ferroportina (glavnog eksportera željeza). Feritin je glavni unutarćelijski protein za pohranu željeza, međutim koristi se i kao parametar u određivanju stepena upale. U ranim fazama upalnog procesa, zahvaljujući laboratorijskim pretragama moguće je ustanoviti nagli pad vrijednosti serumskog željeza, porasta serumskog feritina, C-reaktivnog proteina, dok su vrijednosti TIBC-a normalne, pri čemu veliki dio otpada na UIBC. Nalaz krvne slike u početnim fazama upale ostaje neznatno izmijenjen u pogledu vrijednosti eritrocita, hemoglobina i hematokrita, dok se ovisno o uzroku upalnog procesa vrijednosti unutar leukocitne loze mogu razlikovati.

LOW VALUES OF SERUM IRON DURING INFLAMMATORY PROCESSES

Špica M.

Iron is the most widespread transition metal in the human body. The body contains an average of 4 to 5 g of iron. Physiologically, it binds to a high-molecular protein compound, so there is no excretory organ for iron. Maintenance of iron in the body is accomplished by a balance of absorption, transport, and storage. Hepcidin is a peptide hormone produced in the liver, and is the main regulator of iron homeostasis. It has been identified as an acute-phase protein with antimicrobial and iron regulatory functions. Hypoferremia represents reduced values of serum iron. It can be a consequence of disease, reduced absorption, but also a consequence of inflammatory processes caused by various agents. In some cases, and as a result of hypoferremia, there are low hemoglobin values and changes in the size and appearance of erythrocytes. However, these parameters can be perfectly fine, and the iron value in the serum is extremely low. The first evidence of the association of hepcidin with anemia in inflammatory conditions was discovered in the laboratory "Nancy Andrews" in Boston. Iron homeostasis in the body is regulated by the interaction of hepcidin and ferroportin (the main iron exporter). Ferritin is the main intracellular protein for iron storage, though, it is also used as a parameter in determining the degree of inflammation. Thanks to laboratory tests, it is possible to establish the following in the early stages of the inflammatory process: a sudden drop in serum iron values, an increase in serum ferritin, and C-reactive protein, while the TIBC values are normal, with UIBC being the major part of those values. The findings of the blood count in the initial stages of inflammation remain slightly altered in terms of erythrocyte, hemoglobin and hematocrit values, while the values within the leukocyte line may differ depending on the cause of the inflammatory process.

ODNOS IZMEĐU LH I FSH I NJIHOV ZNAČAJ KOD ŽENA TOKOM ŽIVOTNOG VIJEKA

Adriana Pavlović, Samira Dizdarević

UVOD: Gonadotropni hormoni su peptidni hormoni koji reguliraju funkciju jajnika i testisa te su esencijalni za normalan rast, seksualni razvoj i reprodukciju. Pod pojmom gonadotropnih hormona podrazumjevamo luteinizirajući hormon (LH) i folikulostimulirajući hormon (FSH) koji se izlučuju u prednjem režnju hipofize i hCG. Lučenje FSH i LH je regulirano od strane GnRH (gonadotropin oslobađajućeg hormona) čija se sekrecija odvija u hipotalamusu. Izostanak lučenja GnRH izaziva anovulaciju i amenoreju. Tokom djetinjstva njegova aktivnost je niska i povećava se tokom puberteta. Značenja laboratorijskih analiza se moraju tumačiti na osnovu toga da li je u pitanju ženska osoba, muškarac ili dijete. Previsoke ili preniske vrijednosti FSH i LH mogu izazvati različite probleme i kliničke slike. Najčešće izaziva neplodnost kod žena, menstrualne poremećaje itd. U periodu starenja dolazi do pojačanog lučenja FSH i LH, te FSH postaje dominantniji u svojim vrijednostima u odnosu na LH kao što je bio i u periodu do puberteta.

SVRHA RADA: Ovaj rad ima za svrhu prezentirati rezultate naših istraživanja i utvrditi razlike između ispitivanih skupina.

METODOLOGIJA I MATERIJAL RADA: Metodologija ovog istraživačkog pristupa je bila deskriptivno-analička retrospektivna studija. Koristili smo podatke iz PZU 'Eurofarm Centar Poliklinike' Bugojno u periodu od 2020 do 2022 godine. Ispitanice koje smo uzeli u obzir smo podijelili u osam starosnih kategorija 1-20 godina, 20-25 godina, >25-30 godina, >30-35 godina, >35-40 godina, >40-45 godina, >45-50 godina i 51-61 godina. Uzeli smo u obzir dob, pol i serumsku koncentraciju FSH i LH. Dobijene podatke smo prikupili na osnovu laboratorijskih analiza.

REZULTATI RADA: Ukupan broj pacijentica koje smo odabrali iznosi 127. Najstarija je imala 62 godine, a najmlađa 15 godina.

ZAKLJUČAK: Značajna procentualna zastupljenost nižih vrijednosti gonadotropnih hormona kod sudionica mlađih od 50 godina u odnosu na sudionice iznad 50 godina, što ukazuje na korelaciju između vrijednosti FSH i LH i dobi žene.

RELATION BETWEEN LH AND FSH AND THEIR SIGNIFICANCE IN WOMEN DURING LIFETIME

Pavlovic A, Dizdarevic S

INTRODUCTION: The gonadotropins are peptide hormones that regulate ovarian and testicular function and are essential for normal growth, sexual development and reproduction. The human gonadotropins include follicle stimulating hormone (FSH) and luteinizing hormone (LH) which are made in the pituitary, and chorionic gonadotropin (hCG). The pituitary gonadotropins are under the control of gonadotropin releasing hormone (GnRH), a decapeptide produced in the hypothalamus. Absence of secretion GnRH results with anovulation and amenorrhea. During childhood GnRH is low and increases during puberty. The meaning of results will depend on whether you are a woman, man, or child. Too high or too low values of FSH can cause different problems and clinical pictures. Most often causes infertility in women, menstrual abnormalities etc. In aging period comes to intensive secretion of FSH and LH, and FSH becomes dominant in regards to LH as in the period of puberty.

OBJECTIVES: The goals of this research are: To determine the serum concentration of FSH and LH; explain the LH/FSH ratio; to compare the obtained results with the aim of determining the differences between the examined groups.

MATERIAL AND METHODS: The methodology is descriptive-analytics retrospective study. We used data from PZU 'Eurofarm Centar Poliklinika' Bugojno in period from 2020 to 2022 year. Test subjects were divided into eight age categories 1-20 years, 20-25 years, >25-30 years, >30-35 years, >35-40 years, >40-45 years, >45-50 years i 51-61 years. We took into consideration age, gender and serum concentration of FSH and LH. Collected data are based on laboratory analysis.

RESULTS: Total number of patients is 127. The oldest patient is 62 and the youngest is 15.

CONCLUSION: Significant percentage representation of lower values of gonadotropic hormones in participants younger than 50 years compared to participants over 50 years, which indicates a correlation between FSH and LH values and the age of the woman.

KORELACIJA IZMEĐU DE RITISOVOG KOEFICIJENTA I KREATIN KINAZE CK Sedina Omeragić

De Ritisov koeficijent je odnos između AST (aspartat transaminaza) i ALT (alanin transaminaza). AST-a ima najviše u jetri, srčanom i skeletnim mišićima. Kada je AST viši od ALT, treba razmotriti mišićni izvor ovih enzima. Na primjer, upala mišića zbog dermatomiozitisa, intenzivno vježbanje, intramuskularna primjena lijeka, infarkt miokarda može uzrokovati $AST > ALT$. Što indicira određivanje keratin kinaze.

Kreatin kinaza (CK) enzim je koji dovodi do pretvorbe kreatina u kreatin fosfat te se nalazi u različitim tkivima tijela. Klinička važnost određivanja CK ogleda se kao marker ili znak za oštećenje mišića, obzirom da je i srce mišić to mu još više daje na značaju. Cilj je potvrditi korelaciju tj. međusobnu povezanost između De Ritisovog koeficijenta i kreatin kinaze, kako bi uočili kritičke vrijednosti usko povezanih parametara (CK, CKMB) te proširili panel laboratorijskih pretraga za te pacijente, ujedno i opravdali dodatne preglede i troškove. Podaci su prikupljeni u Zavodu za medicinu rada ZE-DO kantona u period od 2015-2021 godine.

U istraživanje je uključeno 53 ispitanika, kod 41 ispitanika je uočen poremećen odnos De Ritisovog koeficijenta u korist AST analize, dok je kod njih 12 odnos ostao nepromjenjen tj. 1:1 AST:ALT. Prikazana je usporedba ove dvije vrste ispitanika te se došlo do zaključka o uskoj povezanosti i korelaciji ovih parametara. Što može poslužiti kod pravovremenog uočavanja kritične vrijednosti kreatin kinaze ali i kreatin kinaze MB.

Istraživanje pokazuje da je odnos između AST i ALT tj. De Ritisov koeficijent usko povezan s određivanjem keratin kinaze, te da je opravdano proširiti panel laboratorijskih pretraga ukoliko se uoči odstupanje u omjeru, osobito za analizu CK i CK MB.

Ključne riječi: De Ritisov koeficijent, AST- aspartat aminotransferaza, CK keratin kinaza

CORRELATION BETWEEN DE RITIS COEFFICIENT AND KREATIN KINASE CK

Omeragić S.

The De Ritis coefficient is the ratio between AST (aspartate transaminase) and ALT (alanine transaminase). AST is most abundant in the liver, heart and skeletal muscles. When AST is higher than ALT, the muscle source of these enzymes should be considered. For example, muscle inflammation due to dermatomyositis, intense exercise, intramuscular drug administration, myocardial infarction can cause $AST > ALT$. Which indicates the determination of keratin kinase.

Creatine kinase (CK) is an enzyme that leads to the conversion of creatine into creatine phosphate and is found in various tissues of the body. The clinical importance of determining CK is reflected as a marker or sign of muscle damage, since the heart is also a muscle, which makes it even more important. . The goal is to confirm the correlation, i.e. the mutual connection between De ritis' coefficient and creatine kinase, in order to observe critical values of closely related parameters (CK, CKMB) and to expand the panel of laboratory tests for these patients, at the same time to justify additional examinations and costs. The data were collected in Institute for Occupational Medicine of ZE-DO Canton in the period from 2015-2021.

53 respondents were included in the research, in 41 respondents a disturbed ratio of De ritis coefficient in favor of AST analysis was observed, while in 12 of them the ratio remained unchanged, i.e. 1:1 AST:ALT. A comparison of these two types of subjects was presented, and a conclusion was reached about the close connection and correlation of these parameters. Which can be useful for timely detection of the critical value of creatine kinase al and creatine kinase MB.

Research shows that the relationship between AST and ALT ie. The De Ritis coefficient is closely related to the determination of keratin kinase, and that it is justified to expand the panel of laboratory tests if a deviation in the ratio is observed, especially for the analysis of CK and CK MB.

Key words: De Ritis coefficient, AST- aspartate aminotransferase, CK keratin kinase

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