ABSTRACT&REFERENCES

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SIZE AND FUNCTIONAL STATE DISTRIBUTION OF CHROMATIN LOOP DOMAINS AND ITS REORGANIZATION UPON CELL ACTIVATION: HI-C DATA ANALYSIS

p. 4-9

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Chromatin structure at high levels of its organization, which remains not to be completely understood, attracts much attention because it is the basis of regulation of functional processes in nuclei of eukaryotic cells. An important aspect of this organization is the existence of relatively autonomic structural elements, the chromatin loop domains. Hi-C is one of the most effective methods to study the three-dimensional structure of chromatin. The bioinformatic databases contain much Hi-C data that have not been examined completely. In particular, a detailed analysis of the loop sizes and regularities of their location in defined chromatin regions (transcriptionally active or inactive) has not been performed, it remains to be seen how the loop density and sizes change, if there is any change, depending on the functional activity of chromatin regions.

The aim of the study *was to figure out the peculiarities of the size and functional state distribution of the chromatin loop domains in cells with different functional activity.*

Materials and methods: *bioinformatic analysis of the Hi-C data deposited in databases of open access.*

Results: *the size distributions of the chromatin loop domains in cells of different types, the distribution of the loop domains among different chromatin compartments in lymphoblastoid GM12878 cells and the size distributions within these compartments have been obtained, the changes in the loop size distribution under mouse lymphocyte activation have been analyzed.*

Conclusions: *the contour length of the loop domains is distributed exponentially, the distribution parameters are cell-specific, the majority of the loops are located in euchromatin regions, and the cell activation is accompanied by an increase in both the number of loops and their contour length*

Keywords*: chromatin, loop domains, chromatin compartments, Hi-C method, cell activation, bioinformatics*

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SEASONAL DYNAMICS OF MANGANESE AND IRON COMPOUNDS IN THE SUPERFICIAL WATERS OF VIDSICHNE WATER INTAKE OF TETERIV RIVER

p. 10-14

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Research aim *– to determine features of the season dynamics of concentrations of manganese (Mn) and iron (Fe) in the surface waters of Vidsichne water intake, Teteriv river in 2012–2014 and clarification of their correlations with the water temperature, hydrogen index (pH), content of dissolved oxygen (DO), and also by the number of dominating associations of planktonic algae.*

Methods. *Water samples (1 dm^3) were taken from the water intake (at realizing arrangements for cleaning and deepening its bottom part), and Mn and Fe compounds concentrations were determined in them by colorimetric methods, DO – by DO 4000 measurer, hydrogen index – by pH-meter, temperature – by the mercury thermometer. For studying the phytoplankton content, there was realized the hydrobiological analysis. The statistical processing of data was realized by MO Excel 2003 program.*

Research results*. Mn compounds concentration in water exceeded MPC$_w$ and had two peak values in summer. Fe compounds were also observed in increased amounts, but their peak was in another season every year. There were revealed reliable correlations of strong and middle Mn concentrations in water with a temperature and DO. The tendency to strengthening correlations of concentrations of these compounds with blue-green algae and weakening – with green ones was demonstrated. Mutual connections of Fe with these parameters were in whole weaker comparing with Mn, especially with pH and planktonic algae. And only in 2014 coefficient values of correlation between iron and temperature and DO essentially grew.*

Conclusions. *It was established, that concentrations of Mn and Fe compounds in water of the water intake exceeded MPC$_w$ during most seasons (0,1 and 0,3 mg/dm^3 respectively) in 2–8 times. The most content of Mn was observed especially in summer months, and Fe – in different seasons. Changes of Mn concentrations were much stronger connected with the water temperature (0,7029, p≤0,01 – in 2012 and 0,6702, p≤0,05 – 2013 years) and DO (–0,6272, p≤0,05 – in 2012, –0,8752, p≤0,0001 – 2013 and –0,6349, p≤0,05 – 2014 years), than ones of Fe concentrations. Correlations of Fe compounds with these parameters reaches reliability only in 2014 year (0,7326 and -0,7469 respectively, p≤0,01). Mn and Fe compounds had reliable connections only with blue-green algae (cyanogen bacteria) among all phytoplankton associations: Mn (0,6808, p≤0,05) – in 2014 and Fe (0,7410, p≤0,01) – in 2012. During the three year period of the studies there was fixed weakening connections between Mn and water temperature (by 28,54 %) and amounts of green algae (by 65,63 %) and strengthening – with amounts of blue-green ones (by 77,95 %), and also the growing dependence of Fe compounds concentrations on the temperature (by 79,12 %) and DO (by 95,77 %). Most revealed tendencies (except season dynamics of Mn and its correlations with the temperature, DO and amounts of blue-green ones) were atypical for the water intake and appeared, most probably, as a result of arrangements for cleaning the bottom part of the water body and its deepening that resulted in disorders in the condition of the water environment, including the abnormal increase of blue-green algae amounts in December of 2012 (up to 91,06 thousand cl/dm^3)*

Keywords: *Mn, Fe, season variations, abiotic parameters, biological parameters, correlations*

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CHROMOSOME TYPE ABERRATIONS OUTCOME IN ONCOGYNECOLOGICAL PATIENTS DUE TO RADIATION THERAPY ON ROCUS-AM AND LINEAR ACCELERATOR CLINAC 600C

p. 15-21

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Aims: *The detection of chromosome type aberrations outcome in oncogynecological patients during radiation therapy depending on the irradiation regime.*

Methods: *The group of 36 oncogynecological patients was examined before treatment, in the middle and at the end of external gamma-radiotherapy ^{60}Co on ROCUS-AM and megavolt therapy on linear accelerator Clinac 600C. Lymphocytes were cultivated by conventional technique during 50–54 hours. Chromosome type aberrations were detected with the classical cytogenetic analysis.*

Results of research: *The chromosome type aberrations changes in lymphocytes of oncogynecological patients during external gamma-radiotherapy ^{60}Co on ROCUS-AM and megavolt therapy on linear accelerator Clinac 600C were demonstrated. The excess of chromosome type cytogenetic damage over spontaneous level was shown in patients before treatment. Quite monotonic increase of chromosome type aberrations frequency from the start to the end of radiotherapy course in both groups was found. However the pace of chromosome type aberrations increase was different depending on the irradiation regime and more pronounced in oncogynecological patients undergoing gamma-therapy ^{60}Co. The range of cells with unstable chromosome aberrations expanded during the radiotherapy course. In the middle of the radiotherapy cells with 1–7 aberrations per cell in both groups were observed. At the end the number of damages per aberrant cell varied from 1 to 11 in ROCUS-AM patients and from 1–9 in patients after megavolt therapy on a linear accelerator. The distribution of the chromosome type aberrations among cells was found to be over-dispersed according to Poisson statistic in both studied groups at the middle and at the end of the radiotherapy course.*

Conclusion: *The study of the radiation-induced aberrations revealed the similar and different features of cytogenetic damages accumulation in patient groups depending on the regime of irradiation. The study results revealed the absence of the expected larger genotoxic effect on the patients' lymphocytes due to treatment on a linear accelerator in comparison with the ROCUS-AM, despite of the difference in the exposure energy. The data obtained are particularly important for a correct assessment of the local fractionated irradiation effects in the non-tumor patient cells.*

Keywords: *chromosome type aberrations, lymphocytes, oncogynecological patients, external radiation therapy.*

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DYNAMICS OF ANXIETY OF PARTICIPANTS OF UNITED FORCES OPERATION

p. 22-26

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The aim of the work*- to investigate features of a psychological state of the participants in the united forces operation that were in the east of our state on the second line of defense for four months.*

Materials and research methods. *Questionnaires of fighters-contractors according to the methods: "Scale of reactive and personal anxiety Ch. D. Spielberger – Yu. L. Khanina "and the Beck Depression Inventory (BDI) questionnaire. The study was conducted in the first days after arriving at the location site, two months in the zone of the united forces operation and two weeks after returning from the war zone. The study was conducted on the basis of 177 separate radar platoon (Lisichansk, Lugansk region) with combatants-volunteers from April to August 2018.*

Simulation Results. *As a result of the study, there were established a predominantly moderate level of reactive and personal anxiety and the absence of signs of depression at the beginning of the assignment and during the stay in the area of the operation. There was an increase in the level of anxiety and the appearance of signs of depression after returning from the combat zone. The analysis of the main problems of the participants of the operation of the combined forces arising from the return to the conditions of peaceful life (violation of the rights to social guarantees, bureaucratic problems when applying for benefits) has been carried out.*

Conclusions. *Thus, in the first days of arrival in the combat zone, the combatants are dominated by the average level of reactive and personal anxiety, and there are no signs of depression. After two months of performing combat missions, the level of reactive and situational anxiety among combatants remains within the average indicators, the participants of the study have no signs of depression, which allows to conclude that a high adaptive level is achieved. Two weeks after returning from the combat zone, most combatants increase the level of reactive anxiety and show signs of mild depression. The prospect of further research is seen in the development of effective methods for the physical and psychological rehabilitation of combatants in order to increase their adaptive capabilities upon returning from the environment*

Keywords: *diagnosis of posttraumatic syndrome, reactive anxiety, personality anxiety, depression, combatant, united forces operation*

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CONTENT OF SOME BIOELEMENTS IN BODIES AND TISSUES OF EXPERIMENTAL ANIMALS UNDER CONDITIONS OF NITROGEN INTOXICATION

p. 27-30

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The aim of the study. *Analyze the content of some bioelements and cumulative properties of heavy metal ions (on an example of cadmium) for nitrate intoxication.*
Materials and methods. *The object of the study was white rats, which were divided into two groups: I – control, II – research (receiving aqueous $NaNO_3$ solution with drinking water at a dose of 1/10 DL_{50}). Intoxication was carried out for 10 days. The material was collected (renal tissue, liver and spleen) on 1st, 14th and 28th days after the completion of the administration of the toxicant. The level of macro- and micronutrients was determined by the atomic absorption spectrophotometer C-115PK. The obtained results were statistically processed using the computer program Statistics.*
Results. *Under the influence of $NaNO_3$, an increase in the calcium level in the renal tissue, liver and spleen was noted compared with the control group of animals. At the same time, the Mg content in the liver was declined throughout the observation period, whereas in the kidneys and spleen – on the first day of the experiment. The research of essential trace elements, such as Zn and Cu, allowed to establish the following changes: enhance of Zn level in the liver on the 1st and 14th day and its decrease on the 28th day; in the renal tissue and spleen the value of this index was increased on the 28th day in comparison with the control group of animals. The content of Cu was increased on the 28th day in the spleen and liver, whereas in the renal tissue the value of this index was lower than the control group values. Te analysis of the cadmium level showed that Cd content in the spleen, the liver and the renal tissue of the animals after influence of $NaNO_3$ exceeded the control values in 3–3,8 times.*
Conclusions*. It was established that the organisms of experimental animals under the condition of nitrate intoxication-are characterizes by the development of dysmicroelementosis, which is featured by the changes in the levels of vital macro- and trace elements in organs and tissues, which is important for the regulation of metabolic processes. An increase in the ability of cadmium ions to accumulate in the studied organs and tissues is also shown*
Keywords:*macroelements, trace elements, sodium nitrate, liver, kidneys, spleen, white rats*

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METABOLIC CHANGES IN THE BONE TISSUE OF ANIMALS IN CONDITIONS OF EXPERIMENTAL CADMIUM INTOXICATION

p. 31-35

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Objective: *to investigate the features of metabolic processes, bioelement composition and mineral density of the bone tissue of white rats (sexually mature males) in conditions of defeat by cadmium ions.*
Materials and methods. *The toxicant (Cadmium chloride, $CdCl_2$, 1,2 mg/kg) was administered to animals for 10 days, and then removed from the experiment on days 1, 14 and 28. The blood and femurs were investigated. Blood levels of calcium-phosphorus metabolism, acidi and alkaline phosphatases, magnesium,*

Hydroxyproline concentrations were studied by standardized methods using reagent kits, as well as the level of Parathyroid hormone and Calcitonin in the development of intoxication. In the ash of the femurs, the content of osteotropic bioelements and toxic cadmium was determined. The bone mineral density (BMD)was investigated using standard x-ray densitometry.

Results. *An increase in the concentration of total and ionized calcium on the background of increased secretion of Parathyroid hormone and reduced Calcitonin has been established; decreased activity of alkaline phosphatase, increased acidi phosphatase, especially on the 14-th day. In animals, an increase in the concentration of Hydroxyproline was observed in the blood (2,5–3,5 times) and a decrease in magnesium. When determining the content of osteotropic bioelements in the ash of the femoral bones of rats under conditions of $CdCl_2$ exposure, a decrease in the content of Calcium, Magnesium, Copper and Zinc in the femoral bones (by 13–45 %) against the background of a significant increase in the content of Cadmium (9,8 times) was found. Also, there is a decrease in BMD, especially low values recorded on the 14th day.*

Conclusions. *The results of complex studies show that under conditions of introduction of $CdCl_2$ into animals, metabolic processes in bone tissue are disturbed, dismicroelementosis develops, the mineral phase of the bone is demineralized, its collagen matrix is destroyed, and resorption dominates over osteosynthesis.*

Keywords: *Cadmium, bone tissue, toxic effects, markers of bone metabolism, osteotropic bioelements, mineral density of bone tissue.*

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AMPHIBIAN SKIN GLANDS SECRETIONS EFFECT ON PLASMA COAGULATION TESTS

p. 36-41

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According to the extremely high mortality and disability rates associated with the abnormal functioning of the hemostasis system, the search for new approaches for the prevention

and treatment of these conditions is one of the most acute problems of modern biochemistry. The active components of reptile poisons are actively used in the treatment of these diseases, but the study of the effects of amphibians' skin glands secretion on the functioning of hemostasis system has not yet been carried out. So, the ***aim*** *of this work was to assess the effects of the components of amphibian skin secretions on the functioning of the coagulation link of the hemostasis system.*

Methods. *In this study the skin secretions of ten Ukrainian species of amphibians were collected: B. bombina, B. variegata, B. bufo, B. viridis, R. temporaria, P. ridibundus, P. esculentus, P. fuscus, S. salamandra and the hybrid of B. bombina and B. variegata. The samples of crude skin secretions were prepared. The activated partial thromboplastin time (aPTT), thrombin time (TT) and prothrombin time (PT) tests were conducted in vitro using the coagulation analyzer (Rayto RT-2201C, China) and the standard set of reagents (RENAM, Russian Federation).*

Results*. It was established that the components of crude skin secretions of B. bombina, B. variegata, their hybrid, R. temporaria and P. ridibundus prolonged the aPTT of clotting plug formation. The components of skin secretions of B. viridis, P. esculentus, P. fuscus and S. salamandra prolonged the TT of clotting plug formation.*

Conclusions. *The fact that some amphibian species prolonged the aPTT and TT of clotting plug formation could be the indicator of the presence of inhibitors of certain factors of coagulation hemostasis or be the reason of the degradation of the components of coagulation hemostasis by active components of skin secretion. Such results prove that the amphibian crude skin secretions are a potential source of the compounds that can affect the hemostasis system. The identification of an active component and the elaboration of its mechanism of action are required in further investigations*

Keywords: *amphibians, skin gland secretions, skin poisons, plasma coagulation tests, coagulation hemostasis*

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QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF POLYPEPTIDE POOL IN PATIENTS WITH BLADDER CANCER

p. 42-47

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Aim: *investigate and characterize the presence of polypeptide pool in blood plasma and tumor tissues in patients with bladder cancer at different stages of the disease.*
Materials and Methods: *Patients with bladder cancer at different stages participated in the trial. The diagnosis was based on X-ray, endoscopic, clinical research methods with morphological verification. None of the patients treated the oncological diseases for a preliminary study. Plasma blood was taken in the preoperative period. Cancer and healthy tissues of the bladder were selected for biopsy, immediately after surgery. Isolation of polypeptide pool in blood plasma and tissue homogenates was carried out using the Nikolaichuk method. The qualitative composition of the protein component of polypeptide pool fraction was investigated using chromatography, using a column with Sephadex G 15.*
Results: *In the course of the study, reliable changes in the content of medium molecules in blood plasma and tumor homogenates in patients with bladder cancer have been shown. The changes correlate with the stage of the disease. A qualitative analysis of the composition of the protein component of medium mass molecules was carried out, using chromatography.*
Conclusions: *The fraction of the average mass molecules from the blood plasma and tumor tissues of patients with various stages of bladder cancer was obtained. The quantitative and qualitative content of the fraction of polypeptide pool in blood plasma and tumor homogenates has been investigated. The content of polypeptide pool in the blood plasma and tumor tissues of patients with bladder cancer is significantly increased compared with the blood plasma of healthy men and compared to healthy tissues of the bladder. The qualitative composition of the polypeptide pool in blood plasma and tumor homogenates differs from that in the plasma of healthy patients or in healthy tissues of the bladder*
Keywords: *polypeptide pool, bladder cancer, tumor marker, molecules of average molecular weight*

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