

Our investigation object is to study mechanisms of acoustic ophthalmopathy development.

Materials and methods. 217 machine-building plant workers were examined. Conditions of work in the workshops: influence of infrasound, whose intensity level exceeds maximum allowable sanitary norms on 16-20 db and runs up to 96-100 db on the frequency of 8-16 Hz. The total equivalent level of noise intensity in one shift exceeds the maximum allowable level on 11-13 dbA in average.

Biomicroscopy was carried out by means of the stereobinocular microscope "Zeiss". The state of eye bottom vessels was studied using the ophthalmoscope 11750-VBI, Welch Allyn; the electroretinogram registration was conducted with A. M. Shamshinova's methodology (1998).

The results of research. The clinical observations showed that protracted influence of acoustic vibrations with pressure even within the normal range upon the human organism stimulates functional changes in the visual analyzer which lead, first of all, to visual discomfort.

Primary signs of microcirculation disorders (like atherosclerotic and hypertonic changes) were revealed by means of biomicroscopy of conjunctiva (especially at persons of 40 years and older). One part of examined (23.76%) had microaneurisms of conjunctiva vessels, more often in the area of the lower sector of limbus and in the area of the lower transitional pleat of mucous eye membrane.

The ophthalmoscopy of vessels of an eye bottom helped to bring to light arterial wall induration in the pool of the second order arterioles, venous plethora, venous glomes like Gwist's symptom, there was also revealed Salus-Gunn's symptom of the I-II degree. The frequency of exposure of vascular changes (like hypertonic, atherosclerotic and atherosclerotic-hypertonic angiopathy) in the examined group exceeds on 71.5% analogical displays of vascular pathology diagnosed in the control group.

Little decline of amplitude parameters of macular electroretinogram was observed at examined persons, both red and green stimuli. Statistic analysis allowed revealing a reliable distinction ($p < 0.001$) between the groups of the amplitude of the wave A of macular electroretinogram of the green stimulus, which mainly rod cells and cones of macular area responds to.

Taking into consideration that there were no revealed significant distinction of parameters in macular electroretinogram on the red stimulus, which mainly macular area cones react to, it was possible to suppose that electrogenesis abnormality as a reliable decline of the amplitude of the wave A of macular electroretinogram on the green sti-

mulus is conditioned, to a considerable extent, by dysfunction of rod cells, situated in the stimulated area.

Bioelectric retinal activity was also investigated at stimulation of low frequency. A reliable decline of electroretinogram amplitude for 10 Hz was revealed at examined persons in comparison with the control. Reliable extension of time interval N-P was considered to be a sign of disruption of interneuronal correlation in external layers of retina, most probably at the stage of information transmission from photoreceptors to neurons of the second level.

Thus, clinical observation of machine-building plant workers achieved that protracted influence of acoustic vibrations with pressure even within allowable level upon the human organism provokes functional changes in visual analyzer, which lead to, at the first place to visual discomfort. Ophthalmoscopy revealed vascular changes like hypertonic, atherosclerotic and atherosclerotic-hypertonic angiopathy in the group of examined persons. This angiopathy exceeds on 71.5% analogical manifestations of vascular pathology diagnosed in the control group. Bioelectric retinal activity was also analyzed. Decline of the electroretinogram amplitude for 10 Hz was displayed at persons from examined group in comparison with the control. Given investigation allowed suggesting a working classification of acoustic ophthalmopathies, which permits to work out a complex of sanitary and pharmacological measures for the prophylaxis and treatment of manifestation of acoustic vibration influence upon the eye.

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COMPLEX DIAGNOSTICS OF MYOENDOMETRIUM PATHOLOGY

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In many countries of the world the recent decades are characterizes by the incidence rate of hormonodependent tumors of reproductive organs (hysteromyoma among them), hyperplastic processes and endometrium cancer with the rejuvenescence of the sick women contingent. Numerous data allow to consider hysteromyoma as a clinical risk marker of the development of genitals' hormonodependent tumors (among them are primary-

multiple formations) in women of not only perimenopausal but also of reproductive age (J.B. Bosman, 1989; E.G. Shvariov, 1993; L.M. Bershtein, 2001; N. Potischman, C.A. Swanson, L.A. Brinton et al., 1993).

In spite of the sufficient number of detection methods of myeometrium pathology, the necessity of new ones is retained. It is stipulated by inadequate susceptibility of the existing methods, their complicacy and high cost at the screening and monitoring stages. For our research of biological material the endometrial secretion was chosen. It is stipulated by the fact, that during the usage of immunofluorescent and histochemical research methods of normal, hyperplastic and malignant endometrium tissue the ability of some enzymes and their isoforms to be accumulated in apical parts of glandular mucus was revealed (E.G. Shvariov, 1993). The biological peculiarity of endometrium is that this hormonosensitive tissue has the ability of cyclic renewal of cellular composition and is influenced by sexual hormones, peroxide lipid oxidation products and proteins.

No doubts that the development of various pathologic processes is associated with the so called "oxidant stress", which can be the direct cause of a disease or accompanies its development. The production of active oxygen forms increases, and the antioxidant system which regulates processes of peroxide lipid oxidation and peroxide protein destruction is involved into the process. The oxidant stress development doesn't affect the isolated disturbance of lipids, proteins or nucleic acids because of their close interaction; thus, they are to be considered as a whole complex.

The offered approach allows to carry out biochemical cytological and crystallographical research simultaneously. Diagnostically it turned out to be more effective than the detection of markers in serum, where the received indexes were rather diverse.

420 women were examined; they were divided into following groups:

- 1) control group, including 64 (15,2 %) women without reproductive organs pathology;
- 2) 208 (49,5%) women with hystero-myoma having normal structure of endometrium;
- 3) 84 (20,1%) women with hystero-myoma having hyperplastic processes;
- 4) 13 (2,86%) women with hystero-myoma in combination with atypical hyperplasia of endometrium;
- 5) 52 (12,4 %) women with hystero-myoma in combination with cancer of endometrium.

In these groups the content of catalase was detected. Catalase is one of the enzymes of antioxidant protection, that is malon dialdehyde, which is the secondary product of peroxide lipid

oxidation and carbonil groups of protein – markers of peroxide destruction.

The meanings of catalase index and catalase number in the control group were $3,09 \pm 0,18$ units and $0,8 \pm 0,08$ units. In women with hystero-myoma having normal endometrium structure, the investigated parameters were $2,53 \pm 0,16$ units and $0,71 \pm 0,05$ units; in women with hystero-myoma in combination with hyperplastic processes the parameters were $1,8 \pm 0,33$ units and $0,44 \pm 0,09$ units. The lowest meanings of these enzymes were registered in the group of women with hystero-myoma in combination with atypical hyperplasia of endometrium and endometrium cancer – $0,68 \pm 0,2$ and $0,2 \pm 0,09$ units ($p < 0,05$). The meanings of malon dialdehyde in the investigated groups, on the contrary, had the tendency to the increasing and were $0,37 \pm 0,1$ units; $0,49 \pm 0,06$ units; $1,68 \pm 0,23$ units and $3,01 \pm 0,85$ units. When evaluating the coefficient of correlation it was determined that there is a strong inverse connection between the investigated data ($p < 0,05$).

The determination of peroxide protein destruction was carried out according to the technique of R.L. Levine et al. (1990) in modification of E.E. Dubinina et al. (1995). The showings were evaluated in peripheral blood as well as in endometrial secretion; the most convincing data were received in endometrial secretion. The results showed the evaluation of showings of peroxide protein destruction on the level of carbonil derivatives in endometrial secretion to be one of the most sensitive showings of the oxidant stress.

The previous years in clinical medicine a new diagnostic technique was developed; it is based on the information of overmolecular level during the transition of biological liquids into the solid states (V.N. Shabalin, S.N. Shtokhina, 1999; 2001).

This information is contained in the structure of the so called facii, the microscopic investigation of which allows to receive the morphological decoding (V.N. Shabalin, S.N. Shatokhina, 2000).

The described phenomena allows the usage of the results of structural analysis of biological liquids in screening and monitoring of patients with hyperplastic processes of myometrium and endometrium cancer.

For the investigation of endometrial secretion, its transition into solid phase with the method of cuneate dehydration was made. The analysis of structural elements of a dehydrated drop was made with the stereomicroscope Mz-12 (Leica) and digital camera "Pixera" (USA). We investigated the samples of dried drops, i.e. facii, as well as their enlarged photographs (from x10 to x160). The coefficients appropriate the endometrium pathol-

ogy of different levels were calculated. Morphometrical showings of facii of endometrium secretion were evaluated with the help of the programme Image Tool.

During the examination of endometrial secret of hormonodependent tumors we determined 3 types of facii: radial (it is found in 48,4% of patients having hysteromyoma with the normal endometrium structure); mixed, which is found in patients with hysteromyoma in combination with hyperplastic endometrium; three-radial, which is found in patients with atypical endometrium hyperplasia and endometrium cancer.

In patients having hysteromyoma with normal endometrium structure in the samples of facii large fissures prevailed, forming special sepa-

rate parts, where only isolated three-radial fissures were met. With the increasing of severity of endometrium pathology (glandular endometrium hyperplasia) the spread of three-radial fissures increased. In patients with atypical endometrium hyperplasia and endometrium cancer the structure of facii differed from that described above: in the investigated samples all over the area of facii the net of three-radial fissures was found.

To determine the power on interaction between the showings Srad and Str the tetrachoroidal coefficient of Pirson was calculated, which was increased with the severity of pathology of myoendometrium from 0,3 to 0,8.

The main structural elements of facii are given in the table №1.

Table 1. The main Characteristics of Endometrial Facii in Myemoendometrium Pathology.

The investigated groups	The main structural elements of facii of uterus biological liquids	Srad (mm ²) (area of radiality)	Str (mm ²) (area of 3-radial fissures)
Patients without tumor pathology of reproductive system (N=64)	siteness, radial fissures, separate parts are expressed, in 10% isolated three-radial fissures can be found.	6,8 ± 0,12	0,3-0,5 ± 0,06
Hysteromyoma with normal endometrium (N=208)	siteness, radiality of fissures, separate parts, in 48,4% isolated three-radial fissures at any age are found.	5,1 ± 0,42	1,1 ± 0,08
Hysteromyoma with endometrium hyperplasia (N=84)	siteness, radiality of fissures, increasing number of separate parts, three-radial fissures.	6,1 ± 0,46	2,1 ± 0,11
Hysteromyoma with atypical endometrium hyperplasia (N=13)	clear siteness is being lost, in peripheral zone isolated radial fissures are kept, on the other part of surface there is a net of three-radial fissures.	2,23 ± 0,58	3,2 ± 0,58
Hysteromyoma with endometrium cancer (N=52)	siteness is lost, in 88% of patients radial fissures are absent, three-radial fissures are the main structural elements.	0	6,7 ± 0,6

Thus, the evaluation of structural peculiarities of endometrial secretion, some enzymes of antioxidant protection, secondary products of peroxide lipid oxidation and markers of peroxide protein destruction allows to reveal patients of high risk group with endometrium pathology at the pre-clinical period; it also allows to reveal forming pathologic processes of myoendometrium, preventing the development of precancer and cancer of this localization. Nontraumatic sampling of the

material, the simplicity of its processing give us large possibilities of effective dispancerization of women with the investigated pathology.

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STABILITY OF THE NATIVE AND IMMOBILIZED INULINASE TO VARIOUS DENATURIZING AGENTS

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Today enzyme inulinase (2,1- β -D-fructanfructanohydrolase, EC 3.2.1.7), which splits off fructose residues from the nonreducing end of the molecule of inuline, is of great interest in connection with the possibility of its using in the production of fructose from inuline and inuline-containing materials. When using inulinase for reducing inuline-containing materials, it has received the product-95% fructose syrup, which doesn't demand of special purified methods. Another direction of using of this enzyme is the direct fermentation of inuline into ethanol.

Endoinulinase *Aspergillus awamori* has been purified by ammonium sulfate precipitation, gel-chromatography on sephadex G-100, SDS-PAGE electrophoresis. The immobilization of inulinase by ion exchange AV-26 and AV-17-2P has been made by adsorption and glutaraldehyde methods. The effect of UV-radiation and carbamide on the stability of native and immobilized enzyme has been investigated. DRT-400 lamp has been used in UV irradiation.

It has been determined that UV irradiation in doses 75.5-151.0 J/m² leads to the inactivation of soluble inulinase both immobilized inulinase preparations preserve 96 % of catalytic activity in dose 151.0 J/m²min. Doses 906-1400 J/m² cause disulfide bonds degradation and the photolysis of catalytic site as a result of amino acid radicals formation. We have observed an increase on the adsorptively immobilized inulinase stability at the 302 J/m². Covalently bonded protein preserves hydrolytic activity in high doses (1300 J/m²). Thus, covalent immobilization provides high stability for the inulinase to UV irradiation. The type of a way of binding influences significantly on the heterogeneous enzyme preparations stability.

It is shown, that the thermo stability of adsorb immobilized inulinase, bound with anionite AV-26, increases in comparison with native inulinase: the immobilized enzyme has the max catalytic activity at temperature 70°C. For immobilized and native enzymes optimums pH are practically the same, only there is a wider range of meanings pH from 4.5 to 5.0. Activity of the native prepares is preserving completely the thermo stability of covalent bound inulinase is more higher than at the adsorb immobilization. So, after heating to 100°C inulinase, immobilized by the chemical method, shows 19% of the catalytic activity of the

native enzyme. The fixation of the triple structure by the multipoint interaction between active groups of the carrier and of the protein takes place after immobilization of the enzyme on anionites. It was shown, that the immobilization leads to the increasing of the activation energy (E_{act}), ΔH of the hydrolysis reaction of inulinase in comparison with diffusion difficulties of the high molecular substrate during the approaching to bounding and catalytic groups of the active center. The negative value ΔS for the hydrolysis reaction of inulinase, realized by the native enzyme, means that the breaking up of the polymeric substrate proceeds with high speed and is characterized by the high order. After the immobilization of inulinase ΔS of the enzyme breaking up of inulinase decreases, apparently at the expense of the direct interaction on of the enzyme with the substrate.

It is shown, that the incubation of soluble inulinase with carbamide in concentration 8 mol/L leads to the total denaturation of the enzyme, and its activity isn't registered. After the interaction of immobilized inulinase with the solution of carbamide in concentration 8 mol/L for 60 min with constant mixing the enzyme showed the catalytic activity (30% of activity of immobilized unmodified inulinase).

Thus, the stability of inulinase in relation to denaturizing agents has been shown to increase with the immobilization of ion exchange. The character of binding with the matrix affects greatly the stability of immobilized enzyme to physical factors.

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LOW-FREQUENCY NEUROMUSCULAR ELECTRICAL STIMULATION TRAINING OF HUMAN SKELETAL MUSCLES IN CONDITIONS OF GRAVITATIONAL UNLOADING

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A number of studies have indicated that sudden exposure to microgravity environment causes a decrease in the tone of the skeletal muscles [Kakurin et al., 1971b; Kozlovskaya et al., 1984], reduction of muscle strength [Cherepakhin & Pervushin, 1970; Kakurin et al., 1971a; Mitarai et al., 1980; Grigor'yeva & Kozlovskaya, 1985; Koryak, 1998; 2002], perceptual and coordination disorders in the neuromuscular systems [Ross et al.,