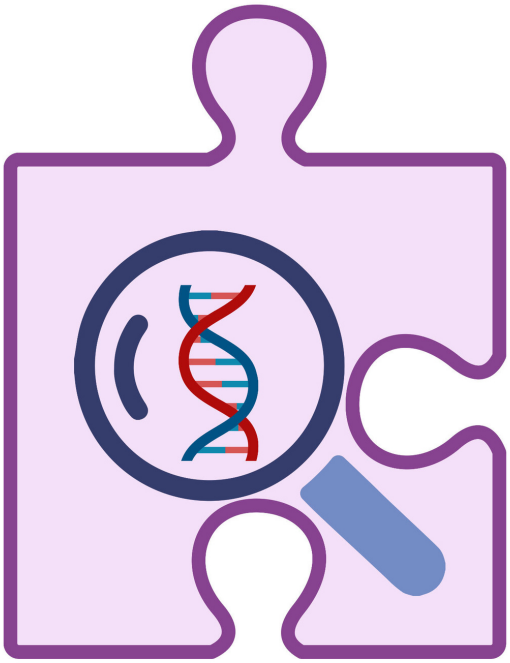
1ST INTERNATIONAL CONFERENCE FOR YOUNG SCIENTISTS

BIOMARKERS OF CIVILIZATION DISEASES

April 21, 2023



BOOK OF ABSTRACTS

Abstract book

1ST INTERNATIONAL CONFERENCE FOR YOUNG SCIENTISTS BIOMARKERS OF CIVILIZATION DISEASES

Bialystok, 2023

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Current diagnosis of Alzheimer’s disease

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With the increasing aging population worldwide, Alzheimer's disease (AD) has rapidly become a pivotal public health problem. According to the World Health Organization (WHO), more than 55 million people worldwide currently live with dementia, and nearly 10 million new cases are reported each year. Moreover, dementia diseases are now the seventh leading cause of death among all diseases and constitute one of the major causes of disability among the elderly worldwide. Alzheimer's disease is the leading form of all dementia disorders. Clinically, it is mainly characterized by cognitive decline, including memory impairment, slurred speech, disorientation, mood and behavior changes, as well as deepening confusion about events, time, and place. Despite the progress of the knowledge about the pathomechanisms underlying Alzheimer's disease, it still remains incurable, only symptomatic treatment is available. Early diagnosis of the disease is a huge challenge for clinicians, it is mainly based on differential diagnosis, which includes neurological, psychological, brain imaging, and biochemical tests. The investigations on biochemical markers, that would allow for the AD diagnosis in life, conducted for years, indicate their essential role in improving the early diagnosis of Alzheimer's disease. The gold standard in laboratory diagnostics is a classic panel of cerebrospinal fluid biomarkers (CSF biomarkers) such as: amyloid beta 1-42, amyloid beta 1-40, tau protein and pTau181. Due to the fact that CSF biomarkers are in vivo evidence of neuropathological changes ongoing in the brain, the application of AD biomarkers allows for improving the accuracy of the clinical diagnosis. In addition, the assessment of their concentrations is helpful in the prognosis of the disease course, assessment of its stage, as well as qualification of patients for new forms of therapy. Moreover, the crucial role of such a panel of tests in the differential diagnosis of patients with neurodegenerative diseases is suggested. Accordingly, CSF biomarkers have been included in the new diagnostic criteria for AD and in the latest biological definition of the disease developed by the National Institute on Aging and Alzheimer's Association.

Cancer - a beast that lurks for each of us

Małgorzata Rusak

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Most body cells are capable of growing, dividing and multiplying when needed. Some cells, such as skin, mucous membrane, intestinal or bone marrow cells, multiply almost permanently. Some, like neurons and muscle cells, never actually divide. The cells regulate their own proliferation: they multiply or stop the process when there is a need. Unfortunately, when the cell ignores the rules and begins to multiply without stopping, it develops a beast that lurks for each of us - a cancer cell. Cancer development is a process stretched over time, it usually lasts 5-20 years, and its course is multi-stage and controlled by mutations accumulating in the cell and leading to a change in its biological properties. In 2011, Hanahan and Weinberg defined the biological features of cancer, which include proliferation independent of signals stimulating cell division, lack of response to factors inhibiting proliferation, lack of programmed cell death, replication immortality, angiogenesis, activation of infiltration and metastasis processes, genome instability, inflammation provoking the formation of cancer, changes in energy metabolism, and "escape" from the mechanisms of immune "supervision". Paul Ehrlich linked first the immune system with the processes of oncogenesis in 1909. He believed that the immune system recognizes cancer cells as foreign and destroys them. In the 1950s, the development of theories related to immune surveillance began, which only gained credibility at the end of the 20th century, which was related to the role of NK cells. It was possible to identify, first in mice, and in 1991 in humans, specific cancer antigens on cancer cells of tumors, the presence of specific cytotoxic T lymphocytes was demonstrated. Finally, at the beginning of this century, a new research hypothesis of the immune response of cancer was created, which combines the defensive effect of the immune system with the opposite phenomenon observed in certain situations - the promotion of tumor development by elements of the immune system. Will this theory allow us to help with fight against the beast that threatens all of us?

Artificial Intelligence in diagnostics - how new types of markers generated by artificial intelligence affect the classic diagnostic approach on the example of the SkinLogic™ system

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We present the results of identification of a new type of biomarkers of allergic skin reaction by advanced Artificial Intelligence algorithm SkinLogic™ based on convolutional neural networks (CCN) trained to automate the evaluation of in vivo allergy skin test results (SPT). Biomarkers as it is defined in the pathophysiological context do not fully correspond to the “markers” identified by medical Artificial Intelligence, hence various interpretation doubts arise. Precise classification of allergic reactions to full allergens appearing during the skin tests is a key stage in the diagnosis of hypersensitivity, particularly with aim to proper application of dedicated immunotherapy. The current reference method for SPT tests assessment is based on a subjective symptomatology observed epidermally, while the new solution provides information on objective subepidermal hyperthermic effect thanks to the multispectral imaging with a independent infrared channel (LWIR). Artificial Intelligence allows for much more precise identification of the pathophysiological effect accompanying the skin allergic reaction than in the case of the classical approach, what is more, it is possible to identify positive reactions even at subminimal level, which in the current clinical practice must be considered as non-specific. This increases the reliability and accuracy of popular skin tests that use the same allergen extracts as those used to prepare desensitizing immunotherapies. This is a breakthrough in the automated instrumental analysis of skin tissue pathology, enabling the detection of minimal lesions with a diameter of less than 0.3 mm and ensures the precise identification of a new type of markers of the skin allergic reaction (HARM - Hyperthermic Allergic Reaction Markers). SkinLogic™ Artificial Intelligence using CNN achieved excellent prediction results compared to the reference method (AUC >0.98, AP >0.97), which were published in 2022 by The NATURE Scientific Reports.

Metabolomic response profiles of patients with acute myeloid leukaemia

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The heterogeneity of acute myeloid leukemia (AML), a complex hematological malignancy, is caused by mutations in myeloid cells affecting their differentiation and proliferation. Thus, various genetic alterations in AML cells may be characterized by a unique metabolome and require different treatment approaches. In this study, we performed untargeted metabolomics to assess metabolomics differences between i) AML patients and healthy controls, ii) AML patients before and after treatment, iii) AML patients with different treatment outcomes, iv) AML patients in different risk groups based on the 2017 European LeukemiaNet (ELN) recommendations for the diagnosis and management of AML, and v) AML patients with and without FLT3-ITD mutation. Analyses were performed in serum samples using liquid chromatography coupled with mass spectrometry (LC–MS). The obtained metabolomics profiles exhibited many alterations in glycerophospholipid and sphingolipid metabolism and allowed us to propose biomarkers based on each of the above assessments as an aid for diagnosis and eventual classification, allowing physicians to choose the best suited treatment approach. These results highlight the application of LC–MS-based metabolomics of serum samples as an aid in diagnostics and a potential minimally invasive prognostic tool for identifying various cytogenetic and treatment outcomes of AML.

The detection of relaxin-2 plasma concentrations in patients with essential hypertension and type 2 diabetes mellitus

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Relaxin-2 (RLN-2) is a pleiotropic hormone with vasodilatory, anti-inflammatory, and insulin-like actions. This determines its role in the pathogenesis of cardiovascular diseases and type 2 diabetes mellitus (T2DM) but its significance in arterial hypertension (AH) remains controversial. To evaluate the frequency of RLN-2 detection and establish the plasma RLN-2 levels in patients with AH, especially in hypertensive patients with T2DM. The study was performed by all ethical principles of the Helsinki Declaration. 136 study subjects were enrolled in the study. 106 participants had AH, and 30 are healthy volunteers. 55 hypertensive patients had comorbid 2TDM. Plasma RLN-2 levels were measured by an enzyme-linked immunosorbent assay (ELISA). Statistical significance was defined as $p<0.05$. The median RLN-2 concentration in the study sample was 2.01 pg/ml [1st quartile 0; 3rd quartile 6.12] (range: 0-16.83). RLN-2 was detectable in 58.09% of study subjects (N=79). Patients with AH presented a higher frequency of RLN-2 detection than control subjects (66.04%,70 vs. 30%,9; $p<0.001$). Besides, the RLN-2 was detected in patients with AH and T2DM more frequently compared with hypertensive patients without T2DM (76.36%,42 vs. 54.9%,28; $p=0.02$). The patients with AH have significantly lower RLN-2 levels in comparison with healthy volunteers (4.8±2.29, range: 0.38-9.03 vs. 11.47±3.1, range: 6.58-16.83; $p<0.001$). Furthermore, the RLN-2 levels were lower in patients with AH and T2DM compared with hypertensive patients without T2DM (3.84±2.22, range: 0.38-8.72 vs. 6.24±1.51, range: 1.23-9.03; $p<0.001$). An increase in the frequency of RLN-2 detection in AH, especially with comorbid T2DM, may indicate the activation of cardiovascular compensatory mechanisms. At the same time, RLN-2 levels are reduced in AH, especially in impaired glucose metabolism, which may reflect the involvement of RLN-2 in the pathogenesis of these diseases.

Contribution of IL-1b and HIF-1a in the development of hyperglycemia in patients with COVID-19 infection and concomitant heart pathology

Alexander Pozhartski

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The category of patients with COVID-19 infection and concomitant cardiovascular pathology (CCP) has a hyperglycemia which is not associated with the intake of glucocorticosteroids. So even nowadays the mechanisms of hyperglycemia development in patients with COVID-19 infection and CCP still remains open. At the first stage of our study there was a randomized retrospective analysis of the medical cards of 182 men aged 54±5.6 years. During the second stage, we investigated the activity of insulin-dependent glycolysis enzymes in macrophages of blood by photochemiluminescent analysis. At the third stage we have established the state of alveolar macrophages (AM) and their microenvironment in bronchopulmonary lavage (BPL) by enzyme immunoassay and photochemiluminescence analysis. The statistical significance of the differences was established using the Mann-Whitney U-test. So, during the study it was possible to establish the presence of hyperglycemia in patients with COVID-19 infection and CCP. A decreased activity of glycolysis enzymes in blood macrophages was revealed: the lowest activity in hexokinase was 59% of the reference values. A shift in the ratio of M2/M1 AM subpopulations in BPL towards anti-inflammatory M2 was found in the group with CCP: the number of M2 AM subpopulations was 5.5 times higher than the number of M1 AM subpopulations ($U = 156.0$, $p>0.05$). An increased content of hypoxia-induced factor (HIF-1a) in the AM microenvironment relative to the reference values was higher by 5.39 times in patients with CCP and by 1.98 times in patients without CCP ($U = 2.0$, $p<0.01$). Conclusion: a significant contribution to the mechanisms of hyperglycemia development in COVID-19 infection and CCP is made by an increased level of IL-1ß and HIF-1a in the microenvironment of alveolar macrophages and in the blood as a result of the imposition of circulatory hypoxia on metabolic and respiratory hypoxia.

Diagnosis and monitoring sarcopenia using inflammatory mediators

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Skeletal muscle ageing is the result of molecular and cellular changes including an imbalance between protein synthesis and degradation, changes in hormonal status and immune cell activity and inflammatory mediator levels. A key lifestyle element that attenuates sarcopenia, and thus the risk of falls and disability, is regular physical activity. The study was designed to analyse the relationship between inflammation and sarcopenia, and to evaluate the influence of lifestyle on the inflammatory profile. The study was conducted with 79 subjects aged 72.1 ± 7.5 years (women n=51, men n=28). The assessment of sarcopenia was carried out in accordance with the algorithm by the EWGSOP2, taking into account reductions in: appendicular skeletal muscle mass index (women ASMI<5.5kg/m2, men ASMI<7.0kg/m2), handgrip strength (women <16kg, men <27kg) and gait speed in a 6-minute test (women and men 6MWT<0.8m/s). The biochemical indicators of the aging process were analyzed using the ELISA test. Sarcopenia (S) was demonstrated among 28 subjects (women n=18, men n=10), no sarcopenia (NS) among 51 subjects (women n=33, men n=18). IGF-1 concentration was significantly lower in the S group (5.43 ± 2.65 ng/mL) compared to NS (10.74 ± 10.30 ng/mL). There was no significant difference in the concentration of IGF-1 binding protein (IGFBP3) between the groups. Concentrations of the inflammatory mediators IL-6 and TNFα in the S group were 80.3 ± 63.7pg/mL and 122.8 ± 91.8pg/mL, respectively, in the NS group 74.8 ± 72.9pg/mL and 81.4 ± 48.6pg/mL, respectively. In conclusion, sarcopenia is confirmed by the high concentration of inflammatory mediators, however, an active lifestyle reduces inflammation and slows down skeletal muscle ageing and ensures maintenance of functional performance.

FAMILY – LINK APP «OKID-S»

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According to data from numerous sources kids brush their teeth on the average only about 30-60 seconds. It is well known that it takes at least 2 minutes to clean all tooth surfaces thoroughly and to remove dental plaque. Mobile app «OKID-S» promotes motivation to perform oral hygiene regularly and consistently for kids, so that will be helpful to control it by parents. It also demonstrates the quality of oral hygiene. To create the family-link app to control children's oral hygiene level. The mobile application was created according to the technical task developed by ourselves. The software includes three modes of using: children's, parent's and doc-tor's app. «OKID-S» is a unique project, which has no any analogues on the russian-language apps market. It will help parents to control oral hygiene of their child by special tracker and will give the opportunity to communicate with the dentist right in it. Child can choose the best character for him and after the month of using the app it will generate video from the photos witch child could do every day while brushing. It'll show the progress and give extra motivation. Also children should hold the phone in front of his face to make the mask work while brushing. It'll make him concentrate on pro-cess. Mobile app «OKID-S» contain «message» button where dentist could communicate with parents and don't mix personal chats with working dialogues. There will be the possibility to add information about professional competitions in the dentist's profile. OKID-S is universal helper to control the procedure of kid's oral hygiene. It'll show all the information to correct and teach child how to brush their teeth properly. It's also a great way to communicate with dentist.

Correlation of advanced glycation end products to with echocardiographic parameters in patients with heart failure and mildly reduced ejection fraction - UPDATE

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Heart failure and mildly reduced ejection fraction (HFmrEF) describe patients with signs and symptoms of HF and left ventricle EF between 41-49%. Currently, there are no tools to predict whether these patients are going to evolve HF with preserved EF (>50%) or HF with reduced EF (<40%). Advanced glycation end products (AGE) are highly oxidant compounds. By binding to the proteins, AGE increases myocardial and vascular stiffness. We aimed to evaluate the correlation between skin AGE values and echocardiographic parameters of diastolic dysfunction in patients with heart failure and mildly reduced ejection fraction. 29 out of 100 planned patients with HFmrEF were enrolled in this prospective, multicenter study. 18 patients after 6 months of enrollment underwent transthoracic echocardiography (TTE) and AGE reader measurement. AGE level was measured using the AGE Reader which is a non-invasive monitoring device that uses ultra-violet light to excite autofluorescence in the skin of the forearm. The result is the average of three measurements taken in immediate succession. Parameters of systolic and diastolic dysfunction were measured using transthoracic echocardiography. Patients were divided into two groups: (1) with loss of left ventricle ejection fraction (LVEF) and (2) with an increase or with stable LVEF after 6 months, compared to TTE parameters during enrollment. There was an intermediate positive correlation between AGE level and parameters of left ventricular diastolic function e'lat (r=0,3 ;p=0,22) and TRPG (r=0,3 ;p=0,21). There are no significant differences in AGE concentration between the group with stable or increased LVEF and the group with loss of LVEF after 6 months (p=0,215). Our preliminary results indicate that AGE may be associated with the pathophysiology of heart failure. Continuation of the study and analysis of the results in the total cohort is crucial to confirmation of our assumptions and achieving statistical significance.

Thickness and volume of epicardial adipose tissue in relation to stiffness and elasticity of aorta assessed by computed tomography angiography

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The aim of the study was to assess the importance of measurements of thickness and volume of epicardial adipose tissue in coronary computed tomography angiography (CCTA) as a predictive factors of increased stiffness and impaired elasticity of aorta. The study involved a group of 97 patients (63.48 ±8.50 years). Indications for performing a CCTA were present in all patients. In accordance to medians of epicardial adipose tissue (EAT) parameters, aortic elasticity and stiffness parameters, patients were divided into subgroups: EAT thickness median 9.40 mm, EAT volume median 61.95 ml, EAT thickness index 5.08 mm/m² and EAT volume index 34.33 ml/m². The mean coronary artery calcium score was 162.24 (±317.69). Mean aortic stiffness index was 4.18 (±0.81). Assessed mean aortic elasticity parameters were 3.29% (±2.37) and 0.12 cm²/dyn (±0.09) for strain and distensibility respectively. A positive linear correlation was observed between EAT parameters and aortic stiffness (0.21), volume (0.51), thickness index (0.24) and volume index (0.55) and for aorta elasticity was observed a negative linear correlation between EAT parameters: thickness (-0.32 and -0.30), volume (-0.49 and -0.48), thickness index (-0.34 and -0.31), volume index (-0.51 and -0.49) and aortic elasticity parameters (aorta strain and aorta distensibility respectively). The study showed that CCTA illustrates a relationship between parameters of EAT and increased stiffness of the aorta, while the most predictive factor of stiffness was the volume index.

Construction of the SPRi biosensor sensitive to the PARP-1 protein for quantitative determinations in blood plasma

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Poly(ADP-ribose)-1 polymerase (PARP-1) is a 113 kDa enzyme found in the cell nucleus, cytoplasm and Cajal bodies. Its level can be determined in blood plasma. PARP-1 bases its action on participation in processes related to ADP-ribosylation. This process, as a reversible reaction, occurs in the case of DNA damage repair, programmed cell death or in cell signaling pathways. Excessive levels of PARP-1 are associated with the formation of many disorders of the nervous and immune systems, as well as in the case of gynecological diseases and tumors. A biosensor with the detection of Surface Plasmon Resonance in the Imaging version (SPRi) was developed for the quantification of PARP-1 in body fluids. The construction of a new biosensor characterized by high measurement precision and a good sensitivity required a series of measurements to determine the validation parameters. A ligand-antibody specific for PARP-1 was placed on a chip with a linker - cysteamine and a gold layer. The optimal ligand concentration (2 ng/mL) was determined. It was also found that the highest SPR signal is obtained at pH 6.5 to 7.5. The limit of detection (LOD) for PARP-1 was determined to be 0.007 ± 0.003 ng·mL−1, and the limit of quantification (LOQ) to be 0.02 ± 0.01 ng/mL. The equation of the calibration curve was determined for the linear range of the response. The biosensor showed adequate precision and accuracy, and good recovery (at levels of 95% to 105%). The usefulness of the constructed biosensor in practice was tested by measuring plasma samples from patients with endometriosis and in the control group. Plasma samples were diluted with PBS buffer in appropriate amounts to fall within the linear range of the calibration curve. PARP-1 was determined in samples using SPRi biosensors and ELISA. Spearman's correlation coefficient was close to 1. PARP-1 may be a marker providing information about pathological changes in the body in the course of endometriosis.

Activation of inflammation in human monocytes and macrophages by nanoparticulate carbon black and urban dust

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Fine inhalable particulate matter (PM) triggers an inflammatory response in the airways. We assessed ex vivo responses of human monocytes (M) and monocyte-derived macrophages (MDM) to carbon black (CB), urban dust (UD), and nanoparticulate carbon black (NPCB), focusing on their pro-inflammatory properties. The human primary M were isolated from peripheral blood mononuclear cells by gradient centrifugation and purified using magnetic CD14+ beads. M were differentiated into MDM by 100 ng/ml phorbol 12-myristate 13-acetate. M were plated at a density of 0.15×106and treated with 100 mg/ml CB, UD, or NPCB for 24 h. After centrifugation the supernatants were analyzed with the Multi-Analyte Inflammatory Cytokine ELISArray Kits (Qiagen, Manchester, UK). Only NPCB increased IL1b in M, while IL6 and TNFa were unchanged. The transition of M cells by PMA highly increased inflammatory response resulting in a 2-3 times increase in both interleukins and TNFa. In MDM only NPCB significantly increased TNFa.Lipopolysaccharide (LPS; 100 ng/ml) induced a strong proinflammatory reaction and elevated all measured parameters about 10 times. Slightly higher, yet not significant values were observed when PM-pretreated M were treated with LPS. In MDM however, both UD and NPCB increased IL1b which is important in acute-phase responses to infection and injury, and NPCB additionally elevated multifunctional proinflammatory cytokine - TNFa. We have shown, that production of proinflammatory interleukins IL1b and IL6 and TNFa is only slightly increased by PM, but cells pretreated with UD and NPCB increase their inflammatory responsiveness to LPS stimulation. Macrophages were much more responsive to fine PM.

Effect of bariatric surgery on matrix metalloproteinase activity in patients with morbid obesity - preeliminary studies

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Obesity is a complex and widespread disease, with related diseases such as type 2 diabetes mellitus (T2DM), hypertension, cardiovascular diseases, and cancer being major causes of mortality. Matrix metalloproteinases (MMPs) are key components of the proteolytic system and are implicated by releasing, activating or damaging cytokines, growth factors and adipose tissue remodelling, important in the development of obesity and its metabolic disorders. The aim of this study was to evaluate plasma activity of MMPs in morbidly obese patients before laparoscopic sleeve gastrectomy and assess the impact of bariatric treatment on selected MMPs' (MMP-7, MMP-12, and MMP-14) activity. The study comprised 63 obese women, divided into two groups: 33 morbidly obese women without metabolic syndrome (oms-) and 30 morbidly obese women with metabolic syndrome (oms+). Blood samples were collected prior to and at one, three, six, and twelve months after surgery. RESULTS: We showed significantly higher plasma activity of MMP-7 and MMP-12 in both morbidly obese groups and MMP-14 only in (oms-) before bariatric surgery compared to the controls. All along 12 months of observation after sleeve gastrectomy the activities of MMP-7, MMP-12, and MMP-14 were still elevated in obese patients in comparison with the lean controls. Obesity is associated with increased activities of plasma MMP-7, MMP-12 in both oms- and oms+ and MMP-14 only in oms-. Despite the overall beneficial effect of bariatric surgery, 12 months after surgery is probably too short to reduce the disorders in MMPs. Further research is needed to clarify the mechanisms of MMP's involvement in the development of obesity and its metabolic complications.

Immunohistochemical identification and evaluation of leptin biosynthesis in the liver of men with different body mass index

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Leptin is a hormonal peptide, synthesized and secreted mainly by adipocytes, i.e. fat cells. This is one of the most important adipokines regulating food intake and the body's energy balance, because of this, it is called "satiety hormone". Leptin is crucial not only in the control of appetite and pathogenesis of excessive weight gain, but also affects liver metabolism. Despite quite numerous studies, changes in production and activity of this hormone in the liver of overweight people have not been fully explained. The aim of the work was to identify immunohistochemical and assessment of leptin biosynthesis changes in the liver of men with different body weight. The study was carried out on liver sections (obtained from the Department of Neurosurgery) from 14 men (body weight from 67 to 95 kg), organ donors without gastrointestinal symptoms. The study participants were divided into two groups: 6 lean subjects (BMI ≤ 25 kg/m2) and 8 overweight subjects (BMI > 25 kg/m2). Paraffin sections (4 μm) were stained with hematoxylin-eosin for general histological evaluation and immunohistochemistry was performed to detect leptin. Hepatic leptin gene expression was determined by qRT-PCR. Increased leptin immunoreactivity was found in the liver of overweight men compared to lean individuals. The strongest expression was observed in people with overweight and fatty liver. This study proves that leptin expression in the liver of men is altered in overweight individuals. The results of the study also indicate the potential importance of this peptide in overweight-related fatty liver disease.

Preliminary evaluation of gene expression and immunohistochemical identification of CacyBP/SIP and β-catenin in the adrenal glands of rats with primary and secondary hypertension

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Hypertension is a lifestyle disease that is a serious health, social and economic problem in most countries of the world. Based on the detectability and reversibility of the direct cause of the disease, two types of hypertension are distinguished: primary and secondary. Untreated high blood pressure can have serious health consequences, including adrenal damage. CacyBP/SIP is a recently discovered protein involved in many cellular processes, including degradation of β-catenin, which is an important factor regulating functions of the vascular system. The aim of the study was evaluation of the immunoreactivity and expression of CacyBP/SIP and β-catenin in the adrenal glands of rats with hypertension of various aetiology. The study was performed on adrenal glands obtained from 24 rats: 5 normotensive (WKY), 7 systemic hypertension (SHR), 5 sham-operated (SHAM) and 7 renovascular hypertension (2K1C). Immunohistochemical reactions were performed on paraffin sections using specific antibodies against CacyBP/SIP and β-catenin. The reaction results were evaluated under a light microscope and subjected to morphometric analysis. Gene expression was tested by RT-qPCR. The analysis of the 2 / 2 obtained results showed a significant decrease CacyBP/SIP immunoreactivity in the adrenal glands of rats with primary and secondary hypertension compared to animals with normal blood pressure. The immunoreactivity of β-catenin in the adrenals of 2K1C rats was also reduced, while that of SHR rats was negative. RT-qPCR analysis confirmed the results of immunohistochemistry. This study showed for the first time differences in the expression of CacyBP/SIP and β-catenin in the adrenal glands of rats with primary and secondary hypertension. This is a pilot study that may contribute to a better understanding of the complex physiology of the adrenal glands in hypertension of various aetiologies.

Collagenases (MMP-1, -8, -13) plasma activity increase in patients with adrenal masses

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Adrenal masses are the most common tumors in humans, however their pathogenesis is still poorly understood. In previous studies, we observed the association between the antioxidative/oxidative balance disturbances and the size of adrenal tumors. Oxidative stress has an important role in the development of matrix metalloproteinases (MMPs) homeostasis disturbances, which activates several mechanisms involved in carcinogenesis. Unfortunately, little is known about the role of MMPs in the pathogenesis of adrenal tumors and their hormonal activity. The aim of our study was to evaluate the activity of selected metalloproteinases (subgroup of collagenases: MMP-1, -8, -13) in the plasma of patients with adrenal tumors, grouped according to their hormonal activity. The study group included 76 patients with different type of adrenal masses, who underwent elective endoscopic adrenalectomy. They were divided into two subgroups depending on hormonal activity: hormonally inactive and hormonally active. All patients had been diagnosed in endocrine departments. The control group consisted of 24 healthy volunteers. The plasma MMPs activities were determined fluorometrically. The incubation time was 3 hours for metalloproteinase-1 (MMP-1), 1 hour for metalloproteinase-8 (MMP-8), 40 minutes for metalloproteinase-13 (MMP-13). The fluorescence was evaluated at 325/393 nm. We found statistically increased plasma activity of all studied MMPs in comparison with the healthy controls. The greatest rise was noted in MMP-13 activity (hormonally inactive adrenal tumors: +49%, $p<0.0001$; hormonally active adrenal tumors: +45%, $p<0.0001$). We found no difference in plasma collagenase activity between the two groups of patients with hormonally inactive or active adrenal tumors. Adrenal tumors are associated with increased activity of MMPs-1, -8, -13. Possible association of MMPs activity with adrenal tumor type requires further research.

The diagnostic value of inflammatory markers (IL-6, CRP/IL-6, CRP/L) for assessing the severity of COVID-19 symptoms based on the MEWS and predicting the risk of mortality

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COVID-19 disease is accompanied by inflammation, which manifests in the form of clinical symptoms and in the laboratory tests. Recent reports suggest that IL-6 concentration or CRP/L, CRP/IL-6 ratios may prove useful in assessing the risk of exacerbation of the disease process or predicting the risk of death caused by COVID-19. The aim of the study was to compare the concentration of IL-6 and ratios, i.e. CRP/L and CRP/IL-6, depending on the stage and duration of the disease in patients with COVID-19. The diagnostic value of the above-mentioned markers in predicting the risk of disease deterioration, death and survival time of COVID-19 patients was also analyzed. The study group consisted of 374 patients aged 56 to 75, hospitalized at the Temporary Hospital No.2 in Bialystok between 11.2020 and 11.2022 due to COVID-19. The results of laboratory tests (IL-6, CRP, CBC) and demographic data were retrospectively analyzed. Based on biochemical tests and peripheral blood counts, the CRP/L and CRP/IL-6 ratios were calculated according to the MEWS scale. In ROC curve analysis, the diagnostic utility of IL-6 (AUC=0.645;p<0.0001;cut-off=58.8), CRP/L (AUC=0.590;p=0.0028;cut-off=88.305) in differentiating patients with mild/moderate to severe COVID-19. The diagnostic usefulness of IL-6 (AUC=0.652;p=0.0001;cut-off=64.9), CRP/L (AUC=0.619;p=0.0099;cut-off=89.816) for the assessment of the risk of death due then COVID-19 was also observed. In Cox regression analysis, CRP/L and age were shown to be associated with a higher risk of death (HR=1.001;p=0.004;HR=1.071;p<0.0001). Increases in IL-6 and CRP/L may indicate the development of inflammation, a decrease in the pool of circulating lymphocytes and, consequently, may be an indicator of the deterioration of the patient's clinical condition. Moreover, an increase in IL-6, CRP/L above the cut-off value may suggest the risk of patient death as a result of the increased inflammatory reaction present in the severe course of COVID-19.

Morphological and functional characteristics of the skin exposed to UVA and UVB radiation

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Human skin is the largest organ and serves as the first line of defense against environmental factors. Electromagnetic radiation is the main external physical factor which affecting the skin. Exposure to the sun ultraviolet (UV) rays or artificial sources such as sun tanning beds affect the physiology of the skin. The degree of skin damage depends on the type of UV radiation (UVA, UVB), type of cells, and their localization in the epidermis or dermis. Exceeding the dose of UV radiation leads to the activation of apoptotic pathways and cell death. The aim of the study was a comparative morphological and immunohistochemical evaluation of the skin of rats exposed to UVA and UVB radiation. The research material came from the Department of Inorganic and Analytical Chemistry. The study was carried out on 18 rats divided into 3 groups of 6 animals each: - control, - rats exposed to UVA radiation (365 nm), where the energy dose was increased every 48 h for 4 weeks (from 0.5 to 5 J/cm2), - animals exposed to UVB radiation (312 nm) where the energy dose was increased every 48 h for 4 weeks (from 0.5 to 5 J/cm2). After administering of sodium pentobarbital, the rats were sacrificed by transection of the heart and a piece of skin and subcutaneous tissue were collected. After fixation in 10% formalin, the material was embedded in paraffin. 4µm thickness paraffin sections were stained with H+E, AZAN method. Immunohistochemical reactions were performed using PCNA, NF-κB p65 and Caspase-3 antibodies. The staining showed morphological changes in the skin of animals exposed to UV radiation, visible in both the epidermis and dermis. The intensity of immunoreactivity of PCNA and NF-κB p65 was the highest in the group of UVB rats, while the expression of Caspase-3 was the strongest in the group of UVA rats. The results of this study indicate that exposure to UV radiation modifies the structure of the skin and disrupts the processes of cell proliferation and apoptosis.

Biomarkers associated with inflammatory state in PPD

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Postpartum depression (PPD) is a condition that disrupts the mother-child relationship and significantly decreases the affected patients' quality of life. Given that PPD affects a substantial proportion of postpartum women (6.5 to 12.9%), there is a growing need to identify the disease early, even during pregnancy, to minimize potential complications and depressive effects. The purpose of this study is to evaluate biomarkers linked to PPD. The intricate etiology of the disorder diminishes the specificity and sensitivity of the markers; nevertheless, they provide valuable information that can assist healthcare providers. The principal challenge in the future will be to simplify and reduce the cost of the technologically advanced methods of detecting PPD markers. Population-based investigations are necessary to validate the effectiveness of prospective PPD biomarkers.

Can vinegars be used in the prevention of civilization diseases?

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Fermented food has been an integral part of the cuisine of many cultures around the world. In recent years, fermented products have gained popularity, especially due to their potential health-promoting properties. Representatives of this group of products are vinegars which, in addition to interesting taste, are characterized by a high content of antioxidant compounds. Oxidative stress is one of the main causes of the development of various disorders and diseases such as diabetes, atherosclerosis, hypertension, neurodegenerative diseases and cancer. The results of numerous scientific studies show that the long-term use of diets rich in plant polyphenols correlates with a lower incidence of chronic diseases of free radical origin and related mortality. The aim of this study was to examine the value of antioxidant potential in vinegars, and thus to determine whether they can be used in the prevention of lifestyle diseases. The material in this study consisted of five vinegars with additives from Octovnia. The antioxidant capacity was measured using the spectrophotometric method with the ABTS reagent. The antioxidant activity of the samples was measured by spectrophotometry using the synthetic DPPH radical. All assays were performed in triplicate, in three separate experiments, yielding 9 replicates. The highest antioxidant potential, taking into account the results from both methods, is characterized by blackthorn vinegar. The lowest recorded value of antioxidant potential was 34%, and the highest was 85%. The above research results show that vinegars, regardless of the type of raw material used, have a high antioxidant potential. In addition, vinegars are a product easily available on the food market, which is why they can be a valuable resource in the prevention of civilization diseases.

Relationship between exposure to tobacco smoke and renalase blood concentration in patients with arterial hypertension

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The aim of the study was to assess the relationship between exposure to tobacco smoke (ETS) and blood renalase concentration in patients with arterial hypertension (AH). A group of 109 patients was recruited for this study (49.74±14.73 years). ETS was assessed independently based on the blood cotinine concentration and on the declared answers in a questionnaire. In accordance to the questionnaire patients were divided into the following subgroups: A– active smoking, B– non-smoking and exposure to environmental tobacco smoke, C– non-smoking and no exposure to environmental tobacco smoke. The same patients were divided based on cotinine concentration into the following subgroups: D– active smokers, E– non-smokers exposed to environmental to-bacco smoke, and subF– non-smokers not exposed to environmental tobacco smoke. Blood co-tinine concentration and blood renalase concentration were measured using ELISA tests. Within the study group the mean cotinine concentration was 16.42±10.43 ng/ml and the mean renalase concentration was 189.73±214.8 ng/ml. Blood renalase concentration was statistically signifi-cantly higher in C than in A and B and in E and F than in D. There was a negative correlation be-tween blood cotinine concentration and blood renalase concentration ($r=-0.41$, $p<0.05$). Regres-sion analysis showed that higher BMI, higher diastolic blood pressure, coronary artery disease and higher blood cotinine concentration are independent factors of lower renalase concentration. The study showed an independent relationship between exposure to tobacco smoke and lower blood renalase concentration.

Catalase and peroxidase as early markers of NAFLD in patients receiving valproic acid

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Valproic acid (VA) is a widely prescribed drug used as a mood stabilizer in bipolar disorder. Long-term therapy with VA is associated with biochemical abnormalities in the liver. Moreover, VA treatment increases the risk of non-alcoholic fatty liver disease (NAFLD). NAFLD is a clinical syndrome not caused by the fat accumulation in the liver cells and is not associated with alcohol intake. In most cases, it is a chronic condition connected to metabolic syndrome and can be a reason for premature death. It is assumed that oxidative stress contributes to fatty liver and cirrhosis. Therefore, a decrease in antioxidant factors such as catalase and glutathione peroxidase, among others, may contribute to the severity of NAFLD. The aim of the study was to assess the pro/antioxidant status of patients suffering from bipolar disorder. The total sample comprised 62 individuals with bipolar disorder (BD group) and 43 healthy people as a control group (CG). The examination included blood assessment in determining biomarkers of pro/antioxidant state and concentration of trace elements. The patients' group was divided into three subgroups based on using medications: a. VA; b. VA and lithium simultaneously; c. only with lithium. The results showed that oxidative enzymes positively associated with BMI have been reported in patients with bipolar disorder but only in those receiving VA. The performed study suggests that oxidative stress has been implicated in affecting NAFLD in people with bipolar disorder receiving VA and could be a potential early marker of developing that syndrome. More studies are needed to determine the possible mechanism.

Poster presentations

In search of new biomarkers: the possible application of selenoprotein-P, renalase, and peroxiredoxin-5 in cardiovascular risk stratification. A one-center study.

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This study aimed to assess the relationship between chosen antioxidants, namely selenoprotein P (SelP), peroxiredoxin-5, renalase, and selected cardiovascular consequences evaluated in ambulatory blood pressure monitoring (ABPM) and echocardiography (ECHO). In our work, cardiovascular consequences refer to higher mean blood pressure (MBP) and pulse pressure (PP) in ABPM, as well as to left atrial enlargement (LAE), left ventricular hypertrophy (LVH), and lower left ventricular ejection fraction (LVEF%) in ECHO. The study group comprised 101 patients admitted to the Department of Internal Medicine, Occupational Diseases and Hypertension to verify the diagnosis of Obstructive Sleep apnea (OSA). Each patient underwent full polysomnography, blood tests, ABPM, and ECHO. Both selenoprotein-P and renalase levels correlated with different ABPM and ECHO parameters. We found no correlation between the peroxiredoxin-5 level and the tested parameters. We point to the possible application of SelP plasma-level testing in the initial selection of high cardiovascular-risk patients, especially if access to more advanced examinations is limited. We further suggest SelP measurement as a possible indicator of patients at increased left ventricular hypertrophy risk who should be of particular interest and may benefit from ECHO testing.

ECG findings and clinical presentations of myocardial ischaemia among patients with cardiac metastasis from primary lung malignancies: A Narrative Review

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Cardiac tumours are substantially infrequent. However, metastasis to the heart from a primary cancer elsewhere in the body is reported often. In addition to its poor prognosis, the diagnosis of a cardiac metastasis is considered tough to establish. Primary lung cancers contribute to the maximum of cardiac metastasis cases. Owing to its predominantly clinically silent nature, myocardial metastasis isn't usually detected until autopsy. This narrative review aims at highlighting the ECG findings that are seen among patients with myocardial metastasis resulting from lung cancer. It also analyses the clinical presentations associated with cardiac metastasis. Although ECG findings are not standard means of diagnosis, characteristic changes were reported, which might suggest further investigations for the same. The studies reported in this review were collected from the databases that include PubMed, Sciencedirect, Hindawi, ResearchGate and AHA journals in the period of 1980-2022. The keywords used for searching in the databases included ECG, cardiac metastasis, lung cancer. Articles focusing on lung cancer specifically was included, and studies reporting findings associated with other forms of cancer were excluded. A majority of case reports was used for this review. Literature review showed that ECG findings in a patient with cardiac metastasis imitated that of myocardial infarction. This review article encourages health researchers to decipher and justify the findings reported and develop a quicker strategic outline for diagnosis. It also aims to educate the healthcare professionals on the early detection of myocardial metastasis with the study of the preliminary ECG picture, thereby ensuring a better prognosis.

IMPACT OF HYPODYNAMIA CAUSED BY PROLONGED DISTANCE EDUCATION ON HEALTH OF MEDICAL STUDENTS

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During the COVID-19 quarantine and the full-scale invasion, many students in Ukraine have been forced to study remotely. This has led to the fact that Ukrainian students have the sedentary lifestyle. Sedentary behavior can lead to poor health quality. The aim of the study is to investigate the impact of hypodynamia caused by distance learning on students' health. The study involved 100 students from the 1st to 6th year of Kharkiv National Medical University, 53 of whom were female and 47 of whom were male. The students were surveyed using a special questionnaire in Google forms. It was found that 72% of respondents began to move significantly less compared to full-time study, while 28% did not notice any changes or began to move more. The emotional state of 74% of respondents has deteriorated, of which 58% attribute this to physical inactivity: 54% have deteriorated in physical health, and 44% attribute the deterioration to physical inactivity. The health of 46% of respondents has no changes. 12% of students spent 3–4 hours in front of the computer, 16% - 4–5, 32% - 5–8, 10% - more than 10 hours, 30% - all day. 78% spend this time sitting stooped or with their legs bent, 2% sit correctly, and 20% lie down. 50% of respondents report the onset or increase in pain in the joints and various parts of the spine. 50% of respondents feel overweight, 38% attribute this to physical inactivity, and 24% feel significant discomfort. 42% of students have noticed a reduced vision, and complain of more frequent headaches. Thus, the analysis of the study results showed that most students suffer from the effects of physical inactivity due to excessive time spent behind the monitor screen, often in unhealthy positions. This was manifested by weight gain, musculoskeletal disorders, reduced vision and emotional instability, as well as more frequent headaches.

Covid-19 pandemic effect on Lithuania national cervical cancer screening program

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Incidence of cervical cancer in Lithuania has been steadily decreasing over the past years. National screening program has made a huge impact on that. When the health system had to shift their attention to saving Covid-19 patients in 2020, planned health services were put on hold. We aimed to evaluate the impact of Covid-19 pandemic on cervical cancer screening program in Lithuania. Data was gathered from the National Health Insurance Fund under the Ministry of Health records about national Cervical cancer screening program. We evaluated how many women were invited and how many did come during year 2017 – 2021. Data from year 2020 was compared to 2017-2019 and 2021. The number of women, who participated in the cervical cancer screening program in 2020 was significantly lower comparing to year 2017 (p=0,001), 2018 (p=0,01), 2019 (p=0,007), and 2021 (p=0,012). The lowest attendance rate was during the first national lockdown March-June 2020 (on average 3580 women per month) – 65,5% lower compared to the same months in 2017-2019 (on average 10371 women per month). The attendance rate in 2021 was significantly higher than in 2020 (54% and 44% of women invited respectively, p=0,012), but didn't reach the significance levels when comparing to years 2017, 2018 and 2019 (significance level 0,338, 0,928, 0,849 respectively). We calculated that on average 33334 women missed their screening in 2020. The 2020 pandemic has made a significant negative influence on the Lithuania's cervical cancer screening program. We need a plan to try and motivate women, who missed their cytological smears in 2020 to come as soon as possible, as lateness can result in higher cervical cancer morbidity and mortality. More detailed studies are needed to assess the potential impact of program disruptions caused by the Covid-19 pandemic on the incidence of cervical diseases in women.

PD-L1+ extracellular vesicles as potential biomarkers of presence and activity in head and neck squamous cell carcinoma

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Head and neck squamous cell carcinomas (HNSCC) originate predominantly from the mucosal epithelium of the oral cavity, pharynx, and larynx. HNSCC is the 6th most common cancer worldwide with around one million new cases every year. Recently, numerous studies have described extracellular vesicles (EVs) to play an important role in HNSCC development and progression. EVs are nanoparticles excreted by all cells in the human body that carry biologically active molecules. Tumor-derived EVs in HNSCC alter tumor growth, induce angiogenesis, promote metastasis, mediate immune escape, and can even facilitate drug resistance. Programmed cell death protein 1 (PD-1) is one of the most important immunological regulators present on cytotoxic T lymphocytes. The ligation of PD-1 and PD-L1 protein that is present in HNSCC cells elicits an immunosuppressive reaction that can lead to tumor immune evasion. Recently, many studies have described PD-L1 to be also present in HNSCC-derived EVs. Several studies have confirmed that patients with HNSCC have a higher level of plasma PD-L1+ EVs compared to healthy patients. Moreover, researchers showed that PD-L1+ EVs level was associated with disease activity. In this review we summarize the PD-L1+ EVs role in HNSCC and it's potential as plasma biomarker of the tumor presence and activity.

Extracellular vesicles cargo candidates for oral squamous cell carcinoma biomarkers

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Oral squamous cell carcinoma (OSCC) is the most common malignancy affecting the oral cavity, with almost 400,000 cases and 170,000 deaths annually. Although Southeast Asia and the Pacific region bear the highest burden of this condition, Europe and South America are also noticing an alarming rise in HPV-induced OSCC cases. As such, many researchers believe that early detection is very important to improve treatment outcomes, which is why they are turning to new diagnostic tools, such as extracellular vesicles (EVs), to detect OSCC at early stages.
These microscopic nanoparticles are present everywhere in the human body and play crucial roles in various physiological and pathological processes.
Recent studies about tumor cells, including those in OSCC, have revealed that secrete EVs that support cancer growth and resistance to chemotherapy as a result they could serve as valuable biomarkers for early detection of the disease.
In light of the fact that recent studies have shown these EVs contain specific cargo molecules that could be used for cancer diagnosis, this review aims to provide the latest findings on OSCC-derived EVs and their cargo molecules with a comprehensive analysis of molecules of OSCC-derived EVs that could serve as cancer biomarkers.

MiRNA as biomarkers in chronic obstructive pulmonary disease

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MicroRNAs (miRNAs) are small non-coding molecules that measure about 22 nucleotides in length. They play a regulatory role in the expression of complementary messenger RNAs. They are also thought to be the primary means of cell-to-cell transmission if released into blood. Numerous cellular and physiological functions are impacted by changes in miRNA expression. They can be involved in the pathogenesis of numerous civiliational diseases, including lung diseases – asthma and chronic obstructive pulmonary disease (COPD). COPD is characterised by airflow limitation along with chronic bronchitis and emphysema. Millions of people globally are impacted by this complex and heterogeneous illness, and early detection is essential for effective management and treatment. Recent research has discovered that miRNAs have the potential to be used as non-invasive biomarkers for the detection and prognosis of COPD, as well as possible therapeutic targets in the future. Specific miRNAs have been found to be overexpressed in COPD patients, and their expression levels have been linked to clinical outcomes like disease severity (as determined by the GOLD stage classification), pulmonary hypertension, exacerbation frequency, and lung function decline. These miRNAs include miRNA-4640-5p, miRNA-125a-5p, miRNA-206, miRNA-374b-5p, and miRNA-223-3p. Some are downregulated, including miRNA-150-5p, miRNA-34a-5p, miRNA-146a, and miRNA-218. Additionally, the inhibition of upregulated molecules in animal models indicates positive therapeutic effects; for instance, the amelioration of pulmonary hypertension is suggested by the inhibition of miRNA-4640-5p. Those findings and mechanisms of miRNA in COPD are discussed in this review, with an emphasis on their function as biomarkers and therapeutic possibilities.

St. John’s wort a potentially clinical anti-neoplastic agent

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St. John’s wort is widely used in the treatment of various inflammatory, viral and neoplastic lesions. For the treatment of mild to moderate depression and other nervous conditions. It is a mixture composed of many components such as: Quercetin, Isoquercetin, Hypericin, Hyperforin, Chlorogenic acid, phenolic acid. The review article presents the numerical values of articles published in the Pubmed database with a given component of St. John’s wort. Obtained for Quercetin, Isoquercetin, Hypericin, Hyperforin, Chlorogenic acid, phenolic acid. This compound shows promising therapeutic potential in the treatment of cancer, cardiac and neurological disorders, HIV infections, etc. Hypericin is as effective as most conventional antidepressants.

Capecitabine (CAP) prodrug enzymatically converted to 5-fluorouracil (5-FU) in vivo

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Capecitabine (CAP) is an antineoplastic prodrug enzymatically converted to 5-fluorouracil (5-FU) in vivo. The animal model was already developed in an effort to gain further understanding of the bioactivation of CAP. We would like to present review of the study of CAP bioactivation in vivo and optimization the timing of prodrug delivery and action as well as its dose administrated in animals. We will concentrate on the use of high magnetic resonance for the study. This technique has been already used in humans and animals to target the tumor but quantification of the specific metabolites of anticancer drugs was not fully developed yet. Previous 19F MRS studies has shown that CAP is activated with three enzymatic steps and two intermediary metabolites, 5'-deoxy-5-fluorocytidine (5'-DFCR) and 5'-deoxy-5-fluorouridine (5'-DFUR), to form 5-FU in tumor tissues. The 19F MRS was applied also for quantitative monitoring the isolated perfused mouse and rat liver treated with 5-FU. It was also shown monitoring of CAP metabolism in human liver 19F MRS at 1.5 and 3T field strength.

Cellular responses to Trastuzumab conjugate treatment using MRI

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Magnetic resonance imaging (MRI) is an important technique in the detection of breast cancer in daily practice. Herein, we present an in vitro study aimed at determining cellular responses to Trastuzumab conjugate treatment using MRI. Breast cancer cells were cultured in three-dimensional (3D) geometry. Proton (1H) MRI and Fluorine-19 (19F) MRI were used for visualization of cellular locations within the Hollow Fiber Bioreactor (HFBR) device and to monitor cellular response to treatments. The results of this study confirm that cell growth is significantly decreased following treatment with Trastuzumab conjugates.

Extracellular vesicle cargo as a novel biomarker in Diabetes and its clinical complications

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Diabetes mellitus (DM) is a chronic disease of inappropriate glucose metabolism. It currently affects over 460 million patients worldwide and this number is constantly growing. Clinically, it causes severe inter-organs pathologies namely: diabetic nephropathy (DN) – the cause of diabetic kidney disease (DKD), micro- and microangiopathies, and neuropathies – causes of the diabetic foot ulcer (DFU). DFU is the major cause of hospital admissions and lower limb amputations in diabetic patients, and DN combined with hypertension can cause 80% of end-stage renal disease globally. We often diagnose DM by measuring blood glucose level. However, it is nonsufficient to monitor diabetic complications or in the very beginning of the DM. Therefore, there is an urgent need to find more specific markers. Extracellular vesicles (EVs) are nano-sized lipid bilayer structures released by different cells that contain specific membrane-markers; and carry functional cargo: proteins and nucleic acids. As EVs are present in various body fluids, they can serve as biomarkers of not only diabetes occurrence, but also its progression, complications, and therapy monitoring. Increased amount of EVs in serum is positively corelated with DM and the cargo of these EVs differs in diabetic complications. Non-coding nucleic acids extracted from blood. EVs can distinguish between a DFU an non-DFU diabetic patients EVs-protein (dipeptidyl peptidase-IV (DPP IV)) extracted from urine distinguishes stages of DKD, which help in monitoring of the patients without conducting standard biopsies. Moreover, there has been found a correlation between increased amount of urinary EV-microRNAs and the severity of DN. EVs extracted from urine or serum are minimally invasive diagnostic methods. I summarize the potential of EVs as biomarkers for Diabetes mellitus and its complications – diabetic foot ulcer and diabetic kidney disease and highlight achievements and challenges in the field.

Extracellular vesicles as novel diagnostic biomarkers - from bench to bed

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Liquid biopsies offer insights into numerous pathological conditions as well as monitoring therapeutic efficiency. Multiple studies have demonstrated extracellular vesicles' capabilities in various conditions, such as cancer, neurodegenerative disorders, and inflammations. Extracellular vesicles (EVs) are membrane-bound, spherical particles containing functional cargo: proteins and various types of nucleic acids, and specific surface markers. They play crucial roles in intercellular and interorgan communication. Due to this characterization, they have revealed the potential in the clinical diagnosis. However, high cost, advanced equipment and long preprocessing limits their clinical appliance. Hence, quick EVs analysis methods are currently under the thundering interest of many different research disciplines. Based on literature analysis, various procedures can be distinguished, e.g., Incorporating super absorbent polymer beads offers a straightforward, one-step technique. Furthermore, Exodisc-B, a device that can autonomously separate components without labels, and electrophoretic migration, a method established by physical properties, has revealed their potential in the isolation from body fluids. This noninvasive procedure have disclose strong prognosis maker for certain cancer as well as therapeutic scale. Sensitive aptasensor provide an innovative method of analyzing specific tumor markers (e.g., MUC1 for early gastric cancer). This cheap and simple method would able to personalize the prophylaxis and prognosis in the future. Moreover, integrated microfluidic devices have accomplished one-step separation and analysis, in turn, improve the efficacy of isolation and reveal the possibility in clinical usage. The latest methodology would boost the evolution in the field of EVs research. Herein I present a short overview of these, as well as their limitations, flaws, and advantages.

ANS Biomarkers for evaluation of stress and follow up of depression from multimodal signal processing

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In this paper I will sum up investigations on Autonomic Nervous System Biomarkers for the evaluation of Stress and Follow up of Depression from multimodal signal processing. I will also show data collected from a selected group of patients with depression, and compare them with healthy individuals. More than 300.000.000 of people suffer depression. Main global cause of dissability and is a mayor contributor to the orveral global morbidity of disease. More than 260.000.000 people suffer anxiety. Non invasive biomarkers in healthy subjects include mental stress, hemodinamic stress, and thermic stress. Pathologic stress is a physiologic adaptation to an ambiental phenomenon that happens regularly and alterates biological systems involved in response to stress, and can alter function of ANS. For this purpose, there are innovative biomarkers. Identification of them [ECG,PPG, respiration] and understanding their functioning offers the posibility to improve the evaluation of stress in healthy individuals, and ANS dysfunction in patients with depression.

Application of the analysis of variances to evaluate biomarkers for human diseases and longevity

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It is sometimes the case that the results of biomedical research are based on the incorrect use of statistical methods. This can produce false results and lead research down the wrong path. The validity of biomarkers for diseases and longevity allows for calculating biological age and life expectancy, assessing strategies aimed at slowing down ageing and standardizing research on disease and longevity. Depending on their origin, physical and biological properties, and characteristics, biomarkers are evaluated using different methods and approaches. Current biomarkers for diseases and longevity are divided into functional and biochemical ones. Functional biomarkers are more numerous, but the biomarker for the number of remaining natural teeth is also significant. Teeth are of great physiological importance for everyday life, affecting chewing, swallowing, speech, facial aesthetics and social interactions. Tooth loss is a serious health problem, especially for the elderly. The prevalence of edentulism tends to increase with age and may affect diseases and longevity. Calculations to evaluate the validity of studies for three special groups of people with a finite number of teeth in elderly age are made. Calculations for people with 1–9 teeth, 10–19 teeth, and more than 20 natural teeth left are given. The paper describes a one-way analysis of variances (ANOVA) for independent groups. It is proposed to use the ANOVA to evaluate the validity of studies of biomarkers for human diseases and longevity. The identification and measurements of biomarkers for longevity will make it possible to calculate biological age more accurately. It will provide better information on recommendations for appropriate medical screening, as well as for pre-existing health conditions.

Evaluating thrombotic event occurrence in ovarian cancer patients by using levels of Ca-125

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Ca-125 is a biomarker used in monitoring ovarian cancer before and after treatment. Ovarian cancer is a thrombogenous cancer and complications can lead to early patient death. Our aim was to evaluate, whether levels of Ca-125 could be used for predicting future thrombotic events. A comparative analysis with a retrospective study of newly diagnosed patients with ovarian cancer from 2017 till 2021 (n=342) was combined. We gathered information about the Ca-125 concentration pre-treatment and followed the patients' history for any thrombotic events (n=66) and compared the results with patients, that had no complications. Patients with thrombotic events, had statistically higher levels of Ca-125 ($p<0,001$), the average concentration of Ca-125 was 1569,6U/ml (median 433,1, mode 9,5). By using ROC scale, a threshold concentration was calculated – 522U/ml (AUC 0,7137, sensitivity 78,8, specificity 58,3). We compared the threshold concentration between patients with no complications and patients with complications. Having a concentration higher than 522U/ml has a statistically significant risk for developing thrombotic complications (OR 5,200, 95% confidence levels 2,752 to 9,830, $p<0,001$). Patients, who have a high Ca-125 concentration usually have an advanced ovarian cancer stage and are in a higher risk of thrombotic events. By evaluating Ca-125 concentration pre-treatment, anticoagulant treatment could be administered earlier.

CHRONIC GRANULOMATOUS DISEASE: NEW TREATMENT STRATEGIES

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Chronic granulomatous disease (CGD) is a primary immunodeficiency characterized by dysfunction of antigen-presenting cells, in which they do not produce reactive oxygen species to destroy pathogens. The development of primary immunodeficiency requires mutations in the gp91phox, p47phox, p22phox, p67phox or p40phox genes, which lead to the formation of mutant NADPH oxidase. Currently, symptomatic therapy is used as a treatment: lifelong antibacterial therapy, antifungal therapy and interferon-γ. Based on the data of available studies to analyze the results of modern treatment used in patients with CGD, its advantages and disadvantages, and to determine strategies for further treatment. The results of statistical data on studies of the last 5-7 years, presented in «Pubmed», «Frontiers» and the electronic resource for the cluster: CGD. Currently, there are 74 ongoing clinical trials worldwide aimed at finding an effective and safe treatment for CGD. A new generation of drugs such as Alentuzumab and gene therapy in the form of retroviral SF71-gp91phox transduced CD34+ cells are in studies. Clinical trials of gene therapy began back in 2004. In 2018, a trial of an orphan drug for X-linked CGC (a lentiviral vector that expresses gp91phox in bone marrow cells) was launched. In July 2022, a new study where Allentuzumab, Busulfan and Whole Body Irradiation-based Conditioning Regimen in Combination with Cytokine Antagonists (IL-6,+/-IFN-gamma) are used was launched. There are high hopes for it. In terms of the future treatment strategies, scientists hope that gene therapy using genome editing technologies such as CRISPR/Cas9 nucleases is a promising approach for patients with CGC. Thus, today, an active search for molecules and combined approaches to the treatment of CGD is ongoing, as evidenced by randomized clinical trials, which, with the use of new high-tech methods of biological and gene therapy, will improve the quality of life of such patients and their survival.

Biomarkers for Prostate Cancer

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In this paper I will sum up and compare Biomarkers for Prostate Cancer. Prevalence [Poland]: Second place between men [391.72/100.000], and fourth place in mortality. No established screening programs. Can be divided into two mayor classes: Prostate Cancer [PC] with alterations on reordering ETS, having many lesions in the signaling of P13K and p53, and Carcinomas with alterations in SPOP/CHDI.1 Within Molecular Biology in Prostate cancer, we have genetic alterations (Via PI3K-25-70% PC, deletions PTEN-10q23-50%, amplifications gen Myc, Deletions and mutations p53-70% PC, MAPK), hereditary genetic mutations [BRCA1, BRCA2, CHEK2, ATM, PALB2, RAD51D, MSH2, MSH6, MLH1, PMS2, RNASEL HOXB13] and factors influencing genetic mutations [Androgens, esteroidal hormones, infectious agents, diet]. Less than 15% of PC are hereditary. Identification of biomarkers can be done through PSA [Prostate Specific Antigen], Imaging Techniques [MRI, transrectal USG biopsy] or inmunohistochemistry [antibody 34B12, p63, p40, human calicreine type 2, protein ki67, overexpression of androgenic receptors and Ki67]. For this purpose we have different brands of Genic expression.

The Clinical Utility of Apolipoprotein A1 and Apolipoprotein B biomarkers in cardiovascular disease's risk Assessment and Management

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Apolipoprotein A1 (Apo A1) and apolipoprotein B (Apo B) are associated with cardiovascular disease. Apo A1 is the main protein of high-density lipoprotein (HDL) cholesterol, which is considered "good" cholesterol because of its protective effects on the cardiovascular system. Meanwhile, Apo B is a protein found in low-density lipoprotein (LDL) cholesterol, which is known as "bad" cholesterol because of its negative effects on the cardiovascular system. A review of the literature was performed based on the scientific databases of PubMed. The search was performed by using the following keywords: "biomarkers", "apolipoprotein". More than 11 published studies between 2017 – 2023 were reviewed. Research has shown that the ratio of Apo B to Apo A1 may be a better predictor of cardiovascular risk than traditional lipid measures such as total cholesterol and LDL cholesterol. Additionally, the measurement of Apo A1 and Apo B levels may provide important information on the effectiveness of lipid-lowering therapies and may help guide treatment decisions. Additionally, new biomarkers such as Apo C-III and PCSK9 have shown promise in predicting cardiovascular risk and guiding treatment decisions. Overall, the use of Apo A1 and Apo B biomarkers, along with other emerging biomarkers, may help improve risk stratification and guide personalized treatment decisions in the management of cardiovascular disease. However, further research is needed to fully understand the clinical utility and optimal use of these biomarkers. In conclusion, Apo A1 and Apo B are biomarkers that have been extensively studied in the context of cardiovascular disease. Apo A1 is a protective biomarker due to its role in reverse cholesterol transport and anti-inflammatory properties. On the other hand, Apo B is considered a pro-atherogenic biomarker due to its association with LDL cholesterol and risk of atherosclerosis.

The Role of Circulating Biomarkers in the Diagnosis and Prognosis of Cardiovascular Disease: A Comprehensive Evaluation of their Clinical Utility

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Cardiovascular disease (CVD) remains the leading cause of morbidity and mortality worldwide. There is growing evidence that circulating biomarkers, which can be measured in blood, urine, or other bodily fluids, may provide valuable insights into the pathogenesis and progression of CVD. It may also have diagnostic and prognostic value. This thesis aims to provide such an evaluation, focusing on the most promising circulating biomarkers associated with the pathogenesis and progression of CVD. A review of the literature was performed based on the scientific databases of PubMed. The search was performed by using the following keywords: "biomarkers", "cardiovascular disease". More than 15 published studies between 2017 – 2023 were reviewed. Studies have shown that circulating biomarkers can be early markers of CVD, allowing early diagnosis and control of the disease. For example, high levels of NT-proBNP have been associated with an increased risk of heart failure, even in asymptomatic patients. By monitoring NT-proBNP levels in at-risk patients, doctors can identify those who may benefit from earlier treatment.Circulating biomarkers are best used in conjunction with traditional risk factors such as age, blood pressure, and cholesterol. For example, hsCRP levels and traditional risk factors can be used to identify patients who are at high cardiovascular risk and require aggressive treatment.Some biomarker tests can be expensive, and the cost-effectiveness of using biomarkers in routine clinical practice needs to be carefully evaluated. This includes assessing the impact of biomarker testing on patient outcomes and healthcare costs. Certain biomarkers, such as hsCRP, NT-proBNP, troponin may be particularly useful in predicting cardiovascular risk and guiding treatment decisions in specific patient populations.Biomarkers in combination with traditional risk factors can improve the accuracy of cardiovascular disease risk prediction.

Standardization of dynamic TXB2 generation as antiplatelet/anticoagulant biomarker

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Thromboxane (TXB2) is first stable product of TXA2 degradation in arachidonic acid cascade, which is activated in response to many inflammatory factors. TXA2 is a highly prothrombotic eiconasoid, it activates platelets and is very important element of hemostasis. There are reports of prognostic role of increased concentration TXB2 as a biomarker in cardio – vascular diseases (CVD). Standardization of dynamic TXB2 generation in whole blood samples stimulated by shear stress. Shear stress was generated by energetic mixing whole blood samples (with citrate as an anticoagulant) in aggregation cuvettes with magnetic stirrer. This method also provides changes of stirring direction. Additionally to samples was added acetylasalicylic acid (ASA) as COX inhibitor, which inhibits thromboxane production. Concentration of TXB2 was measured by high preassure liquid chromatography (HPLC). Stirring whole blood samples in chamber with specific gas mixture, which consisted of 80% N2, 19,5% CO2, 0,5% O2, caused statistically significant increase of TXB2 concentration in compare to samples without stirring. In addition, mixing samples with ASA didn't increase TXB2 concentration. In conclusion, this method needs further standarization in reference to other antiplatelet compounds and many various patological conditions connected with overreactive platelets. However, already obtained results shows high sensitivity and precision of this method. After more detailed standarization it could be used for antiplatelet/anticoagulant evaluation of many compunds and in diagnostic of CVD caused by eicosanoids and overreactive platelets.

Anticoagulant properties of extract from Curcuma longa by thromboelastometry in vitro

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Literature data indicate that natural raw materials containing polyphenols may exert an anticoagulant effect. One of such materials is powdered turmeric rootstock (Curcumae longae rhizoma) which contains curcumin. The aim of the study was to evaluate in detail the anticoagulant properties of the extract from powdered turmeric rootstock (Curcumae longae rhizoma). Methods: Soxhlet extraction with a polar solvent (70% ethanol). Afterwards the evaluation of the effect of the obtained extract on the coagulation parameters of pork blood using in vitro thromboelastometry method (apparatus ROTEM) in platelet-rich plasma. Results: Turmeric rootstock extract in a concentration-dependent manner prolonged the clotting time and the time of clot formation (CT/CFT), decreased the slope of the coagulation curve (alpha) and had no statistically significant effect on the maximum cohesion of the clot (MCF). In conclusion, the antithrombotic properties of an ethanolic extract of C. longa have been demonstrated in vitro. Admittedly further research, including in vivo research, confirming this properties, are necessary but it may be expected that, apart from the known cholagogic, choleretic, antibacterial and antioxidative properties of the raw material, it can be used as an auxiliary in the treatment and prevention of thromboembolic events that are complications of civilization diseases affecting the circulatory system such as hypertension and diabetes.

Anticoagulant properties of lemon balm (Melissa officinalis) by thromboelastometry in vitro

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Literature data indicate that plant materials containing polyphenols and flavonoids may have an anticoagulant effect. One of such materials is lemon balm leaf (Melissa officinalis flos).The aim of the study was to evaluate in detail the anticoagulant properties of the leaf extract M. officinalis. This raw material contains numerous flavonoids, including quercetin and polyphenols, especially rosmarinic acid.Methods: Soxhlet extraction with a polar solvent (water), then, the evaluation of the effect of the obtained extract on the coagulation parameters of pork blood using in vitro thromboelastometry metho (apparatus ROTEM) in platelet-rich plasma.Results: Lemon balm extract in a concentration-dependent manner prolonged the clotting time and the time of clot formation (CT/CFT), decreased the slope of the coagulation curve (alpha) and had no statistically significant effect on the maximum cohesion of the clot (MCF).In conclusion, the antithrombotic properties of an aqueous extract of lemon balm have been demonstrated in vitro. This justifies undertaking further research and may indicate that, apart from the known sedative properties of the raw material, it can be used as an auxiliary in the treatment and prevention of thromboembolic events that are complications of civilization diseases affecting the circulatory system, especially those dependent on emotional stress.

Anticoagulant properties of ginkgo biloba leaf extract thromboelastometry in vitro

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Literature data indicate that plant materials containing polyphenols may exert an anticoagulant effect. One of such raw materials, containing such polyphenols as diterpene lactones – ginkgolides, trilactone sesquiterpene – bilobalide is a ginkgo biloba leaf (Ginkgo biloba L.). The aim of the study was to evaluate in detail the anticoagulant properties of ginkgo biloba leaf extract. Soxhlet extraction using dried and ground green leaves of G. Biloba with 95% ethanol. Evaluation of the effect of the obtained extract on the coagulation parameters of pork blood using in vitro thromboelastometry method in whole blood using the ROTEM apparatus. G. Biloba extract, in a concetration-dependent manner prolonged the clotting time and clot formation time (CT/CFT), decreased the slope of the coagulation curve (Alpha) and had no statistically significant effect on maximal cohesion of the clot (MCF). In conclusion, the anticoagulant properties of an ethanolic extract of G. Biloba leaves have been demonstrated. On the one hand, further research is needed to confirm these properties, on the other hand, it indicates the fact that the tested raw material can be used as a supplementary therapy in treatment and prevention of thromboembolic events occurring as complications of various civilization diseases affecting the circulatory system. This is a valuable addition to the known properties of the raw material, such as improving blood flow in blood vessels, especially in the brain and antioxidant properties and reducing vascular permeability with increasing their flexibility.

The role of lncRNAs in the treatment of Alzheimer's disease

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Alzheimer's disease (AD) is a neurodegenerative and progressive disease of unknown etiology, and the main clinical manifestation is loss of episodic memory and cognitive function. It is the most common type of dementia in the elderly, affecting 6% of people over 65, and has a mortal-ity rate of around 500,000 people. Extracellular β-amyloid (Aβ) plaques and intracellular neuro-fibrillary tangles (NFTs), consisting of phosphorylated tau protein, are characteristic histo-pathological features of AD. Recent studies suggest that long non-coding RNAs (lncRNAs) play an important role in AD. The human genome is 80% transcribed as non-coding RNA (ncRNA) and is likely capable of manipulating various biological processes. ncRNA consists of long non-coding RNAs (lncRNAs) and microRNAs. Long non-coding RNAs (lncRNAs), playing a key role in the regulation of gene expression at the epigenetic, transcriptional and post-transcriptional levels as well as in chromatin modulation and protein complex organization, are non-protein coding transcripts that are longer than 200 nucleotides and play an important role in the pathogenesis of AD . Most lncRNA genes are transcriptionally regulated by histone modification. Due to such a diverse role of lncRNAs in the pathomechanism of AD, lncRNAs can serve as unique therapeutic targets in the diagnosis and treatment of Alzheimer's disease. The BDNF-AS lncRNA plays an important role in the regulation of BDNF protein expression. Inhibition of lncBDNF-AS increases BDNF mRNA expression, increases BDNF protein, and triggers neuronal differentiation, and given the role of BDNF in AD and other neurological disorders, pharmacological inhibitors of BDNF-AS may have significant therapeutic potential for treatment.The complex networks leading to the development of AD and the sophisticated ability of lncRNAs to modify biological pathways make understanding their role in the pathomechanism an attractive diagnostic tool and a new therapeutic option.

The role of new biomarkers of heart damage in cardio-oncology patients

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In recent years, the survival rate of cancer patients has been increasing due to new, effective anti-cancer therapies. However, increased survival in these patients is associated with the risk of developing cardiovascular diseases, which are very often the reason for the death of oncological patients, immediately after its recurrence. Despite the benefits of chemotherapy in the treatment of cancer, it can cause catastrophic tissue damage, resulting in a range of life-threatening cardiovascular toxicities. Due to this, there is an increasing emphasis on the early use of biomarkers of cardiac damage to prevent cardiotoxicity at an early stage, before it becomes irreversible.The most important markers of heart damage are cardiac troponin and natriuretic peptides. Cardiac troponins, with high specificity for cardiac injury, are the gold standard for the detection of cardiac necrosis and cardiomyocytes, and the importance of their monitoring for cardiotoxicity has been demonstrated mainly in studies of cancer patients treated with anthracyclines. A correlation was found between an increase in troponin I and a greater degree of left ventricular dysfunction and a higher incidence of cardiovascular events. Natriuretic peptides, secreted by cardiomyocytes, are important biomarkers of myocardial pressure overload and distension, and are of particular importance in the detection of acute cardiotoxicity because their levels increase within 24 hours of exposure to chemotherapy. Currently, studies are underway on the usefulness of myeloperoxidase and microRNAs in predicting adverse effects and worse prognosis, they are more specific in detecting both acute and chronic effects of chemotherapy. Rapid detection of cardiac biomarkers enables early detection of toxicity. The use of a combination of different markers will be crucial for future cardioprotective strategies.

The role of mcRNA and lncRNA in the pathogenesis of atherosclerosis

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Atherosclerosis is a major risk factor for the development of cardiovascular diseases, which are the leading cause of death worldwide. Atherosclerosis is initiated by endothelial activation followed by the accumulation of lipids, fibrous elements, and calcifications, resulting in vasoconstriction and activation of inflammatory pathways. Long non-coding RNAs (lncRNAs) and microRNAs (miRNAs) are important regulators in atherosclerotic plaque development. miRNAs regulate gene expression after transcription, while lncRNAs can activate and repress genes through various mechanisms at both the transcription and translation levels. miRNAs are key molecules for maintaining cardiovascular homeostasis, in particular the most studied molecule, miR-126, plays a role in preventing atherosclerosis by regulating the vascular endothelial growth factor (VEGF) pathway and inhibiting endothelial permeability. Several lncRNAs identified in atherosclerotic plaques play a protective role in vascular disease, and one of them, lncRNA CHROME (a regulator of cholesterol homeostasis in miRNA expression), protects against atherosclerosis by miRNA inhibition. Knowledge and further research on the functions of non-coding RNAs in atherosclerotic plaque development show that miRNAs and lncRNAs alter the transcription of genes involved in atherosclerosis. Progress in understanding the mechanisms leading to the development of atherosclerosis may provide better therapeutic options, improve diagnosis and prognosis of the disease.

The role of immune system cells in the development of atherosclerosis

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The amazing progress in science that has been observed for several years has shown the enormous potential rests in immune cells that can become carriers in the therapy of many diseases. So far, the focus has been mainly on the modulation and management of risk factors, including: hyperlipidemia and hypertension, inhibition of platelet aggregation and interventional revascularization. However, understanding the pathomechanism of chronic inflammation in the vessel walls, and thus learning the role of immune cells in atherosclerosis, are the basic actions that we must take so that the anti-inflammatory approach can also be included in the treatment guidelines, which brings unimaginably large possibilities of modern treatment of atherosclerosis and prevention of its effects. An increase in oxidative stress, which leads to an inflammatory reaction through a cascade of reactions is one of the key elements affecting the condition of the aortic wall or vessels coronary. The immune system itself, as a highly complex and a specialized unit, it works on different fronts, as some lymphocytes are thought to drive atherosclerosis while others protect against it. Therefore, the progression of cardiovascular disease may probably result from an imbalance of pro- and anti-inflammatory forces, therefore it is necessary to characterize specific types of immune cells and understand their function in atherosclerosis. Shifting the balance towards anti-inflammatory immune responses has great potential as it opens the door to new therapeutic pathways that can slow down or even reverse the disease, and this will result in more effective management of the disease.

Use of plastic bags to manage hypothermia in pre-term infants- Highlights and Challenges: A Narrative Review

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Babies born before term (less than 37 weeks of gestation) are termed as ‘pre-term babies’. Around 15 million babies are born pre-term every year worldwide. In addition to the long-term post-birth complications, there are certain immediate dangers associated with prematurity such as breathing problems, increased susceptibility to infections, enterocolitis, low birth weight and heart issues. One of the most common short-term complications is hypothermia, or low body temperature. Prompt use of plastic/polythene bags, skin-to-skin care (SSC), transwarmer mattress, warming hats and transport incubator can significantly reduce the near fatal consequences of hypothermia. This narrative review aims to shed light on the benefits and risks associated with the use of plastic bags in the management of hypothermia in pre-term infants. It also focusses on the success rate of temperature control that is achieved following the use of plastic bags to wrap the babies in the hospital. The studies reported in this review were collected from the databases that include PubMed, Sciencedirect, Hindawi, Nature and JAMA Network in the period of 2009-2023. The keywords used in this study were prematurity, infants, hypothermia, temperature and plastic bags. The articles that emphasized only on the use and benefits of plastic bags for babies were included, and the studies that focused on temperature control for babies using other traditional or modern techniques were excluded. Literature review showed that the use of plastic bag wrapping technique is one of the most efficacious mode of management of hypothermia in pre-term infants. This review article aims to educate the healthcare providers, especially hailing from the rural areas regarding this cost-effective method for managing in-hospital hypothermia among premature babies. This would prove helpful to hospital professionals and midwives from remote areas, who do not have the access to high-performance medical equipment.

Galectin-3 as a biomarker for early diagnosis of heart failure in pediatric patients with congenital heart defects

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Congenital heart defects are one of the most common malformations that can lead to heart failure. A significant challenge in the diagnosis and treatment of these diseases is the early identification of patients at risk for heart failure. To this end, researchers are focusing on finding biomarkers that could indicate this threat. One of the potential predictors is a protein from the galectin family, specifically galectin-3. In this review, the authors analyzed the available results of studies on the use of galectin-3 as a diagnostic tool for congenital heart defects leading to heart failure in pediatric patients. In recent years, galectin-3 has become one of the potential diagnostic biomarkers of heart failure. Galectin-3 is a protein that affects biological processes such as cell adhesion, cell proliferation and apoptosis. Studies have shown that elevated serum galectin-3 may serve as an indicator of heart failure. Clinical studies in paediatric patients with congenital heart defects and myocardial insufficiency have shown that galectin-3 levels were increased in patients with more severe disease as well as in patients with poorer treatment outcomes. These results suggest that galectin-3 may be a useful diagnostic biomarker of heart failure, allowing early detection of the disease and better monitoring of patients. Galectin-3 is a promising diagnostic biomarker of heart failure, complementing echocardiography. Studies show that it can be a useful tool for identifying paediatric patients with congenital heart defects who are at higher risk of heart failure, and for monitoring disease progression and treatment outcomes.

Fermented coffee - a drink helpful in the prevention of civilization diseases

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One of the reasons for the development of lifestyle diseases is oxidative stress. This condition results from an imbalance between antioxidants and reactive oxygen species. Increased synthesis of free radicals, in addition to physiological processes, may also be the result of the body's response to environmental factors, which include, among others, an incorrect diet. The results of numerous scientific studies show that the long-term use of diets rich in plant polyphenols correlates with a lower incidence of chronic diseases of free radical origin and related mortality. The current state of knowledge indicates the richness of nutrients and bioactive substances in fermented products. As is known, the fermentation process can have a positive effect on increasing the amount of bioactive ingredients. One of the products formed as a result of metabolic changes carried out by microorganisms is fermented coffee. The material in the study was fermented coffee available on the food market (Kisi-Kisi). The total polyphenol content (TPC) determination was carried out according to ISO 14502-1 and the method of Singleton VL, Rossi JA with the use of the Folin - Ciocalteu reagent. Absorbance was measured at 765 nm (Agilent 8453UV). Results are expressed in mg/L gallic acid. The antioxidant activity of the samples was measured by spectrophotometry using the synthetic DPPH radical. The absorbance was measured at a wavelength of 518 nm. All assays were performed in triplicate, in three separate experiments, yielding nine replicates. The total polyphenol content was 175.6 mg GAE/L. The value of antioxidant potential was recorded at the level of 83.1%. The above research results have shown that fermented coffee can be a rich source of polyphenols, and its antioxidant potential is comparable to products commonly considered as strong antioxidants. This means that it can be a good nutritional choice for people at risk of oxidative imbalance.

Can a fermented drink based on moringa and jasmine be a source of antioxidants?

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From month to month, more and more fermented drinks appear on the food market, surprising consumers with their composition. One of them is a product based on jasmine - a plant from the Oleaceae family - and the tree of life - moringa. As the analyzes show, jasmine is an ingredient with antimicrobial, anti-inflammatory and anti-cancer properties. Studies also indicate the salutary effect of this plant on the human body by removing free radicals, which is due to the presence of numerous phytonutrients: alkaloids, flavonoids (rutoside), terpenes and phenols. Moringa is also presented in the scientific world as a plant material with a composition rich in health-promoting bioactive ingredients: alkaloids, tannins, saponins and phytates. Due to so many reports on the health-promoting properties of fermented products and the rich phytochemical composition of plants that are a component of the product, the aim of the study was to examine the content of polyphenols in a fermented drink based on moringa and jasmine, thus checking whether it can be an important source of antioxidants. The material in this study was a fermented drink based on moringa and jasmine available on the food market (Kisi-Kisi). The total polyphenol content (TPC) determination was carried out according to ISO 14502-1 and the method of Singleton VL, Rossi JA with the use of the Folin - Ciocalteu reagent. Absorbance was measured at 765 nm (Agilent 8453UV). All tests were performed in triplicate. Results are expressed in mg/L gallic acid. The total polyphenol content was 133.2 mg GAE/L. The above research results have shown that a fermented drink based on moringa and jasmine can be a rich source of polyphenols. The high content of bioactive compounds in the product is determined by the plant raw materials from which it was made. This means that it can be a good nutritional choice with potentially beneficial health-promoting properties.

Biomarkers and methods of their determination in selected neurodegenerative diseases

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The number of people affected by neurodegenerative diseases is constantly soaring. There are mainly elderly people who are ever-increasing part of highly developed societies. In neurodegenerative diseases the function and structure of cells of the nervous system are disturbed. Nervous system disorders cause mobility problems (ataxia) and cognitive impairment (dementia). Out of all the neurodegenerative diseases in this poster there are information about biomarkers in Alzheimer disease (AD), Parkinson's disease (PD) and multiple sclerosis (MP). Biomarkers are objective and measurable physiological changes (or disease changes) in particular material. Information about the presence or exact content of biomarkers are useful in diagnosis, monitoring the course of disease and assessing the effectiveness of treatment method used. Biomarkers of neurodegenerative diseases are detected in the cerebrospinal fluid (CSF) and blood. Blood biomarkers are sought because it is more accessible and easier to take a sample compared with the CSF. Functional magnetic resonance imaging (fMRI) is also used. This work assumes a review and chemical overview of biomarkers of mentioned neurodegenerative diseases and its detection techniques.

Discovery and translation of cancer biomarkers: proteomics and genomics

Sara Bień

Kolegium Nauk Medycznych; Uniwersytet Rzeszowski; Rzeszów; Polska

Cancer is often diagnosed in its late stages, when the chance of a cure is relatively low, and while research initiatives in oncology are discovering many potential cancer biomarkers, few of them make it to clinical use. The review covers the current discovery and translation of cancer biomarkers with a focus on proteomics and beyond. The aim of the paper is to present the advantages of addressing the challenges of integrating multiple omics approaches to achieve optimal sensitivity for tumor heterogeneity analysis. The review examined proteomic and genomic techniques for detecting cancer biomarkers and outlined the advantages and challenges of integrating multiple omics approaches to achieve optimal sensitivity and address tumor heterogeneity. Identification of aggressive tumors requires improved sensitivity and implementation of biomarkers representative of tumor heterogeneity. Over the last decade of genomic and proteomic research, significant advances have been made in next-generation sequencing and mass spectrometry techniques. This in turn has led to a dramatic increase in the identification of potential genomic and proteomic cancer biomarkers. However, there has been limited success in translating these findings into clinical practice. New techniques are the most promising molecular tool for comprehensive cancer assessment, early detection and transition to precision medicine in oncology.

Biomarkers of sepsis: a review of the literature

Sara Bień

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Biomarkers can be useful for identifying or ruling out sepsis, identifying patients who may benefit from certain treatments, or assessing response to treatment. The aim of the study was to analyze sepsis biomarkers that were used in clinical or experimental studies to help better assess their usefulness. The PubMed electronic database search engine was used to identify clinical and experimental studies that evaluated a biomarker in sepsis. Many biomarkers have been evaluated for use in sepsis. Most biomarkers have been clinically tested, mainly as prognostic markers in sepsis; relatively few have been used for diagnosis. None have sufficient specificity or sensitivity to be used routinely in clinical practice. PCT and CRP are the most widely used, but even these have limited ability to distinguish sepsis from other inflammatory conditions or predict outcome.

Biomarkers of gastroesophageal reflux disease

Sara Bień

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Gastroesophageal reflux disease (GERD) encompasses an array of disorders unified by the reflux of gastric contents. Owing to the multitude of potential disease manifestations, both esophageal and extra-esophageal, no single biomarker can capture the disease spectrum, making it more plausible that there be a set of GERD biomarkers, each quantifying specific aspects of GERD-related pathology. This review aimed to comprehensively search the literature on biomarkers of GERD, specifically in relation to endoscopically negative esophageal disease and excluding conventional pH-impedance monitoring. The aim of the study was to identify serum GERD biomarkers to influence or predict disease incidence. We searched PubMed and Embase for biomarkers of GERD. Histopathologic biomarkers, baseline impedance, and serologic assays are some of the candidate biomarkers reviewed. The most unifying concept was of manifestations of impaired esophageal mucosal integrity, evident by increased ionic and molecular permeability, and/or destruction of tight junctions. Impaired mucosal integrity quantified by baseline mucosal impedance, proteolytic fragments of junctional proteins, or histopathological features, has emerged as a promising GERD biomarker.

Saliva biomarkers in cancer detection

Sara Bień

Kolegium Nauk Medycznych; Uniwersytet Rzeszowski; Rzeszów; Polska

There is an urgent need to develop fast, highly accurate and non-invasive tools for cancer screening, early detection, diagnosis, staging and prognosis. Saliva, as a multicomponent oral fluid, contains secretions from the large and small salivary glands, which are largely supplied with blood. Molecules such as DNA, RNA, proteins, metabolites and microbiota present in the blood can also be found in saliva. Recently, saliva diagnostics to identify specific biomarkers have received much attention because sampling and processing is simple, cost-effective, accurate, and causes no discomfort to the patient. Here, we consider the latest candidate salivary biomarkers for systemic cancer, dividing them according to their origin into: genomic, transcriptomic, proteomic, metabolic and microbial , as well as described in salivary biomarkers used for systemic cancer detection. The aim of the review was to understand the potential mechanisms by which tumors mediate changes in the profile of salivary biomarkers, as well as to describe in salivary biomarkers used for systemic cancer detection. Recent approaches to the development of saliva biomarkers have explained the tremendous progress towards clinical application. Several biomarkers have been identified and validated for the systematic detection of cancer at the preclinical level. The integration of a better understanding of saliva and emerging new, accurate detection technology will open a new era in saliva diagnostics.

Adiponectin as a risk factor for type 2 diabetes

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Type 2 diabetes is one of the most common civilization diseases in the world. It is said that 422 million people around the world have diabetes and 179 million people haven't been diagnosed yet, and the number of patients is increasing every year. The causes of the disease are related to insulin resistance and insulin secretory dysfunction, also there are some environmental factors that significantly increase the risk of the diabetes, which are obesity and overweight, stress, poor diet and lack of physical activity. Adiponectin (ADPN) is a cytokine produced in adipose tissue that affects many metabolic processes, especially carbohydrate and fatty acid metabolism in the liver and muscle, also indirectly affects the insulin sensitivity of peripheral tissues. ADPN has antiatherosclerotic, anti-inflammatory and insulin sensitivity-enhancing properties. The main mediator of the antiatherosclerotic property of adiponectin is T-cadherin, a protein that binds adiponectin to the cell membrane. Reduced levels of adiponectin in the blood are considered to be an independent risk factor for type 2 diabetes. Lifestyle changes, fish consumption, omega-3 supplementation, following the Mediterranean diet and some diabetes medications, i.e. glitazones, angiotensin-converting enzyme inhibitors or angiotensin receptor blockers take part in increasing an adiponectin levels. The goal of intensive research should be to develop new medications that would raise plasma adiponectin levels. The purpose of this study was to summarize the current knowledge regarding the action and role of adiponectin as a risk factor for type 2 diabetes.

The role of galectin 3 as a biomarker of cardiovascular diseases

Kamil Jugo

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Cardiovascular disease is a term that encompasses a great many disease entities, such as heart failure and coronary artery disease. With the development of civilization, we are seeing an increase in the incidence of these diseases, so it is very important to look for new markers to detect them and assess their prognosis. One potential biomarker of heart disease is galectin-3, a protein belonging to the lectin family, whose property is to bind β-galactosides through a carbohydrate recognition domain. Galectin-3 is predominantly localized in the cytoplasm, and can also be secreted into the extracellular environment and serum and urine through an incompletely understood mechanism resembling egocytosis. Many cell types, especially macrophages, as well as skin, prostate, and colonic epithelial cells, show galectin-3 expression. This lectin is secreted by macrophages activated by myocardial injury. It stimulates the release of TGF-β factor and some interleukins, additionally enhances the proliferation of fibroblasts present in the myocardium and collagen synthesis, which consequently contributes to myocardial fibrosis and progression of myocardial failure. It also plays a role in the regulation of the cell cycle, induction of angiogenesis and cell proliferation, suggesting that galectin 3 may also be used as a biomarker for certain cancers. Despite the low expression of galectin 3 in cardiomyocytes, its concentration significantly increases in decompensated myocardial failure. Research has shown that serum galectin 3 levels can be useful for assigning patients with heart failure to particular groups of high, intermediate and low risk of acute myocardial infarction, allowing the appropriate intensity of therapy to be selected. In conclusion, galectin 3 is a promising biomarker in cardiovascular disease mainly through its involvement in myocardial fibrosis.

HER-2 overexpression as a prognostic factor in gastric cancer.

Paulina Nowak

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Gastric cancer is classified as a disease of civilization. It is characterized by a relatively poor prognosis. It is most often detected at a very advanced stage of development, which reduces patients' chances of cure or long-term survival. There is a constant search for new treatments or diagnostics that could help many patients. One of the factors that have recently been evaluated in the context of determining the prognosis of gastric cancer patients is the presence of HER-2 receptors. This is a protein that belongs to the epithelial growth factor receptor group. Its expression is also evaluated in the presence of breast cancer. In gastric cancer, HER-2 overexpression is found in a significant percentage of patients. It is more often associated with histologic intestinal type and the location of the lesion at the gastroesophageal junction. Overexpression is determined by immunohistochemistry or FISH methods. HER-2 receptor expression is associated with a worse prognosis among patients. Along with patient age and TNM scale, they are determined as independent prognostic factors. The association of HER-2 receptors with tumor size, infiltration of adjacent tissues, presence of distant metastasis or metastasis to adjacent lymph nodes has been determined. HER-2 receptors may indicate a poorer response to standard chemotherapy treatment. However, the demonstration of overexpression of the receptors in question in gastric cancer provides opportunities for treatment that will be molecularly targeted, thus giving patients a better chance of therapy success. With the confirmation of the presence of this receptor in patients, monoclonal antibodies against HER-2 can be used. In conclusion, the determination of the presence of HER-2 receptor mutations is a prognostic factor in gastric cancer and allows the selection of appropriate treatment.

Importance of CA242 marker in the diagnosis of pancreatic cancer

Kamil Jugo

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Pancreatic cancer is one of the cancers with the worst prognosis. The 5-year survival rate is described as less than 5 percent, and this cancer ranks 5th in terms of causes of death from malignant tumors. Risk factors mainly include smoking, diabetes, obesity and emerging chronic pancreatitis. Detection of pancreatic cancer is based on imaging tests such as endoscopic ultrasonography and retrograde cholangiopancreatography, but these are too invasive and expensive to use for screening. In addition to imaging tests, we can use tumor markers, which are much less expensive and more relevant to screening the general population. For the diagnosis of pancreatic malignant neoplasm, the CA19-9 marker is mainly used, but its sensitivity and specificity are not sufficient to use in screening. Other markers complementary to the diagnosis of pancreatic cancer are CA242 and the fetal cancer antigen CEA. The CA242 marker is a carbohydrate antigen that is a sialic acid-containing derivative that is overexpressed in tumor tissues and its serum concentration is derived more from tumor cells. CA242 antigen has the highest specificity of the 3 markers, so using it in diagnostics reduces the number of false positives. However, it has a lower sensitivity than CA19-9. In conclusion, simultaneous determination of CA19-9 and CA242 markers may be a better diagnostic alternative than determination of the individual markers individually, and when combined with consideration of disease risk factors, may increase early detection of pancreatic cancer.

The role of lipoprotein-associated phospholipase A(2) in the assessment of cardiovascular risk in patients with atherosclerosis

Paulina Nowak

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Atherosclerosis is one of the most common cardiovascular diseases. Its development is related to the development of civilization. It is a disease of the arteries, in which atherosclerotic plaques form in their wall, which are composed mainly of cholesterol. This leads to narrowing of the lumen of the vessels, and consequently to ischemia of the organs. Due to damage to the wall, inflammation occurs. A marker for assessing inflammation in atherosclerosis is lipoprotein-associated phospholipase A(2) Lp-PLA(2). It is an enzyme produced by macrophages, lymphocytes and monocytes present in atherosclerotic plaques. It exhibits vascular specificity. By hydrolyzing phospholipids on LDL particles, it leads to the formation of atherosclerotic mediators. This accelerates the development of atherosclerosis, and increases the risk of destabilization of the atherosclerotic plaque, which is a very unfavorable phenomenon, as it can lead to many negative phenomena, including acute coronary syndromes, which are a major threat to life. Due to its properties and its proven association with atherosclerosis, Lp-PLA(2) is a very good predictive marker for determining the cardiovascular risk present in atherosclerosis. Increased levels of this enzyme in patients correlate with increased cardiovascular risk, so the determination of its levels can be used to reduce it. This could have many positive effects for patients and become another useful tool for the physician. In conclusion, lipoprotein-associated phospholipase A(2), which accelerates the development of atherosclerosis, is a useful marker for assessing cardiovascular risk in people struggling with the disease.

The role of biomarkers in the diagnosis of atherosclerosis using pentraxin 3 as an example

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A biomarker is an objectively measurable biological indicator that perfectly reflects changes in the body, both physiological and pathological. There are a number of studies that suggest that a biomarker such as pentraxin 3 can act as an important indicator providing information on the efficacy and course of treatment in the inflammatory process in vascular diseases. Pentraxin 3 (PTX 3) is a specific marker of local inflammation that reflects the occurrence of the inflammatory process in cardiovascular diseases, and thus can be used as a reliable parameter to assess the severity of the aforementioned group of diseases. Studies have shown that pentraxin 3 has anti-inflammatory effects and inhibits the activation of the complement system. It can also affect a number of ailments such as hypertension, coronary artery disease, arrhythmias and heart failure. In addition, studies suggest that pentraxin 3 can be used as a reliable parameter to assess the severity of atherosclerosis. Therefore, the biomarker PTX3 can be used in the diagnosis and monitoring of cardiovascular disease. In this post, the authors focus on describing the action of pentraxin 3 with particular emphasis on its role in the inflammatory process in the course of vascular disease, as well as its impact on a number of cardiovascular diseases. In addition, they analyze the presence of the PTX3 marker as an adverse prognostic factor for the group of diseases described in this paper.

GPx-1 activity as a potential biomarker in coronary artery disease

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Glutathione peroxidases (GPx) are a family of antioxidant enzymes that catalyze the reduction of hydrogen peroxide and organic peroxides with the help of reduced glutathione. They are responsible for protecting cells from oxidative stress and regulating cellular redox balance. In humans, eight forms of GPx have been identified, which may exhibit different activity in particular pathological states of the body. The main focus was on GPx-1 due to numerous studies describing its importance in cardiovascular diseases. The aim of the study was to identify available studies evaluating GPx-1 activity and its role in cardiovascular events, which enabled the assessment of its usefulness as a potential biomarker. The PubMed database was searched using the following terms: "glutathione peroxidase 1", "biomarker", "coronary artery disease", "cardiovascular events". Criteria were adopted to identify 6 scientific papers. The results of the study indicated a decrease in GPx-1 activity in patients with coronary artery disease (CAD). Moreover, as GPx-1 activity decreased, the likelihood of future cardiovascular events increased. A decreased GPx-1 activity may contribute to an increased risk of cardiovascular complications in patients with CAD and can be considered as a potential biomarker of poor prognosis in this disease.

Adiponectin as a risk factor for type 2 diabetes

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Type 2 diabetes is one of the most common civilization diseases in the world. It is said that 422 million people around the world have diabetes and 179 million people haven't been diagnosed yet, and the number of patients is increasing every year. The causes of the disease are related to insulin resistance and insulin secretory dysfunction, also there are some environmental factors that significantly increase the risk of the diabetes, which are obesity and overweight, stress, poor diet and lack of physical activity. Adiponectin (ADPN) is a cytokine produced in adipose tissue that affects many metabolic processes, especially carbohydrate and fatty acid metabolism in the liver and muscle, also indirectly affects the insulin sensitivity of peripheral tissues. ADPN has antiatherosclerotic, anti-inflammatory and insulin sensitivity-enhancing properties. The main mediator of the antiatherosclerotic property of adiponectin is T-cadherin, a protein that binds adiponectin to the cell membrane. Reduced levels of adiponectin in the blood are considered to be an independent risk factor for type 2 diabetes. Lifestyle changes, fish consumption, omega-3 supplementation, following the Mediterranean diet and some diabetes medications, i.e. glitazones, angiotensin-converting enzyme inhibitors or angiotensin receptor blockers take part in increasing an adiponectin levels. The goal of intensive research should be to develop new medications that would raise plasma adiponectin levels. The purpose of this study was to summarize the current knowledge regarding the action and role of adiponectin as a risk factor for type 2 diabetes.

Anticoagulant properties of extract from Ruta Graveolens by thromboelastometry in vitro.

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Anticoagulant properties of extract from Ruta Graveolens by thromboelastometry in vitro. Literature data indicate that natural raw materials containing polyphenols may posses an anticoagulant effect. One of such materials is rue herbs (Ruta Graveolens). The aim of the study was to evaluate in detail the anticoagulant properties of the extract from rue herbs (Ruta Graveolens). Soxhlet extraction with a polar solvent (30% ethanol). Afterwards the evaluation the effect of the obtained extract on the coagulation parameters of pork blood using in vitro thromboelastometry method (apparatus ROTEM) in platelet-rich plasma. Rue herbs extract in a concentration-dependent manner prolonged the clotting time and the time of clot formation (CT/CFT), decreased the slope of the coagulation curve (α) and had no statistically significant effect on the maximum cohesion of the clot (MCF). In conclusion, the antithrombotic properties of an ethanolic extract of Ruta Graveolens have been demonstrated in vitro. Admittedly further research, including in vivo research, confirming this properties, are necessary but it may be expected that, apart from the known properties of the raw material, such as lowering blood pressure, improving peripheral circulation and sealing the walls of blood vessels, it can be used as an auxiliary in the treatment and prevention of thromboembolic events that are complications of civilization diseases affecting the circulatory system such as hypertension and diabetes.
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The analysis of the impact of rotating magnetic field on oxidative stress markers

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Oxidative stress is characterized by an excessive concentration of reactive oxygen species (ROS) resulting from a disturbance in the balance between ROS production and their removal by antioxidant systems (SOD, CAT, GPx). Prolonged and intense oxidative stress can cause various forms of damage to cells, which markers are total antioxidant capacity (TAC), reactive oxygen species modulator (ROMO1), and malondialdehyde (MDA). It has been demonstrated that magnetic fields can positively affect human health, for example, by reducing oxidative stress. Aim of the study was determination of the effect of a rotating magnetic field (RMF) on the activity/concentration of selected oxidative stress markers. A group of 30 healthy volunteers (15 women and 15 men) (mean age 24.8 ± 5.1) was included in the study. Serum samples were collected in K2EDTA tubes. A portion of the serum was withdrawn and treated as an internal control group (IC). Additional serum samples were exposed to RMF at different frequencies (25 and 50 Hz) using RMF for two exposure durations (1 and 3 hours). Activity/concentration of selected oxidative stress markers. (CAT, GPx, SOD TAC, ROMO, MDA) was analyzed by ELISA. Statistical analysis was performed using the R studio program. The influence of a RMF on the activity/concentration of SOD, MDA, TAC, and ROMO1 was demonstrated ($p<0.001$; $p=0.0013$; $p<0.001$; $p=0.003$). The RFM can reduce oxidative stress, as evidenced by higher SOD and CAT activities in the IC than in samples placed in the RFM. Prolonged exposure to the RFM at 50 Hz increased the TAC level, indicating an intensification of oxidative stress in these samples. The optimal conditions for staying in the RFM (reducing oxidative stress) are 1 hour and 50 Hz for SOD and MDA; 3 hours and 25 Hz for CAT and TAC. In the case of ROMO1 it is stated that 1 hour and 25 Hz are the optimal conditions for no increased production of reactive oxygen species.

5 oxidative stress biomarkers in schizophrenia patients

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Schizophrenia (SCZ) is a psychiatric disorder with a complicated etiology and chronicity. Oxidative stress (OS) may play a role in the pathophysiology of SCZ. OS is a state caused by an excess of reactive oxygen species and an impaired antioxidant defense comprised of antioxidant enzymes. It can be expressed by lipid peroxidation or altered activity of antioxidant enzymes. Aim of the study was determination of the relationship between the activity/levels of selected oxidative stress markers depends on SCZ type and treatment. The study included 150 subjects. The blood was collected for K3EDTA and clot tubes. The study group consisted of 116 patients of the Psychiatry Clinic in Szczecin with diagnosed schizophrenia (7 women, 21 men with deficit SCZ); (24 women, 20 men with non-deficit SCZ); (17 women,13 men with first psychosis); (7 women and 7 men ultra-high risk of psychosis)]. The control group (KSP) comprises 34 healthy individuals (19 females, 15 males). The study material was erythrocytes and serum. Antioxidant enzymes activity was tested by the spectrophotometric method and TAC, MDA by ELISA. Statistical analysis used STATISTICA. Statistical analysis showed a significant relationship between the activity/level of SOD, CAT, GPX, TAC, MDA, and the kind of schizophrenia ($p<0.05$), as well as between GPX activity, MDA level and the treatment type (($p<0.001$. $P<0.01$). Patients with schizophrenia experience chronic oxidative stress, as evidenced by lower levels of selected OS markers. All examined patients had similar antioxidant enzyme activity, suggesting that OS develops in the early stages of the disease and persists throughout. First-episode subjects had the highest MDA levels- it may be related to increased lipid peroxidation with the onset of increased positive symptoms. In contrast, similar TAC levels in all groups indicate reduced antioxidant capacity during the early stages of the disease.

Diagnosis of latent autoimmune diabetes in adults - a challenge for modern diabetology

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Latent autoimmune diabetes in adults is a subtype of type 1 diabetes mellitus characterized by late onset and heterogeneous clinical picture. It shares some features both with type 1 and type 2 diabetes, which may result in difficulties defining and diagnosing. The prevalence of latent autoimmune diabetes in adults seems underestimated. Patients suffering from this disease are often misdiagnosed and not treated properly, which may lead to rapid progression to insulin-dependence and developing diabetic complications due to prolonged hyperglycaemia. To confirm the diagnosis, a glutamic acid decarboxylase autoantibodies test should be used. Ideally, it would be performed on all the patients with diabetes, so the autoimmune etiology could be excluded. It is impossible because of financial and logistic limitations. Therefore, it is necessary to determine a group of patients with high autoimmune diabetes risk who need screening. Many authors proposed a set of clinical features that could be used for that purpose, but with no scientific consensus. The other assay crucial in the diagnostic process is the C-peptide level measuring. This test can not only evaluate the endogenous insulin production, but also may be potentially used as a screening tool, helpful in differentiating type 2 diabetes and latent autoimmune diabetes in adults. Based on the current knowledge and findings of other researchers we want to propose the most optimal diagnostic algorithm for latent autoimmune diabetes in adults.

The use of hyperpolarized magnetic resonance imaging technique in the analysis of carbon-13 metabolites

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Changes in metabolism after radiation therapy affect therapeutic efficacy, although the mechanism underlying these changes is unclear. The new imaging technique, called carbon-13 dynamic nuclear polarization (DNP) magnetic resonance imaging, examines the glycolytic flux in a dynamic, real-time manner. A review of the literature on patients with intracranial tumors. In this literature study, we sought to explore the feasibility of sodium MR imaging for the initial assessment of the radiotherapeutic efficacy of intracranial tumors. 13C-MRI non-invasively captured various glycolytic changes occurring in tumors and immune systems in response to irradiation, suggesting its potential for clinical use in the future. 13C-MRI is effective for detecting glycolytic changes in tumor.

Immunohistochemical localization and reactivity assessment of CB1, CB2, S100A6 and apelin in the hearts of women of different age groups

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Cardiovascular diseases are a major social and economic problem both in Poland and worldwide. Aging is a crucial risk factor for cardiovascular morbidity and mortality. Studies have shown the important role for the endocannabinoid system, S100A6 protein and apelin in regulating the functioning of the cilculatory system. The contractility of myocardial cells is closely related to intracellular fluctuations in calcium content. Cannabinoids and apelin modulate the flow of calcium in cardiomyocytes by affecting calcium channels. The S100A6 protein has been shown to regulate the transition of calcium between the sarcoplasmic reticulum and the cytosol in cardiomyocytes. The purpose of this study was to evaluate cannabinoid receptors, S100A6 protein and apelin in the hearts of healthy women of different ages based on immunohistochemistry. The study was conducted on the hearts of 10 women (organ donors) with a medical history without cardiovascular disease, divided into two age groups: women above and below 50 years of age. Paraffin-embedded heart sections were immunohistochemically stained for the detection of CB1 and CB2 receptors, S100A6 protein, and apelin. The analysis of the results showed a significant decrease in the immunoreactivity of CB1 and CB2 receptor in the cytoplasm of cardiomyocytes in the hearts of women over 50 years of age compared to women in the younger age group. The immunoreactivity of CB1, S100A6 and apelin in the endothelium of the myocardial vessels was weaker in women over 50 than in younger women, while the intensity of the CB2 immunosignal in the endothelium of the coronary vessels was similar in both groups of women. The findings suggest an important role of the receptors and proteins studied in myocardial function. This report may contribute to a better understanding of the role of the endocannabinoid system, S100 proteins and apelin in cardiac function, as well as put the spotlight on the processes involved in age related cardiomyopathy.

Electrical Impedance Tomography as a biomarker of spatial and temporal changes in ventilation in a patient with coronary artery disease and accompanying massive respiratory failure

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A 73-year-old man with coronary artery disease underwent CABG surgery. On the 3rd postoperative day, after implantation of 3 vascular bypasses the patient developed respiratory failure requiring mechanical ventilation with 100% oxygen. Due to progressive insufficiency, deterioration of the general condition and poor parameters in blood gas tests, ECMO (Extracorporeal Membrane Oxygenation) was implanted, which ensured adequate oxygen pressure and improved the general condition of the patient. After 5 days of oxygenation support and antibiotic therapy, there was an improvement in blood oxygenation and general condition. It was decided to end the ECMO support. The decision on the possibility of explanting ECMO was made on the basis of the assessment of dynamic lung function using electrical impedance tomography. EIT (Electrical Impedance Tomography) is a device that uses chest electrical resistance measurement to visualize the dynamic aeration of the lungs by region. Changes in impedance of lung tissue as a biomarker of spatial changes reflected the state of distension and collapse of the pulmonary alveoli. The EIT allows to select ventilation parameters, including PEEP (Positive End-expiratory Pressure), basing on the values of lung distension and collapse. Currently available methods do not illustrate the dynamic state of the lungs in real time. Due to the lack of radiation exposure, the patient's condition was constantly monitored, which allowed to react rapidly to provide optimal ventilation. Thanks to impedance as a biomarker of ventilation, it was possible to evaluate the therapy at the patient's bedside. Summing up the adjustment of appropriate ventilation parameters, the possibility of continuous monitoring of the patient's lung condition in the absence of radiation exposure are the main advantages of using impedance as a biomarker of ventilation in patients undergoing surgical treatment of ischemic heart disease, so common among the society today.

Do brewing temperature and time affect the antiglycoxidative properties of birch leaf tea?

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Birch leaf (Betulae folium) is a herbal raw material extracted from downy birch (Betula pubescens Ehrh.) and/or silver birch (B. pendula Roth). The herb is used for urinary ailments to enhance urine flow. The birch leaves also have an antirheumatic and diaphoretic effect, improve metabolism as well as detoxify the circulatory system. An important component of plants, responsible for many of the health-promoting actions of the various herbs, are polyphenols. Polyphenols contain at least two hydroxyl groups attached to an aromatic ring. Many of them exhibit strong antiglycation and antioxidant activity. Glycation and oxidation of biomolecules are inextricably linked. Therefore they are collectively referred to as glycoxidation. Carbonyl/oxidative stress plays a key role in many diseases' etiopathogenesis. Carbonyl/oxidative stress is an important etiopathogenetic component of many diseases, so polyphenols are considered to prevent their development. The experiment evaluated the influence of brewing time and temperature on birch leaf infusion's total phenolic content (TPC). 1 g of birch leaves were brewed with 100 ml of distilled water at 70 and 100°C for 3, 5 or 10 min. All variants were prepared in 3 replicates. TPC was determined using the Folin-Ciocâlteu method. At each of the tested variants, the infusion prepared at 100°C showed markedly increased TPC compared to that at 70°C. A 5-minute incubation at both 70 and 100°C was characterized by significantly higher TPC than 3-minute incubation at both temperatures. The TPC of 10-minute brewing at 70°C and 100°C exceeded in comparison with the other 4 variants (3 and 5 minutes at 70 and 100°C). Birch leaf infusion can exert health-promoting effects by inhibiting carbonyl/oxidative stress. The biomarker tested showed a general tendency to increase with incubation time and temperature. Our experiment demonstrated the most favorable effect on TPC by brewing the tea at 100°C for 10 min.

The impact of plasminogen activator inhibitor 1 on the blood lipid profile in patients with acute myocardial infarction and type 2 diabetes mellitus

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Current data describe the key role of plasminogen activator inhibitor 1 (PAI1) in multi-age subclinical and clinical conditions, which can complicate the course of AMI and T2DM with dislipidaemia which increases the risk of cardio-cerebrovascular complications' development. There has been performed a retrospective study on the basis of the Kharkiv city clinical hospital № 27. Medical histories of the patients with AMI and T2DM and of the patients with AMI and without T2DM have been studied. In the course of the research there were surveyed 60 patients, 20 women and 40 men. All the patients were divided into 3 groups. The 1st clinical group comprises 31 patients with AMI and T2DM, the 2nd – 24 patients with AMI and without T2DM and the control group – 4 relatively healthy people. As a result of the investigation it has been found that in the 1st group PAI1 level reached 63,27±1,50 ng/ml during the first 24 hours of AMI, in the 2nd group – 51,03±1,66 ng/ml, in the control group – 18,64±0,62 ng/ml ($p<0,001$). In the 1st group total cholesterol level was 6,38 ± 0,14 mmol/l, in the 2nd group – 5,05 ± 0,10 mmol/l and in the control group – 4,55±0,12 mmol/l ($p<0,05$). In the 1st group low-density lipoproteins (LDL) level reached 4,44±0,12 mmol/l, in the 2nd group patients – 3,27±0,06 mmol/l and in the control group – 2,51±0,17 mmol/l ($p<0,001$). In the 1st group very low-density lipoproteins (VLDL) level reached 1,82±0,08 mmol/l, in the 2nd group – 0,98±0,04 mmol/l and in the control group – 0,85±0,06 mmol/l ($p1\text{-}2<0,001$). As a result of correlation analysis there has been revealed a direct relationship between PAI1 and total cholesterol level ($r=0,72$, $p<0,01$), LDL level ($r=0,41$, $p<0,05$), VLDL level ($r=0,60$, $p<0,05$) and triglycerides level ($r=0,43$, $p<0,01$). The data of correlation analysis suggest the existence of pro-atherogenic properties of PAI1 and the role of progression of atherosclerosis has been proven by scientific researches.

What influence to health and personal life of nurse have a work shift?

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Professional work is an inseparable aspect of human life, that is why it is extremely important that it will not negatively affect the overall well-being of human. Nurses works on their feet all day, often working 12 hour shifts or more. Many nurses are required to work nights, weekends and holidays. Nurses must deal with death and dying. Suffering and pain of patient is constance. This type of work often implement to personal health, family, social, sexual life of nurse. Shift work brings various problems, such as: lack of sleep, irregular rest, eating meals in a hurry, which affects health and well-being. Health is the most important value in the life of every human being. It is a good and should be protected. Every person should be responsible for their health by taking preventive measures, a healthy lifestyle, which has the greatest impact on well-being and health. Employer should be interested to condition of health of his employee. The aim of the poster is to show how shift work impact to health and personal life of nurses. The methodology is based on the review of materials.

Influence of smoking on salivary inflammatory profile

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Smoking is the cause of numerous oral pathologies, however, new devices that deliver nicotine to the body (e-cigarettes and heat-not-burn products) are considered to be less harmful to health in the public opinion. The aim of the study was to evaluate the effect of smoking traditional cigarettes, e-cigarettes, and heat-not-burn products on bunch of the salivary cytokines, chemokines, and growth factors. Unstimulated saliva was collected from 100 patients, divided equally into four groups (group 1. smokers of traditional cigarettes, group 2. smokers of e-cigarettes, group 3. smokers of heat-not-burn products, group 4. control). The concentrations of the tested parameters in unstimulated saliva were assessed by Bio-Plex® Multiplex. We showed that smokers of traditional cigarettes were the only group characterized by increased induction of the local immune response in unstimulated saliva by increasing the level of IFN-γ compared to other groups. Contrary to the above results, both mentioned smoking devices products appear to have a similar inhibiting mechanism on the immune response system of unstimulated saliva (reduced concentration of numbers of cytokines/chemokines/growth factors).

DNA methylation as a prognostic and therapeutic cancer biomarker

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It is estimated that there are 19 million new cases of cancer and almost 10 million cancer-related deaths worldwide every year, according to WHO. Therefore it is of great importance to seek new methods of treatment, prevention and early diagnosis of various types of cancer. Carcinogenesis is affected by epigenetic modifications such as DNA methylation, which is a process of adding methyl groups to cytosine in the DNA molecule in GC-rich sequences called CpG islands. DNA methylation regulates gene expression and can lead to the silencing of important tumor suppressor genes (TSG) or the upregulation of oncogenes. It is catalysed by a group of enzymes called DNA methyltransferases (DNMTs). In normal cells most CpG islands are unmethylated, aside from oncogenes, which have a methylated promoter region and their expression is repressed. Many diseases, including cancer, are associated with changes in DNA methylation patterns. TSGs are inhibited by hypermethylation of CpG islands in their promoter regions, while oncogenes are activated because of hypomethylation. DNMT enzymes responsible for DNA methylation were found to be overexpressed in various cancer types, including leukemia, breast and ovarian cancer, gastric, colorectal and hepatocellular cancers, and many others. DNA methylation as well as expression of DNMT encoding genes in samples from biofluids could be helpful prognostic and therapeutic biomarkers of cancer, especially in cases where traditional diagnostic methods are invasive and disliked by patients (i.e. colonoscopy). Some examples of such biomarkers are the SEPT9 gene (methylated in colorectal cancer), as well as SHOX2 and PTEGER4 genes (methylated in lung cancer). The potential of alterations in DNA methylation as cancer biomarkers will be discussed on the conference poster.

Dependence of PTH and Ca^{2+} levels on tumor size in patients with primary hyperparathyroidism - preliminary study

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The most common cause of primary hyperparathyroidism (PHPT), in about 80% of cases, is a single adenoma. Adenoma is a benign neoplasm originating from a single progenitor cell in which an oncogenic mutation has occurred. Nevertheless, the pathogenesis of PHPT is still not fully understood. So far, despite the characteristic deviations in laboratory results, PHPT is not considered in the diagnosis of complaints caused by complications, appearing in the form of masks of symptoms from various systems. The aim of the study was to evaluate PTH and Ca^{2+} levels in patients with primary hyperparathyroidism depending on the tumor size. We also assessed the impact of parathyreoidectomy on parathyroid hormone (PTH) and Ca^{2+} levels. The study group included 30 patients (28 women, 2 men) aged 35-85 (62,8 in average) with primary hyperparathyroidism, who underwent parathyreoidectomy at the 1st Department of General and Endocrine Surgery at the University Hospital in Bialystok. The results of histopathological examinations in all patients indicated a single adenoma. The average PTH level before surgery was 442,12 pg/ml;, intraoperatively: 125,22 pg/ml and the day after: 38,74 pg/ml. Patient were divided into two subgroups according to the adenoma size (<2cm and >2cm). We did not find significant relationship between size of parathyroid gland and preoperative PTH and Ca^{2+} levels. We observed significant decrease of PTH level one day after surgery. Surgical treatment of primary hyperparathyroidism is an effective method causing decrease of PTH and Ca^{2+} levels in the PHPT patient's blood. Although we did not find any significant relationship between the tumor size and the PTH and Ca^{2+} levels, this requires further research.

A comparative study on the antioxidant and antiglycation properties of different vitamin D forms

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Vitamin D plays multiple essential roles in the body and has many beneficial properties. Recently, there has been an increase in its popularity and growing interest in vitamin D supplementation. However, the mechanisms of vitamin D action have not yet been sufficiently explored. In our study, we focused on the biomarkers of the antioxidant (advanced oxidation protein products) and antiglycation (advanced glycation end products) properties of the four main forms of vitamin D, such as cholecalciferol, calcifediol, alfacalcidol, and calcitriol. For this purpose, we used an in vitro bovine serum albumin model. Glucose, fructose, ribose, and methylglyoxal were used as glycation factors. We showed that all forms of vitamin D exhibit antioxidant and antiglycation activity, although calcitriol demonstrated the most potent effect. Notably, the antioxidant and anti-glycating activity is similar to routinely used antioxidants (reduced glutathione) and protein glycation inhibitors (aminoguanidine). The pleiotropic action of vitamin D, especially calcitriol, may indicate a high therapeutic potential of vitamin D supplementation in various diseases with carbonyl stress etiology. Moreover, our findings highlight the importance of vitamin D supplementation as a natural and safe therapeutic approach for combating oxidative stress and glycation, which are implicated in the pathogenesis of numerous chronic diseases. Further research is needed to fully understand the underlying mechanisms of vitamin D pleiotropic effects and determine the optimal dosages and formulations for clinical use.

State of antioxidant system under conditions of experimental nephropathy and influence of glutathione

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The study aimed to determine a state of the oxidative-antioxidant system in the blood and liver of rats by experimental nephropathy and influence of glutathione. The experiment was carried out on 131 male albino rats with the bodyweight of 0,16–0,18 kg. Experimental nephropathy was modeled by injection of a single intraperitoneal dose of folic acid (250 mg/kg, Sigma-Aldrich). Glutathione was introduced daily (100 mg/kg) by the intragastric way for 3 and 7 days following the injection of folic acid. The degree of oxidative modification of proteins (OMP) was evaluated in the blood by the level of aldehyde and ketone derivatives of neutral (OMP370) and basic (OMP430) composition. The level of OMP370 by nephropathy was higher 36% and OMP430 – 14,6% on 3rd day of the experiment compared to control rats. Ceruloplasmin levels in animals with nephropathy increased by 28% and 43% on 3 and 7 days compared to control rats. The level of SH-groups in the blood of rats with nephropathy was lower by 26% on 3rd day compared to control rats. Catalase activity decreases by 25% on both days compared to group of control. There was the decreased level of GPx activity in the blood by 40% on 3rd day and by 20% – 7th day compared to control. The level of H2S was lower by 35,5% on the 3rd day and by 25,7% on 7th day of the experiment compared to control. The glutathione increased the level of gasotransmitter by 14,3% in blood plasma of rats on 3 day and by 11% on 7 day of the experimental period. The introduction of glutathione during 7 days equated the levels of OMP370, TBA-active products, SH-group and activity of GPx of experimental animals to the values of the control group. Decreased antioxidant defence and overproduction of reactive oxygen species lead to oxidative stress – one of the key mechanisms of distant organ injury by kidney disease. Our study confirms the positive effects of exogenous glutathione on the animals state under conditions of experimental nephropathy.

Consumption of a nutrient-deficient diet as a risk factor for liver damage in the mother-fetus system

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In recent years, there has been an increase in the prevalence of gastrointestinal diseases in Ukraine, in particular, disorders of the hepatobiliary system. The diet plays the greatest importance among the factors that can negatively affect the state of the liver in the mother-fetus system. The purpose of this study was to determine the effect of a nutrient-deficient diet on the structural and functional state of the liver. The study involved 13 female WAG rats, divided into two groups: the first group (control) and the second group included female rats, receiving a diet with insufficient amounts of nutrients. The research implied a complex of IHC-studies of liver tissue (eNOS and iNOS) and biochemical studies of liver homogenates. The expression of eNOS in the vessels of the liver of mother rats receiving a nutrient-deficient diet and their newborn offspring was weak and uneven. Positively stained endothelium of sinusoids in most cases was found in the periportal parts of the lobules, while the central parts showed a mosaic or complete absence of staining. iNOS, on the other hand, marked the endotheliocytes of both sinusoids and central veins, and adjacent hepatocytes that were in a state of protein dystrophy. The liver tissue of mother rats was found to have a decrease in the level of all studied substances, but the content of C, PL and TG was significantly reduced (by 48.4% ($p=0.001$), 17.6% ($p<0.01$) and 60.9% ($p<0.05$). Newborn rat pups were shown to have a significant ($p<0.001$) decrease in the level of C by 21.01%, TG by 41.69%, as well as glycogen content (by 36.04%, $p< 0.001$). Conclusions. Thus, based on the findings, it can be concluded that long-term consumption of a diet with an insufficient amount of nutrients results in significant changes in the structural and functional state of the liver in the mother-fetus system and is a risk factor for the development of organic impairments.

Development of arterial hypertension in young people under stress caused by the war in Ukraine

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The stress factor acts as a protective, adaptive reaction of the body, accompanied by an acceleration of the heartbeat, an increase in cardiac output, that is, more blood enters the muscles and brain. Such changes occur under the influence of catecholamines - adrenaline and noradrenal, which lead to narrowing of blood vessels and a rise in blood pressure. It is proved that the longer and more intense the stress acts on the body, the stronger the nature of the changes that occur in the circulatory system.The purpose of the study was to establish the impact of stress caused by a full-scale war in Ukraine on the development of hypertension in young people. The survey involved 105 respondents, among them 77.1% of women aged 17 to 21 years, who were students of IFNMU, NMU and KNMU. Almost 100% of respondents were in Ukraine from the first days of the war, 68.7% near the front line or in the occupied territories. A sociological study was conducted through a survey using a special Google form, which was distributed using social networks Viber, Telegram. The survey showed that only 27.1% of respondents do not observe a deterioration in their well-being that began after the start of a full-scale war in Ukraine, which was accompanied, in particular, by dizziness (43.5%), tinnitus (28.2%), excessive sweating (38.8%), palpitations (42.4%), headache (52.9%), insomnia (45.9%). After analyzing the results of the survey, you can also see that the news in the media and anxiety in the air have a bad effect on the emotional state of constantly stressed respondents, with whom in 21.2% of cases they struggle with sedatives, mainly of plant origin (64.3%). Only 10.3% of respondents went to the doctor because of their complaints. Thus, according to the results of the study, it can be concluded that in conditions of chronic stress caused by a full-scale war in Ukraine, almost 100% of respondents showed symptoms of the initial stage of arterial hypertension.

Could AOPP be a useful marker of gastric cancer development?

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Gastric cancer (GC) is ranked 4th in terms of mortality among all kinds of tumours. Unhealthy lifestyle and dietary habits can result in gastric cancer development through oxidative stress, caused by overproduction of reactive oxygen species (ROS). Reactive oxygen species are able to interact with proteins, transforming them into oxidated forms. The purpose of the study is an evaluation of advanced oxidation protein products (AOPP) in GC patients in comparison with the healthy patients and referencing to the histopathological parameters. Another goal of the research is the evaluation of AOPP diagnostical usefulness by ROC curve. The study was conducted on a group of 50 patients diagnosed with GC, treated in the 2nd Clinical Department of General and Gastroenterological Surgery Unit at the Medical University of Bialystok Clinical Hospital.AOPP concentration was (statistically significantly) higher in gastric cancer patients compared to the control group ($p < 0.0001$). Moreover, AOPP concentration in the patients with the tumour diameter over 5cm was higher than in the patients with the tumour diameter lower or equal to 5 cm ($p < 0,05$), AOPP concentration was also higher in T3 + T4 stage patients than in T1 + T2 stage patients ($p < 0,05$).We indicated high diagnostical usefulness of AOPP in differentiating patients with adenocarcinoma and with mucinous adenocarcinoma (AUC = 0,7725) and in differentiating patients with gastric cancer in pT1 + pT2 stage and with gastric cancer in pT3 + pT4 stage (AUC = 0,7284). Moreover, AOPP (AUC = 0,7341) can be useful in differentiating patients with lymph node metastatis and with those without it (AUC = 0,6889). AOPP can be also used to differentiate patients with distant metastasis and with patients without distant metastasis (AUC = 0,7032). AOPP can be a useful marker for differentiating histological type, depth of neoplasm infiltration, presence of lymph node and distant metastasis in patients with GC.

Effectiveness of the use of diagnostic methods in the diagnosis of syncope in the emergency department

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Syncope is one of common causes of hospitalisation in the Emergency Department (ED). Data says that 1% of patients per year are admitted to the ED due to a temporary loss of consciousness (TLOC). Recent guidelines suggest the use of lab markers to confirm the diagnosis of syncope in people admitted for TLOC. The aim of the study was assesment the effectiveness of the use of diagnostic possibilities in the ED of the University Clinical Hospital in Białystok among patients admitted to ED after TLOC. Attention was drawn to the value of the results of markers in order to compare them with other publications. The study was based on a retrospective analysis, individual charts of patients from the ED of the University Clinical Hospital in Bialystok were source of data. The study group consisted of patients of the ED admitted to the ward due to TLOC. The group consisted of patients aged over 18 years, healthy and with diseases, admitted during one year. The results of the study showed that ED patients are a homogeneous group, given the use of diagnostic. Moreover, they point to the commissioning of additional tests to exclude injuries. Analysis of the records revealed deficiencies in the entry of patients' vitals into the charts. The study showed the effectiveness of the use of diagnostic methods in the setting of the ED of the hospital is comparable to the results presented in the literature, also indicating that staff should pay attention to filling out medical records.

Pro- and anti-inflammatory biomarkers in non-alcoholic fatty liver disease and hypertension patients

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Non-alcoholic fatty liver disease (NAFLD) affects up to 50% of patients with hypertension (HT). The objective of our study was to assess the changes in anti-inflammatory systems (kallistatin, IL-10) and pro-inflammatory activity (IL-1β and high-sensitivity CRP (hsCRP)) in patients with NAFLD under the influence of concomitant HT. 63 patients with NAFLD and HT and 52 patients with isolated NAFLD were examined. Plasma kallistatin, IL-10, IL-1β and hsCRP levels were evaluate using ELISA. Kallistatin levels in patients with NAFLD and HT were 65.03 ng/ml (95% CI 61.38; 68.68), which was significantly lower than in the isolated NAFLD group (83.42 ng/ml (95% CI 81.89; 84.94), $p<0.001$) and control results (111.70 ng/ml (95% CI 106.14; 113.22), $p<0.001$). The level of IL-10 in the group of NAFLD and HT also reached minimal values (12.69 pg/ml (95% CI 11.93; 12.95) against 14.34 pg/ml (95% CI 13.27; 14,34) in the group with isolated NAFLD ($p<0.001$) and 16.19 pg/ml (95% CI 15.15; 17.74) in the control group ($p<0.001$)). The opposite results were observed in the study of IL-1β content, which was increased in the NAFLD and HT group (17.55 pg/ml (95% CI 17.06; 19.73) versus 15.72 pg/ml (95% CI 15,25; 17.44) in the isolated NAFLD group ($p<0.001$) and 8.26 (95% CI 7.79; 8.46) in the control group ($p<0.001$)). Patients with NAFLD and HT had an increase in hsCRP (7.90 mg/l (95% CI 7.96; 8.75) versus 6.55 mg/l (95% CI 6.47; 7.57) in the group with isolated NAFLD ($p<0.001$) and 2.07 mg/l (95% CI 1.83; 2.85 mg/l) in the control group ($p<0.001$)). It has been shown that with HT progressing in NAFLD patients, the kallistatin level substantially reduces ($p<0.001$, $p=0.011$ for HT severity and BP grade) along with IL-10 levels decrease ($p<0.001$) and IL-1β ($p<0.001$) and CRP levels ($p<0.001$) increase. Thus, patients with NAFLD and HT are likely to experience changes in biomarker status toward a pro-inflammatory state and deepening of these deviations with the progression of concomitant hypertension.

OPRM1 single nucleotide polymorphism as biomarker of pain intensity and opioid consumption

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Research on the metabolomic diagnostics of pain is a rapidly developing field of medicine. Currently, it is believed, that pain, apart from the parameter evaluating the treatment, may be a separate disease entity. One of the branches of research in the diagnosis of pain is research on single nucleotide polymorphisms (SNPs) in acute and inflammatory pain. SNPs can be predictors of pain intensity and indicate an increased need for analgesics, also in the perioperative period. A potential SNP associated with differences in pain perception and opioid requirements is the SNP A118G of opioid mu-receptor 1 (OPRM1). The aim of the study is to determine whether there is a correlation between the occurrence of SNP A118G OPRM1 in pediatric patients after surgery and the severity of pain and the doses of opioid analgesics needed to control pain after extensive orthopedic surgery. The study is conducted at the Department of Anesthesiology for Children and Adolescents of the UDSK in Bialystok. The initial research group consists of 40 patients after surgical scoliosis correction. Peripheral blood from which nucleated cells (leukocytes) were extracted was used to perform genotyping of the obtained samples for OPRM1 SNP. Differences in pain perception and opioid requirements were analyzed according to the presence of SNP A118G opioid mu-receptor 1 (OPRM1). As a result of the study, it will be possible to further develop knowledge about the genetic determinants of acute and inflammatory pain and from the point of view of clinical practice, genetic diagnostics may in the future become a kind of biomarker of pain - enabling the detection of high-intensity postoperative pain risk groups.

Molecular biomarkers of gastric cancer

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Gastric cancer is one of the leading malignancies in the world, being the cause of more than 768,000 deaths annually. Despite developments in treatment methods, the five-year survival rate for gastric cancer patients is still very poor. Looking for the reasons for this condition, we need to pay attention to the diagnostic process of that tumor. As gastric cancer initially presents with non-specific symptoms, most patients at the moment of diagnosis are at an advanced stage. Therefore, there is a need to search for new, more efficient diagnostic tools that would allow to predict or detect the malignancy at an early stage. A significant development of diagnostic techniques enabled the search for molecular biomarkers that could be obtained in a minimally invasive way. The so-called liquid biopsy is a method that uses body fluids such as blood, urine, saliva, or stool to detect tumor molecular biomarkers. This novel approach in the search for biomarkers, will hopefully open up new opportunities for the efficient diagnosis of gastric cancer in the future. Therefore, we would like to provide an overview of the latest potential molecular biomarkers of gastric cancer. We focus on molecular biomarkers acquired with a liquid biopsy, such as blood proteins as well as differentially methylated and expressed genes.

Could mean platelet volume serve as an alternative glucoregulation biomarker in pediatric type 1 diabetes mellitus?

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Prolonged hyperglycemia and insulin deficiency can lead to non-enzymatic glycation of platelet membrane proteins. Subsequently, platelets increase in their size. The objective of this study was to assess the utility of platelet index, mean platelet volume (MPV), as a biomarker of glucoregulation quality in children with type 1 diabetes mellitus (T1DM). This study included 453 pediatric patients treated for T1DM at the Institute for Children and Youth Health Care of Vojvodina. According to the glycated hemoglobin (HbA1c) levels, i.e. glucoregulation quality, the patients were divided into two groups: (1) well controlled and (2) poorly controlled T1DM. The values of MPVs were statistically compared between the groups. According to the HbA1c cut-off level of 7.0%, 264 children had good and 189 poor glucose control. MPV was found to be a significant indicator of poor glucoregulation ($p<0.001$) in pediatric patients with T1DM. The proposed cut-off value for MPV in the glucose control monitoring was 7.6 fL. Our study showed that MPV as a biomarker could have monitoring properties in terms of glucose control in children with T1DM.

Activity and concentration of collagenases in the liver of rats with T2DM

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Type 2 diabetes mellitus (T2DM) is a metabolic disease characterized by tissue resistance to insulin (insulin resistance). T2DM affects the whole body; however, in the liver, it impairs hepatic insulin receptor signaling, which causes a disruption of glycogenesis, glucogenesis, and lipid synthesis over time. Under these conditions, hepatic fat accumulation, increased oxidative stress, inflammation, and disturbed extracellular matrix (ECM) remodeling occur. Metalloproteinases (MMPs) are proteolytic enzymes responsible for regulating ECM components. One of the groups belonging to MMPs is collagenases, which degrade collagen. The present study aimed to investigate how T2DM affects the activity and concentration of collagenases in the liver and serum. The experiment was conducted on 16 male Wistar rats, which were divided into two groups (n=8): control (C) and diabetes (T2DM) groups. Diabetes was induced by feeding rats with a high-fat diet and administration of streptozotocin at week 4 of the experiment. The activity of MMPs was measured spectrofluorimetrically. The concentration of MMPs was determined using commercial ELISA kits. The activity (MMP-1, MMP-13) and concentration (MMP-1, MMP-8, MMP-13) of collagenases in the liver of rats with T2DM were significantly lower than in the control group. Serum activity (MMP-1, MMP-8, MMP-13) of collagenases was statistically higher in the group with type 2 diabetes compared to controls, and no statistically significant differences were seen in the level. T2DM affects the remodeling of MMPs in both liver tissues and serum. The altered expression of MMPs may be responsible for the abnormal degradation of ECM, which is the primary cause of vascular complications caused by T2DM.

Activity and concentration of stromelysins in adipose tissue of rats with type two diabetes mellitus

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Diabetes mellitus is a disease increasingly recognized worldwide. Type 2 diabetes mellitus (DM2) is a chronic disease, often developing insidiously over many years without clinical symptoms. It is accompanied by micro- and macrovascular complications based on two interdependent metabolic defects: insulin resistance and impaired insulin secretion by pancreatic β-cells. Adipose tissue is a fat store and an endocrine organ that actively responds to the body's metabolic state. Patients with type 2 diabetes develop adipocyte hypertrophy, resulting in changes in cell-matrix interaction and extensive remodeling of the extracellular matrix (ECM). Enzymes involved in the production and degradation of bioactive ECM molecules include stromelysins – proteolytic enzymes of the extracellular matrix metalloproteinases (MMPs) group. This study aimed to investigate the activity and concentration of stromelysins in adipose tissue of rats with DM2. The experiment was conducted on 14 male Wistar rats, divided into two groups: C-control and DM2-rats with type 2 diabetes. After ten weeks of the experiment, the rats had their subcutaneous fat and visceral fat collected. The activity and concentration of the stromelysins (MMP-3, MMP-10, and MMP-11) were determined in the tissue homogenates. The results show that visceral fat was significantly higher in each of the MMPs tested (both activity and concentration) compared to subcutaneous fat in the control group and the group of rats with type 2 diabetes. DM2 generally did not affect the ECM remodeling in the adipose tissue.

Parameters of nitrosative stress in patients with titanium implants

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Products made of titanium are widely used in medicine, e.g. in maxillofacial traumatology, orthognathic surgery and head and neck cancer treatment. Titanium is considered a biocompatible, durable and abrasion resistant material. However, there are more and more reports on the adverse effects of titanium biomaterials on the human body. The aim of the study was to evaluate the impact of mandibular titanium anastomoses on nitrosative stress parameters in the plasma of patients with mandibular fracture treated with miniplates and screws made of titanium alloy (Ti-6Al-4V). The study group included 32 patients with bilateral mandibular fracture, in whom osteosynthesis of bone fragments was performed using titanium fixation systems. The control group consisted of 32 healthy subjects qualified for surgical treatment due to facial skeletal defects, which were before jaw osteotomy. In the study group higher concentration of: nitric oxide, S-nitrosothiols, peroxynitrite, nitrotyrosine were found in relation to the control. It can be assumed that systemic changes in biomarkers of nitrosative stress may be caused by local changes associated with the presence of miniplates and titanium screws used to immobilize mandibular fragments. However, this issue requires further research.

Circulating cytokines in mandibular fracture patients treated with titanium implants

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Patients with mandibular fractures are a significant problem in clinical practice. This fractures lead to morphological and functional disorders of the stomatognathic system. Treatment of mandibular fractures is aimed at restoring the anatomical shape of the bones and occlusion before the injury, as well as restoring the proper functions of the masticatory system and facial aesthetics. The use of internal bone fixation systems with the use of mini-plates and screws makes it possible to obtain a good anatomical and functional effect, avoiding long-term intermaxillary immobilization and tooth splinting, which is burdensome for the patient. Currently, anastomoses made of titanium and its alloys are used for the osteosynthesis of mandibular fragments, which results from the high biocompatibility of these materials. Despite the undoubted advantages of titanium bone fixations, there is still a discussion about their negative impact on the human body, both at the implantation site and systemically. The aim of the study was to assess the impact of mandibular titanium fixations on the concentration of pro- and anti-inflammatory cytokines in the blood plasma of patients with a mandibular fracture treated with osteosynthesis of bone fragments. The study group consisted of 30 patients with mandibular fracture, treated surgically with the use of miniplates and titanium screws made of titanium alloy (Ti-6Al-4V), ChM Lewickie Sp. z o.o., Bialystok. The control group consisted of 30 generally healthy patients aged who went for the extraction of impacted teeth. Studies have shown a significantly higher concentration of cytokines (IL-1ß, IL-6) in the plasma of patients with a mandibular fracture compared to the control group. The obtained results may indicate that the cause of systemic changes in the examined parameters may be local immunological reactions due to the presence of foreign bodies in the form of titanium mandibular fixations.

Selected biomarkers of inflammation in the salivary glands of rats with type 2 diabetes mellitus

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Insulin-independent type 2 diabetes mellitus (DM2) causes numerous organ complications, including salivary glands. Impaired saliva secretion increases the risk of dental caries, hinders wound healing in the mouth, is responsible for swallowing problems, and increases susceptibility to fungal infections. However, the causes of reduced salivary secretion in DM2 patients are unknown. The primary source of oral inflammation in DM2 patients 2 may be systemic inflammation associated with chronic hyperglycemia. Our study is the first to evaluate the salivary inflammatory biomarkers in the salivary glands of rats with DM2. The experiment was conducted on 20 male Wistar Cmdb:WI rats randomly divided into two groups: control and DM2. Interleukin 1 α (IL-1α), tumor necrosis factor α (TNF-α), and interleukin 10 (IL-10) were assayed in the salivary gland homogenates using ELISA method. In DM2 rats, we observed significantly higher levels of pro-inflammatory cytokines (↑IL-lα, ↑TNF-α) and anti-inflammatory cytokines (↑IL-10) in both the parotid and submandibular glands. Salivary inflammatory biomarkers increase with a decrease in salivary secretory function, which may indicate the contribution of inflammation to salivary gland hypofunction.
The role of immune system cells in the development of atherosclerosis.

The role of immune system cells in the development of atherosclerosis

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The amazing progress in science that has been observed for several years has shown the enormous potential rests in immune cells that can become carriers in the therapy of many diseases. So far, the focus has been mainly on the modulation and management of risk factors, including: hyperlipidemia and hypertension, inhibition of platelet aggregation and interventional revascularization. However, understanding the pathomechanism of chronic inflammation in the vessel walls, and thus learning the role of immune cells in atherosclerosis, are the basic actions that we must take so that the anti-inflammatory approach can also be included in the treatment guidelines, which brings unimaginably large possibilities of modern treatment of atherosclerosis and prevention of its effects. An increase in oxidative stress, which leads to an inflammatory reaction through a cascade of reactions is one of the key elements affecting the condition of the aortic wall or vessels coronary. The immune system itself, as a highly complex and a specialized unit, it works on different fronts, as some lymphocytes are thought to drive atherosclerosis while others protect against it. Therefore, the progression of cardiovascular disease may probably result from an imbalance of pro- and anti-inflammatory forces, therefore it is necessary to characterize specific types of immune cells and understand their function in atherosclerosis. Shifting the balance towards anti-inflammatory immune responses has great potential as it opens the door to new therapeutic pathways that can slow down or even reverse the disease, and this will result in more effective management of the disease.

Assessment of the level of growth factors in the saliva of patients after stroke

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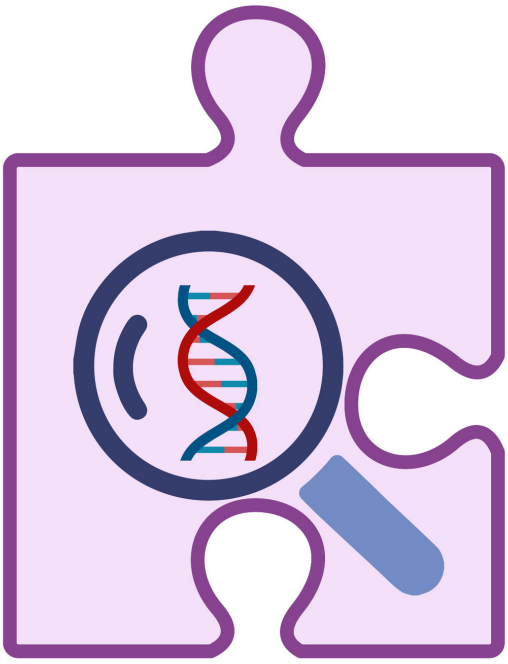
Cerebral stroke, as a civilization disease, is a very serious social problem. Therefore, there is a need to develop new diagnostic, therapeutic and prognstic methods. Currently, the use of makers obtained from the saliva of the patients seems to be promising. The aim of the research was to evaluate the level of growth factors in saliva of stroke sufferers. The research was carried out in 22 patients after cerebral stroke (study group) and in 22 healthy individuals (control group). The subjects from both groups were matched in terms of age and sex. A general medical interview and oral health examination were conducted. Samples of unstimulated saliva were also collected from each patient. The biological material was analyzed to assess the level of fibroblast growth factor (FGF), granulocyte colony stimulating factor (G-CSF), hepatocyte growth factor (HGF), Interleukin-3/mast cell growth factor (IL-3/MCGF), leucemia inhibitory factor (LIF), macrophage colony-stimulating factor (M-CSF), platelet-derived growth factor (PDGF-BB), stem cell growth factor-beta (SCGF-beta), vascular endothelial growth factor (VEGF). Statistically higher levels of FGF, G-CSF, HGF, LIF, M-CSF, SCGF-beta and VEGF ($p<0.05$) were found in post-stroke patients, and lower levels of IL-1alpha in comparison to the control group. There is an increased production of salivary growth factors in stroke patients. Salivary growth factors may have potential diagnostic value in those individuals. Undrestanding the role of particular growth factors may result in the development of effective methods of treatment of stroke-patients with the use of cell therapies or recombinant groth factors.



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