Зміст / Contents

Anatomical and physiological remodeling of the heart in strength athletes, together with changes in a number of hemodynamic parameters, contribute to the generation of a large and stable cardiac output and ensure increased extraction of oxygen from the blood in order to adapt the body to active muscle work.

Key words: circulatory system, hemodynamics, physical load, adaptation.

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ASYMMETRY AS A COMMON-BIOLOGICAL LAW, UMSA AND PSMU PHYSIOLOGY CHAIR CONTRIBUTION IN ASYMMETRY AND HANDEDNESS STUDY

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There is no doubt that asymmetry indeed can be considered as a real common-biological law, realizing its regulative action both in alive and in non-alive nature. The term "pathological asymmetries" involves abundant asymmetries, the ones observed under pathological conditions. There exist "a syndrome of lefty", one can differentiate "left diseases" met only in left-handed people; one can say and write about pathologies met only at mixed handedness or ambidextrism. Right-handers are tended to have own problems with health. There are diseases peculiarities in left-handers and right-handers. UMSA Physiology chair teachers contributed much in discovering the "right" and "left" types of blood system reactions in symmetrical vascular regions in the animals and people. Varieties in charge and erythrocytes number were claimed as the most contributive factors defining "right" and "left" type of blood reaction. Cellular and molecular levels of asymmetry as well as tissular, organic, systemic, organismic, population-species (which expression best and comfortable for assessing represents sinistrality or left-handedness) and biospheric found detailed description in this article. Doubtly, asymmetry represents very important factor of adaptation to changeable and pathological conditions and should be known well by the specialists of various branches of theoretical and applied Biology and Medicine. Our chair teachers and students of the students' scientific group contributed much into asymmetry and typological aspects study both under physiological and pathological conditions, describing their importance in Biology, Physiology, Dentistry and other branches of theoretical and applied Science; the authors analyzed some results received in their article.

Key words: *asymmetry, International students, typologies, left-handedness.*

Connection of the publication with planned research works.

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Introduction.

There exist common-biological laws characteristic only for alive or non-alive nature as well as those characteing both. Asymmetry belongs to such universal laws finding its expression at alive matter all organizational levels beginning from the molecular (only left-folded aminoacids, for example, L-arginine are useful in nature but can be L-arginine is an effective medication for prevention of endothelial dysfunction, a predictor of

anthracycline cardiotoxicity in patients with acute leukemia, D-aminocids are non-useful or even toxic, D-glucose but not L-glucose is useful, right-folded DNA represent 95-98% of all DNA while L-DNA - 2-5% with participation in histonic proteins biosynthesis) [1], cellular (for example, period between peri-implantation and gastrulation, during gastrulation process from embryonic stem cells to self-assembling and generating embryo-like structures de novo, in course of ovogenesis with three polar bodies formation, during hematopoiesis) [2], tissular ones [3] and ending with the biospheric one (Nothern and Southern Poles asymmetry); while defining genetic (the genes of right-left intra-embryonic development in animals and human being, for example, lefty, nodal and many others, right-shift theory of M.Annett et al.) [4, 5, 6] and epigenetic developmental mechanisms [7]. There exist structural and functional consequences of reversible lipid asymmetry in living membranes [8]. Flip-flop with negatively-charged phospholipid phosphatidylserine transfer from the inner to the outer membrane in part results into coagulation cascade or apoptosis activation. There was a research set about gene expression profiles left-right asymmetry in fetal and embryonic human brains. Hemispheric asymmetry degree gets decreased with aging [9] while defining bigger morbidity in the old and while being powerful factor of adaptation to non-favorable and changing conditions (for example, knee symmetry is accompanied by knee osteoarthritis progression) [10]. Membrane asymmetry influences on pro-oxidants' and antioxidants' activity [11].

It was determined that having a lateralized brain can enhance the capacity to perform two tasks simultaneously while having independent sensory processing and motor outputs on the left and right sides and while increasing brain efficiency [12]. Dichotic listening can be applied for hemispheric asymmetry assessment [13]. Asymmetry scores were trying to be determined on EEG asymmetry in the cortex anterior (frontal) parts. As the literary data emphasize, asymmetry represents a symbol of beauty, harmony, health and good adaptation; they write about asymmetry individual patterns. So-called "reversed asymmetries" were described for adextrals or non-right handed people [14]. Body-specific mental rotation was thought and proven among the mechanisms defining extremity choosing to perform one and another operation; dexters had better mental rotation and more lateralized hand dominance was observed in the right-handed participants [15]. Manual asymmetry gets decreased while aging from the adulthood to the elderness and getting old but gets increased from infancy to the adulthood [16].

It is possible to speak and to write about gender-age asymmetry while taking gender-age typological aspect into consideration in a relation to antioxidant defenses in a whole saliva by psychosocial stress with such a result that antioxidant defensive or protective mechanisms activation was found to be Activation of antioxidant defenses in whole saliva by psychosocial stress is more manifested in young women than in young men [17].

Nervous and humoral regulative systems are in tight connections in norm and pathology. Asymmetry in higher integrated functions in part in attention was found to be determined by asymmetric coupling in rhythmic interlimb coordination [18]; some hypothalamic nuclei are in the limbic system composition while emphasizing to these regulative systems connection as well. There are the data about the neuroendocrine system asymmetry. Cortisol levels were found to be in their decrease in most asymmetrical but in increase in the most symmetrical men concerning to their face asymmetries while emphasizing to stress better course at asymmetry [19] that is in correlation with the data according to which asymmetry represents a significant adaptation factor to new, changeable, non-favorable conditions (stress and diseases course in part); for example, amygdale decreased volume defines maladaptive behavior while left amygdale increased volume - adaptive emotional skills whereas bilateral global amygdale volume asymmetry diminishing - psychiatric disturbances [20]. Taking into consideration the fact that stress results into asymmetry between hypothalamic-pituitary-adrenal axis and sympathetic nervous system activity there was an expectation that maltreated youth aged 9-14 years would exhibit greater asymmetry on salivary alpha-amylase and cortisol than the ones in the control group but there were no significant associations between responses in these two biomarkers [21]. By Holm-Bonferroni correction for multiple comparisons, the left amygdale was determined to be the key substrate for both empathy and alexithymia; left amygdale less volume was characteristic for the cognitive alexithymia, its two sizes increase - for empathy; gender varieties were not characteristic for empathy though were observed at alexithymia at which males but not females had difficulties in fantazing correlations to the smaller grey matter volume in the middle cingulate cortex [22].

There are the data about exocrine glands symmetry/asymmetry: women with symmetrical breast glands are thought to have more expressed potential fertility than the ones with asymmetrical breast glands [23]. There exist prediction of near-term breast cancer risk based on bilateral mammographic feature asymmetry [24], association between breast cancer laterality and tumor location, particularly in the USA [25]. There are researches on so-called fluctuating asymmetry in dermatoglyphics of breast carcinoma [26]. Hormones and therefore endocrine glands are involved into asymmetrical answer as well: in part there are the data about fluctuating asymmetry and steroid hormones [27].

Asymmetry study has not only theoretical but big applied significance. The scientists performed and perform mapping brain asymmetry in health and disease. In part autism spectrum disorders were found to be accompanied by damaged structural hemispheric asymmetries in a brain areas broader range than others; right amygdale was found to be a participant in the pain reactions. The asymmetry role was depicted at Parkinson's disease, Alzheimer's disease, amyotrophic lateral sclerosis, multiple or disseminated sclerosis [28], dyslexia, depression, autism spectrum disorders (with rightward asymmetry and atypical hemispheric asymmetries for language and white matter microstructure reduced hemispheric asymmetry) [29, 30], combined hyperactive/inattentive types (ADHD-C) with significant visual attentional bias to the right side and following left subclinical neglect in children and adult [31, 32], anosognosia [33], schizophrenia (with digit ratio 2D:4D assessment), generalized anxiety disorder (with sympathetic and hypothalamic-pituitary-adrenal asymmetry on alpha-amylase and cortisol asymmetry while defining enzymes and hormones asymmetry id

est so-called biochemical one) [34], right and left benign mesial temporal lobe epilepsy (interhemispheric functional connectivity asymmetry damage) [35], posttraumatic stress disorders (amygdalar asymmetries) [36], social anxiety disorder (amygdala functional lateralization together with damaged fronto-amyglale communication with the pre-frontal cortex were found to be pathogenetically contributive), mild cognitive impairment while being determined in the asymmetry of choroid plexus, neurochemistry, protein distribution, brain connectivity and the vagus. There is a research comparing the data on hippocamp, amygdale and entorhinal cortex asymmetry in norm and at neurodegenerative disease [37]. One can distinguish the neurochemical asymmetries, unilateral motor dysfunction, unilateral limb weakness, asymmetric atrophy as well as work load and aerobic asymmetries. Some results demonstrated genetic effects on planum temporal asymmetry and their limited relevance to neurodevelopmental disorders, intelligence or educational attainment [38].

EEG asymmetry is described separately, for example, concerning to the examined psychometric properties, both the adults and children, in norm and pathology, for instance, at attention-deficit and hyperactivity disease ADHD [39], familial depression (taking internalizing symptoms in children into consideration) [40], mood and anxiety disorder symptoms (asymmetrical frontal cortical activity in electrocorticography) [41].

Sinistrality represents asymmetry population-species level the mostly comfortable for assessment, both in norm and pathology. The research set was performed in this aspect in twins [42]. There are research on assessment and comparison of higher integrative functions for instance attention (left-handers outperformed the right-handed participants on selective attention) [43]; biochemical profile of the dexters and sinisters was found to be different (there was lipoproteins double level in the left-handed diabetics) [44]. Right-handers get sick more in helminthoses, while left-handers - on prothozoonozes, by the Turkish researchers' data [45]. Its study attracts the scientists from many countries, for example, in Saudi Arabia about the impact of handedness among left-handed surgeons who insist on training the contralateral hand [46] as well as Australia, United Kingdom; in Turkey where, accordingly to the results of one survey performed in 194 participants, 8 endoscopic surgeons prefer left dominant hands, 50% consider that it is essential to change the devices and to adapt them for left-handed specialists while 66% informed about comfort to work with any device and absent essentiality of the devices mentioned adaptation [47]. These multiple research have not only in theoretical but in applied aspect as well and there are still multiple non-solved questions despite their big amount; actuality is also impacted by the left-handedness percentage increase in the world and strictly negative attitude to left-handedness and left-handers in Africa, by the fact that only 5% of all left-handers are real, born by one or two left-handed parents while 95% - forced or hidden and non-real; there are multiple professional diseases of the left-handed nurses and doctors depicted in many countries in part in Taiwan. Special attention was and is paid to the facts that left-handed people should deal to the devices for the right-handed ones; left-handed dentists have problems while working with the tools for the right-handed ones while being students and during their professional activity as well as professional diseases (musculoskeletal and vision diseases in part), difficulty in searching the assistants and while working with them, in part, in cardiosurgery, with adaptation tension and proposal to train contralateral hand; the specialists of surgical branches of medicine face these problems in a bigger extent; it increases the multi-faceted research role concerning to left-handedness and left-handers, in part in medical students; PSMU dental students start their professiogenesis beginning from the 2nd course of their study [48]. The epilepsy start age was found to be earlier for the left-handed patients [49], while some neurologists consider that epilepsy is spread in bigger extent in left-handers than in right-handers [50]. The opinion concerning to being apraxy as the disease met only in the left-handers is different because some specialists think that it can be observed in the right-handed patients as well [51].

There is a point of view concerning to handedness and risk of breast cancer [52], left-handed women were found to have right breast cancer more often that the right-handed ones, bilateral breast volume asymmetry was detected in screening mammograms to be a potential marker of breast cancer [53]. Handedness associations with the developmental coordination disorders were depicted in the Portuguese left-handed children [54], the examined age and gender influenced on the results received. They say about the syndrome of the left-hander.

It is rather important to take into consideration that there exists left-handedness three major types. Real left-handedness is the inheritant one because these people have two left-handed parents. Also one can differentiate hidden left-handedness when left-handed people's children use their right hands instead of the left ones. This sinistrality type is expressed under the conditions when the left-hander has his/her right hemisphere decreased or absent activity - it is evidently that right hemisphere governs left hand work. If the parents are right-handers but their children use their left hand from case to case or even constantly this sinistrality type is called as unreal due to left hemisphere problems resulting in right hand activity lowering or even absence that leads to the dextral person's essentiality to use his/her left arm instead of the right one. Physiological systems functioning were determined to be in connection to sinistrality both under physiological and pathological conditions by Physiology chair teachers, in part, cand.med.sci., assistant, the Responsible for all International students on scientific activity and Physiological students' scientific group together with the students participating in scientific activity at the chair [55]. International students represent big population of the higher education applicants in our educational establishment as well; a big row of printed works was dedicated to their various organs systems functioning while interhemispherical asymmetry individual profile and other typological aspects taking into consideration [56, 57]. We paid and pay big attention to inter-disciplinary integration in educative and scientific activity, particularly between Physiology, Neurology, Cosmetic Medicine and Dentistry, while assessing the asymmetry and typological aspects taking into account [58, 59, 60].

As the review data demonstrate asymmetry is studied in a complex with ethnic, gender, age typological as-

pects, interhemispherical asymmetry individual profile; also there is a research set accordingly to which children with left frontal asymmetry had more externalizing problems and their mothers perceived hassles bigger amount in their parenting role though parenting hassles and externalizing problems were not associated in the examined children with right frontal EEG asymmetry; as it is known externalizing and internalizing behavior represent a significant or even maximal degree of so-called external and internal control locus; there are works about relationship of approach/avoidance motivation and asymmetric frontal cortical activity thus while characterizing behavioral strategies of coping (emotional, of approach), defense and avoidance [61]. Movements' asymmetry was assessed in the Korean adolescents sick in idiopathic scoliosis [62]. Sinistrality was studied in a complex with various typological aspects in our research and multiple others, while emphasizing to the cultural influences on the development of lateral preferences [63].

There is membranes asymmetry: its getting disordered by Plasmodium malariae in Er membranes [64]; phosphatidylethanolamine binding to Annexin V while participating into anticoagulation as well as activity as the anticancer target (this research set was performed in India) [65]; membranes biophysical asymmetry expression in inner layer twofold more unsaturation than the outer one in eukaryotes [66]; cholesterol asymmetry (in part in the synthetic membranes with fast flip-flop after thermal fields action because cholesterol is hydrophobic) [67]; compositional phospholipids asymmetry characterized by phosphatidylethanolamine and phosphatidylserine dominance on the membrane inner layer while phosphatidylcholine and sphingomyeline on the outer layer with specific flippase proteins participating in flip-flop for triggering the blood coagulation and apoptosis due to phosphatidylserine transfer to outer layer.

Regional varieties in hemostatic system functioning can not be absent at the hemostatsis system factors normal synthesis and their consequent passage into the blood stream. We mean procoagulants, anticoagulants, fibrinolysis activators and inhibitors. There exists organic asymmetry, inner organs produce the factors influencing on vascular-platelet (microcirculative, primary) hemostasis and the coagulational one (blood coagulation, secondary) one while possessing proaggregant and antiaggregant, procoagulative and anticoagulative, profibrinolythic and antifibrinolythic features. What inner organs are the most contributive in mentioned aspect? We would like to mention following with such a left-right asymmetry namely the lungs, the big hemispheres, the kidneys, the vessels (in part the endothelium and in their vascular bed) and without it the examples of which are the bone marrow (where hemopoiesis takes place that is of great importance if to remember about significant participation of the formed elements mainly the erythrocytes which number is the biggest among all blood cells, the leucocytes and the platelets participating both in vascular-platelet and coagulational hemostasis, maintaining the blood rheological properties due to absorbing and desorbing the substances influencing on hemostasis in its wide aspect - we mean not only clot or thrombus formation but maintaining the blood liquid state that is provided my multiple pathways and mechanisms), womb (the pregnant womb can give a risk to have an embolism with near-uteral or near-womb liquids with DIC-syndrome or disseminated intravascular coagulation syndrome development, it is important to remember that thromboplastin found in these liquids belong to the most active in the body together with the one in the big hemispheres though this syndrome has three phases and after the hypercoagulation phase defined by mentioned thromboplastin release in part there will be the different-directed phase when the indices part in the differential coagulogram will testify to hypercoagulation while another one - hypocoagulation, this phase is changed by hypocoagulation phase; also taking the womb's menstrual function into consideration and powerful anticoagulants heparin produced by the basophils located in the endometrium functional layer desquamating during bleeding, one can conclude that this organ hemostatic potential depends on its current function), the prostate and the thyroid (with fibrinolysis dominance over the procoagulation due to plasminogen activator and the 5th artery in the thyroid - a.thyroidea ima; surgeons are afraid to perform their operations on these organs because of abundant bleedings during and after them, only the thyroid gland have 5 arteries). They say about hemostatic potential mosaicity in the organism. These data made us interested in blood asymmetry study and sinistrality as its expression at population-species level.

The aim of the study.

To review the data concerning asymmetry study as a common-biological law as well as UMSA and PMSU Physiology chair contribution into its assessment in part in blood system, interhemispherical asymmetry individual profile as asymmetry expression at population-species level together with other typological aspects in the International students from various countries.

Main part.

We would like the data received by d.med.sci, professor Mistchenko Vitaliy Petrovich, his pupils and followers be known far from Ukraine. The coagulational hemostasis indices (blood coagulation time, time of plasma recalcification, thrombine, prothrombine, activated partial thromboplastine time, euglobuline clot solution velocity, natural clot lysis) were more expressed in the investigated vessels (blood circulation regions namely symmetrical cubital vein) on the right, in others - on the left as well as the ones characterizing tissular hemostasis. Erythrocytes from right and left cubital veins had practically equal hemocoagulative features from the both sides. In capillary blood there were some differencies in right- and left-handed people: in the first one erythrocyte number, hemoglobin concentration, some rheological (viscosity, velocity sedimentation rate, hemolysis maximum time) and coagulative properties were dominant on the right, in the second one - on the left. In common, the erythrocyte hemostasis indexes asymmetry were more expressed in human capillary blood than in the venous one. The results received for the first time allowed differentiating the rheology and erythrocyte hemostasis reacting "right" and "left" types. Moreover, right-handed people had the right one, while left- handed - the left one. Real and hidden left-handers had the left reaction type or mentioned indices dominance on the left while real right-handers and unreal left-handers had right reaction type. Unreal sinistrality in the foreign students was accompanied by right-hemisphered simultant thinking pathway dominance resulting in difficult tests solving.

We assessed asymmetry and sinistrality in the foreign students from different countries and paid much attention to the interhemispherical asymmetry individual profile assessment in them. We propose some other own results on asymmetry and sinistrality study performed by the cand.med.sci, Physiology chair assistant, the Responsible for all non-Ukrainian students on scientific activity in Poltava state medical university and for Physiological students' research group Tkachenko Elena Viktorovna with her students studying General medicine and Dentistry performed in the students and in the Poltava Regional Hospital patients. Left- handed students had right masseter and mimic muscles stronger development while right-handed - on the contrary. Left-handed patients from Poltava Regional Hospital had left-sided dystopy both on permanent occlusion and on the third molars while left-handed patients - the right-sided one. Left-handers had bigger retention on permanent occlusion than the right-handers. Retention was not determined in ambidexters. Left-handed patients exhibited left first incisive special dystopy while right-handed patients - the one of the right first incisive. The students amounts were 30, 25, 15 and 50 correspondingly - 120 as a whole. The distribution on interhemispherical asymmetry individual profile was as follows as: 50 left-handers, 50 right-handers and 20 ambidexters. According to our results received the real dexters had only orthognathic and prognathic occlusions. Orthogenic occlusion was dominant in the real sinisters. The hidden sinisters did not have any physiological occlusion types but had biprognathic and deep occlusion in the equal correlation. The unreal sinisters had orthognathic, prognathic and biprognathic occlusions. The ambidexters did not have occlusion physiological types but had a practically equal distribution in opisthognathic and crossing occlusion. We dedicated some investigations to assessing the face asymmetry in the right- and left-handed students after their face halves co-inciding with computer technologies and determined less harmony while matching the face left halves in the left-handers and right halves in the right-handers in Ukrainian, Egyptian and Iraqi students that can be explained by the left masseter bigger development in the left-handers and the right one - in the right-handed students; these data can be applied in Cosmetic medicine, Psychology (if to think about face harmony), Dentistry (face harmony can get disturbed at improper denturing in part), Neurology, Physiology.

Left-handedness as a whole, its types, interhemispherical asymmetry individual profile were assessed together with mentioned typological aspects. Left-handed students possessing simultant but not successive pathway of the information processing due to their right hemisphere dominant had big difficulties or even impossibility in solving the tests; we propose either not to give them the tests at all or not to think the test form as the main controlling, to use only educating tests with the tests writing on the board, discussion in the academic group, writing the tests and the variants completely if the students have writing normal velocity or to write only the test condition (the key words if there is especially big difficulty to write in a foreign language) and the correct answer with the choosing backgrounding; this work can be performed even in the languages the International students know better or well (for example, in French in the Moroccan students and the ones from Tunis, in Arabic for the students from Arabic countries); some students could not write but were typing rapidly in the laptop or tablet, others were allowed to write their concepts at the lesson or/and at home in the language/s they know better/well; our research demonstrated that the left-handed and ambisinistral students had especially little velocity of their writing. We had such academic groups where the students asked either only not to unite the letters on the board, or use only capital letters additionally and even plus this; there were the students who could read only the printed texts; mentioned problems were especially expressed in the students with real or hidden sinistrality and in the ones coming from Arabic countries other than Morocco and receiving their education in Russian or Ukrainian because they knew English rather well mostly. Left-handers' adaptation were influenced by bigger amount of factors than the one of the right-handed foreign students and they assessed it as harder comparatively to the right-handed International students that corresponds to the scientific sources data performed by other authors.

Conclusions.

As conclusions, we would like to mention that one can differentiate hemostasis "right" and "left" type by coagulational, tissular and erythrocytic hemostasis indices in the observed when one group has dominant indices on the right, while others - on the left. Positive and negative bioenergetical-informational action influenced on blood indices differently in the research performed by Goubkin-Mateisky Sergei Alexeyevich and Mistchenko Vitaliy Petrovich, because intact formed elements carry negative charge and because organism represents and integrity of dipoles - left-right in a given case is actual to be emphasized - by the biomechanics' theory of Drozdovskaya Alisa Akimovna and by the works of K.A. Ivanov-Mouromsky demonstrated first the body right half is charged positively while the left one - negatively. Lateral therapy uses the data received. Also it can be concluded that asymmetry should be studied with the typological aspects; in part additional multi-faceted attention should be paid to left-handed people study while mentioning the interhemispherical asymmetry individual profile not only theoretical but rather big applied significance in part in Psychology, Neurology and Pedagogy for example while studying the foreign applicants. Typological belonging taking into consideration will define individualized study which must be in priority because only it can help to reach optimal academic adaptation of the foreign students maximally and other adaptation types in part the cultural and the cross-cultural ones significantly that is among any educational establishment task because only its will encourage to foreign applicants desire to study in Ukraine primarily.

Prospects for further research.

Our modern research were dedicated to assessing the foreign students' typological belonging impact on their physiological systems functioning, their academic, cultural and cross-cultural adaptation. We would like to widen the data about physiological and pathological asymmetry expression in people from various countries, in part in our university International students as well as asymmetry degree contribution into multi-faceted adaptation of higher education applicants from various countries.

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АСИМЕТРІЯ ЯК ЗАГАЛЬНО-БІОЛОГІЧНИЙ ЗАКОН, ВНЕСОК КАФЕДРИ ФІЗІОЛОГІЇ УМСА ТА ПДМУ У ВИВЧЕННІ АСИМЕТРІЇ ТА РУКОСТІ

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Резюме. Стаття присвячена аналізу асиметрії як загально-біологічного закону, вираженого на всіх рівнях організації живої матерії з різновидами залежно від статі, віку, етнічної приналежності, представляючи при цьому істотний фактор адаптації в нових і мінливих умовах з розумінням того, що хвороба є проявом дезадаптації. Окрему увагу автори приділили огляду літературних даних щодо асиметрії мозку та ендокринної системи, асиметрії мембран, рукості як найбільш комфортного для оцінки прояву асиметрії на популяційно-видовому рівні з блискучими прикладами прикладного дослідження асиметрії та рукості. Вони представили літературні та власні дані, що описують дослідження асиметрії крові, відзначивши вагомий внесок у це співробітників кафедри фізіології нашого навчального закладу з обґрунтуванням отриманих результатів. Дуже важливо пам'ятати про асиметрію морфофункціональних особливостей еритроцитів, зокрема гемостатичних властивостей, показників коагуляційного та тканинного гемостазу в симетричних ділянках судин спостережуваного, оскільки вони визначають «правий» і «лівий» типи діяльності системи крові. У лівшів обов'язково взяти кров на дослідження з лівого безіменного пальця та лівої ліктьової вени, а з правих - у правшів, тому що в крові субдомінантної кінцівки може бути анемія та гіпокоагуляція, що можливо коригувати навіть ліками одразу. Неправильно брати кров з лівих судин один раз, а з правих - інший раз. Також значну увагу автори приділили своїм дослідженням на тему необхідності врахування типологічної приналежності іноземних студентів під час роботи з ними, зокрема в педагогічному процесі, для досягнення максимального індивідуального підходу в навчанні та забезпечення їх оптимальної різнобічної адаптації.

Ключові слова: асиметрія, асиметрія крові, асиметрія гемостазу, іноземні студенти, студенти міжнародного факультету, типології, ліворукість.

ASYMMETRY AS A COMMON-BIOLOGICAL LAW, UMSA AND PSMU PHYSIOLOGY CHAIR CONTRIBUTION IN ASYMMETRY AND HANDEDNESS STUDY

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Abstract. The article is devoted to analyzing the asymmetry as a common-biological law expressed at alive matter organization all levels with varieties dependently on gender, age, ethnic belonging, while representing the adaptation essential factor in a new and changeable conditions with understanding that disease represents dys-adaptation expression. The authors paid separate attention to reviewing the literary data concerning to the brain and endocrinal system asymmetry, membranes asymmetry, handedness as asymmetry expression at population-species level the most comfortable for assessment with brilliant examples of the asymmetry and handedness applied study. They presented the literary and own data describing blood asymmetry study while mentioning a significant contribution of our educational establishment Physiology chair staff in it with the results received backgrounding. It is very important to remember about asymmetry of the Er morpho-functional peculiarities including hemostatic properties, coagulational and tissular hemostasis indices in the symmetrical vascular regions of the observed because they define "right" and "left" types of blood system activity. It is essentially to take blood from the left fourth finger and left cubital vein for analysis in the left-handed patients, while from the right ones - in the right-handed because there can be anemia and hypocoagulation in the blood of subdominant extremity that can be corrected even with medicines at once. It is wrongly to take blood from the left vessels one time and the right ones - another time. Also the authors paid significant attention to their researches on the topic about foreign students' typological belonging essentiality to take into consideration during work with them, in part in pedagogical process, to reach maximal individual approach in study and to provide their optimal multi-faceted adaptation.

Key words: asymmetry, blood asymmetry, hemostasis asymmetry, foreign students, International students, typologies, left-handedness.

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THE PARTICIPATION OF IRISIN IN THE MECHANISMS OF WEIGHT LOSS IN OBESITY

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During muscle contractions, several biologically active substances are produced, which conduct communication between various organs, systems and tissues following the body's metabolic needs. Irisin belongs to the list of substances called myokines. It causes various effects on the metabolism, taking part in implementing the health-improving impact of physical exercises, which determines the interest in its study by researchers in the field of physical culture. The main effect of irisin is the activation of converting white fat into brown fat in adipocytes, followed by an increase in mitochondrial lipid oxidation. Despite a wide range of research, the main regularities of the action of irisin have not yet been systematized. In this review, we analyze the mechanisms and features of irisin's participation in losing body weight. The study aims to establish the molecular mechanisms and regularities of the participation of the myokine irisin in losing body weight of obese women during health fitness classes and the possibility of using the level of circulating irisin as a marker of the effectiveness of training loads using the analysis of scientific literature. It has been established that in the studies, there is a high heterogeneity of indicators of mRNA and protein irisin levels in tissues and blood in response to physical exertion. Factors that affect the level of irisin include the type of tissue, the type of object, the method of measurement, the directionality, intensity and duration of physical exertion.