

ISSN 2744-1229

Decembar 2023, Vol. 2.

Saplement zbornika 2,
pp 4-101



ZBORNİK RADOVA

iz

Laboratorijske tehnologije i izazovi

Komora medicinsko-laboratorijskih dijagnostičara FBiH

**Zbornik radova 2. Konferencije sa
međunarodnim sudjelovanjem
“Laboratorijske tehnologije i izazovi”,
16-17. 12. 2023. Sarajevo, BiH.**

**Abstracts of the 2nd International Conference
“Laboratory technologies and challenges”,
16-17. December 2023. Sarajevo, B&H.**

Sarajevo, 2023.

ČLANOVI STRUČNO-NAUČNOG I ORGANIZACIONOG ODBORA

Aida Mujičić (BiH)
Amir Ibrahimagić (BiH)
Berina Haračić (BiH)
Dženana Gušić (BiH)
Dženisa Čajić (BiH)
Emina Muftić (BiH)
Emina Smajić (BiH)
Enver Ivanković (BiH)
Esad Burgić (BiH)
Fatima Bilajac (BiH)
Harisa Šido Ružnić (BiH)
Ivana Škrlec (Hrvatska)
Jasminka Talapko (Hrvatska)
Kamelija Madacki Todorović (BiH)
Katarina Katanić (Srbija)
Katja Puljčan (Hrvatska)
Lejla Hasanbegović (BiH)
Ljiljana Benković (BiH)
Magdalena Perić (Hrvatska)
Mirjana Stupnišek (Hrvatska)
Nikola Spasojević (Srbija)
Sanela Hajro (BiH)
Sedina Omeragić (BiH)
Vaid Frljučkić (Crna Gora)
Zijada Smailagić (BiH)

STRATEGIJA KOKNURENTNOSTI U LABORATORIJSKOJ MEDICINI

Emina Smajić¹, Aleksandra Pašić², Samira Bošnjak³, Benjamin Dubravac³

¹Poliklinika Agram Sarajevo, Bosna i Hercegovina

²Klinička Biohemija sa Imunologijom KCUS, Sarajevo, Bosna i Hercegovina

³Medicinsko biohemijski laboratorij LabPoint, Tešanj, Bosna i Hercegovina

SAŽETAK

Uvod

Strategija konkurentnosti u laboratorijskoj medicini predstavlja plan za pomicanje poslovanja prema održivom rastu. Konkurentnost laboratorije ovisi o njenoj sposobnosti i sposobnosti drugih sudionika u lancu da predvide i zadovolje zahtjeve pacijenta, iskoriste mogućnosti krajnjeg tržišta i odgovore ili utječu na promjene tržišne potražnje, a sve uz poštivanje dobre laboratorijske prakse. Cilj rada je bio istražiti kako klinički laboratoriji mogu postati konkurentniji primjenom strategija konkurentnosti.

Materijal i metode

Proučena je relevantna literatura koja pridonosi uspostavi efikasnog laboratorijskog menadžmenta.

Rezultati

Analizom naučne i stručne literature koja se bavi ovom temom došli smo do rezultata koji ukazuju na to da se konkurentnost može posmatrati u odnosu na kvalitet pružene medicinsko laboratorijske usluge, u odnosu na troškove usluge i u odnosu na zadovoljstvo korisnika. Identificirana je najčešće korištena mjera konkurencije tzv. Herfindahl-Hirshmanov indeks (HHI). Primjenom strategije konkurentnosti povećava se vriednost za pacijente tokom vremena. Zakonski propisi, politička dinamika, promjenjive društvene i demografske karakteristike i tehnologija koja stalno napreduje pokreću velike promjene u zdravstvu, što rezultira raspadom mreža zdravstvenih ustanova i pojačanom konkurencijom i pritiscima na troškove.

Zaključak

Uvođenje novih strategija, koncepata i tehnologija koje ubrzavaju kompletan laboratorijski ciklus od velike je važnosti u visoko konkurentnoj laboratorijskoj industriji.

2. Konferencija sa međunarodnim sudjelovanjem "Laboratorijske tehnologije i izazovi"

Primjenom strategije konkurentnosti dolazi do poboljšanja kvalitete i procesa, što za posljedicu ima smanjenje troškova i povećanje zadovoljstva kupaca tj. pacijenta.

Ključne riječi: medicinsko laboratorijska dijagnostika, strategija konkurentnosti

COMPETITIVE STRATEGY IN LABORATORY MEDICINE

Smajić E¹, Pašić A², Bošnjak S³, Dubravac B³

¹Poliklinika Agram Sarajevo, Bosnia and Herzegovina

²Klinička Biohemija sa Imunologijom KCUS, Sarajevo, Bosnia and Herzegovina

³Medical biochemical laboratory LabPoint, Tešanj, Bosnia and Herzegovina

ABSTRACT

Introduction

Competitive strategy in laboratory medicine is a plan for advancement of business towards sustainable growth. Competitiveness of a laboratory, and its collaborators, depends on its ability to predict and meet patient needs, use the market potential, and respond or change in market demand, while maintaining good laboratory practice. Goal of this paper was to research how clinical laboratories can become competitive by applying competitive strategy.

Material and methods

Research of relevant published materials on establishing an efficient laboratory management.

Results

Through analysis of scientific and expert literature that deals with this topic we have obtained results that indicate that competitiveness can be measured based on: quality of provided medical laboratory service; cost of the service; and customer satisfaction. Herfindahl-Hirshman Index (HHI) has been identified as the most often used measure of competitiveness. By applying competitiveness strategy value for patients is increased. Changing regulations, political pressures, changing social and demographic characteristics along with continual technological advancements are causing great changes in healthcare resulting in disintegration of network of healthcare institutions and increased competitive and income pressures.

Conclusion

Introduction of new strategies, concepts and technologies which are accelerating the laboratory cycle is extremely important in highly competitive laboratory

industry. Applying competitiveness strategy leads to higher quality end results and processes, which in turn results in lower costs and increasing patient (customer) satisfaction.

Keywords: medical laboratory diagnostic, competitive strategy

ULOGA DIPLOMIRANIH INŽINJERA MEDICINSKO-LABORATORIJSKE DIJAGNOSTIKE U PRIMJENI ZAKONA O ZAŠTITI NA RADU

Adi Mirojević

Granulo RE d.o.o. Sarajevo, Bosna i Hercegovina

SAŽETAK

Uvod

Usvajanjem novog Zakona o zaštiti na radu Federacije BiH (*Službene novine FBiH* 73/2020), pored novih instituta, uspostavljeni su i zahtjevi koji se odnose na stručne poslove iz oblasti zaštite na radu, koje u skladu sa pratećim podzakonskim aktima mogu vršiti inženjeri medicinsko-laboratorijske dijagnostike.

Materijali i metode

Primjenom deskriptivne metode i analize zakonskih propisa iz oblasti zaštite na radu, utvrđena je uloga i značaj diplomiranog inženjera medicinsko-laboratorijske dijagnostike u primjeni Zakona o zaštiti na radu.

Rezultati

Istraživanjem novih propisa iz oblasti zaštite na radu i analizom sadržaja podzakonskih akata, utvrđeni su uslovi i pravila pod kojima diplomirani inženjer medicinsko-laboratorijske dijagnostike može učestvovati u vršenju stručnih poslova iz oblasti zaštite na radu.

Vršenje stručnih poslova iz oblasti zaštite na radu povjereno je ovlaštenim organizacijama za zaštitu na radu, koje moraju između ostalog ispunjavati odgovarajuće kadrovske uvjete. Pravilnikom o uvjetima koje moraju ispunjavati ovlaštene organizacije za obavljanje stručnih poslova iz oblasti zaštite na radu (*Službene novine FBiH broj 23/2021*), diplomirani inženjeri medicinsko-laboratorijske dijagnostike su prepoznati kao kadar koji je kompetentan da vrši stručne poslove iz oblasti zaštite na radu.

Zaključak

Novim propisima o zaštiti na radu pružena je jedinstvena prilika za proširenje stručnih kompetencija diplomiranih inženjera medicinsko-laboratorijske dijagnostike, kroz do-

2. Konferencija sa međunarodnim sudjelovanjem "Laboratorijske tehnologije i izazovi"

datno stručno usmjeravanje. Pored primjene stručnih znanja iz oblasti biologije, mikro-biologije, prevencije i promocije zdravlja, omogućeno je sticanje novih znanja iz oblasti zaštite na radu, ispitivanja uslova radne sredine i procjene rizika. Pored toga osigurani su i instrumenti za provjeru stečenih kompetencija, kroz obavezu polaganja stručnog ispita za vršenje stručnih poslova iz oblasti zaštite na radu, na osnovu kog se potvrđuje osposobljenost za samostalan rad u ovlaštenim organizacijama.

Ključne riječi: Diplomirani inženjer medicinsko-laboratorijske dijagnostike, Zakon o zaštiti na radu, ispitivanje uslova radne sredine, procjena rizika.

**THE ROLE OF GRADUATED ENGINEERS IN MEDICAL LABORATORY
DIAGNOSTICS IN THE IMPLEMENTATION OF THE OCCUPATIONAL
SAFETY AND HEALTH ACT**

Mirojević A.

Granulo RE d.o.o. Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

With the adoption of the new Occupational Safety and Health Act of the Federation of Bosnia and Herzegovina (Official Gazette of FBiH 73/2020), alongside the introduction of new institutes, requirements have been established pertaining to professional activities in the field of occupational safety and health. According to accompanying sub-legislative acts, these responsibilities can be carried out by graduated engineers in medical laboratory diagnostics.

Material and Methods

By employing a descriptive method and analyzing legal regulations in the field of occupational safety and health, the role and significance of graduated engineers in medical laboratory diagnostics in the application of the Occupational Safety and Health Act have been determined.

Results

Through an examination of new regulations in the field of occupational safety and health and an analysis of the content of sub-legislative acts, the conditions and rules under which graduated engineers in medical laboratory diagnostics can engage in professional activities in the realm of occupational safety and health have been identified.

The execution of professional activities in occupational safety and health is entrusted to authorized organizations for occupational safety, which, among other requirements, must meet appropriate staffing conditions. By the Regulation on the Conditions that Authorized Organizations Must Fulfill for the Performance of Professional Activities in the Field of Occupational Safety and Health (Official Gazette of FBiH number 23/2021), graduated engineers in medical laboratory diagnostics are recognized as personnel com-

petent to carry out professional activities in the field of occupational safety and health.

Conclusion

The new regulations on occupational safety and health provide a unique opportunity to expand the professional competencies of graduated engineers in medical laboratory diagnostics through additional professional orientation. In addition to applying professional knowledge in the fields of biology, microbiology, prevention, and health promotion, the acquisition of new knowledge in the areas of occupational safety and health, examination of working conditions, and risk assessment is facilitated. Furthermore, instruments for verifying acquired competencies are ensured through the obligation to pass a professional examination for the performance of professional activities in the field of occupational safety and health. This examination confirms the capability for independent work in authorized organizations.

Keywords: Graduated engineer of medical-laboratory diagnostics, Law on occupational safety, examination of working environment conditions, risk assessment.

PRIMJENA miRNA U DIJAGNOSTICI INFARKTA MIOKARDA

Ivana Škrlec

Fakultet za dentalnu medicinu i zdravstvo, Sveučilište Josipa Jurja Strossmayera
Osijek, Hrvatska

SAŽETAK

Uvod

Infarkt miokarda jedan je od najčešćih uzroka morbiditeta i mortaliteta u svijetu. Pravovremena dijagnoza i revaskularizacijska terapija od pojave boli u prsima važna je za sanaciju ishemijskog miokarda čime se smanjuje mortalitet i poboljšava prognoza infarkta. MikroRNA (miRNA) su nekodirajuće RNA sastavljene od 19 do 25 nukelotida, koje sudjeluju u signalnim putovima povezanim sa metabolizmom, staničnom proliferacijom, odgovorom na stres, diferencijacijom i staničnom smrću. MiRNA se mogu pronaći u uzorcima, plazme, seruma i periferne krvi. Upravo zato se mikroRNA mogu smatrati biomarkerima za dijagnozu raznih bolesti. Sve veći broj istraživanja pokazuje da miRNA mogu biti važni biomarkeri u dijagnozi i prognostičkom predviđanju infarkta miokarda. Međutim, različita istraživanja pokazuju nedosljedne rezultate miRNA u dijagnozi infarkta miokarda. Napravljen je sustavni pregled dosadašnjih istraživanja kako bi se saželi rezultati istraživanja koji su procjenjivali dijagnostičke miRNA u pacijenta s infarktom miokarda.

Materijal i metode

Sustavno su pretražene bibliografske baze podataka Web of Science i PubMed za članke koji su istraživali povezanost miRNA i infarkta miokarda.

Rezultati

Uključena su 74 članka, od toga devet za miR-1, osam za miR-133, 11 za miR-208 i 11 za miR-499. Sve četiri navedene miRNA pokazale su da su značajan dijagnostički marker u procjeni infarkta miokarda. Također, utvrđena je značajna povezanost između miR-208 i smrtnosti nakon infarkta miokarda. MiRNA su važni biomarkeri za ranu dijagnozu infarkta miokarda.

Zaključak

Razine miR-1, miR-133, miR-208 i miR-499 u krvi značajn su dijagnostički marker kod infarkta miokarda. Pouzdaniji biomarkeri u dijagnozi infarkta miokrada su miR-208 i miR-499 u odnosu na miR-1 i miR-133.

Projekt br. IP7-FDMZ-2023

Ključne riječi: infarkt miokarada; miRNA; sustavni pregled

THE USE OF miRNA IN THE DIAGNOSIS OF MYOCARDIAL INFARCTION

Škrlec I.

Faculty of Dental Medicine and Health, Josip Juraj Strossmayer
University of Osijek, Croatia

ABSTRACT

Introduction

Myocardial infarction is one of the most common causes of morbidity and mortality worldwide. From the onset of chest pain, rapid diagnosis and revascularization therapy are crucial for the rehabilitation of an ischemic heart, minimizing mortality and improving the prognosis of infarction. MicroRNAs (miRNAs) are non-coding RNAs with a length of 19 to 25 nucleotides and are involved in signaling pathways related to metabolism, cell proliferation, stress response, differentiation, and cell death. MiRNAs can be found in plasma, serum, and peripheral blood samples. For this very reason, microRNAs can be used as biomarkers to diagnose many disorders. Many studies show that miRNAs can be essential biomarkers for diagnosing myocardial infarction. However, different studies show contradictory results of miRNA in diagnosing myocardial infarction. A systematic review of previous research was performed to outline the outcomes of studies that evaluated the diagnostic value of miRNAs in patients with myocardial infarction.

Material and Methods

The Web of Science and PubMed bibliographic databases were systematically searched for articles investigating the association between miRNAs and myocardial infarction.

Results

Seventyfour articles were included, nine for miR-1, eight for miR-133, 11 for miR-208, and 11 for miR-499. All four miRNAs listed are significant diagnostic markers in assessing myocardial infarction. Furthermore, a correlation between miR-208 and mortality after myocardial infarction was discovered. MiRNAs are significant indicators for the early detection of heart attacks.

Conclusion

The levels of miR-1, miR-133, miR-208, and miR-499 in the blood are important diagnostic markers for myocardial infarction. Compared to miR-1 and miR-133, miR-208 and miR-499 are more reliable biomarkers for the diagnosis of myocardial infarction.

Grant no. IP7-FDMZ-2023

Keywords: myocardial infarction; miRNA; systematic review

PANELI ZA NASLEDNE KARCINOME

Katarina Katanić

Aqualab laboratorije, Srbija

SAŽETAK

Paneli za nasledne karcinome predstavljaju sofisticirane genetičke testove koji otkrivaju predispoziciju pojedinaca za nasledne oblike karcinoma. Nasledni karcinome čine 5% do 10% svih karcinoma i ovi panelis su posebno važni za osobe sa nasleđenim genskim mutacijama, jer imaju veće šanse za razvoj određenih vrsta karcinoma u mlađem uzrastu u poređenju sa opštom populacijom.

Paneli omogućavaju analizu mutacija kod 79 gena povezanih sa 24 tipa naslednih karcinoma, uključujući dojku, jajnike, kolorektum, prostatu i želudac. Ova vrsta genetičkog testiranja pruža informacije koje pomažu u dijagnostici, potvrđivanju dijagnoze, određivanju terapije i modifikaciji postojećih terapija. Takođe imaju ključnu ulogu u prevenciji, omogućavajući identifikaciju genetičke predispozicije i redovne kontrole kako bi se sprečilo ili rano otkrilo prisustvo određenog karcinoma.

Navedeni su različiti tipovi panela, prilagođeni broju gena povezanih sa određenim karcinomima. Posebno se ističu BRCA1/2 geni, gde mutacije povećavaju rizik od karcinoma dojke, jajnika i drugih organa. Rana identifikacija ovih mutacija omogućava pacijentima personalizovan pristup lečenju i prevenciji.

Metoda testiranja, Next Generation Sequencing (NGS), omogućava analizu celog genoma sa visokom preciznošću od 99,9%. Važno je napomenuti da se kao uzorak koriste 2 EDTA epruvete krvi, čime se proces testiranja čini praktičnim i pristupačnim pacijentima.

U zaključku, paneli za nasledne karcinome predstavljaju napredan alat u dijagnostici, personalizaciji lečenja i prevenciji karcinoma. Njihova sveobuhvatnost, tačnost i jednostavnost uzimanja uzoraka čine ih ključnom analizom u oblasti onkologije, pružajući dragocene informacije pacijentima i olakšavajući rad lekarima.

Ključne reči: nasledni karcinomi, mutacije gena

HEREDITARY CANCERS PANELS

Katanic K.

Aqualab laboratories, Serbia

ABSTRACT

Hereditary cancer panels are sophisticated genetic tests that reveal the predisposition of individuals to hereditary forms of cancer. Hereditary cancers account for 5% to 10% of all cancers and these panels are especially important for people with inherited gene mutations, as they have a higher chance of developing certain types of cancer at a younger age compared to the general population.

The panels analyse existence of mutations in 79 genes associated with 24 types of hereditary cancers, including breast, ovarian, colorectal, prostate and stomach. This type of genetic testing provides information that helps diagnose, confirm a diagnosis, determine therapy, and modify existing therapies. They also play a key role in prevention, enabling the identification of genetic predisposition and regular check-ups to prevent or detect the presence of certain cancers early.

Different panel types are listed, and consist of the number of genes associated with specific cancers. The BRCA1/2 genes are very important, because the mutations in these genes increase the risk of breast, ovarian and other organ cancers. Early identification of these mutations allows patients a personalized approach to the treatment and prevention.

The testing method, Next Generation Sequencing (NGS), enables analysis of the whole genome, with a high accuracy of 99,9%. It is important to note that 2 EDTA tubes of blood are used as a sample, which makes the testing process practical and affordable for patients.

To conclude, panels for hereditary cancers represent an advanced tool in diagnosis, treatment personalisation and cancer prevention. Their comprehensiveness, accuracy and simplicity of sampling make them a key analysis in the field of oncology, providing valuable information to patients and facilitating the work of doctors.

Keywords: hereditary cancers, gene mutations

kkatanic@aqualab.rs

**ULOGA POLIMORFIZMA GENA ZA
DIHIDROPIRIMIDIN-DEHIDROGENAZU (DPYD) U
PERSONALIZIRANOM LIJEČENJU 5-FLUOROURACILOM**

Adis Muhić¹, Edina Zahirović^{2,3}

¹OJ Klinička patologija, citologija i humana genetika, Klinički centar Univerziteta u Sarajevu, Bosna i Hercegovina

²OJ Klinička mikrobiologija, Klinički centar Univerziteta u Sarajevu, Bosna i Hercegovina

³Univerzitet u Sarajevu, Fakultet zdravstvenih studija, Bosna i Hercegovina

SAŽETAK

Uvod

Gen za DPYD nalazi se na hromosomu 1p22 s 4399 nukleotida na 23 kodirajuća egzona te kodira sintezu enzima dihidropirimidin-dehidrogenaze (DPD). U slučaju potpuno nasljednog nedostatka DPD-a, kada je enzimska aktivnost <1%, nastaje tzv. timin-uracilurija, odnosno poremećaj koji se manifestira neurotoksičnošću uz konvulzije i/ili zastojem u mentalnom i fizičkom rastu i razvoju. U rjeđim slučajevima se nedostatak može povezati i s autizmom. Enzim DPD ima ključnu ulogu u metabolizmu fluoropirimidina kao limitirajući faktor brzine metabolizma te u normalnim uslovima metabolizira približno 80-90 % primijenjene doze 5-fluorouracila (5-FU) u netoksični dihydrofluorouracil (DHFU).

Materijal i metode

Pretražena je naučna literatura u bazama podataka Medline, PubMed, baze lijekova te ostali naučni izvori publikovani u posljednjih 10 godina. Komentarisane su terapijske smjernice za primjenu i individualizaciju terapije 5-FU-om. Opisana je i moguća važnost drugih polimorfizama DPYD-a te su navedene etničke i rasne razlike u njihovoj učestalosti. Iznoseni su podaci o mogućnostima individualizacije terapije 5-FU-om i informacije o laboratorijima koje provode genotipizaciju DPYD-a.

Rezultati

U randomiziranoj studiji ozbiljne nuspojave zabilježene su kod 38,2% ispitanika (nositelji mutacija c.2194G>A, c.1905+1G>A i c.496A>G). Kliničko ispitivanje Pan-

European Trials in an Alimentary Tract Cancer (PETACC-8) također potvrđuje gore navedeno jer je u istom utvrđeno da su se ozbiljne nuspojave javljale kod 85,7 % nositelja mutacije c.2846A>T i 60,8 % nositelja mutacije c.2194G>A dok mutacija c.85T>C nije bila povezana s razvojem ozbiljnih nuspojava. U radu Henricks i sar. pokazano je da je predterapijsko testiranje isplativo i ne predstavlja dodatni trošak za zdravstveni sistem.

Zaključak

Nosioci inaktivirajućih alela DPYD-a imaju značajno veći rizik od ozbiljnih nuspojava. Genetičko testiranje DPYD-a ili mjerenja aktivnosti DPD-a prije primjene lijeka olakšava odluku o odabiru 5-FU-a i odgovarajuću dozu.

Ključne riječi: DPD, DPYD, 5-FU

**THE ROLE OF DIHYDROPYRIMIDINE DEHYDROGENASE (DPYD)
GENE POLYMORPHISM IN PERSONALIZED
TREATMENT WITH 5-FLUOROURACIL**

Muhić A¹, Zahirović E^{2,3}

¹OJ Clinical Pathology, Cytology and Human Genetics,
Clinical Center of the University of Sarajevo,
Bosnia and Herzegovina

²OJ Clinical Microbiology, Clinical Center of the University of Sarajevo,
Bosnia and Herzegovina

³University of Sarajevo, Faculty of Health Studies,
Bosnia and Herzegovina

ABSTRACT

Introduction

The gene for DPYD is located on chromosome 1p22 with 4399 nucleotides in 23 coding exons and encodes the synthesis of the enzyme dihydropyrimidine dehydrogenase (DPD). In the case of a completely hereditary deficiency of DPD, when the enzyme activity is <1%, the so-called thymine-uraciluria, i.e. a disorder manifested by neurotoxicity with convulsions and/or retardation in mental and physical growth and development. In rare cases, the deficiency can also be associated with autism. The DPD enzyme plays a key role in the metabolism of fluoropyrimidines as a rate-limiting factor and under normal conditions, it metabolizes approximately 80-90% of the applied dose of 5-fluorouracil (5-FU) into non-toxic dihydrofluorouracil (DHFU).

Material and methods

Scientific literature was searched in Medline, PubMed, drug databases, and other scientific sources published in the last 10 years. Therapeutic guidelines for the application and individualization of 5-FU therapy are commented. The possible importance of other DPYD polymorphisms is also described, and ethnic and racial differences in their frequency are indicated. Data on the possibilities of individualizing 5-FU therapy and information on laboratories performing DPYD genotyping are presented.

Results

In the randomized study, serious side effects were recorded in 38.2% of subjects (carriers of mutations c.2194G>A, c.1905+1G>A, and c.496A>G). The Pan-European Trials in an Alimentary Tract Cancer (PETACC-8) clinical trial also confirms the above, as it found that serious side effects occurred in 85.7% of c.2846A>T mutation carriers and 60.8% of c.2846A>T mutation carriers c.2194G>A while the c.85T>C mutation was not associated with the development of serious side effects. In the work of Henricks et al., it has been shown that pre-therapeutic testing is cost-effective and does not represent an additional cost for the healthcare system.

Conclusion

Carriers of inactivating DPYD alleles have a significantly higher risk of serious side effects. Genetic testing of DPYD or measurement of DPD activity before drug administration facilitates the decision to choose 5-FU and the appropriate dose.

Keywords: DPD, DPYD, 5-FU

MY BIOME

Nikola Spasojević
Aqualab laboratorije, Srbija

SAŽETAK

MyBiome je test koji pruža detaljnu analizu mikrobioma creva koristeći tehnologiju NGS (Next-Generation Sequencing). Ovaj test identifikuje bakterije, gljive, kvasnice i parazite u crevima, pružajući informacije o njihovoj funkciji i uticaju na zdravlje. Tehnologija sekvenciranja omogućava proučavanje celog genoma mikroorganizama u crevima, a zaključci su izvedeni iz najnovijih istraživanja u ovoj oblasti.

Rezultati MyBiome testa obuhvataju informacije o biodiverzitetu mikrobioma, važnim vrstama bakterija, digestivnom potencijalu, genetičkom sastavu uzorka, mikrobnim metabolitima, eukariotskim mikroorganizmima i nutritivnim savetima. Biodiverzitet mikrobioma se meri Shanon indeksom, dok se analizom identifikuju korisne ili patogene bakterije.

Pored toga, test pruža informacije o potencijalu varenja različitih hranljivih materija i genetičkom sastavu uzorka, uključujući procenat ljudske DNK, što može biti indikator intestinalne inflamacije. Takođe, pruža informacije o prisustvu gljiva, archea, kvasnica i parazita.

Na osnovu rezultata, MyBiome nudi personalizovane nutritivne preporuke kako bi se postigao balans u mikrobiomu creva. Test se preporučuje osobama sa digestivnim poremećajima, poremećajima metabolizma, kardiovaskularnim bolestima, inflamatornim ili imunskim bolestima, neurodegenerativnim bolestima, poremećajima raspoloženja ili hroničnim umorom.

Kao uzorak se koristi feces, a za uzorkovanje se koristi specijalna četkica i posuda za skladištenje koja dolazi sa samim kitom. Uzorkovanje vrše sami pacijenti u udobnosti svog doma, prikupljanjem fecesa koji se našao na toalet papiru. Rezultati se dobijaju nakon 4 do 5 nedelja od dana kada stignu u laboratoriju.

Ključne reči: mikrobiom, mikroorganizmi, bakterije

MY BIOME

Spasojević N.
Aqualab laboratories, Serbia

ABSTRACT

MyBiome is a test that provides a detailed analysis of the gut microbiome using NGS (Next-Generation Sequencing) technology. This test identifies bacteria, fungi, yeast and parasites in the gut, providing information about their function and impact on health. Sequencing technology makes it possible to study the entire genome of microorganisms in the intestines, and the conclusions are drawn from the latest research in this field.

MyBiome test results include information on microbiome biodiversity, important bacterial species, digestive potential, genetic sample composition, microbial metabolites, eucaryotic microorganisms and nutritional recommendations. Biodiversity of the microbiome is measured by the Shannon index, while the analysis identifies beneficial or pathogenic bacteria.

In addition, the test provides information on the digestion potential of various nutrients and the genetic sample composition, including the percentage of human DNA, which can be an indicator of intestinal inflammation. It also provides information on the presence of fungi, archaea, yeasts and parasites.

Based on the results, MyBiome offers personalized nutritional recommendations in order to achieve balance in the gut microbiome. The test is recommended for people with digestive disorders, metabolic disorders, cardiovascular disease, inflammatory or immune embolisms, neurodegenerative diseases, mood disorders or chronic fatigue.

Feces is used as a sample, and a special brush and storage container are provided for adequately sampling. Sampling is done by the patients themselves in the comfort of their own home, by collecting feces left on the toilet paper. Results are available after 4 to 5 weeks from the day they arrive at the laboratory.

Keywords: microbiome, microorganisms, bacteria

IZAZOVI LABORATORIJSKOG TESTIRANJA NA DROGE

Sedina Omeragić

Zavod za medicinu rada i sportsku medicinu ZDK, Zenica, Bosna i Hercegovina

SAŽETAK

Konzumacija i probavanje droga u najvećem broju slučajeva počinje kao eksperimentalna ili rekreativna upotreba u adolescentskom dobu. Droga je psihoaktivna supstanca koja, nakon kontinuirane zloupotrebe u relativno kratkom vremenskom periodu, izaziva zavisnost. Testom na droge utvrđujemo prisustvo droge, metabolit droge ili neke druge biomarkere koji ukazuju na upotrebu ili zloupotrebu narkotika. Test na droge se može obavljati iz krvi, pljuvačke, urina, znoja ili dlake kose. Droga u organizmu može ostati čak i do tri mjeseca što se testiranjima može još uvijek dokazati, a najranije se može dokazati već nakon 30 minuta od konzumacije (testiranjem iz krvi) ili već nakon 4-8 sati od konzumacije (testiranjem iz urina). Najčešći panel koji se koristi jeste panel od 6 vrsta droga: amfetamini, barbiturati, benzodiazepini, kokain; metadon, opijati, uključujući heroin i drugi.

Rad će prikazati analizu zbivanja u predanalitičkoj i analitičkoj obradi ove vrste testiranja, prikazati greške prilikom samog uzimanja uzorka, prikazati sve vrste izazova laboratorijskog testiranja na droge. Ova analiza povlači za sobom više vrsta izazova od same vrste testiranja (rapid testovi), vremenskog zadržavanja supstance u organizmu, interferencija pojedinih vrsta lijekova koje u sebi sadrže testirane supstance, a poseban izazov kod ove vrste testiranja jeste što testirane osobe nerijetko pokušavaju da „varaju“ na ovim testovima.

Istraživanje je uključivalo sve vrste zapažanja laboratorijskog osoblja od samog pravilnog uzimanja uzorka, tjelesne mase ispitanika pa sve do intenziteta korištenja supstance. Vođen je dnevnik rada od strane laboratorijskog osoblja na osnovu kojeg su uočene promjene koje utječu na izvođenje testa.

Na osnovu dugogodišnjeg iskustva laboratorijskog osoblja dolazimo do zaključka mnogi su faktori ali i izazovi koji utječu na obradu testa na droge. Bez obzira na nelagodnosti prilikom uzimanja uzorka od velike je važnosti sprovesti sve procedure za uzorkovanje urina. Uočena je ovisnost tačnosti rezultata testa s pravilnim uzimanjem uzorka.

Ključne riječi: rapid test na droge, predanalitički izazovi, analitička dijagnostika

CHALLENGES OF LABORATORY DRUG TESTING

Omeragić S

Institute for Occupational Medicine and Sports Medicine of ZDK, Zenica,
Bosnia and Herzegovina

ABSTRACT

The consumption and consumption of drugs in most cases begins as experimental or recreational use in adolescence. A drug is a psychoactive substance that, after continuous abuse in a relatively short period of time, causes addiction. With a drug test, we determine the presence of a drug, a drug metabolite or some other biomarkers that indicate the use or abuse of narcotics. The drug test can be performed from blood, saliva, urine, sweat or a hair of hair. The drug can remain in the body for up to three months, which can still be proven by testing, and the earliest it can be proven after 30 minutes of consumption (testing from blood) or already after 4-8 hours after consumption (by urine testing). The most common panel that is used is a panel of 6 types of drugs: amphetamines, barbiturates, benzodiazepines, cocaine; methadone, opiates, including heroin and others.

The paper will present an analysis of the events in the pre-analytical and analytical processing of this type of testing. show errors during the actual sample collection, show all types of challenges of laboratory drug testing. This analysis entails more types of challenges than the type of testing itself (rapid tests), the time retention of the substance in to the body, interference of certain types of drugs that contain tested substances, and a special challenge with this type of testing is that tested persons often try to "cheat" on these tests.

The research included all kinds of observations by the laboratory staff, from the proper collection of the sample, the subject's body weight to the intensity of substance use. A work diary was kept by the laboratory staff, on the basis of which changes affecting the performance of the test were observed.

Based on the long-term experience of the laboratory staff, we come to the conclusion that there are many factors and challenges that affect the processing of the drug test. Regardless of the discomfort during sample collection, it is of great importance to carry out all procedures for urine sampling. The dependence of the accuracy of the test results on the correct collection has been observed sample.

Keywords: rapid drug test, pre-analytical challenges, analytical diagnostics

ZNAČAJ LABORATORIJSKE DIJAGNOSTIKE KOD UTVRĐIVANJA I PRAĆENJA BOLESTI ŠTITNJAJČE

Sanja Ćorović¹, Dženisa Klepo²

¹Medicinski laboratorij MedLAB Čapljina, Bosna i Hercegovina

²Poliklinika BiH medicinski laboratorij, Konjic, Bosna i Hercegovina

SAŽETAK

Uvod

Rad u laboratoriji omogućava nam da uvidimo da je u porastu broj osoba koje imaju problem sa štitnom žlijezdom, njenim radom i stvaranjem/izlučivanjem hormona, zbog čega smo odlučili osvrnuti se na značaj i ulogu ove žlijezde koja svojim izgledom podsjeća na leptira, nalazi se u vratnom predjelu i izlučuje važne hormone koji imaju brojne uloge za naš organizam.

Materijal i metode

Ovaj rad je urađen korištenjem dostupne naučne i stručne literature publicirane u relevantnoj bazi podataka PubMed uporabom ključnih riječi "štitna žlijezda", "hormoni štitnjače", "bolesti štitnjače", "hipotireoza", "hipertireoza". Metoda rada je pregledna.

Rezultati

Štitnjača proizvodi dva glavna hormona, trijodtionin (T3) i tiroksin (T4), koji kontroliraju metabolizam i utječu na mnoge druge tjelesne sisteme. Hormoni štitnjače igraju ključnu ulogu u kontroliranju brzine metabolizma. Ako razina ovih hormona nije ispravna, to može dovesti do problema s prekomjernim ili nedovoljnim sagorijevanjem kalorija, što može utjecati na tjelesnu težinu i energetske nivo. Stvaranje i balans hormona štitnjače kontrolira se regulacijskim mehanizmom na relaciji hipofiza-štitnjača, te povratnom spregom u relaciji sa TSH (tireostimulirajući hormon). Kod osoba koje imaju nepravilno stvaranje hormona dolazi do različitih stanja i bolesti štitnjače. U tom smislu moguće je razlikovati hipotireozu, hipertireozu i autoimune poremećaje štitnjače.

Zaključak

Zbog simptoma koji se teško uočavaju, pacijenti nekad teško otkrivaju problem, a zbog nedovoljne statistike o broju obeljelih, ne vode se ni preventivna mjerenja hormona kod

2. Konferencija sa međunarodnim sudjelovanjem "Laboratorijske tehnologije i izazovi"

pacijenata pa je važno ukazivati pacijentima na značaj mjerenja hormona štitnjače jer se problemi sa ovom žlijezdom mogu održavati i na druge zdravstvene probleme.

Ključne riječi: štitnjača, hormoni štitnjače, bolesti štitnjače, hipotireoza, hipertireoza

THE IMPORTANCE OF LABORATORY DIAGNOSTICS IN DETERMINING AND MONITORING THYROID DISEASE

Ćorović S¹, Klepo Dž²

¹Medical laboratory MedLAB Čapljina, Bosnia and Herzegovina

²Polyclinic of BIH medical laboratory, Konjic, Bosnia and Herzegovina

ABSTRACT

Introduction

Working in the laboratory allows us to see that the number of people who have problems with the thyroid gland, its work and the creation/secretion of hormones is on the rise, which is why we decided to look back at the significance and role of this gland, which looks like a butterfly, finds is in the neck area and secretes important hormones that have numerous roles for our body.

Material and methods

This work was done using the available scientific and professional literature published in the relevant PubMed database using the keywords "thyroid gland", "thyroid hormones", "thyroid diseases", "hypothyroidism", "hypertriiose". The working method is transparent.

Results

The thyroid gland produces two main hormones, triiodothionine (T3) and thyroxine (T4), which control metabolism and affect many other body systems. Thyroid hormones play a key role in controlling metabolic rate. If the level of these hormones is not correct, it can lead to problems with excessive or insufficient burning of calories, which can affect body weight and energy level. The creation and balance of thyroid hormones is controlled by a regulatory mechanism in the relationship between the pituitary gland and the thyroid gland, and by a feedback loop in relation to TSH (thyrostimulating hormone). In people who have irregular hormone production, various thyroid conditions and diseases occur. In this sense, it is possible to distinguish between hypothyroidism, hyperthyroidism and autoimmune thyroid disorders.

Conclusion

Due to symptoms that are difficult to notice, patients sometimes find it difficult to detect the problem, and due to insufficient statistics on the number of white patients, preventive hormone measurements are not conducted in patients, so it is important to point out to patients the importance of thyroid hormone measurements, because problems with this gland can persist and other health problems.

Keywords: thyroid gland, thyroid hormones, thyroid diseases, hypothyroidism, hyperthyroidism

KORELACIJA STRESA I NIVOA KORTIZOLA ZDRAVSTVENIH RADNIKA

Ehlimana Pobrić¹, Kenan Galijašević²

¹Opća bolnica Tešanj, Tešanj, Bosna i Hercegovina

²Medicinski fakultet, Univerzitet u Zenici, Zenica, Bosna i Hercegovina

SAŽETAK

Uvod

U posljednje vrijeme sve veću pažnju naučne i šire javnosti privlače ispitivanja uticaja stresa, a posebno stresa sa radnog mjesta na zdravstveno stanje zaposlenih. Povećava se interesovanje za izučavanje stresa i njegovih posljedica na zaposlene u zdravstvenom sektoru. Individualna procjena objektivnog stanja ili događaja utiče na pojavu stresnog odgovora pojedinca, povećanjem nivoa kortizola u krvi. Ciljevi istraživanja su utvrditi koje faktore radnog okruženja medicinske sestre/tehničari u Općoj bolnici Tešanj doživljavaju kao stresne i/ili izražajno stresne.

Materijal i metode

U istraživanje je uključeno 30 ispitanika starosne dobi između 18 i 60 godina (medicinske sestre i tehničari srednje, više i visoke stručne spreme). Istraživanje je provedeno na osnovu Sestrinske stres skale (ENSS) za procjenu faktora rizika stresa medicinskih sestara/tehničara, korišten je upitnik za radni lokus kontrole, te nivo kortizola određen u laboratoriji iz uzorka krvi, kod ispitanika nakon noćne smjene.

Rezultati

Najučestaliji stresori koje su ispitanici navodili jesu finansijski i faktori organizacije radnog procesa. Malen broj ispitanika naveo je kao stresore faktore ličnog ekonomskog statusa. Utvrđena je umjerena pozitivna korelacija u odnosu stresa i nivoa kortizola medicinskih sestara/tehničara.

Zaključak

Medicinske sestre i tehničari navode kao izvor stresa na radu strah od specifičnih opasnosti i štetnosti u zdravstvu, što upućuje na potrebu poboljšanja edukacije, mjera zaštite i sigurnosti na radu.

Ključne riječi: stres, nivo kortizola, medicinske sestre/tehničari

pobricehlimana@hotmail.com

CORRELATION BETWEEN STRESS AND CORTISOL LEVELS OF HEALTH WORKERS

Pobrić E¹, Galijašević K²

¹General Hospital Tešanj, Tešanj, Bosnia and Herzegovina

²Faculty of Medicine, University of Zenica, Bosnia and Herzegovina

ABSTRACT

Introduction

Studies of the impact of stress, especially stress from the workplace, on the health status of employees have recently attracted increasing attention from the scientific and general public. There is an increasing interest in studying stress and its consequences on employees in the health sector. An individual assessment of an objective state or event affects the occurrence of an individual's stress response, by increasing the level of cortisol in the blood. The aim of the study is to determine which factors of the work environment nurses/technicians perceive as stressful and/or expressively stressful in the Tešanj General Hospital.

Material and methods

Thirty subjects between the ages of 18 and 60 (nurses and technicians with secondary, higher and higher education) were included in the research. The research was conducted on the basis of the Nursing Stress Scale (ENSS) for assessing the stress risk factors of nurses/technicians, a questionnaire was used for the work locus of control, and the cortisol level was determined in the laboratory from a blood sample, in the subjects after the night shift.

Results

The most frequent stressors mentioned by the respondents are financial and organizational factors of the work process. A small number of respondents mentioned factors of personal economic status as stressors. A moderate positive correlation was found in the relationship between stress and cortisol levels of nurses/technicians.

Conclusion

Nurses and technicians cite as a source of stress at work the fear of specific dangers and harms in health care, which points to the need to improve education, protection measures and safety at work.

Keywords: stress, cortisol level, nurses/technicians

pobricehlimana@hotmail.com

BIOLOŠKE OPASNOSTI U HRANI

Emina Idrizović

Služba za mikrobiologiju hrane, Institut za zdravlje i sigurnost hrane Zenica,
Bosna i Hercegovina

SAŽETAK

Biološke opasnosti u hrani su organizmi ili tvari, koje oni proizvode, a koje predstavljaju prijetnju po ljudsko zdravlje. Ove opasnosti uzrokuju trećinu globalnih bolesti u svijetu, a njihov uticaj ogleda se kroz zdravstvene i ekonomske posljedice. Biološki kontaminanti hrane mogu biti: bakterije, virusi, kvasci, paraziti i plijesni, mada se o plijesnima uglavnom raspravlja u kontekstu mikotoksina. Cilj rada je ukazati na važnost procjene bioloških rizika iz hrane, podizanje svijesti građana i razvoja metoda i sistema koji bi omogućili otkrivanje bolesti koje se prenose hranom.

Procjenjuje se da virusi uzrokuju više od 50% bolesti koje se prenose hranom, a najznačajniji su hepatitis A, norovirusi, rotavirusi. Bakterije koje se prenose hranom odavno su poznate i stoljećima odnose živote ljudi, a najznačajnije su kampilobakterioza, salmoneloza, jersinioza, a slijede je *Escherichia coli* (STEC) koja proizvodi Shiga toksin i *Listeria monocytogenes* infekcije. Broj oboljelih od kampilobakterioze činio je više od 62% svih prijavljenih potvrđenih slučajeva u 2021 g., međutim u BiH, uglavnom zbog neotkrivanja i netestiranja, nismo imali niti jedan prijavljeni slučaj kampilobakterioze. Salmoneloza je i dalje druga najčešće prijavljena zoonoza, a serotip *Salmonella* Enteritidis je i dalje najčešći prijavljeni uzročnik izbijanja trovanja hranom u Evropi. Danas ne smijemo zanemariti ni postojanje sve većeg broj patogena u nastajanju, kao ni mogućnost promjene virulentnosti poznatih patogena i razvoj rezistencije na antibiotike u kontekstu lanca prehrane. Važan alat za smanjenje i kontrolu bioloških opasnosti koje se prenose hranom je procjena rizika koja se ogleda u njegovoj sposobnosti da identifikuje opasnosti i procjeni njihov uticaj na populaciju. Sigurnost hrane u budućnosti potrebno je sagledavati kroz procjenu rizika potencijalno novih i već poznatih opasnosti, a BiH mora uložiti dodatne napore kako bi razvila efikasne mehanizme testiranja i prepoznavanja bolesti povezanih sa hranom.

Ključne riječi: biološke opasnosti, rizici, sigurnost hrane.

BIOLOGICAL HAZARDS IN FOOD

Idrizović E.

Department for Food Microbiology, Institute for Health and Food Safety Zenica,
Bosnia and Herzegovina

ABSTRACT

Biological hazards in food are organisms or compounds they create, which represent a risk to human health. These hazards cause third of the global diseases and their impact is significant to general health and economy. Biological food contaminants can be bacteria, viruses, yeasts, parasite, and mold. Although the mold has been discussed in context of mycotoxin.

Aim of the study is to present the importance of biological food hazard assessment and raising awareness as well as development of methods and systems that would allow detection of food born illness.

It is estimated that viruses cause more than 50% of food borne diseases and most significant are hepatitis A, norovirus, rotavirus. Bacteria that are transmitted by food are well know and have been cause of death for centuries. Most significant of these are: campylobacteriosis, salmonellosis, yersinosis and are followed by *Escherichia coli* (STEC) which produces Shiga toxin and *Listeria monocytogenes* infections. Number of patients caused by campylobacteria was more than 62% of all reported and confirmed cases u 2021. However, in Bosnia and Hercegovina, mainly because of lack of identification and lack of testing, we haven't had single reported case of campylobacteriosis. Salmonellosis is still second most reported zoonosis and serotype *Salmonella Enteritidis* is the most commonly reported cause of food poisoning outbreak in Europe. We can't neglect the fact of even larger number of pathogens that are being formed, nor possibility of change in virulence of known pathogens and antibiotics resistance development in context of food chain. Important tool for control and reduction of food born biological hazards is risk assessment that has ability to identify critical points and assess these risk factors for population.

The development of food safety must include risk assessment of potentially new and know hazards. Bosnia and Herzegovina need to put additional effort to develop efficient testing mechanisms and recognition of food born illness.

Keywords: biological hazard, risk, food safety

ZNAČAJ I OPASNOST UPOTREBE NITRITA I HLORIDA U MESU I MESNIM PRERAĐEVINAMA

Dženana Hasanbašić^{1*}, Čamka Kovač¹, Alma Agić¹, Amila Šut¹, Amir Ibrahimagić¹

¹Služba za hemijsku dijagnostiku, Institut za zdravlje i sigurnost hrane,
Bosna i Hercegovina

SAŽETAK

Uvod

Meso predstavlja značajan izvor energije za naš organizam, obiluje proteinima, vitaminima, te mineralima. Radi očuvanja mesa u primjeni su brojni načini konzerviranja među kojima je upotreba hemijskih konzervanasa jako raširena u mesnoj industriji. Nitriti kao konzervansi imaju široku primjenu u mesnoj industriji jer poboljšavaju kvalitet, trajnost i sigurnost proizvoda, posebno zbog inhibicije rasta i razmnožavanja bakterija. Zbog štetnog djelovanja nitrita na zdravlje ljudi te dokazanog kancerogenog djelovanja nitrozamina, upotreba nitrita u mesnoj industriji nastoji se smanjiti. Nitriti su najčešće dodani u kombinaciji s kuhinjskom soli (NaCl). U ovom istraživanju su ispitivane koncentracije nitrita i hlorida u mesu i proizvodima od mesa, koji su prikupljeni na tržištu Zeničko-Dobojskog kantona u 2022. godini. Ukupno je analizirano 85 uzoraka.

Materijal i metode

U ovom istraživanju su ispitivane koncentracije nitrita i hlorida u mesu i proizvodima od mesa, koji su prikupljeni na tržištu Zeničko-Dobojskog kantona u 2022. godini. Ukupno je analizirano 85 uzoraka. Analiza nitrita i hlorida rađena je u skladu sa standardima BAS ISO 2918:2007 i BAS ISO 1841-1:2007.

Rezultati

Izmjerena prosječna koncentracija nitrita u uzorcima je 8,330 mg/kg, a rezultati su se kretali u rasponu od 0,550 mg/kg do 45,705 mg/kg. Prosječna koncentracija hlorida je 2,377% m/m, sa rasponom od 0 do 9,955 % m/m.

Zaključak

Rezultati istraživanja pokazuju potrebu za kontinuiranim praćenjem količina nitrita i hlorida u gotovim proizvodima na tržištu, te primjenu tehnoloških procesa koji bi smanjili upotrebu ovih aditiva u mesnoj industriji.

Ključne riječi: nitriti, hloridi, meso

THE IMPORTANCE AND DANGER OF USING NITRITE AND CHLORIDE IN MEAT AND MEAT PRODUCTS

Hasanbašić Dž^{1*}, Kovač Ć¹, Agić A¹, Šut A¹, Ibrahimagić A¹

¹Department for Chemical Diagnostics, Institute for Health and Food Safety Zenica,
Bosnia and Herzegovina

ABSTRACT

Introduction

Meat represents a significant source of energy for our organism, rich in proteins, vitamins, and minerals. To preserve meat, various methods of preservation are employed, among which the use of chemical preservatives is widespread in the meat industry. Nitrites, as preservatives, find broad application in the meat industry as they enhance product quality, shelf life, and safety, particularly due to the inhibition of bacterial growth and reproduction. However, due to the harmful effects of nitrites on human health and the proven carcinogenic effects of nitrosamines, efforts are made to reduce their use in the meat industry. Nitrites are most commonly added in combination with table salt (NaCl). This study investigated the concentrations of nitrites and chlorides in meat and meat products collected from the market in the Zenica-Doboj Canton in 2022, with a total of 85 samples analyzed.

Materials and Methods

The concentrations of nitrites and chlorides in meat and meat products collected from the market in the Zenica-Doboj Canton in 2022. were examined in this study. A total of 85 samples were analyzed. Nitrite and chloride analysis were performed in accordance with BAS ISO 2918:2007 and BAS ISO 1841-1:2007 standards.

Results

The measured average concentration of nitrites in the samples was 8.330 mg/kg, with results ranging from 0.550 mg/kg to 45.705 mg/kg. The average chloride concentration was 2.377% , with a range from 0 to 9.955%.

Conclusion

The research results indicate the need for continuous monitoring of nitrite and chloride levels in finished products on the market, as well as the implementation of technological processes to reduce the use of these additives in the meat industry.

Keywords: nitrites, chlorides, meat

dzenana.hasanbasic@inz.ba

UTICAJ MODIFIKACIJA SMJERNICA EUROPSKE KONFEDERACIJE LABORATORIJSKE MEDICINE NA ANALIZU SEDIMENTA URINA

Vedina Kučuković

Univerzitet u Sarajevu - Fakultet zdravstvenih studija, Bosna i Hercegovina

SAŽETAK

Uvod

Analiza urina je najstariji postupak u medicini korišten u dijagnostičke svrhe koja se primjenjuje više hiljada godina i čini sastavni dio rutinskog laboratorijskog rada. Predanalitička faza, počevši od pravilnog uzorkovanja, transporta, pohrane do same pripreme uzorka, određuje kvalitetu uzorka i predstavlja važan dio procesa ka formiranju ispravnog laboratorijskog nalaza. Kako bi standardizirala analizu urina, Europska konfederacija laboratorijske medicine (ECLM) objavila je Europske smjernice za analizu urina, koje pružaju posebne upute za analizu sedimenta urina. Unatoč tome, laboratorije često modificiraju procedure na osnovu dostupnosti opreme, potrošnog materijala i reagenasa. Međutim, prije uvođenja u rutinsku praksu, potrebno je ispitati mogući uticaj na rezultate laboratorijskih ispitivanja.

Materijal i metode

U istraživanje je bilo uključeno 100 ispitanika, muškog i ženskog spola, koji su zadovoljili kriterije za uključenje u istraživanje. Istraživanje je prospektivna, eksperimentalna i komparativna studija sprovedena u periodu od tri mjeseca. Za eksperimentalni dio istraživanja korišteni su uzorci prvog jutarnjeg urina prikupljeni u sterilne jednokratne posude. Nakon fizičke i hemijske analize, svaki uzorak je dalje pripremljen na dva načina: u skladu sa ECLM smjernicama i prema modificiranom protoklu.

Rezultati

Primjena modificiranog protokola, rezultira statistički značajnim povećanjem broja eritrocita i leukocita u odnosu na urin pripremljen prema ECLM smjernicama. Primjena modificiranog protokola rezultira višom detekcijom kristala mokraćne kiseline, dok je ECLM protokolom utvrđena bolja detekcija kalcijum oksalata. Primjena različitih protokola nije imala značajan uticaj na rezultate nalaza soli, epitelnih ćelija, sluzi i bakterija.

Zaključak

Modifikacije protokola za analizu sedimenta urina, promjene relativne centrifugalne sile, vrste epruvete, volumena uzorka i načina uklanjanju supernatanta imaju statistički značaj na rezultate ispitivanja. Provođenja kvalitetne standardizirane procedure za mikroskopsku analizu sedimenta urina ima ogroman značaj obzirom da je cjelokupni pregled urina vrlo važna dijagnostička pretraga za procjenu stanja urinarnog sistema.

Ključne riječi: urin, sediment urina, ECLM

**IMPACT OF MODIFICATIONS OF THE EUROPEAN CONFEDERATION
OF LABORATORY MEDICINE GUIDELINES
ON URINE SEDIMENT ANALYSIS**

Kučuković V.

University of Sarajevo - Faculty of Health Studies, Bosnia and Herzegovina

ABSTRACT

Introduction

Urinalysis is the oldest diagnostic procedure in medicine, which has been applied for thousands of years and is an integral part of routine laboratory work. The pre-analytical phase, starting with proper sampling, transportation, storage and the preparation of the sample, determines the quality of the sample and represents an important part of the process towards a correct laboratory finding. In order to standardize urinalysis, the European Confederation of Laboratory Medicine (ECLM) published the European Guidelines for Urinalysis, which provide specific instructions for urine sediment analysis. Despite this, laboratories often modify procedures based on the availability of equipment, consumables and reagents. However, before implementing it into routine practice, it is necessary to examine the possible impact on the results of laboratory tests.

Material and methods

In the research were included 100 male and female respondents, who meet the criteria for inclusion in the research. The research is a prospective, experimental and comparative study conducted over a period of three months. For the experimental part of the research were used first morning urine samples collected in sterile disposable containers. After physical and chemical analysis, each sample was further prepared in two ways: according to ECLM guidelines and according to a modified protocol.

Results

Application of the modified protocol results statistically significant increase in the number of erythrocytes and leukocytes compared to urine prepared according to ECLM guidelines. Application of the modified protocol results in a higher detection of uric acid crystals, while the ECLM protocol established a better detection of calcium oxalate. The application of different protocols did not have a significant impact on the results of the findings of salt, epithelial cells, mucus and bacteria.

Conclusion

Modifications of the protocol for the analysis of urine sediment, changes in the relative centrifugal force, type of test tube, sample volume and method of removing the supernatant have a statistical significance on the test results. Carrying out a high-quality standardized procedure for the microscopic analysis of urine sediment is of great importance, since the overall examination of urine is a very important diagnostic test for assessing the state of the urinary system.

Keywords: *urine, urine sediment, ECLM*

**DIGITALNA TRANSFORMACIJA U ZDRAVSTVU:
„KLJUČNA ULOGA DIGITALIZACIJE PODATAKA“**

Lejla Gurbeta Pokvić*, Emina Mrđanović

Naučnoistraživački institut Verlab za biomedicinski inženjering, medicinske uređaje i vještačku inteligenciju, Sarajevo, Bosna i Hercegovina

SAŽETAK

U modernom dobu, digitalna transformacija postaje ključna za unapređenje zdravstvenog sektora. Ova transformacija duboko utječe na način na koji pružamo zdravstvenu njegu. Centralni aspekt ove transformacije je digitalizacija podataka. Digitalizacija podataka u zdravstvu nije samo prebacivanje papirnatih zapisa u digitalni format. To je revolucionaran proces koji omogućava prikupljanje, pohranu i analizu ogromnih količina podataka o pacijentima i zdravstvenim procesima. Kroz ovo, pružatelji zdravstvene skrbi dobivaju bolji uvid u povijest bolesti, liječenja i preventivne mjere.

Osnaženi tehnološkim alatima, analitika podataka, telemedicina i vještačka inteligencija, zdravstveni stručnjaci imaju pristup informacijama u realnom vremenu. Ovo omogućuje brže donošenje odluka, bolje koordinisanje njege između različitih disciplina te veću personalizaciju liječenja.

Unatoč mnogim prednostima, postoji i niz izazova. Sigurnost podataka i zaštita privatnosti pacijenata ostaju glavne brige. Tehničke i kulturne prepreke također mogu usporiti ili otežati proces implementacije digitalnih tehnologija.

Ipak, postoje primjeri institucija koje su uspješno proveli ovu transformaciju. Njihove priče o uspjehu nude uvid u koristi digitalizacije u zdravstvu. Osim toga, prognoze za budućnost sugerišu daljnji napredak kroz inovacije i tehnološki razvoj.

Digitalna transformacija zdravstva putem digitalizacije podataka otvara vrata novim mogućnostima. Ključno je sagledati izazove s optimizmom, fokusirati se na rješenja i surađivati kako bismo zajednički oblikovali budućnost zdravstvene njege.

Ova prezentacija nije samo o informacijama koje dijelimo, već i o dijalogu koji želimo potaknuti.

**DIGITAL TRANSFORMATION IN HEALTHCARE:
“THE KEY ROLE OF DATA DIGITALIZATION”**

Gurbeta Pokvić L.*, Mrđanović E.

Verlab Research Institute for Biomedical Engineering, Medical Devices and Artificial Intelligence, Sarajevo, Bosnia and Herzegovina

ABSTRACT

In the modern age, digital transformation is becoming essential for the improvement of the healthcare sector. This transformation is profoundly affecting the way we deliver healthcare. A central aspect of this transformation is the digitization of data. Digitization of data in healthcare is not just about converting paper records into digital format. It is a revolutionary process that enables the collection, storage and analysis of huge amounts of data about patients and health processes. Through this, health care providers get a better insight into the history of the disease, treatment and preventive measures.

Empowered by technological tools, data analytics, telemedicine and artificial intelligence, healthcare professionals have access to real-time information. This enables faster decision-making, better coordination of care between different disciplines and greater personalization of treatment.

Despite the many advantages, there are also a number of challenges. Data security and protection of patient privacy remain major concerns. Technical and cultural barriers can also slow down or hinder the process of implementing digital technologies.

However, there are examples of institutions that have successfully implemented this transformation. Their success stories offer insight into the benefits of digitization in healthcare. In addition, forecasts for the future suggest further progress through innovation and technological development.

The digital transformation of healthcare through data digitization opens the door to new possibilities. The key is to look at challenges with optimism, focus on solutions and work together to shape the future of healthcare together.

This presentation is not only about the information we share, but also about the dialogue we want to encourage.

ZNAČAJ ODREĐIVANJA KONCENTRACIJE MOKRAĆNE KISELINE U SERUMU KOD PACIJENATA SA AKUTNIM INFARKTOM MIOKARDA U ODNOSU NA PRISUSTVO ŠEĆERNE BOLESTI

Jasmina Kišija-Bajrić

Zavod za medicinu rada i sportsku medicinu ZDK, Zenica, Bosna i Hercegovina

SAŽETAK

Uvod

Mokraćna kiselina je heterociklični spoj ugljika, azota, oksigena i hidrogena, nastala kao produktat metaboličke razgradnje purinskih nukleotidnih baza adenina i guanina većinom iz životinjskih proteina. U organizmu joj se pripisuju mnoge važne fiziološke funkcije, ali isto tako i prisustvo u patofiziološkim procesima u sklopu bolesti metaboličkog sindroma (kao što su npr. akutni infarkt miokarda, dijabetes melitus). U navedenom istraživanju se kroz ispitivanje serumskih koncentracija urata istraživala njihova uloga u (pato)fiziološkim mehanizmima organizma nakon miokardne infarkcije.

Materijal i metode

U istraživanje su bili uključeni pacijenti koji su boravili na Klinici za bolesti srca, krvnih žila i reumatizam Kliničkog centra Univerziteta u Sarajevu. Nakon primjene faktora uključenja, u istraživanje je konačno ušao 61 ispitanik dobi od 37 do 81 godine života sa dijagnozom akutnog infarkta miokarda. U prvoj grupi od 28 ispitanika pacijenti su kao komorbiditet imali dijagnozu dijabetes melitusa tipa 2, dok kod 33 ispitanika druge grupe ovo oboljenje nije bilo prisutno.

Rezultati

Nakon sprovedenog istraživanja i analize dobivenih rezultata dobiveno je da su postojale razlike u smislu da su prosječne koncentracije mokraćne kiseline bile više kod pacijenata sa akutnim infarktom miokarda sa dijabetes melitusom tipa 2 kao komorbiditetom, iako one nisu bile i statistički značajne. Također, postojale su i povezanosti, u smislu da su niže vrijednosti eejkcione frakcije, više vrijednosti mitralne regurgitacije i više vrijednosti dimenzija lijeve pretkomore i lijeve komore u dijastoli bile praćene sa višim koncentracijama mokraćne kiseline kod pacijenata sa akutnim infarktom miokarda, koje nisu bile i statistički značajne.

Zaključak

Na osnovu analize rezultata, diskusije i zaključaka ove studije predlaže se da se mokraćna kiselina smatra biomarkerom dešavanja kod akutnog infarkta miokarda i u tom smislu izvede daljnja istraživanja.

Ključne riječi: mokraćna kiselina, akutni infarkt miokarda, dijabetes melitus.

THE IMPORTANCE OF DETERMINING THE CONCENTRATION OF URIC ACID IN SERUM IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION IN RELATION TO THE PRESENCE OF DIABETES

Kišija Bajrić J.

Institute for Occupational Medicine and Sports Medicine of ZDK, Zenica,
Bosnia and Herzegovina

ABSTRACT

Introduction

Uric acid is a heterocyclic compound of carbon, nitrogen, oxygen and hydrogen, formed as a metabolic degradation product of purine nucleotide bases of adenine and guanine mainly from animal proteins. It has many important physiological functions attributed in the organism, but it is also present in pathophysiological processes within the metabolic syndrome diseases (such as acute myocardial infarction, diabetes mellitus, etc.). In this study, the role of urates in the (patho)physiological mechanisms of the organism after myocardial infarction was studied through the examination of serum urate concentrations of the examinees.

Material and methods

The research involved patients who were at the Clinic for diseases of heart, blood vessels and rheumatism of Clinical Center of University of Sarajevo. After applying factors for inclusion, 61 subjects from 37 to 81 years of age with the diagnosis of acute myocardial infarction finally entered the study. In the first group of 28 subjects, patients had diagnosis of type 2 diabetes mellitus as comorbidity, while 33 others in the second group did not have this disease.

Results

After conducting the study and analyzing the obtained results, there were determined differences, in the way that the average uric acid concentrations were higher in patients with acute myocardial infarction altogether with type 2 diabetes mellitus as comorbidity, although they were not statistically significant. Also, there were determined correlations, in the way that the lower values of the ejection fraction, the higher values of the

mitral regurgitation and the higher values of the dimensions of the left atrium and left ventriculum in diastola were followed with higher uric acid concentrations in patients with acute myocardial infarction, although they were not statistically significant.

Conclusion

Based on the analysis of the results, discussion and conclusions of this study, it is suggested that uric acid should be considered as a biomarker of events in acute myocardial infarction, and in that way to carry out further research.

Keywords: uric acid, acute myocardial infarction, diabetes mellitus

AKREDITACIJA, PREDNOSTI I POSTUPCI

Sanela Avdagić-Tanković

Institut za akreditiranje BiH, Sarajevo, Bosna i Hercegovina

SAŽETAK

Medicinske laboratorije igraju ključnu ulogu u pružanju zdravstvenih usluga, pružajući osnovne dijagnostičke testove i praćenje napretka toka liječenja. Kako bi se osigurala pouzdanost, kompetentnost i ukupni kvalitet laboratorija, akreditacija prema ISO 15189 je znak povjerenja koji potvrđuje njihovu usklađenost sa međunarodnim standardima.

Šta je akreditacija?

Akreditacija se postiže kada laboratorija ima uspostavljen sistem upravljanja kvalitetom koji je u skladu sa zahtjevima standarda ISO 15189. Akreditaciju laboratorije, sprovodi neovisno ovlašteno tijelo za akreditaciju (npr. BATA) koje ocjenjuje laboratoriju kroz provjeru da li sistem upravljanja kvalitetom zaista funkcioniše kako bi trebao i da li je u skladu sa standardom. Akreditaciono tijelo takođe radi u skladu sa standardom (ISO/IEC 17011) i član je Evropske organizacije za akreditaciju (EA) i Međunarodne saradnje za akreditaciju laboratorija (ILAC).

Šta je ISO 15189?

ISO 15189 Medicinske laboratorije – Zahtjevi za kvalitet i kompetentnost je međunarodni standard koji utvrđuje zahteve za kvalitet i kompetentnost u medicinskim laboratorijama. Pruža okvir za razvoj upravljanja kvalitetom i osigurava da laboratorije rade u skladu sa harmoniziranim standardima. Za razliku od ISO 9001, koji postavlja kriterijume za sisteme upravljanja kvalitetom u bilo kojoj organizaciji, ISO 15189 se posebno fokusira na jedinstvene zahtjeve medicinskih laboratorija. Standard pokriva širok spektar disciplina, uključujući kliničku biohemiju, toksikologiju, hematologiju, transfuziju krvi, mikrobiologiju, virologiju, parazitologiju, serologiju, histopatologiju, citologiju, mrtvačnice, imunologiju, genetiku, andrologiju i histokompatibilnost i imunogenetiku, kao i usluge testiranja uz pacijenta (sastavni dio novog izdanja).

Važnost akreditacije u skladu sa ISO 15189

Iako akreditacija nije obavezna u svakoj zemlji, njen značaj ne treba potcijeniti, posebno u oblasti javnog zdravlja. Akreditacija služi kao znak kompetentnosti, demonstrirajući

posvjećenost laboratorije pružanju stručnih i visokokvalitetnih usluga. Pruža nekoliko ključnih prednosti koje doprinose ukupnom uspjehu i reputaciji medicinskih laboratorija.

Globalno priznanje

ISO 15189 je globalno priznati standard (u EU od 2003). Kroz multilateralne sporazume o međusobnom priznavanju (MLA) u okviru Međunarodne saradnje za akreditaciju laboratorija (ILAC), laboratorije akreditirane prema ISO 15189 izdaju izvještaje o ispitivanju prihvaćene u preko 80 zemalja širom svijeta. Ovo globalno priznanje omogućava laboratorijama da doprinesu zdravstvenom zdravlju ne samo u svojoj zemlji već i na globalnom nivou.

AKREDITACIJA, PREDNOSTI I POSTUPCI

Avdagić-Tanković S.

Institute for Accreditation of B&H, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Medical laboratories play a critical role in the delivery of healthcare services, providing essential diagnostic tests and monitoring treatment progress. To ensure the reliability, competence, and overall quality of these laboratories, ISO 15189 accreditation is a mark of confidence that verifies their adherence to international standards.

What is accreditation?

Accreditation is achieved when the laboratory has a quality management system in place that complies with the requirements of the ISO 15189 standard. To accredit a laboratory an independent notified accreditation body (eg. BATA) assesses the laboratory to investigate if the quality management system indeed functions as it is supposed to and if it complies with the standard. Accreditation body itself also operates according to a standard (ISO/IEC 17011) and is member of the European Co-operation for Accreditation (EA) and International Laboratory Accreditation Cooperation (ILAC).

What is ISO 15189?

ISO 15189 *Medical Laboratories – Requirements for quality and competence* is an international standard that specifies the requirements for quality and competence in medical laboratories. It provides a framework for the development of management system and ensures that laboratories operate in line with harmonized standards. Unlike ISO 9001, which sets out criteria for quality management systems in any organisation, ISO 15189 specifically focuses on the unique requirements of medical laboratories.

The standard covers a wide range of disciplines, including clinical biochemistry, toxicology, haematology, blood transfusion, microbiology, virology, parasitology, serology, histopathology, cytology, mortuaries, immunology, genetics, andrology, and histocompatibility & immunogenetics, as well as point-of-care testing services (included in new version).

Importance of ISO 15189 accreditation

While ISO 15189 accreditation is not mandatory in every country, its significance

should not be underestimated, especially in the field of public health. Accreditation serves as a mark of competence, demonstrating a laboratory’s dedication to delivering proficient and high-quality services. It provides several key benefits that contribute to the overall success and reputation of medical laboratories.

Global recognition

ISO 15189 is a globally recognised standard (in EU from 2003). Through multilateral mutual recognition arrangements (MLA) within the International Laboratory Accreditation Cooperation (ILAC), laboratories accredited to ISO 15189 have their certificates and test reports accepted in over 80 countries worldwide. This global recognition allows laboratories to contribute to medical health not only within their own country but also on a global scale.

**IZMJENE U NOVOM IZDANJU STANDARDA ZA KVALITET
I KOMPETENTNOST MEDICINSKIH LABORATORIJA
BAS EN ISO 15189:2023 (ISO 15189:2022)**

Erna Skenderović

Institut za akreditiranje BiH, Sarajevo, Bosna i Hercegovina

SAŽETAK

Implementacija zahtjeva standarda ISO 15189:2022 predstavlja međunarodno prihvaćen i priznat način osiguranja kvaliteta usluga medicinskih laboratorija. Novo izdanje standarda ISO 15189:2022 „Medicinske laboratorije - Zahtjevi za kvalitet i kompetentnost“ naglašava brigu o pacijentu, kontinuirana poboljšanja, a takođe uvodi princip implementacije zasnovan na riziku. Struktura standarda je usklađena sa standardom ISO/IEC 17025:2017 i kompatibilna je sa elementima sistema upravljanja prema standardu ISO 9001. Novo izdanje standarda ISO 15189:2022 sadrži elemente u vezi sa ispitivanjima uz pacijenta (point-of-care) koji su ranije bili propisani u standardu ISO 22870:2016.

U novom izdanju standarda značajno su unaprijeđeni zahtjevi koje se odnose na zaštitu nepristrasnosti, povjerljivosti i prava pacijenata. Jedan od ciljeva revizije standarda je bio da se osigura prilagođavanje sistema upravljanja medicinskih laboratorija prema njihovim specifičnim potrebama, a u zavisnosti od konteksta i kompleksnosti laboratorije, zbog čega je smanjen broj propisanih zahtjeva u odnosu na prethodno izdanje. Omogućeno je više fleksibilnosti u implementaciji određenih zahtjeva, pri čemu se odluke o nivou i načinu implementacije moraju zasnivati na analizi rizika. Takođe, uzimajući u obzir napredak informacionih tehnologija, unaprijeđeni su zahtjevi za informacionu sigurnosti i upravljanje podacima u laboratorijskim informacionim sistemima.

Upoređivanjem prethodnog i novog izdanja može se zaključiti da ključni zahtjevi koji se odnose na kvalitet rezultata medicinskih ispitivanja nisu doživjeli značajne promjene, čime se potvrđuje da je implementacija standarda ISO 15189 dugoročno jedan od najpouzdanijih alata za osiguranje povjerenja u usluge medicinskih laboratorija. Akreditiranje medicinskih laboratorija prema standardu ISO 15189 omogućava njihovo prepoznavanje kao kompetentnih laboratorija koje kontinuirano osiguravaju pouzdane usluge, uz stalna poboljšanja i brigu o pacijentu.

**A REVIEW OF CHANGES IN THE NEW STANDARD FOR QUALITY
AND COMPETENCE OF MEDICAL LABORATORIES
BAS EN ISO 15189:2023 (ISO 15189:2022)**

Skenderović E.

Institute for Accreditation of B&H, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Implementation of requirements prescribed in the ISO 15189:2022 standard is considered an internationally accepted and recognized tool ensuring the quality of medical laboratories' services. The new issue of the standard ISO 15189:2022 „Medical laboratories – Requirements for quality and competence“ highlights patient care, continuous improvement and introduces the risk-based principle. The structure of the standard is aligned with the ISO/IEC 17025:2017 standard, ensuring compatibility with the ISO 9001 standard as well. Furthermore, the new issue of the standard ISO 15189:2022 now includes the elements related to point-of-care testing, previously prescribed in the ISO 22870:2016 standard.

In the new issue of the standard, requirements for impartiality, confidentiality and patient's rights were significantly improved. One of the aims of the revision was to ensure the design of the system according to the specific needs of laboratories, considering the context and complexity of the laboratory, resulting in less prescribed requirements in comparison to the previous issue. More flexibility is allowed in the implementation of particular requirements, based on risk analysis. Considering the advances in information technology, the requirements for information security and data management in laboratory information systems have been improved.

A comparison of the previous and the new issue of the standard shows no significant changes related to the key requirements ensuring the quality of the results of medical examinations, confirming the implementation of the standard ISO 15189 as a long-term tool for confidence in medical laboratories' services. Accreditation of medical laboratories to ISO 15189 ensures their recognition as competent laboratories, continually delivering confident services, committed to continuous improvement and patient care.

erna.skenderovic@bata.gov.ba

**CANDIDA ALBICANS — MEHANIZMI NASTANKA INFEKCIJA,
DIJAGNOSTIKA I LIJEČENJE**

Jasminka Talapko

Fakultet za dentalnu medicinu i zdravstvo Osijek, Hrvatska

SAŽETAK

Candida albicans je gljivica koja je prisutna kod 50% populacije kao komenzal, odnosno, dio je mikrobiote. Posredstvom raznih čimbenika dolazi do poremećaja u homeostazi *C.albicans* što ima za posljedicu prijelaz iz normalne flore na uzročnika oportunističkih i patogenih infekcije, naime, komenzalni odnos je prisutan sve dok postoji ravnoteža između imunološkog sustava domaćina i čimbenika virulencije *C. albicans*. Za nastanak kandidijaze iznimno je bitna virulentnost *C.albicans* jer tada je *C.albicans* sposobna izazvati čitav niz različitih kliničkih manifestacija koje mogu biti lokalizirane poput mukokutanih poremećaja pa sve do invazivnih bolesti koje zahvaćaju više organskih sustava i time značajno ugrožavaju život oboljelog.

Mehanizam nastanka infekcije uzrokovane gljivicom *C.albicans*: na čimbenicima virulencije koje gljivica posjeduje, a koji aktivno sudjeluju kako u patofiziologiji nastanka tako i u napredovanju tijekom infekcije se zasniva mehanizam nastanka infekcija uzrokovanih *C.albicans*. Prvi korak je kolonizacija koja je ujedno i inicijalna infekcija i uzrokuje ju jedna skupina čimbenika virulencije dok širenje infekcije pomaže druga skupina. Prijelaz iz komenzalnog oblika u patološki se odvija zahvaljujući polimorfizmu, morfološkom prijelazu u kojem blastospore prelaze u hife dok su pseudohife prijelazni oblik. Upravo je hifalni oblik invazivan jer u tom obliku *C.albicans* aktivno prodire u tkivo domaćina. Proces inducirane endocitoze značajno je ovisan i o aktivnosti domaćina, a o aktivnosti *C.albicans* je ovisna aktivna penetracija. U formiranje hifa je uključeno nekoliko signalnih puteva, a najznačajniji je cAMP-ovisna protein kinaza A (ciklički adenzin monofosfat PKA). Kandidalizin je hifa-specifični toksin koji je ključan čimbenik nastanka kandidijaze te dovodi do uspostave sustavne infekcije i u konačnici do smrti. Poseban problem predstavlja sposobnost *C.albicans* da stvara biofilm što je bitan čimbenik patogenosti. Zlatnim standardom u dijagnostici invazivne kandidijaze se smatra klasična metoda kultivacije. Danas su u uporabi i brojni nekultivacijski dijagnostički testovi kao i brojni molekularni testovi (PCR). U liječenju invazivne kandidijaze koriste se tri skupine antimikotika: azoli, ehinokandini i polieni,

a koji će se antimikotik primjeniti u liječenju, ovisi o mjestu infekcije te o komorbiditetima samoga pacijenta.

Projekt IP 8 – FDMZ -2023

Ključne riječi: *Candida albicans*, dijagnostika, infekcija, liječenje

CANDIDA ALBICANS — MECHANISMS OF INFECTION, DIAGNOSIS AND TREATMENT

Talapko J.

Faculty of Dental Medicine and Health, Osijek, Croatia

ABSTRACT

Candida albicans is a fungus that occurs as a commensal in 50% of the population; it is part of the microbiota. Various factors disrupt the homeostasis of *C. albicans*, resulting in the transition from a normal flora to the cause of opportunistic and pathogenic infections, i.e., the commensal relationship is present as long as there is a balance between the host's immune system and the virulence factors of *C. albicans*. The virulence of *C. albicans* is extremely important for the development of candidiasis, as *C. albicans* can cause a whole range of different clinical manifestations, which can be localized, such as mucocutaneous disorders, to invasive disease affecting multiple organ systems, thereby significantly endangering the patient's life.

The mechanism of infection caused by the fungus *C. albicans*: the mechanism of the infection caused by *C. albicans* is based on the virulence factors that the fungus possesses and which are actively involved in both the pathophysiology of the development and the progression of the infection. The first step is colonization, i.e., the initial infection, which is caused by one group of virulence factors, while another group promotes the spread of the infection. The transition from the commensal to the pathological form occurs thanks to polymorphism, a morphological transition in which blastospores transform into hyphae, while pseudohyphae represent a transitional form. The hyphal form is invasive, as *C. albicans* in this form actively invade the host tissue. The induced endocytosis is mainly dependent on the activity of the host, and the active penetration is dependent on the activity of *C. albicans*. Several signaling pathways are involved in the formation of hyphae, the most important of which is cAMP-dependent protein kinase A (cyclic adenosine monophosphate PKA). Candidalysin is a hyphae-specific toxin that is a crucial factor in the development of candidiasis and leads to the establishment of a systemic infection and, ultimately, to death. A particular problem is the ability of *C. albicans* to form a biofilm, a significant factor in pathogenicity. The classical culture method is the gold standard for diagnosing invasive candidiasis. Numerous diagnostic tests without cultivation and molecular tests (PCR) are used today. Three groups of antimycotics are used to treat invasive candidiasis: azoles, echinocandins, and polyenes.

Which antimycotic is used for treatment depends on the location of the infection and the patient's concomitant diseases.

Grant No. IP 8 – FDMZ - 2023

Keywords: *Candida albicans*, diagnosis, infection, treatment

DISTRIBUCIJA I VRSTA SEROGRUPA *LEGIONELLA* SPP. NA PROSTORU FEDERACIJE BOSNE I HERCEGOVINE

Emilija Hrapović¹, Adna Mesihović^{1,2}

¹Sveučilište/Univerzitet "VITEZ", Vitez, Travnik, Bosna i Hercegovina

²Ministarstvo za nauku, visoko obrazovanje i mlade KS, Sarajevo,

Bosna i Hercegovina

SAŽETAK

Uvod

Infekcija *Legionellom* uglavnom se događa inhalacijom aerosola generiranog iz vodenih izvora poput distribucijskih sustava i rashladnih tornjeva. Vrsta *Legionella pneumophila* odgovorna je za otprilike 90% slučajeva legioneloze, od čega je oko 85% pripisano serogrupi 1. Druge vrste *Legionelle* rijetko su patogene za ljude, pri čemu su najčešće *L. longbeachae* (3.9%) i *L. bozemanii* (2.4%), osim u Australiji i Novom Zelandu, gdje je *L. longbeachae* odgovorna za 30% slučajeva legionarske bolesti. Nasuprot tome, distribucija vrsta *Legionella* i serogrupa u okolišu slabo je poznata; većina okolišnih studija obuhvaćala je ograničen broj uzoraka i/ili su samo identificirale vrstu *L. pneumophila*.

Materijal i metode

Istraživanje distribucije i vrsta serogrupa *Legionella* spp. na prostoru Federacije Bosne i Hercegovine provedeno je u razdoblju od 2014. do 2018. godine u turističkim i ugostiteljskim objektima. Ovo istraživanje analiziralo je sojeve *Legionelle* koristeći Liofilchem – ov *Legionella* Latex Kit tipiziranje za identifikaciju.

Rezultati

Od ukupno 237 analiziranih uzoraka, *Legionella* je potvrđena u 25.74% (61 uzorak), dok nije potvrđena u preostalim 74.26% (176 uzoraka). U pozitivnim uzorcima, *Legionella pneumophila* Serogrupa 1 detektirana je u 59.01% (36 uzoraka), *Legionella pneumophila* Serogrupa 2-15 u 26.23% (16 uzoraka), a serogrupa *Legionella* species u 14.75% (9 uzoraka). Prosječna temperatura u pozitivnim uzorcima iznosila je 51.79 °C, s raznolikošću od 31.9 °C do 69 °C. *Legionella pneumophila* Serogrupa 1 je detektirana u 22.95% (n=14) uzoraka pri temperaturi ispod 20 °C, 21.31% (n=13) uzoraka pri temperaturi od 21-50 °C, te 24.59% (n=15) uzoraka pri temperaturi većoj od 50 °C. Od

ukupnog broja pozitivnih uzoraka, 65.58% (n=40) je pokazalo nedostatak klora. U tih 40 slučajeva, *Legionella pneumophila* Serogrupa 1 je detektirana u 55%(n=22) uzoraka, *Legionella pneumophila* Serogrupa 2-15 u 35% (n=14) uzoraka, a *Legionella species* u 10%(n=4) uzoraka.

Zaključak

Rezultati ovog istraživanja pružaju dokaz da *Legionella* predstavlja značajan javnozdravstveni problem. Kontinuirani monitoring pomoći će u poboljšanju razumijevanja epidemiologije *Legionelle* u BiH te u provedbi učinkovitih mjera kontrole kako bi se smanjila njena pojava u vodi namijenjenoj za ljudsku potrošnju.

Ključne riječi: *Legionella*, *Serogrupa*, *distribucija*

DISTRIBUTION AND SEROGROUP TYPES OF *LEGIONELLA* SPP. IN THE TERRITORY OF THE FEDERATION OF BOSNIA AND HERZEGOVINA

Hrapović E¹, Mesihović A^{1,2}

¹"VITEZ" University, Travnik, Bosnia and Herzegovina

²Ministry of Science, Higher Education and Youth KS, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

Legionella infection mainly occurs by inhalation of aerosols generated from water sources such as distribution systems and cooling towers. The *Legionella pneumophila* species is responsible for approximately 90% of legionellosis cases, of which approximately 85% are attributed to serogroup 1. Other *Legionella* species are rarely pathogenic to humans, with the most common being *L. longbeachae* (3.9%) and *L. bozemanii* (2.4%), except in Australia and New Zealand, where *L. longbeachae* is responsible for 30% of Legionnaires' disease cases. In contrast, the distribution of *Legionella* species and serogroups in the environment is poorly known; most environmental studies included a limited number of samples and/or only identified the *L. pneumophila* species.

Material and methods

Investigation of the distribution and types of serogroups of *Legionella* spp. in the territory of the Federation of Bosnia and Herzegovina, was conducted in the period from 2014 to 2018 in tourist and hospitality facilities. This study analyzed *Legionella* strains using Liofilchem's *Legionella* Latex Typing Kit for identification.

Results

Out of a total of 237 analyzed samples, *Legionella* was confirmed in 25.74% (61 samples), while it was not confirmed in the remaining 74.26% (176 samples). In positive samples, *Legionella pneumophila* Serogroup 1 was detected in 59.01% (36 samples), *Legionella pneumophila* Serogroup 2-15 in 26.23% (16 samples), and *Legionella* species serogroup in 14.75% (9 samples). The average temperature in the positive samples was 51.79 °C, with a range of 31.9 °C to 69 °C. *Legionella pneumophila*

Serogroup 1 was detected in 22.95% (n=14) of samples at a temperature below 20 °C, 21.31% (n=13) of samples at a temperature of 21-50 °C, and 24.59% (n=15) of samples at a temperature higher than 50 °C. Of the total number of positive samples, 65.58% (n=40) showed chlorine deficiency. In those 40 cases, *Legionella pneumophila* Serogroup 1 was detected in 55% (n=22) of samples, *Legionella pneumophila* Serogroup 2-15 in 35% (n=14) of samples, and *Legionella species* in 10% (n=4) of samples.

Conclusion

The results of this research provide evidence that *Legionella* represents a significant public health problem. Continuous monitoring will help in improving the understanding of the epidemiology of *Legionella* in Bosnia and Herzegovina and in the implementation of effective control measures to reduce its occurrence in water intended for human consumption.

Keywords: *Legionella, Serogroup, distribution*

UTJECAJ COVID-19 PANDEMIJE NA ODRŽIVOST Ljudskih RESURSA U KLINICI ZA INFEKTIVNE BOLESTI U ZAGREBU

Mirjana Stupnišek

Klinika za infektivne bolesti "Dr. Fran Mihaljević", Odjel za kontrolu kvalitete,
Zagreb, Hrvatska

SAŽETAK

Uvod

Tijekom pandemije COVID-19 sustav javnog zdravstva odigrao je ključnu ulogu u borbi protiv SARS-CoV-2. Pandemija je istaknula arhitektonske, infrastrukturne i kadrovske nedostatke brojnih zdravstvenih ustanova. Zdravstveni radnici, posebice oni koji rade na odjelima za hitan prijam i odjelima za liječenje zaraznih bolesti, posebno su bili izloženi infekciji SARS-CoV-2 (od engl. *Severe Acute Respiratory Syndrome Coronavirus-2*). Organizacijske praznine, neadekvatna osobna zaštitna oprema (OZO), niska usklađenost i izazovi u provedbi pravovremenih i učinkovitih mjera mogu dovesti do značajnih proboja COVID-19 u zdravstvenim ustanovama. Svrha ovog istraživanja bila je prikazati učestalost COVID-19 među zaposlenicima u zdravstvenoj ustanovi i prikazati učinkovitost mjera za sprječavanje i suzbijanje širenja SARS-CoV-2, kao infekcije povezane sa zdravstvenom zaštitom, s ciljem održavanja ljudskih resursa u pandemiji COVID-19.

Materijal i metode

Opservacijska studija provedena je od ožujka 2020. do listopada 2023. u Klinici za infektivne bolesti u Zagrebu, Hrvatska. Analizirani su podaci iz upitnika o izloženosti (zanimanje, vrsta izloženosti, rezultat testa na SARS-CoV-2, izolacija/karantena, cijepljenje) zaposlenika koji su bili u bliskom kontaktu s osobom pozitivnom na SARS-CoV-2. Etičko povjerenstvo Klinike odobrilo je ovo istraživanje.

Rezultati

U istraživanje je bilo uključeno ukupno 645 ispitanika, od čega 492 (76,3%) zdravstvenih radnika. Pozitivan test na SARS-CoV-2 utvrđen je kod 404 (62,6%), a mjera samoizolacije izrečena je za 241 (37,4%) zaposlenika, od kojih je 18 (7,5%) razvilo simptome bolesti i pozitivan test na SARS-CoV-2. Najveći broj pozitivnih zaposleni-

ka, njih 135 (33,4%), zabilježen je u petom epidemijском valu. Izloženost na radnom mjestu prijavilo je 237 (36,7%) ispitanika, izvan posla 221 (34,3%), a nepoznato 187 (29,0%). U Klinici je cijepljenje zaposlenika započelo 27. prosinca 2020. S dvije doze cijepljeno je ukupno 587 (76,7%) zaposlenika, 421 (55%) je primio booster dozu; a 81 (10,6%) zaposlenik se nije želio cijepiti. Među 81 (10,6%) zaposlenikom koji nisu bili cijepljeni niti prethodno zaraženi SARS-CoV-2, njih 20 (24,7%) postalo je pozitivno na SARS-CoV-2 nakon listopada 2021. Prije primovakcinacije, ukupno 99 (12,9%) zaposlenika imalo je dijagnosticiran COVID-19.

Zaključak

U promatranom razdoblju, 36,7% ispitanika inficiralo se sa SARS-CoV-2 na radnom mjestu, a 8,8% ispitanika postalo je pozitivno tijekom samoizolacije. Naše je istraživanje pokazalo da dobra organizacija, pravilna uporaba zaštitnih mjera i OZO, provedba učinkovitih SOP-a, učinkovitost mjera poput pravovremenih inspekcija i procjene rizika nakon incidenata izloženosti, testiranje zaposlenika te provedba mjera izolacije i samoizolacije mogu rezultirati nižom pojavnošću COVID-19 među zaposlenicima u zdravstvenim ustanovama unatoč svakodnevnoj izloženosti i velikom broju pacijenata pozitivnih na COVID-19.

THE IMPACT OF THE COVID-19 PANDEMIC ON THE SUSTAINABILITY OF HUMAN RESOURCES AT THE UNIVERSITY HOSPITAL FOR INFECTIOUS DISEASES IN ZAGREB

Stupnišek M.

University Hospital for Infectious Diseases "Dr. Fran Mihaljevic", Department for Quality Control, Zagreb, Croatia

ABSTRACT

Introduction

During the COVID-19 pandemic, the public health system played a key role in the fight against SARS-CoV-2. The pandemic highlighted the architectural, infrastructural, and personnel deficiencies of a large number of public health institutions. Healthcare workers, especially those working at emergency and infectious diseases departments, are particularly exposed to infection with Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Organizational gaps, inadequate personal protective equipment (PPE), low compliance, and challenges in implementing timely and effective measures can lead to significant outbreaks of COVID-19 in health settings. The purpose of this study was to show the frequency of COVID-19 among employees in health care institution and present the effectiveness of measures to prevent and suppress the spread of SARS-CoV-2, as an infection associated with health care, with the aim of sustaining human resources in the COVID-19 pandemic.

Material and methods

The observational study was conducted from March 2020 to October 2023 at the University Hospital for Infectious Diseases (UHID) in Zagreb, Croatia. Data from the self-reported questionnaire (occupation, type of exposure, SARS-CoV-2 test result, isolation/quarantine, vaccination) of the employees in close contact with SARS-CoV-2 positive person were analyzed. The UHID Ethics Committee approved this research.

Results

A total of 645 respondents were included in the study, of which 492 (76.3%) were HCWs. A positive test for SARS-CoV-2 was found in 404 (62.6%), and the measure

of self-isolation was pronounced for 241 (37.4%) employees, of whom 18 (7.5%) developed symptoms of the disease and positive test for SARS-CoV-2. The largest number of positive employees, 135 (33.4%), were recorded in the fifth epidemic wave. Exposure at the workplace was reported by 237 (36.7%) employees, out-of-work 221 (34.3%), and unknown 187 (29.0%).

In UHID, vaccination started on December 27, 2020. A total of 587 (76.7%) employees were vaccinated with two doses; 421 (55%) employees received a booster dose; and 81 (10.6%) employees did not want to be vaccinated. Among 81 (10.6%) employees who were neither vaccinated nor previously infected with SARS-CoV-2, 20 (24.7%) of them became positive for SARS-CoV-2 after October 2021. Before primovaccination, a total of 99 (12.9%) employees were diagnosed with COVID-19.

Conclusion

In the observed period, 36.7% of employees acquired SARS-CoV-2 infection at the workplace, and 8.8% of employees became positive during self-isolation. Our study showed that good organization, proper use of protective measures and PPE, implementation of effective SOPs, the effectiveness of measures such as timely inspections and risk assessment after exposure incidents, testing of employees, and the implementation of isolation and self-isolation measures can result in a lower incidence of COVID-19 among employees in healthcare facilities despite daily exposure and a high rate of COVID-19-positive patients.

UZORKOVANJE, OBRADA I ZASTUPLJENOST IZOLOVANIH MIKROORGANIZAMA IZ KRVI -HEMOKULTURA-

Vaid Frljučkić

Služba za kuhinju i sterilizaciju, Instituta za javno zdravlje Crne Gore, Crna Gora

SAŽETAK

Krv zdravih osoba je sterilna i zbog toga svako prisustvo mikroorganizama u krvi predstavlja infekciju krvi. Ako se radi o prolaznom prisustvu živih mikroorganizama u tekućoj krvi onda se radi o bakterijemiji, međutim ako dolazi do stalnog ponavljanja bakterijemija zbog zbog neprekidnog mehaničkog prodora mikroorganizama u krv iz lokalnog žarišta onda se ta infekcija krvi naziva sepsa, a sam proces zasijavanja i kultivisanja krvi na vještačkim hranilištima u cilju izolacije i identifikacije eventualno prisutnih mikroorganizama iz krvi naziva se hemokultura.

Tema izlaganja obuhvata etiologiju, patogenezu, uzorkovanje, obradu i interpretaciju nalaza obrađenih materijala, kao i rezultate prikaza najčešće izolovanih mikroorganizama, njihovu morfologiju, patogenezu kao i njihovu osjetljivost na određene antibiotike i hemioterapeutike.

Takođe da tema bude interesantnija u stručnom radu su predstavljeni statistički podaci jednogodišnjeg istraživanja sprovedenog na pacijentima KBC Podgorica, u cilju ispitivanja zastupljenosti izolovanih mikroorganizama iz obrađenih hemokultura, gdje je istraživanjem obuhvaćeno ukupno 1463 uzorka hemokultura ležećih pacijenata KBC Podgorica, odrađenih u laboratoriji Instituta za javno zdravlje, Cetra za medicinsku mikrobiologiju Podgorica.

Od ukupno obrađenih uzoraka, 640 (44%) hemokultura je bilo sa neonatologije, 403 (27%) sa pedijatrije i 420 (29%) sa drugih odjeljenja. Od ukupnog broja uzoraka, uvrđeno je 321 (22%) pozitivnih hemokultura, 1048 (72%) uzoraka je bilo sterilno, a u 94 (6%) uzoraka utvrđena je kontaminacija. Najviše zastupljeni izolati bili su koagulaza negativni stafilocoki, ukupno 193 (71.5%) uzoraka.

**SAMPLING, PROCESSING AND REPRESENTATION OF
ISOLATED MICROORGANISMS FROM
BLOOD – HEMOCULTURE**

Frljučkić V.

Laboratory Kitchen and Sterilization Department,
Institute of Public Health of Montenegro

ABSTRACT

The blood of healthy people is sterile, and therefore any presence of microorganisms in the blood represents a blood infection. If it is a transient presence of living microorganisms in the flowing blood, then it is bacteremia, however, if there is a constant currence of bacteremia due to the continuous mechanical penetration of microorganisms into the blood from local focus, then this infection of the blood is called sepsis, and the process of seeding and culturing blood on artificial feeding grounds in order to isolate and identify possibly present microorganisms from the blood is called hemoculture.

The topic of presentation includes etiology, pathogenesis, sampling, processing and interpretation of the findings of processed materials, as well as the results of the presentation of the most frequently isolated microorganisms, their morphology, pathogenesis, as well as their sensitivity to certain antibiotics and chemotherapeutics.

Also, to make the topic more interesting in my professional work, I presented the statistical data of my one-year research conducted on patients of KBC Podgorica, with the aim of examining the presence of isolated microorganisms from processed blood cultures, where the research included a total of 1463 samples of blood cultures from bedridden patients of KBC Podgorica, performed in the laboratory of the Institute for public health, Center for Medical Microbiology Podgorica.

Of the total processed samples, 640 (44%) blood cultures were from neonatology, 403 (27%) from pediatrics and 420 (29%) from other departments. From the total sample, 321 (22%) positive blood cultures were found, 1048 (72%) samples were sterile, and contamination was found in 94 (6%) samples.

The most common isolates were coagulase-negative staphylococci, a total of 193 (71.5%) samples.

vaid.frljuckic@ijzcg.me

ZASTUPLJENOST VISOKORIZIČNIH HPV TIPOVA U ŽENSKOJ POPULACIJI U TUZLANSKOM KANTONU

Arnela Mulahmetović^{1,2}

¹Zavod za biomedicinsku dijagnostiku i istraživanje Nalaz. Tuzla,
Bosna i Hercegovina

²Ginekološka ordinacija Omeragić, ordinacija za ginekologiju i akušerstvo,
Tuzla, Bosna i Hercegovina

SAŽETAK

Uvod

Cilj istraživanja je ispitivanje zastupljenost visokorizičnih HPV tipova u ženskoj populaciji u Tuzlanskom kantonu.

Materijal i metode

Istraživanje je provedeno kao komparativna studija u koju je uključeno 100 pacijentica u rasponu od 21 do 63 godine starosti na području Tuzle. Uzorci su prikupljeni u privatnoj ordinaciji Dr. Omeragić, ordinacija za ginekologiju i akušerstvo. Analiza uzoraka: Zavod za biomedicinsku dijagnostiku i istraživanje NALAZ. Za molekularnu dijagnostiku visokorizičnih tipova HPV-a iz brisa cerviksa korištena je RealTime PCR tehnika (qRT-PCR).

Rezultati

Od ukupno 100 testiranih žena, 30% je imalo pozitivne rezultate testa. Rezultati ovog istraživanja pokazuju da su tipovi HPV HR 39 i HPV HR 56 najrasprostranjeniji među visokorizičnim genotipovima (17% svaki tip), dok je HPV HR 16 drugi (13%). Najviše pozitivnih pacijentica nalazi se u dobnoj grupi od 40-49 godina..

Zaključak

Učestalost infekcije pojedinačnim visokorizičnim tipovima HPV-a je znatno češća u odnosu na infekcije uzrokovane višestrukim tipovima HPV-a. Iako je infekcija visokorizičnim tipovima HPV-a češća kod žena srednje životne dobi, kod žena mlađe životne dobi je češća infekcija višestrukim tipovima HPV HR-a. Kako bi se dobila bolja slika zastupljenosti visokorizičnih HPV tipova u ženskoj populaciji u Tuzlanskom kantonu

2. Konferencija sa međunarodnim sudjelovanjem "Laboratorijske tehnologije i izazovi"

neophodno je proširiti ovo istraživanje uključivanjem podataka o seksualnim navikama, vakcinaciji protiv HPV-a i informiranosti o spolno-prenosivim bolestima, te uključiti znatno veći broj ispitanica što ujedno predstavlja i limitaciju ove studije.

Ključne riječi: HPV; HPV genotipizacija; Tuzlanski kanton

THE PREVALENCE OF HIGH-RISK HPV TYPES IN THE FEMALE POPULATION IN THE TUZLA CANTON

Mulahmetović A^{1,2}

¹Institute for Biomedical Diagnostics and Research Nalaz.,
Tuzla, Bosnia and Herzegovina

²Omeragic Gynecological Clinic, a clinic for gynecology and obstetrics,
Tuzla, Bosnia and Herzegovina

ABSTRACT

Introduction

The aim of the research is to investigate the prevalence of high-risk HPV types in the female population in the Tuzla Canton.

Material and Methods

The research was conducted as a comparative study, involving 100 female patients ranging from 21 to 63 years of age in the Tuzla region. Samples were collected at the private practice of Dr. Omeragic, a clinic specializing in gynecology and obstetrics. Sample analysis was performed at the Institute for Biomedical Diagnostics and Research "NALAZ." For the molecular diagnosis of high-risk HPV types from cervical swabs, the RealTime PCR technique (qRT-PCR) was employed.

Results

Out of the 100 tested women, 30% had positive test results. The results of this study are satisfactory and demonstrate that HPV HR 39 and HPV HR 56 are the most prevalent among high-risk genotypes (17% each type), while HPV HR 16 is second on the list (13%). The highest number of positive patients was found in the age group of 40-49 years.

Conclusion

The frequency of infection with individual high-risk HPV types is significantly higher compared to infections caused by multiple HPV infections. Although high-risk HPV infection is more common in middle-aged women, multiple HPV HR infections are more common in younger women. To obtain a better understanding of the prevalence

of high-risk HPV types in the female population in the Tuzla Canton, it is necessary to expand this study by including data on sexual habits, HPV vaccination, awareness of sexually transmitted diseases, and a larger sample size, which represents a limitation of this study.

Keywords: HPV; HPV genotyping; Tuzla Canton

MOLEKULARNE METODE U LABORATORIJSKOJ DIJAGNOSTICI

Kamelija Madacki Todorović

Medicinski fakultet, Škola za nauku i tehnologiju, Sarajevo (SSST Sarajevo),
Sarajevo, Bosna i Hercegovina

SAŽETAK

Savremene molekularne metode revolucionirale su laboratorijsku dijagnostiku posljednjih desetljeća, pružajući nevjerovatne uvide u genetsku i molekularnu osnovu bolesti. Ovaj rad daje pregled ključnih molekularnih tehnika koje se koriste u laboratorijskoj dijagnostici i njihov uticaj na kliničku praksu. Rad obuhvata pregled tehnike amplifikacije nukleinskih kiselina kao što su lančana reakcija polimerazom (PCR), PCR u stvarnom vremenu, ističući njihove primjene u otkrivanju i kvantificiranju genetskog materijala. Dodatno, ulogu sekvenciranja sljedeće generacije (NGS) u otkrivanju genomskih informacija, omogućavajući sveobuhvatnu analizu genetskih varijacija povezanih s raznim bolestima. Primjena molekularne dijagnostike je ključna u tačnom i pravovremenom otkrivanju bolesti u infektivnim bolestima, onkologiji i genetskim poremećajima.

Kako se molekularne metode nastavljaju razvijati, primjena istih otvara mogućnosti za povećanje preciznosti, brzine i obima laboratorijske dijagnostike, što u konačnici pridonosi učinkovitom liječenju pacijenata, te personaliziranim pristupima liječenja pacijenta.

Napredak u molekularnim metodama revolucionirao je laboratorijsku dijagnostiku, nudeći neuporedivu preciznost i učinkovitost u otkrivanju i karakterizaciji bolesti. Naglasak je na primjeni molekularnih tehnika u savremenom dijagnostičkom pristupu, njihova uloga u identificiranju genetskih markera, uzročnika infekcija i različitih procesa na nivou ćelije.

Molekularne tehnike su transformirale genetsku analizu, omogućujući identifikaciju mutacija, genomskih varijacija i mikrobnih genoma s velikom preciznošću.

Tehnike hibridizacije nukleinskih kiselina, kao što su fluorescentna in situ hibridizacija (FISH) i microarray su metode koje olakšavaju vizualizaciju i identifikaciju specifičnih sekvenci DNA ili RNA, nudeći dragocjene uvide u hromosomske abnormalnosti i obrasce ekspresije gena.

Savremena primjena molekularne dijagnostike i metoda važne su u procesu donošenja kliničkih odluka, terapijske strategija i pristupa personalizirane medicine. Molekularne

2. Konferencija sa međunarodnim sudjelovanjem "Laboratorijske tehnologije i izazovi"

metode imaju sve istaknutiju ulogu u laboratorijskoj dijagnostici, pružajući kliničarima neprocjenjive uvide u tačnu dijagnostiku i personaliziranu brigu za pacijente.

Primjena molekularne dijagnostike pored zaraznih bolesti i genetike također ima ulogu u farmakogenomici, personaliziranoj medicini i praćenju onkoloških pacijena.

Ključne riječi: molekularne metode, laboratorijska dijagnostika, personalizirana medicina

MOLECULAR METHODS IN LABORATORY DIAGNOSTICS

Madacki Todorović K.

Medical school, School for Science and Technology, (SSST Sarajevo),
Sarajevo, Bosnia and Herzegovina

ABSTRACT

Modern molecular methods have revolutionized laboratory diagnostics in recent decades, providing incredible insights into the genetic and molecular basis of disease. This paper provides an overview of key molecular techniques used in laboratory diagnostics and their impact on clinical practice. The paper includes an overview of nucleic acid amplification techniques such as polymerase chain reaction (PCR), real-time PCR, highlighting their applications in the detection and quantification of genetic material. Additionally, the role of next-generation sequencing (NGS) in uncovering genomic information, enabling comprehensive analysis of genetic variation associated with various diseases. The use of molecular diagnostics is essential in the accurate and timely detection of diseases in infectious diseases, oncology and genetic disorders.

As molecular methods continue to develop, their application opens up possibilities for increasing the precision, speed and scope of laboratory diagnostics, which ultimately contributes to the effective treatment of patients and personalized patient treatment approaches.

Advances in molecular methods have revolutionized laboratory diagnostics, offering unparalleled precision and efficiency in disease detection and characterization. The emphasis is on the application of molecular techniques in the modern diagnostic approach, their role in identifying genetic markers, infectious agents and various processes at the cellular level.

Molecular techniques have transformed genetic analysis, enabling the identification of mutations, genomic variations, and microbial genomes with high precision.

Nucleic acid hybridization techniques such as fluorescence in situ hybridization (FISH) and microarray are methods that facilitate the visualization and identification of specific DNA or RNA sequences, offering valuable insights into chromosomal abnormalities and gene expression patterns.

Modern application of molecular diagnostics and methods are important in the process of making clinical decisions, therapeutic strategies and approaches to personalized medicine. Molecular methods are playing an increasingly prominent role in laboratory diagnostics, providing clinicians with invaluable insights into accurate diagnosis and personalized patient care. In addition to infectious diseases and genetics, the application of molecular diagnostics also plays a role in pharmacogenomics, personalized medicine and monitoring of oncology patients.

Keywords: molecular methods, laboratory diagnostics, personalized medicine

IZOLACIJA INFLUENZA VIRUSA NA ČELIJSKOJ KULTURI

Edina Zahirović^{1,3}, Irma Salimović-Bešić^{1,3}, Adis Muhić², Azra Čamdžić¹,
Amela Dedeić-Ljubović^{1,3}

¹Klinički centar Univerziteta u Sarajevu, OJ Klinička mikrobiologija,
Bosna i Hercegovina

²Klinički centar Univerziteta u Sarajevu, OJ Klinička patologija, citologija
i humana genetika,
Bosna i Hercegovina

³Univerzitet u Sarajevu, Fakultet zdravstvenih studija,
Bosna i Hercegovina

SAŽETAK

Uvod

Čelijska kultura predstavlja zlatni standard u izolaciji i identifikaciji influenza virusa. Najčešće korištena čelijska linija u istraživanju influenza A (H1)pdm09 i B virusa je Madin-Darby Canine Kidney (MDCK), izvedena iz epitela psećeg bubrega. Za izolaciju virusa influenza A podtip H3, preporučena je linija MDCK SIAT-1, proizvedena genetičkim inženjeringom. Proces replikacije virusa u čelijskoj kulturi otkriva se procjenom karakterističnih morfoloških promjena u ćelijama, poznatih kao citopatogeni efekat (CPE). Cilj ove studije je bio prikazati iskustva u implementaciji izolacije influenza virusa na čelijskoj kulturi u svijetlu razvoja novih dijagnostičkih tehnologija.

Materijal i metode

Ispitivanje je obuhvatilo respiratorne uzorke tokom tri uzastopne sezone influence u periodu od 2017. do 2020. godine. Uključeni su uzorci kod kojih je potvrđen virus influence rtRT-PCR (*real-time Reverse Transcription- Polymerase Chain Reaction*) metodom čiji je Ct (*Cycle treshold*) ≤ 30 . Uzorci su inokulirani na MDCK i MDCK SIAT-1, gdje je praćena pojava CPE tokom 7 dana intenziteta od 1-4.

Rezultati

U periodu istraživanja, 375 uzoraka imalo je pozitivan rtRT-PCR rezultat na prisustvo influenza virusa. Kriterij za inokulaciju (Ct ≤ 30) ispunjavalo je ukupno 77,60% (291/375) uzoraka, od čega je na MDCK liniju inokulirano 58,76%(171/291) influenza

2. Konferencija sa međunarodnim sudjelovanjem "Laboratorijske tehnologije i izazovi"

A(H1)pdm09 i 12,71% (37/291) influenza B (soj Victoria), dok je na MDCK-SIAT 1 liniju inokulirano 28,52% (83/291) uzoraka pozitivnih na influenza A(H3) virus. Jasan CPE uočen je kod 34,71% (101/291) inokuliranih uzoraka, neovisno o tipu/podtipu virusa i ćelijske linije. Izolacija influenza A(H1)pdm09 i B virusa bila je uspješna u 35,67% (61/171) odnosno 29,73% (11/37). Izolati influenza A(H3) virusa na MDCK-SIAT 1 ćelijskim kulturama prikupljeni su u 34,93% (29/83) inokuliranih uzoraka. Najveći udio inokuliranih uzoraka (54,45%; 55/101) imao je intenzitet CPE 3+/4 tokom četvrtog dana (44,55%;45/101)od inokulacije.

Zaključak

Ćelijska kultura i dalje ostaje nezamjenljiva metoda za antigensku karakterizaciju virusa, u ispitivanju osjetljivosti na antivirolike, kao i u proizvodnji vaccine, bez obzira na dužinu trajanja i nižu osjetljivosti u odnosu na metode molekularne detekcije virusa.

Ključne riječi: influenza, MDCK, CPE

ISOLATION OF INFLUENZA VIRUS IN CELL CULTURE

Zahirović E^{1,3}, Salimović-Bešić I^{1,3}, Muhić A², Čamdžić A¹, Dedeić-Ljubović A^{1,3}

¹Clinical Center of the University of Sarajevo, Clinical Microbiology,
Bosnia and Herzegovina

²Clinical Center of the University of Sarajevo, Clinical Pathology, Cytology and
Human Genetics, Bosnia and Herzegovina

³University of Sarajevo, Faculty of Health Studies,
Bosnia and Herzegovina

ABSTRACT

Introduction

Cell culture is the gold standard in the isolation and identification of influenza viruses. The most commonly used cell line in influenza A (H1)pdm09 and B virus research is Madin-Darby Canine Kidney (MDCK), derived from canine kidney epithelium. For the isolation of influenza virus A subtype H3, the line MDCK SIAT-1, produced by genetic engineering, is recommended. The process of viral replication in cell culture is detected by evaluating characteristic morphological changes in cells, known as the cytopathogenic effect (CPE).

Material and methods

The study included respiratory samples during three consecutive influenza seasons in the period from 2017 to 2020. Samples where the influenza virus was confirmed by the rtRT-PCR (real-time Reverse Transcription-Polymerase Chain Reaction) method and whose Ct (Cycle threshold) was ≤ 30 were included. The samples were inoculated on MDCK and MDCK SIAT-1, where the appearance of CPE was monitored during 7 days of intensity from 1-4.

Results

During the research period, 375 samples had a positive rtRT-PCR result for the presence of influenza virus. The criterion for inoculation ($Ct \leq 30$) was met by a total of 77.60% (291/375) of the samples, of which 58.76% (171/291) of influenza A(H1) pdm09 and 12.71% (37/291) influenza B (Victoria strain), while 28.52% (83/291) samples positive for influenza A(H3) virus were inoculated to the MDCK-SIAT 1 line.

Clear CPE was observed in 34.71% (101/291) of inoculated samples, regardless of virus type/subtype and cell line. Isolation of influenza A(H1)pdm09 and B virus was successful in 35.67% (61/171) and 29.73% (11/37), respectively. Influenza A(H3) virus isolates on MDCK-SIAT 1 cell cultures were collected in 34.93% (29/83) of the inoculated samples. The largest proportion of inoculated samples (54.45%; 55/101) had CPE intensity 3+/4 during the fourth day (44,55%;45/101) after inoculation.

Conclusion

Cell culture remains an irreplaceable method for antigenic characterization of viruses, in testing susceptibility to antivirals, as well as in vaccine production, regardless of the length of time and lower sensitivity compared to molecular virus detection methods.

Keywords: influenza, MDCK, CPE

ANTIBIOTSKA REZISTENCIJA UZROČNIKA INFEKCIJA URINARNOG TRAKTA

Aida Pilav, Dženita Nezirović

JU Zavod za javno zdravstvo kantona Sarajevo, Bosna i Hercegovina

SAŽETAK

Uvod

Rezistencija bakterija na antibiotik predstavlja prioritetni globalni javno-zdravstveni problem. Posljedice koje rezistencija bakterija na antibiotik ima u liječenju infekcija su neuspjeh terapije, širenje rezistentnih sojeva i povećani troškovi liječenja. Infekcije urinarnog trakta jedne su od najčešće prisutnih infekcija u vanbolničkoj praksi.

Cilj ovog istraživanja bio je da se identifikuju uzročnici infekcija urinarnog trakta i stepen njihove rezistencije na antimikrobne lijekove u Kantonu Sarajevo kao i njihova povezanost sa starošću i polom bolesnika.

Da bi se navedeni cilj rada ispunio biti će potrebno uzeti podatke iz baze podataka za analizu uzoraka urinokultura 200 pacijenata, a potom obraditi i analizirati podatke, prema vrsti uzročnika, antibiogramu te prema starosti i spolu pacijenta.

Istraživanje je pokazalo da postoji statistički značajan uticaj dobi i spoli na infekciju mokraćnog sistema.

Materijal i metode

Ova studija je analitičko-deskriptivna, retrospektivnog karaktera. Radi se o originalnom istraživačkom radu koji je obuhvatio 200 ispitanika, koji su grupisani prema etiologiji, istraživanjem je obuhvaćeno 200 uzoraka urinokultura u periodu septembar-decembar 2019. godine iz baze podataka Zavoda za javno zdravstvo Kantona Sarajevo.

Istraživanje je obavljeno u javnozdravstvenoj mikrobiološkoj laboratoriji u javnoj ustanovi Zavod za javno zdravstvo Kantona Sarajevo.

Statistička analiza prikupljenih podataka obavljena je korištenjem statističkog paketa Statistics SPSS V 23.0, gdje su se za pripremu i prikazivanje rezultata koristili programi paketa Microsoft Office-a odnosno Microsoft Word i Excel.

Za dokazivanje izvjesnih razlika između varijabli su korišteni neparametarski i parametarski statistički testovi obrade podataka. Obradeni podaci prikazani su pomoću grafikona i tabela različite formulacije.

Rezultati

Najzastupljenije bakterije koje su uzrokovale infekciju mokraćnog sistema u periodu od 01.09.2019. do 31.12.2019. su: *Escherichia coli* (66,45 % pozitivnih uzoraka), *Enterococcus faecalis* (11,54 % pozitivnih uzoraka), *Klebsiella* species (7,62% pozitivnih uzoraka), *Proteus* species (7,56 % pozitivnih uzoraka), *Escherichia coli* (ESBL) (2,2 % pozitivnih uzorka), *Klebsiella* spp. (ESBL) (1,60 % pozitivnih uzoraka), *Enterobacter* species (1,38 % pozitivnih uzoraka), te *Pseudomonas* species (1% pozitivna uzorka). Dakle, od ukupno 20181 ispitivanih uzoraka, 75% pacijenata je imalo uredan nalaz.

Statističkom analizom je utvrđeno da je rezistentni soj *E. coli* zastupljen u procentu od 20,9%, te da nije statistički značajan u odnosu na nerezistentni soj.

Rezistentni oblici *E. coli* najčešće su bili rezistentna na ampicilin (71% uzoraka), a potom slijedi gentamicin (11% uzoraka), cefoxitin (9% uzoraka), cephalexin (5% uzoraka), nitrofluantrion (3% uzoraka). Rezistentni oblici *E. coli* najmanje su bili rezistentni na amoxicilin.

Zaključak

Statističkom analizom podataka utvrđeno je da dob ima uticaj na infekciju mokraćnog sistema. Statističkom analizom podataka utvrđeno je da spol ima uticaj na infekciju mokraćnog sistema. Interakcija dobi i spola ima uticaj na zastupljenost mokraćnih infekcija.

Ključne riječi: infekcije mokraćnog sistema, rezistencija, antibiotic

ANTIBIOTIC RESISTANCE IN URINARY TRACT INFECTIONS

Pilav A, Nezirović Dž.

Cantonal Public Health of Sarajevo, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

Bacterial resistance to antibiotics is a priority global public health problem. A causal relationship between antibiotic consumption and bacterial resistance has been proven in numerous studies. The consequences that antibiotic resistance of bacteria has in the treatment of infections are trap failure, spread of resistant strains, and increased treatment costs. Urinary tract infections are one of the most common infections in outpatient practice.

The aim of this study was to identify the causes of urinary tract infections and the degree of their resistance to antimicrobial drugs in the Sarajevo Canton, as well as their relationship with the age and sex of patients.

In order to meet this goal, it will be necessary to conduct a desktop analysis of a urine sample of 200 patients, and then process and analyze data by type of causative agent, antibiogram and age and sex of the patient.

Research has shown that there is a statistically significant effect of age and gender on urinary tract infection.

Materijal and methods

This study is analytical-descriptive, retrospective in nature. It is an original research work that included 200 respondents, who were grouped according to etiology, the research included 200 urine culture samples in the period September-December 2019 from the database of the Public Health Institute of Canton Sarajevo.

The research was carried out in the public health microbiology laboratory in the public institution of the Institute of Public Health of Canton Sarajevo.

The statistical analysis of the collected data was performed using the statistics package Statistics SPSS V 23.0, where the Microsoft Office package programs, namely Microsoft Word and Excel, were used to prepare and display the results.

To prove certain differences between the variables, non-parametric and parametric statistical tests of data processing were used. Processed data are presented using graphs and tables of different wording.

Results

The most common bacteria that caused urinary tract infections in the period from September 1, 2019. until 31.12.2019. are: *Escherichia coli* (66.45% of positive samples), *Enterococcus faecalis* (11.54% of positive samples), *Klebsiella* species (7.62% of positive samples), *Proteus* species (7.56% of positive samples), *Escherichia coli* (ESBL) (2.2 % of positive samples), *Klebsiella* spp. (ESBL) (1.60% of positive samples), *Enterobacter* species (1.38% of positive samples), and *Pseudomonas* species (1% of positive samples). Therefore, out of a total of 20181 tested samples, 75% of patients had a normal result.

The statistical analysis determined that the resistant strain of *E. coli* is represented in the percentage of 20.9%, and that it is not statistically significant compared to the non-resistant strain.

Resistant forms of *E. coli* were most often resistant to ampicillin (71% of samples), followed by gentamicin (11% of samples), cefoxitin (9% of samples), cephalexin (5% of samples), nitrofluantrione (3% of samples). The resistant forms of *E. coli* were the least resistant to amoxicillin.

Conclusion

Statistical analysis of the data revealed that age has an influence on urinary tract infection. Statistical analysis of the data revealed that gender has an influence on urinary tract infection. The interaction of age and gender has an influence on the occurrence of urinary infections.

Keywords: urinary tract infections, resistance, antibiotics.

GLAVNI UZROCI ODBIJANJA DOBROVOLJNIH DARIVATELJA KRVI U ZAVODIMA ZA TRANSFUZIJSKU MEDICINU

Matea Rebrina¹, Mirjana Stupnišek²

¹Klinički bolnički centar Sestre milosrdnice, Klinički zavod za kemiju,
Zagreb, Hrvatska

²Klinika za infektivne bolesti „Dr. Fran Mihaljević“, Zagreb, Hrvatska

SAŽETAK

Uvod

Cilj je prikazati najčešće razloge odbijanja potencijalnih darivatelja krvi po spolu i usporediti ih između gradova Osijeka i Zagreba.

Materijal i metode

Istraživanje je provedeno po principu retrospektivne studije tijekom 2021. godine iz baza podataka Hrvatskog zavoda za transfuzijsku medicinu u Zagrebu i Kliničkog zavoda za transfuzijsku medicinu u Osijeku. Korišten je χ^2 -test, dok je statistička analiza napravljena pomoću programskog sustava *MedCalc* (inačica 14.12.0, *MedCalcSoftware*) uz razinu značajnosti od $P < 0,05$.

Rezultati

Hrvatski zavod za transfuzijsku medicinu u Zagrebu kao najčešći razlog odbijanja potencijalnih darivatelja krvi navodi sniženu koncentraciju hemoglobina zbog koje je odbijeno 7 119, od kojih 2 583 (36 %) muškarca i 4 536 (64 %) žena. Također, Klinički zavod za transfuzijsku medicinu u Osijeku odbio je najviše potencijalnih darivatelja krvi zbog snižene koncentracije hemoglobina, njih 660, od kojih 235 (36 %) muškaraca i 425 (64 %) žena. Nakon obrade podataka nema statistički značajne razlike u odbijanju potencijalnih darivatelja krvi zbog hemoglobina u Zagrebu i Osijeku uspoređujući ih po spolu ($P = 0,729$). Zbog krvnog tlaka odbijenih potencijalnih darivatelja krvi u Zagrebu bilo je 3 855, 2 375 (62 %) muškaraca i 1 480 (38 %) žena. Odbijenih potencijalnih darivatelja krvi zbog krvnog tlaka u Osijeku je bilo 369, 141 (38 %) muškarac i 228 (62 %) žena. Statistički značajna razlika u odbijanju potencijalnih darivatelja krvi zbog krvnog tlaka u gradovima po spolu postoji ($P < 0,001$).

Zaključak

Najčešći razlozi odbijanja dobrovoljnih darivatelja krvi tijekom 2021. godini u Hrvatskom zavodu za transfuzijsku medicinu u Zagrebu i Kliničkom zavodu za transfuzijsku medicinu u Osijeku jesu snižena koncentracija hemoglobina te krvni tlak kod obaju spolova.

Ključne riječi: darivatelji krvi; hemoglobin; krvni tlak

MAIN REASONS FOR REFUSAL OF VOLUNTARY BLOOD DONORS IN INSTITUTIONS FOR TRANSFUSION MEDICINE

Rebrina M¹, Stupnisek M²

¹University Hospital Centre Sisters of Mercy, Zagreb, Croatia

²University Hospital for Infectious Diseases „Dr. Fran Mihaljevic“, Zagreb, Croatia

ABSTRACT

Introduction

The aim of the study is to present the most common reasons for rejection of potential blood donors by gender and to compare them between the cities of Osijek and Zagreb.

Material and methods

The research was conducted according to the principle of a retrospective study during 2021 from the databases of the Croatian Institute for Transfusion Medicine in Zagreb and the Clinical Institute for Transfusion Medicine in Osijek. The chi-square test was used, while statistical analysis was performed using the MedCalc software system (version 14.12.0, MedCalcSoftware) with a significance level of $P < 0.05$.

Results

The Croatian Institute for Transfusion Medicine in Zagreb states that the most common reason for rejection of potential blood donors is low hemoglobin concentration, which led to the rejection of 7,119, of which 2,583 (36%) were men and 4,536 (64%) were women. Also, the Clinical Institute for Transfusion Medicine in Osijek rejected the most potential blood donors due to low hemoglobin concentrations, of which 660 were men (36%) and 425 (64%) were women. After processing the data, there is no statistically significant difference in the rejection of potential blood donors due to hemoglobin in Zagreb and Osijek, comparing them by gender ($P = 0.729$). There were 3,855 potential blood donors rejected due to blood pressure in Zagreb, while 2,375 (62%) were men and 1,480 (38%) were women. There were 369 rejected potential blood donors due to blood pressure in Osijek; 141 (38%) were men and 228 (62%). There is a statistically significant difference in the rejection of potential blood donors due to blood pressure in cities by gender ($P < 0.001$).

Conclusion

The most common reasons for refusing voluntary blood donors in 2021 at the Croatian Institute for Transfusion Medicine in Zagreb and the Clinical Institute for Transfusion Medicine in Osijek are low hemoglobin concentration and blood pressure in both sexes.

Keywords: Blood Donors; Blood Pressure; Hemoglobin

PROCJENA RIZIKA U ODNOSU NA LABORATORIJSKO PRAĆENJE KARCINOMA DOJKE KOD ŽENA

Amar Kustura*, Berina Hasanefendić¹

¹Klinički Centar Univerziteta u Sarajevu, Bosna i Hercegovina

SAŽETAK

Uvod

Osim genetske podloge odnosno postojanja historije karcinoma dojke u porodici i nošenja mutacija na *BRCA 1* i *BRCA 2* genu postoje i drugi rizikofaktori kao što su: gojaznost kao posljedica nezdravog života sa manjkom fizičke aktivnosti nakon menopauze, pušenje i konzumiranje alkohola, ali i starenje, nerađanje ili kasno prvo rađanje djeteta iza 30. godine života, nedojenje, menstruacija prije 12. godine života i menopauza iza 55. godine života, korištenje hormonske nadomjesne terapije i korištenje oralnih kontraceptiva. Ciljevi su: Ispitati da li postoji povećan rizik za razvoj karcinoma dojke u odnosu na godine starosti i rizikofaktore. Ispitati koja vrsta karcinoma dojke je najčešće dijagnostikovana kod žena u Kantonu Sarajevo. Ispitati koji tumorski markeri u kombinaciji ili zasebno su najčešće korišteni u dijagnozi ili praćenju karcinoma dojke i njegovih metastaza. Izvršiti procjenu osjetljivosti i specifičnosti za tumorske markere u praćenju recidiva karcinoma dojke kod žena.

Materijal i metode

Istraživanje je provedeno sa alatom za prikupljanje podataka o rizikofaktorima i tumorskim markerima iz kartona porodične medicine.

Rezultati

Pomoću χ^2 testa dokazano je da postoji statistička značajnost između starenja i drugih rizikofaktora i razvoja karcinoma dojke kod žena. Najčešće dijagnostikovani tip karcinoma dojke kod žena u Kantonu Sarajevo je invazivni duktalni karcinom.

Zaključci

Dokazane su radne hipoteze i odbačene nulte. Povišeni nivoi CA 15-3 za praćenje recidiva su imali osjetljivost koja je iznosila 81.8% sa specifičnošću koja je iznosila 100%.

RISK ASSESSMENT AND LABORATORY MANAGEMENT OF FEMALE BREAST CANCER

Kustura A*, Hasanefendić B¹

¹Clinical center University of Sarajevo, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

Except for genetic background or existence of history of breast cancer in the family and carrying mutations on BRCA 1 and BRCA 2 gene there are other risk factors: obesity as consequence of unhealthy life with lack of physical activity after menopause, smoking and drinking alcohol, aging, non-birth or late first birth after 30th year, no breastfeeding, menstruation before 12th year and menopause after 55th year, using hormonal replacement therapy and oral contraceptives. Examine if there is a higher risk for development of breast cancer in regards to age and risk factors. Examine which type of breast cancer is the most diagnosed among women in Kanton Sarajevo. Examine which tumor markers in combination or alone are most used in diagnosis or screening of breast cancer and its metastasis. Make an assesment of sensitivity and specificity for tumor markers in screening of relapse of female breast cancer.

Material and methods

Research is conducted with tool for gathering data of risk factors and tumor markers from family medicine record.

Results

With Chi-square test it is proved that there is a statistical significance between aging and other risk factors and development of female breast cancer. The most diagnosed type of female breast cancer in Kanton Sarajevo is invasive ductal cancer.

Conclusions

Affirmative hypotheses are proven and null hypotheses are rejected. Elevated levels of CA 15-3 used for screening of relapse had sensitivity of 81.8% with specificity of 100%.

amar.kustura@hotmail.com

KOMPARACIJA REZULTATA GLUKOZE NA RAZLIČITIM APARATIMA, KOD OSOBA SA DIJABETESOM – KROZ PRIKAZ SLUČAJA

Nermin Kotorić

Laboratorijski dijagnostički servis, Opća bolnica Tešanj, Bosna i Hercegovina

SAŽETAK

Uvod

Standardno liječenje dijabetesa tipa 1 oslanja se na praćenje glukoze u krvi na temelju niza tehnologija od samokontrole glukoze u krvi (BGM) do kontinuiranog praćenja glukoze u međustaničnoj tečnosti (CGM). Standardne preporuke za BGM aparate su 6 – 10 dnevnih mjerenja, dok CGM sistemi nude kontinuitet u mjerenju - svakih 5 minuta, sa nizom korisnih podataka o kretanju glukoze. Čak i dok CGM tehnologija sazrijeva, pacijenti koriste BGM za kalibraciju CGM sistema i doziranje. Pitanje kako tačnost obje tehnologije međusobno djeluju još uvijek je u stalnom ispitivanju i poređenju. Ciljevi su: 1. Komparirati rezultate više vrsta glukometara i kontinuiranog mjerača glukoze sa referentnim vrijednostima glukoze iz venske krvi i utvrditi prosječna odstupanja do 10%, i odstupanja od 10 do 20%., 2.Odabrati najkvalitetniji aparata za kalibraciju CGM – AIDEX sistema., 3. Usporediti rezultate glukoze na CGM - AIDEX aparatu sa porukama tijela na promjene nivoa glukoze.

Materijal i metode

Na dobrovoljcu je provedeno 14 dnevna kontrola nivoa glukoze iz kapilarne krvi na 6 BGM aparata, sa 35 mjerenja, uz istovremeno praćenje rezultata na CGM sistemu. Uzorci venske krvi za referentno mjerenje uzeti su 13 puta. Svjesno izazivana hipo i hipe rglikemije u rasponu vrijenosti od 3,5 do 24,0 mmol/l.

Rezultati

Analizom prosjeka ukunih odstupanja rezultata glukoze na CGM AIDEX senzoru i tri BGM aparata (Accu chek performa, GoCheck2, Wellion Cala light) smo utvrdili da se kreću do 10% od referentnih vrijednosti i mogu se preporučiti za pouzdanu kalibraciju AIDEX senzora. Kod ostala tri BGM aparat (Bionime 550, Bionime 720, Medisign GH829 utvrdili smo prosječna odstupanja u rasponu od 10% do 20%. Takođe smo ocijenili pozitivnu usklađenost rezultata AIDEX senzora sa simptomima organizma na promjene glukoze.

Zaključak

Za dobru regulaciju glukoze potrebani su kvalitetni i pouzdani mjerači, danas to imamo kroz kombinaciju dva sistema koji se dopunjuju i. smatramo da uz dobru edukaciju o pravilnoj kombinaciji i upotrebi mogu puno doprinjeti u kvalitetnom tretmanu osoba sa dijabetesom

Ključne riječi: mjerači glukoze u krvi, kontinuirano praćenje glukoze, kalibracija, tačnost.

COMPARISON OF GLUCOSE RESULTS ON DIFFERENT DEVICES, IN PEOPLE WITH DIABETES - THROUGH A CASE REPORT

Kotorić N.

Laboratory diagnostics service, General Hospital Tešanj, Bosnia and Herzegovina

ABSTRACT

Introduction

Standard management of type 1 diabetes relies on blood glucose monitoring based on a range of technologies from self-monitoring of blood glucose (BGM) to continuous interstitial fluid glucose monitoring (CGM). Standard recommendations for BGM devices are 6-10 daily measurements, while CGM systems offer continuity in measurement - every 5 minutes, with a series of useful data on glucose movement. Even as CGM technology matures, patients use BGM for CGM system calibration and dosing. The question of how the accuracy of both technologies interact is still under constant examination and comparison. Aims of the study: 1. To compare the results of several types of glucometers and continuous glucose meters with reference values of glucose from venous blood and determine average deviations of up to 10%, and deviations of 10 to 20%. 3. Compare the glucose results on the CGM - AIDEX app with the body's messages on changes in glucose levels.

Material and methods

A 14-day control of glucose level from capillary blood was performed on a volunteer on 6 BGM devices, with 35 measurements, with simultaneous monitoring of the results on the CGM system. Venous blood samples for reference measurement were taken 13 times. Consciously induced hypo and hyperglycemia in the boiling range from 3.5 to 24.0 mmol/l.

Results

By analyzing the average deviations of the glucose results on the CGM AIDEX sensor and three BGM devices (Accu chek performa, GoCheck2, Wellion Cala light), we found that they range up to 10% from the reference values and can be recommended for reliable calibration of the AIDEX sensor. With the other three BGM devices (Bionime 550, Bionime 720, and Redesign GH829) we found average

deviations in the range of 10% to 20%. We also evaluated the positive compliance of AIDEX sensor results with the body's symptoms of glucose changes.

Conclusion

Good glucose regulation requires high-quality and reliable meters, today we have this through the combination of two systems that complement each other and we believe that with good education on the correct combination and use, they can contribute a lot to the quality treatment of people with diabetes

Keywords: blood glucose meters, continuous glucose monitoring, calibration, accuracy.

PATOLOGIJA NA DIGITALNOJ PLATFORMI (OD UZORKA DO DIGITALNOG STAKLA)

Adna Smajić

PZU Poliklinika „UniMed“ Univerziteta SSST, Sarajevo, Bosna i Hercegovina

SAŽETAK

Uvod

Procedura rada u jednom patohistološkom laboratoriju teče kroz nekoliko faza kao što su prijem i protokolisanje uzorka, disekcija, dehidracija, uklapanje tkiva u parafin, mikrotomsko rezanje, bojenje, montiranje i mikroskopiranje.

Materijal i metode

Uvođenje slide skenera odnosno pojava digitalnog stakla predstavlja revoluciju za patologiju, pružajući potpuno nov i znatno poboljšan pristup ovom zahtjevnom poslu.

Rezultat

Prednosti digitalnog stakla u patohistološkim laboratorijima su mnogobrojne: Omogućava znatno brži pristup informacijama, skenirana stakla se lako dijele i dostupni su svim članovima tima što ubrzava proces donošenja odluka i dijagnoze. Patolozi imaju jednostavan pristup konsultacijama s kolegama, čak i ako su fizički udaljeni. Još jedna značajna prednost je sposobnost mjerenja tkiva i udaljenosti između stanica. To pomaže u preciznijoj kvantifikaciji i karakterizaciji različitih patoloških promjena, što značajno doprinosi boljoj dijagnostici i praćenju toka bolesti.

Zaključak

Pojava digitalnog stakla u patohistološkim laboratorijima predstavlja značajan korak naprijed. Ova tehnološka inovacija podržava napredak u medicinskim istraživanjima i dijagnostici, čime se pridonosi dobivanju dijagnoze brže, tačnije i sigurnije.

Ključne riječi: digitalno staklo, napredak, bolja dijagnostika

**PATHOLOGY ON A DIGITAL PLATFORM
(FROM SAMPLE TO DIGITAL SLIDE)**

Smajić A.

PZU Polyclinic „UniMed“ University SSST, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

The workflow in a pathology laboratory involves several stages, such as sample reception and assigning a protocol number, dissection, dehydration, tissue embedding in paraffin, microtome sectioning, staining, mounting, and microscopy.

Material and methods

The introduction of slide scanners and the emergence of digital slides represent a revolution for pathology, providing a completely new and significantly improved approach to this demanding task.

Results

There are numerous advantages of digital slides in pathology laboratories: they enable significantly faster access to information, scanned slides are easily shareable and available to all team members in real-time, speeding up the decision-making and diagnosis process. Pathologists have easy access to consultations with colleagues, even if they are physically distant, improving collaboration among experts and enabling better tissue interpretation and analysis. Another significant advantage is the ability to measure tissues and distances between cells, aiding in more precise quantification and characterization of various pathological changes, which significantly contributes to improved diagnostics and disease monitoring.

Conclusion

The introduction of digital slides in pathology laboratories represents a significant step forward, allowing for faster, more precise, and efficient work. This technological innovation supports progress in medical research and diagnostics, ultimately leading to faster, more accurate, and safer diagnoses.

Keywords: digital slides, advancement, improved diagnostics

adna.smajic@unimed.ba

DIGITALNA MORFOLOŠKA ANALIZA RAZVOJNIH OBLIKA GRANULOCITNE LOZE KAO NOVI PRISTUP U LABORATORIJSKOJ DIJAGNOSTICI

Emsel Papić¹, Sanela Hajro^{1,2}, Nermina Klapuh-Bukvić^{1,2}

¹Odsek Laboratorijske tehnologije, Univerzitet u Sarajevu – Fakultet zdravstvenih studija, Sarajevo, Bosna i Hercegovina

²Organizaciona jedinica Klinička biohemija sa imunologijom, Klinički Centar Univerziteta u Sarajevu, Sarajevo, Bosna i Hercegovina

SAŽETAK

Uvod

Manuelna mikroskopska analiza razmaza periferne krvni i koštane srži predstavlja neizostavan instrument u procjeni hematoloških oboljenja. Zbog tehničke zahtjevnosti i stručnosti osoblja, ispitivanje morfoloških karakteristika razvojnih oblika granulocitne loze može biti subjektivno. Posljednjih godina, implementacija umjetne inteligencije (engl. *artificial intelligence, AI*) u laboratorijskoj dijagnostici omogućila je razvoj brojnih automatiziranih sistema čime je ostvaren napredak u morfološkoj dijagnostici. Cilj je predstaviti značaj primjene digitalne morfološke analize u ispitivanju razvojnih oblika granulocitne loze.

Materijal i metode

Pregledana je literatura u širokom opsegu elektroničkim putem kroz dostupne relevantne baze podataka kao što su PubMed (Medline) i Scopus. Pretraživanje je izvršeno uz pomoć ključnih riječi *granulocytes, digital morphology* i *artificial intelligence*.

Rezultati

Na osnovu dostupne naučne literature, uočeni su varijabilni rezultati između različitih automatiziranih sistema za morfološku analizu. Primarno, prijavljena su velika odstupanja u rezultatima razvojnih oblika granulocitne loze između manuelne mikroskopske i digitalne morfološke analize, naročito u fazi promlijeocita, mijelocita i metamijelocita. U najvećem broju slučajeva razlike su zavisile od stručnosti osoblja. Tako je jednoj studiji preciznost pri morfološkoj analizi patoloških oblika granulocita porasla za čak 15% primjenom sistema baziranih na AI. Također, značajna prednost ovih sistema je pohra-

na slika visoke rezolucije što omogućava pregled kompleksnih slučajeva s udaljenih mjesta. Bez obzira na olakšanu morfološku analizu stanica, neophodno je ovaj sistem primjenjivati selektivno. Složenost i varijabilnost stanične morfologije, naročito u leukopeniji onemogućuje dovoljno preciznu digitalnu morfološku analizu što zahtjeva da se rezultati moraju preklasificirati od strane iskusnih stručnjaka.

Zaključak

U narednom periodu više pažnje treba posvetiti pitanju standardizacije u skladu s preporukama Međunarodnog odbora za standardizaciju u hematologiji. Osim toga, cilj AI nije da u potpunosti zamijeni laboratorijske profesionalce, već da služi za pomoćno sredstvo u bržoj i preciznijoj klasifikaciji svih staničnih oblika.

Ključne riječi: granulociti; digitalna morfologija; umjetna inteligencija

DIGITAL MORPHOLOGICAL ANALYSIS OF IMMATURE FORMS OF GRANULOCYTES AS A NEW APPROACH IN LABORATORY DIAGNOSTICS

Papić E¹, Hajro S^{1,2}, Klapuh-Bukvić N^{1,2}

¹Department of Laboratory Technology, Faculty of Health Studies, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

²Department of Clinical Chemistry and Biochemistry, Clinical Center University of Sarajevo, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

Manual microscopic analysis of peripheral blood and bone marrow smears is an indispensable instrument in the assessment of hematological diseases. The study of morphological characteristics of immature forms of the granulocytic lineage can be subjective due to the technical demands and expertise of personnel. In recent years, the implementation of artificial intelligence (AI) in laboratory diagnostics has enabled the development of numerous automated systems, which has made progress in morphological diagnostics. Aim of the study is to present the significance of the application of digital morphological analysis in the examination of immature forms of granulocytes.

Material and methods

The literature was thoroughly analyzed using databases like PubMed (Medline) and Scopus. The search was performed using the following keywords: granulocyte, digital morphology, and artificial intelligence.

Results

Based on the available scientific literature, varying results were observed between different automated systems for morphological analysis. Large discrepancies were found in the results of immature forms of granulocytes between manual microscopic and digital morphological analysis, particularly of promyelocyte, myelocyte, and metamyelocyte. In one study, the precision in morphological analysis of pathological forms of granulocytes increased by as much as 15% using AI-based

systems. A significant advantage of these systems is the storage of high-resolution images, which enables viewing of complex cases from remote locations. Regardless of the facilitated morphological analysis of cells, it is necessary to apply this system selectively. The complexity and variability of cellular morphology, especially in leukopenia, prevents sufficiently precise digital morphological analysis, which requires that the results must be reclassified by experienced morphological experts.

Conclusion

More attention should be paid to the issue of standardization in accordance with the recommendations of The International Council for Standardization of Hematology. In addition, the goal of AI is not to completely replace laboratory professionals, but to serve as an aid in faster and more accurate classification of all cellular forms.

Keywords: granulocytes; digital morphology; artificial intelligence

VENEPUNKCIJA KOD OSOBA SA MENTALNIM OBOLJENJIMA

Amra Nanić

Ustanova za socijalno zbrinjavanje, zdravstvenu njegu, odgoj i obrazovanje,
Pazarić, Sarajevo, Bosna i Hercegovina

SAŽETAK

Uvod

Venepunktura ili venepunkcija je medicinski postupak pomoću kojeg se dolazi do uzorka krvi koji se koristi u dijagnostičke svrhe i liječenje. U zdravstvenim ustanovama, ovaj postupak se izvodi od strane paramedičara, flebotomista, dijaliznih tehničara, i drugog medicinskog osoblja. Važno je da se slijedi standardna procedura za uzimanje krvi kako bi se dobili tačni laboratorijski rezultati. Venipunkcija je jedna od najčešćih rutinskih invazivnih procedura. Iako je venipunkcija relativno bezopasna za pacijenta, može biti potencijalno opasna po samog flebotomistu / medicinsko osoblje. Nalazi krvi mogu biti korisan alat u razvoju efektivnog plana terapije za mentalne bolesnike. Problemi se javljaju kad pacijenti na antipsihoticima odbijaju venepunkciju. S toga je bitno da se medicinsko osoblje upozna sa mentalnim bolestima i nekim od mogućih ponašanja koji se mogu javiti s obzirom na prirodu same bolesti, kao što su: sumnja i paranoja, neprijateljski stav i ponašanje, ne slijeđenje datih instrukcija, vrpoljenje i migoljenje za vrijeme sjedenja, ustaje kad se očekuje da sjedi, destruktivno ponašanje... Zbog prirode same psihčke bolesti, preporučeno je da se uvijek procesu venepunkcije ovakvih pacijenata pristupa sa prisustvom pratnje istog, zbog sigurnosti i udobnosti kako pacijenta tako i medicinskog osoblja/flebotomiste.

Materijal i metode

Pregledana je literatura u širokom opsegu elektroničkim putem kroz dostupne relevantne baze podataka kao što su PubMed i Scopus. Pretraživanje je izvršeno pomoću ključnih riječi *venipuncture*, *mental disorders*, *phlebotomy*.

Rezultati

Na osnovu dostupne naučne literature uočene su razlike između uzorkovanja krvi ispitnika oboljelih od shizofenije i drugih mentalnih oboljenja sa uzorkovanjem krvi osoba bez mentalnih oboljenja. Primarno, prijavljena su odstupanja od same pripreme ispi-

tanika prije izvođenja venepunkcije. Prema istraživanjima, iako je za sam postupak venepunkcije pacijenata dovoljan verbalni pristanak to je bila prva prepreka kod osoba sa mentalnim bolestima, s obzirom na prirodu same bolesti. Zbog toga je bila otežana i sama psihička i fizička priprema pacijenata od strane medicinskih tehničara. U najvećem broju slučajeva razlike su zavisile od stručnosti osoblja. Tako su u jednoj studiji čak uočene razlike prilikom venepunkcije između ispitanika oboljelih od različitih mentalnih bolesti. U istraživanje je bilo uključeno 145 bolesnika koji su primili olanzapin, 66 ispitanika liječenih risperidonom, 31 ispitanik liječen flufenazinom, 33 ispitanika liječena klozapinom, 25 ispitanika liječenih kvetiapiinom, i 22 ispitanika liječena haloperidalom. Ispitivanja su pokazala da najbolju stopu saradnje ostvaruju osobe liječene olanzapinom tj osobe sa bipolarnim poremećajem. Ostvarena stopa dovedena je u vezu sa samom prirodom bolesti u odnosu na ostala oboljenja kao što je shizofrenija ili ADHD.

Zaključak

U narednom periodu treba posvetiti više pažnje edukaciji laboratorijskog osoblja, flebotomista o mentalnim oboljenjima kako bi mogli prepoznati takvog pacijenta prije izvođenja samog postupka venepunkcije te pristupati prema takvom pacijentu adekvatno, a u cilju sprječavanja mogućih povreda ili ne mogućnosti prikupljanja uzorka krvi koji može biti od ključnog značaja za pacijenta u daljem tijeku liječenja.

Ključne riječi: venepunkcija, mentalno zdravlje, poremećaji mentalnog zdravlja, duševna bolest, flebotomija

VENIPUNCTURE OF PEOPLE WITH MENTAL DISORDERS

Nanić A.

Social welfare and healthcare upbringing and education institution –
Pazarić, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Introduction

In medicine, venepuncture or venipuncture is the process of obtaining intravenous access for the purpose of venous blood sampling (also called phlebotomy) or intravenous therapy. In healthcare, this procedure is performed by medical scientists, paramedics, phlebotomists, dialysis technicians and other nursing staff. It is essential to follow a standard procedure for the collection of blood specimens to get accurate laboratory results. Venipuncture is one of the most routinely performed invasive procedures. Thus, although venipuncture is relatively harmless for the patient it can be hazardous for the phlebotomist. Blood tests can be a useful tool in developing an effective treatment plan for mental health by a comprehensive understanding of a person's physical health. Problems arise when patient as involuntary psychotropic medication refuse a blood draw for tests. It is important to familiarise with the major psychiatric diseases and some of the possible behavior like: suspiciousness and paranoia; hostility, doesn't follow through on instructions; fidgets and squirms in seat; leaves seat when expected to stay; destruction acting out... Due to the unique nature of psychiatric illness, it is recommended that the approach preceding and following specimen collection be modified for the comfort and safety of the patient and phlebotomist.

Material and methods

The literature was thoroughly analyzed using databases like PubMed and Scopus. The search was performed using the following keywords: *venipunction, mental health, mental health disorders, mental illness*.

Results

Based on the available scientific literature, varying differences were observed between venepuncture of subjects with mental disorders and subjects who do not have diagnosed

any mental disorder. Multiple variances were reported between preparation of subjects based on their mental health. According to the researchers, although for the proces of venepunction it is enough to have verbal consent, that is the first barrier for persons with mental disorder, based on the nature of their illness. Therefor there are problems with phisical and psihical preparation of subjects. For the most case scenario, the differences were based on phlebotomists experience. In one of the study there were differences in venepunction even between mental patients when it comes to the diagnose. Subjects suffering from mental illness are divided according to clinical symptoms and received therapy for the venepuncture process. The study included 145 patients who received olanzapine, 66 patients treated with risperidone, 31 patients treated with fluphenazine, 33 patients treated with clozapine, 25 patients treated with quetiapine, and 22 patients treated with haloperidol, 6 patients who received promazine, 2 patients treated with clopixon, and 1 patient each received aripiprazole or ziprasidone. The research has shown that the highest percentage of collaboration have subjects who received olanzapine, subjects with bipolar disorder. Achieved percentage is brought in case with the nature of the illness, with regard to other mental illnesses like schizophrenia or ADHD.

Conclusion

More attention should be paid to the issue of phlebotomists education when it comes to mental health disorders so that they can recognize sung patient before venepunction, and react properly, towards suppression of possible injuries or inability of collecting blood samples that can be significant for the patients treatment.

Keywords: *venipunction, mental health, mental health disorders, mental illness, phlebotomy.*

ZLATNI SPONZOR



Grbavička 7a, 71000 Sarajevo
Bosna i Hercegovina, www.berg.ba

SREBRNI SPONZORI



Lab Unica d.o.o. Stupska bb, 71000 Sarajevo
t:+387 33 518 531 f:+389 33 518 530 E-mail: info@labunica.ba



BromaBel - 051/509-651
Branka Popovića 39, 78000 Banja Luka

BRONZANI SPONZORI



Londža 138 (PC Roma II) 2.sprat,
72000 Zenica, BiH
www.mes.ba



BOSNA-VET doo Zenica
laboratorijska oprema, mikrobiologija,
molekularna dijagnostika, sigurnost hrane
bosnavet@bih.net.ba; www.bosnavet.ba



Rudarska 20b (objekat 1 Centar II),
88000 Mostar, BiH



Igmanska 5a, 71320 Vogošća
Tel: +387 33 476 320; Fax: +387 33 476 321
E-mail: farmavita@farmavita.ba



+38761/380-225
Rajlovačka 23
71000 Sarajevo

OSTALI SPONZORI



Shimadzu d.o.o. Sarajevo
Address: Pijačna 14A1, Sarajevo
Tel: +387 33 550 515 tel: +387 61 486 808 website: www.shimadzu.hr