Nicolaus Copernicus University, Toruń, Poland
Ukrainian Research Institute for Medicine of Transport, Odesa, Ukraine

Gorsha O. V., Gorsha V. I.

Diagnostics and correction of disregulation states by physical methods

Горша О. В., Горша В. И.

Диагностика и коррекция физическими методами дизрегуляторных состояний

Toruń, Odesa

2017

Nicolaus Copernicus University, Toruń, Poland
Ukrainian Research Institute for Medicine of Transport,
Odesa, Ukraine

Gorsha O. V., Gorsha V. I.

Diagnostics and correction of disregulation states by physical methods

Горша О. В., Горша В. И.

Диагностика и коррекция физическими методами дизрегуляторных состояний

Toruń, Odesa

2017

Gorsha O. V., Gorsha V. I. Diagnostics and correction of disregulation states by physical methods. Nicolaus Copernicus University, Toruń, Poland, Ukrainian Research Institute for Medicine of Transport, Odesa, Ukraine. 2017. 80 p. Bibliography of 86 items. ISBN 9781387266524. DOI http://dx.doi.org/10.5281/zenodo.1000404
PBN Poland https://pbn.nauka.gov.pl/sedno-webapp/works/832669

Reviewers:
dr hab. M. Napierała (Poland)
dr hab. W. Zukow (Poland)

The monograph is devoted to the diagnosis and medical correction of dysregulatory states which are often premorbid period of many diseases and can cause life-threatening conditions, the prevention of which is especially important for representatives of operator occupations.

This monograph presents the results of own researches - overall results of decade-long following.

ISBN 9781387266524

DOI http://dx.doi.org/10.5281/zenodo.1000404

PBN Poland https://pbn.nauka.gov.pl/sedno-webapp/works/832669

Nicolaus Copernicus University, Toruń, Poland
Str. Lwowska 1, 87-100 Toruń, Poland
www.umk.pl

80 p. Number of characters: 130 000 (with abstracts). Number of images: 10 x 1000 characters (lump sum) = 10 000 characters.
Total: Number of characters: 140 000 (with abstracts, summaries and graphics) = 3,5 sheet publications.

FOREWORD

In connection with the global implications of technological and social disasters (mainly due to “human factor”), the relevance of the creation of the screening premorbid diagnostic, the evaluation of professional adaptation with a further corrective rehabilitation influence cannot be overestimated. Along with that, the modern realities are the deepening of political and socio-economic problems in Ukraine and progressive crisis in the world and they require not only the creation of high-tech, but also they need more accessible diacritical and reconstructive medical technologies.

The monograph is devoted to the diagnosis and medical correction of dysregulatory states which are often premorbid period of many diseases and can cause life-threatening conditions, the prevention of which is especially important for representatives of operator occupations.

This monograph presents the results of own researches - overall results of decade-long following.

The fragment of the work, presented to your attention, of course, displays a wide range of possible diagnostic and correctional and rehabilitation approaches in dysregulating conditions only sectorally, but, we hope that it will be the beginning of the next phase of development of this direction.

GORSHA OKSANA VIKTOROVNA
Chief scientific officer,
Head of clinical Department of medical rehabilitation,
State enterprise "Ukrainian research Institute of t
ransport medicine, Ministry health of Ukraine"
Doctor of medical Sciences

INTRODUCTION

One of the important problems of modern medicine are research in the field of "medicine of the healthy person", including analysis of negative influence of factors of industrial environment, studying of adaptation of organism, the formation of the intermediate functional states in the complicated conditions of the living environment and activities [1-6].

Within learning of intermediate functional states of the organism, the study of pathogenetic mechanisms of development of dysregulation and the understanding of their biological significance are crucial [5, 6, 7-10].

Special aspects of any dysregulation is the reduction of adaptation (or increasing of its price) and dysfunction of metabolic processes, which is manifested by the decrease of their variability and standardization of the underlying exchange mechanisms, but simplification of regulation is the path to dysregulation [11-19]. That is why, there are a few parameters as a somatic realization of dysregulatory state, primarily they are the autonomic dysfunction and disorders of biochemical stress continuum [1, 20-25].

In our researches we decided to study the functional and biochemical regulatory mechanisms of professional adaptation of transport operators to the effects of chronic informative stress by way of developing diagnostic criteria of objectification emerging dysregulatory states and pathogenetic substantiation of methodological approaches to their medical correction [8, 16, 20, 21, 26-34].

It is known that prenosological diagnostic requires higher medical experience, financial and time costs, as well as realization of extensive scientific and practical researches [1, 4, 5, 35, 36]. Apparently, this is the reason of ever-deepening crisis of preventive direction of our medicine and a similar trend we can see around the world. However, the identification and timely correction of intermediate functional states can prevent the formation of disease and syncope, which is especially important for

representatives of the operator professions because degradation of their health may cause emergency situations [4, 37-40].

Over the past year in Ukraine there were recorded 153205 accidents, it means that every day there are almost 420 cases. The statistic of accidents with victims is also disappointing – there are 26160 cases in which 32352 4464 person were injured and killed, so there are correspondingly 89 and 12 person per day [41]. Among the causes of accidents leading place is taken by the "human factor" [39, 41, 42]. And at the same time, from all categories of transport operators, the group of drivers remains to the poorest category as to health and preventive supervision [39, 43-45].

According to the literature, professional activity of drivers associated with the impact on their body with a number of adverse factors [19, 39, 43-49], but the main component in a complex of production factors which are characteristic of this profession is high neuro-emotional overload [4, 39, 42, 43, 45, 46, 50].

The high voltage level of the labour of representatives of the operator professions create the preconditions for increasing the level of psychoemotional tension, which may go beyond adaptive system and accompanied by, in particular, disorders of the autonomic and biochemical regulation [8, 16, 20, 21, 46, 26-34]. The mechanism of transformation of psycho-emotional stress in the disease is complicated and requires subsequent in-depth study. In addition, the influence of age and experience of drivers on their health and professional characteristics is evident, however, in the available literature, the relevant data are rather contradictory [46, 51, 52, 48].

The limited use of many medications by individuals of transport operators professions should also be noted (particularly sedatives, antihistamines and other means), it happens due to the declining ability to respond rapidly to emergency situations [8, 27-29, 44]. The feasibility of reducing of drug component at premorbid stages of disease also necessitates the involvement and pre-formed physical factors in the complexes of their medical correction [8, 27-29, 45, 53].

Continuity between the diagnostic and remediation technology is a key issue, especially in preventive medicine, while only subject feedback and pathogenetic

approach can ensure the elimination of violations and prevent them[27-29, 45, 54, 55].

Thus, in the basis of the research, the results of which we present to your attention, we put the development of a comprehensive system of prenosological diagnosis of dysregulatory states of the representatives of the operator professions (drivers) and methodological principles of corrective rehabilitation effect those are based on studying of additional pathogenetic mechanisms of dysregulation.

SECTION 1
CONCEPTUALIZATION ABOUT DYSREGULATORY CONDITIONS AND THEIR MEDICAL CORRECTION IN THE OPERATOR'S CONTINGENT

1.1. Regulation and dysregulation of life processes

According to the classical definition – the regulation of life – it means to bring all life processes in accordance with the requirements of the genetic program of the organism and the environment in order to preserve life and procreation [7, 55].

Reaction of a complicated organism to a particular effect controlled by the mechanisms of regulation at different levels (molecular, subcellular, cellular, tissue, organ and system). Depending on the nature and characteristics of management activity we allocate nervous, endocrine, hormonal and other types of regulation.

The basis of the regulation of physiological functions are the mechanisms of self-regulation of functional systems that is carried out through a universal feedback mechanisms. Functional systems described in living organisms by academician P. K. Anaheim represent dynamic, self-organizing and self-regulating central-peripheral organization, all components of which interact in achieving good adaptive results for the body. As a useful results for body, first of all, we allocate indicators of the internal environment, a dynamic equilibrium which defines the different directions of metabolic processes [13, 2].

Separate functional systems are increasing their self-regulatory activities. As shown by V. G. Zilov [57], strengthening the processes of self-regulation of functional systems may have sanogenic effect. However, under prolonged and/or intense adverse effects breakthrough of the weakest link may occur –mechanisms of self-regulation with the weakest functional system are damaged.

The ability of the organism to self-regulation based on the principles of signal, feedback and antagonistic relations. An important element in the complicated system of ensuring integrity of the organism is the principle of antagonistic regulation of functions. Of course the fundamental importance for the development of the doctrine of the antagonism of excitatory and inhibitory influences in the central nervous system was the discovery of I. M. Sechenova, also the so-called central inhibition in the nervous system or also we can call it "sechenovskiy" inhibition in the nervous system [1, 10, 14, 22].

The nervous system is the central source of the antagonistic regulation of the constancy of the internal environment of the body homeostasis functions of the various organs, also regulation of the dynamics of adaptive processes such as proliferation, inflammation, immune reactions. Thanks to data obtained by using morphological methods, all new parts of a hierarchical system of homeostasis regulation are discovered. The beginning of this system is in the central nervous system, and endocrine organs and cells, producing biologically active substances are "inserted" between the nervous system and cells as effectors, directly providing a particular function of the body.

It is crucial for understanding of homeostatic regulation of antagonistic values that the balance between excitatory and inhibitory influences of the CNS neurons and associated cells of a lower level is changed not only by direct influence of one or another factor, but with the aid of signal, i.e., reflexively, in response to the influence of afferent impulses. Various authors have concluded that the progress in the development of the central problems of clinical medicine, they mean problems of adaptation and compensation of disturbed functions –they are largely determined by the further expansion of the information about the antagonistic cells and the regulation of their mutual relations in the whole organism [26].

Thus, the principles of the theory of the functional self-regulating systems and feedback mechanisms allow you to split the adaptive and compensatory mechanisms of regulation at several hierarchical levels, among which systemic and intracellular levels of the regulatory processes are crucial [5, 12, 13, 57].

The leading role in achieving of homeostatic balance at the system level of regulation is the autonomic nervous system. Neural changes in the central nervous system associated with the antagonistic effects of inhibitory and activating systems of the autonomic centers of the brain, which, in turn, reacts on influence from the cortex of the brain, humoral factors, and also it reacts to irritants coming from the external environment [10, 12, 35].

The physiological significance of regulation of the activities and functions of the structures of the body is that it provides a measure of their implementation, i.e. the feature, without which the reaction loses its biologically useful and adaptive role. It is the measure that differentiates physiological reaction from pathological reaction, and the more perfect the mechanisms of regulation, the more precise the measure of the function. Providing the necessary implementation of processes, activities and functions of the structures of the body, the regulation plays the role of a control mechanism. The change in measure due to a violation of the regulation, is an expression and result of a dysregulation pathology [5, 26, 58, 59].

In conclusion, it should be emphasized that the characteristics of regulation and dysregulation of activity on the stages of the formation of pathology are not well understood, whereas the knowledge of their basic patterns is a necessary foundation for early disease detection and timely therapy [55].

1.2. Definition of the terms "dysregulation pathology", "dysregulation syndrome" and "dysregulatory state"

The term ‘dysregulation pathology" introduced in 2002 by academician G. N. Kryzhanovskiy. According to the author: "Dysregulation pathology is a pathology arising from the violation of the regulation and function of living systems" [5]. When dysregulation pathology occurs dysregulation of activity of bodies and their functions are the cause and endo-genetic pathogenetic mechanism or it is the cause of further development of this patho-process, or of the emergence of new pathological processes.

Dysregulatory disorders can be primary if they arise from the initial pathological changes in device regulation, or secondary if they are due to the initial pathological process in the structure of the target but they obtain the value of the leading pathogenetic mechanism due to a number of conditions, [5, 60].

Arising originally in any integrative system of the body (nervous, endocrine, immune), dysregulation disease can then be extended to other integrative interrelated systems and their constituent bodies, become thus multi-organ and Multisystem pathology, i.e. to become a disease of regulation [5, 18].

G. N. Kryzhanovsky and A. Yu. Merkulov (2006). – propose the following classification of pathological dysregulation disorders: 1) transient dysregulation of functions that occurs in all pathological processes and is, thus, typical process 2) dysregulation disease – it is resistant dysfunction of the nervous system that do not disappear after the elimination of the pathological process and causes the appearance of new pathologies 3) dysregulation disease – it is dysregulation disease, that acquired nosological symptoms of the disease [18].

The joint Plenum of the Russian and Moscow society of pathophysiologists, Scientific Council of General pathology and pathophysiology on the topic "Dysregulatory pathology" was held in 2007 and helped to organize and

summarize existing views. From the point of view of opinions presented there dysregulation disease occurs due to dysregulation of the activities at the level of cells, organs, systems and whole organism. At the plenary session considered aspects of dysregulation of mitochondrial cytopathy (O. M. Pozdnyakov), dysregulate neurohumoral systems in trauma (V. N. Yale, S. V. Zyablitsev), the features of temperament as a risk factor dysregulatory disorders (L. A. Severyanova, V. V. Plotnikov, D. V. Plotnikov), the features of dysregulation of GABA receptor complex in experimental chronic epileptical of the brain (M. N. Karpov, I. G. Rebrov et al.) etc.

The work of Professor Pankov D. D has made a great contribution to the development of concepts about the formation of premorbid dysregulatory stages of the disorder, which were interpreted by the author as a "dysregulation syndrome" [61].

During three decades, Pankov D. D. (1975 - 2008) has conducted a study of syndromic manifestations associated with disorders of Central regulation of the cardiovascular and other body systems, firstly we studied adult (in the clinic of nervous diseases), and then we worked in pediatrics. He interpreted this phenomenon as a result of congenital problems associated with genetic (including chronodispersion) and perinatal circumstances. In earlier works, the Professor has labeled this generation as neurogenic disorders or cerebrogenic.

However, further he recognizes a better term, that was proposed by pathophysiology (Kryzhanovsky, G. P., 2002) – the term is dysregulation (dysregulatory) pathology.

Talking about dysregulation disorders manifestations that are pathognomonic, the author emphasizes that despite the diversity of related phenomena, on the premorbid stage, they are polymorphic and transient.

Polymorphism of dysregulation syndrome is explained due to the fact that in each case the activity of regulatory mechanisms may be adequate or inadequate to the physiological condition of the organism and specificity of its activities. If it turns out to be inadequate, then there is a subclinical or clinical phenomena. These phenomena

can include both signs of imbalance at the level of central regulatory mechanisms (most often the symptoms associated with the peculiarities of the physiological state of the CNS, ANS) and the results of their effects in the periphery, i.e. on the level of actual controlled systems and organs.

Duration of dysregulation manifestations, which have subclinical or clinical manifestation may be determined based on a kind of "mobilization readiness" of the organism to sanogenesis. If this willingness is high and the physiological state of the organism is not complicated by additional disorders or stress, dysregulation syndrome regresses rather quickly. This situation is typical for young people who are relatively healthy, and not burdened by excessive loads for their emotional and physical health. In these cases, the dysregulation syndrome occurs transiently.

Also Pankov D. D. emphasizes the role of the ANS in the regulation of the functioning of the body. Its involvement in these processes explains the fluctuation in autonomic tone, a high frequency of autonomic symptoms in dysregulation syndromes. The author offers a list of mental disorders and neuro-vegetative areas classified in the ICD X, which can be a manifestation of dysregulation syndrome:

P51 Sleep disorders with nonorganic etiology

P45.3 Somatoform autonomic dysfunction of the nervous system

P48 Other neurotic disorders

P59 Behavioral syndromes associated with physiological disturbances and physical factors(unspecified)

024.8 other dystonia

024.9 unspecified dystonia

43 Migraine

44 Other headache syndromes

44.1 Vascular headache, that is not elsewhere classified

44.2 tension-type headache

047 sleep disorders

047.0 Violation of falling asleep and maintaining sleep [insomnia]

047.1 Violations in the form of increased sleepiness [hypersomnia]

047.2 violations of periodicity of sleep and wakefulness

090.8 Other disorders of autonomic [Autonomous] nervous system

090.9 Disorder of the autonomic [Autonomous] nervous system (unspecified)

099.1 Other disorders of autonomic [Autonomous] nervous system in other diseases classified elsewhere.

And finally, back to the question about the term "dysregulatory state" we used this wording to refer to intermediate states of health, with the basis of dysregulatory character, and for permanent (in contrast to the dysregulation syndrome) [8, 16, 20, 21, 27-34]. Also, in addition to the violation of regulatory mechanisms, the step nature of the formation of pathological changes steps that through the mechanisms of sanogenesis transferred to pathogenic. In our further studies, we established two main dysregulatory states, which are fairly fixed, that allows them to diagnose: "stress and compensation" and "burnout." As a result of further developments diagnostic algorithm for their recognition has been proposed and tested [34].

1.3. Drivers – operator's contingent, which is at risk of developing of dysregulatory states under the influence of information stress

Due to health and hygiene research, the professional activity of drivers is associated with the impact of a number of adverse factors on their body.

Determining the value of each production factor, a team of authors headed by V. Y. Umansky [45] divided the totality of the productive factors affecting on car drivers into 3 groups:

The first group is forming – there are factors that determine the severity and intensity of work (vibration, noise, infrasound, intermittent microclimate, variable lighting conditions at different times of the day, aerosols of disintegration and condensation, causing dust and gas composition of the air in the cabin of the car, working position with forced position of the body and performing of operations using the hands and feet, constant emotional stress, prolonged attention, information processing and acceptance of correct decisions in the conditions of shortage of time, the tension of the analyzer functions, shift work.

Confounding factors – these are factors, that enhance the action of forming (physical inactivity, carrying out repair work in emergency situations and in stationary environments, the presence of harmful habits – for example smoking or alcohol abuse.

Predisposing factors – it means the presence of chronic diseases of the vital organs and systems of the body, which limit or make impossible the safe operation of the vehicle (which can lead to accidents if drivers suffer from somatic diseases).

Analysis of the incidence of persons in this occupational category showed that the main group, which has such professionally caused diseases, are persons aged 40 years and older, with work experience more than 20 years. However, a lot of drivers have this pathology at a younger age (30 years old and 10 years old). Disease of the respiratory system occupies the leading place in the structure of overall morbidity

with temporary disability (55,6 %), and in the structure of occupational diseases of drivers of urban passenger transport the pathology of the musculoskeletal system dominates [4, 45, 50, 62].

V. M. Velutina et al note that the leading adverse factors in workplaces of drivers are high tension attention (duration of concentration up to 90% of shift duration), the effects of noise (86 dBA), the total vibration (in the low and mid frequencies in the Z-axis it is up to 98 dB), toxic substances in the air of working zone (excessive concentrations of acrolein, carbon monoxide by half, and oxides of nitrogen are 1,2 times), hypothermia in the cold and intermediate periods of the year during repair and maintenance work [48, 51, 52].

Of importance are also the issues of mental adaptation of vehicle drivers and the risk of development of border neuropsychiatric disorders. The research of A. S. Bashkireva (2003) shows that informational and emotional load characteristic of the driver's activities, lead to the depletion of compensatory mechanisms of adaptation and early development of border neuropsychiatric disorders down to vehicle drivers. The leading role in the Genesis of mental disadaptation of drivers belongs to the professional experience. A significant frequency of maladaptive disorders, and the lack of an organized inter-professional selection among the drivers necessitate the development and implementation of a system of psychological and psychophysiological monitoring for the management of mental health and address protection of the driver's personnel [43, 46].

In 2005-2006, the Ukrainian research Institute of transport medicine, performed physiological testing more than 500 drivers of various transport who attended periodic and preliminary medical examination. The results indicate that 10-12% of individuals who plan to operate vehicles, have a low professional reliability according to their psychophysiological indicators, they have a high risk of making wrong decisions, therefore, they have a high risk of accidents [42].

According to various authors, – emotional stress of the driver during the driving accompanied by psycho-emotional disorders in the form of significant increase in blood pressure, rapid heart rate, increasing of adrenaline and adrenaline-

like substances in blood content [19, 63]. Such neuro-emotional stress combined with hypokinesia dramatically increases the likelihood of heart disease and blood vessels and is a risk factor in such common diseases as hypertension, ischemic heart disease, atherosclerosis [47, 64-66].

Generalized literature data allow us to classify car drivers transport with the age group of 40 to 50 years to the group with high-risk in relation to the development of cardiovascular pathology, especially hypertension and coronary artery disease. It should be noted that simultaneously with the increase of drivers in the incidence of SSS, these diseases are harder accompanied by a large number of complications and more frequent accession of comorbidities. Hypertension and ischemic heart disease recorded in 40-49 years and even earlier, is regarded by the authors as a factor, and as an indicator of risk of premature aging of the driver [52, 53, 66].

Employees of the St. Petersburg Institute of Bioregulation and gerontology of SZO RAMN (2007) conducted research on the biological age, rate of aging, occupational health of drivers of vehicles. The results indicate an accelerated decline in mental performance of vehicle drivers. It was installed the premature narrowing of the range of adaptive reactions of the cardiovascular system to submaximal exercise at drivers in comparison with the control group. It is proved that premature age-related changes of physiological indices of drivers are just "risk indicators", while long driving experience is a real risk factor, accelerating the aging process [43].

The formation of psychosomatic disorders in conditions of adaptation to the anthropogenic environment of vehicle drivers according to many researchers, is associated with a leading professional unfavorable factors – such as high neuro-emotional stress, determined by the number and nature of incoming information, high responsibility, sudden onset of a critical situation. Hypodynamia, feeding disorders, shift work, adverse of physical and chemical factors of the working environment aggravated the negative effect of psycho-emotional stress [4, 43, 44, 46, 48, 50].

Thus, majority of studies indicate that factors of production, exerting a negative impact on worker health, primarily have an effect on psychological processes that are linked to the body's attempt to adapt to new adverse conditions [67,

68]. And from the adaptation reserve of the organism depends on the time during which the particular unfavorable factor or a combination of them will have a reversible impact on biological, including neuro-mental processes. In fact, the effect of production factors can be considered from the standpoint of acute or chronic stress [9].

Academician M. M. Khananashvili (1998) with a group of collaborators have identified the concept of information stress (as option of dysregulation pathology) – it is a body condition that occurs due to the unfavourable combination of factors in the information triad: 1) a significant increase of the volume of information to be processed with the purpose of decision-making 2) reduce of the time allotted for such brain work 3) the high motivation of optimal decision making [67, 69, 70]. The adverse (stress) combination of these three most important factors of forming individually developed behavior occurs when information overload combined with a lack of time or with lack of information, but in both cases, under conditions of high motivation of behavior [67, 70, 71].

According to the authors of the concept the informational stress is an under-studied transitional state from normal to the disease, taking into account its importance for the understanding of the processes taking place from the beginning of the action of pathogenic stimulus to the emergence of sustainable syndromes pathology and their respective regulation [67, 70]. M. M. Khananashvili (1998) stresses that developing a response to stress stimuli may play a biologically protective, positive role. Representation of heterogeneous biological significance of stress based on the results of the study of integral forms of life — behavior and performance of autonomic systems. Confirmation of the validity of these ideas was obtained and using analytical methods of studying the brain. Results of neurochemical, and neuropharmacological neuromorphological studies thus raised the question stated in number of publications [67, 69, 70, 72].

It should be noted that in the framework of developing ideas about psychogenic stress the totality of behavioural and autonomic, including humoral changes in the period of the transition state is defined by the author as a state of

positive biological information hyperstress optimizing higher nervous activity, increasing its resistance to adverse influence of the information triad. Biologically positive stress occurs as a primary reaction to stressful situation, but further development of stress is characterized by individual features. Depending on the number of properties of the nervous system, innate and acquired nature is possible to observe a stable confinement of a high-level of higher nervous activity, under conditions of continuing stress exposure, which is primarily determined by the high level of development of self -regulation brain function. In this case, it forms a new level of stress norms. But you can also observe a gradual weakening self-regulation functions and then there are signs, certainly indicating the transition of biologically positive stress to the negative stress, culminating in the formation of stable symptoms and syndromes of pathology. The analysis of the complex behavioral and neurophysiological indicators of their manifestation allows you to find the critical moments of the transition biologically positive stress to the negative stress biologically and the latest in sustainable pathology [9, 35, 54, 56, 67, 70, 71, 73].

Described positions about the concept of stress has allowed us to establish the presence of adverse effects described informational triad (information overload combined with the lack of time or with lack of information, but in both cases, under conditions of high motivation of behavior) on drivers of vehicles while performing their professional duties. The contingent is in terms of long-term informational stress and risk for dysregulation pathology.

Thus, studies of various authors show that informational and emotional load characteristic of the operator's activity lead to the depletion of compensatory mechanisms of adaptation and early development of borderline disorders relatively to vehicle drivers [15, 22, 23, 42, 54, 55, 57, 58].

The leading role in the Genesis of maladjustment of drivers belongs to the professional experience. A significant frequency of maladaptive disorders, and the lack of an organized inter-professional selection among the drivers necessitate the development and implementation of a system of psychological and

psychophysiological monitoring for the management of mental health and address the protection of driver personnel [14, 23, 44, 49, 54, 74, 75].

On the basis of results of sanitary-hygienic studies characterizing the working conditions of drivers developed a system of organizational, sanitary-hygienic and medical-preventive measures to improve working conditions and reduce the incidence of drivers. At the same time, prophylactic measures are limited to conducting preliminary and annual medical examinations, physiological selection, provision of drivers by milk or other equivalent products, but do not include pharmacological and non-pharmacological methods of correction, due to restore the normal functioning of the organism [53, 57].

Thus, according to the literature, professional activity of drivers associated with the impact on their body a number of unfavorable factors, but the main component in a complex set of production factors characteristic of the profession high neuro-emotional stress remains. Psycho-emotional reactions play a leading role in the process of adapting to the effects of other factors of production environment [1, 3, 7, 11, 15, 22, 23, 37, 42, 57, 58, 76].

The complex of unfavorable production factors has a strong negative effect on the mental state, physiological functions of the state and the professional health operators of the transport industry – car, which is manifested by the exhaustion of compensatory resources, increased risk of developing of various diseases and complication of their flow [7, 13, 15, 22, 42]. In the end of the above it leads to increasing of somatic and neuropsychiatric morbidity, in most transport industries can be regarded as professionally due to morbidity [54, 58].

The current situation puts searching of techniques evaluation criteria of the earliest disorders of adaptation down to drivers to a number of actual problems. As a somatic expression of dysregulation states it is justified the allocation of a number of parameters of maladjustment to the stress of the biochemical continuum and vegetative disadaptation due to the influence of set of occupational hazards of the drivers ' working [5, 13, 14, 15, 19, 30, 35, 54, 61, 73, 74, 75, 77, 78].

1.4. The principles of medical correction of dysregulation states

Correction of dysregulatory processes and treatment of diseases of regulation have a number of features [8, 19, 38, 55]. One of them is due to the unity of the integrative systems of the body the dysregulation of each system can arise due to direct damage of the pathogenic agent, as a result of desynchronization and dysregulating influence of the modified systems. This leads to the necessity of complex pathogenetic therapy (CPT), aimed at the normalization as involved in the pathological process systems, as other units of the formed pathogenetic chain.

It is known that therapeutic effects do not directly eliminate pathological changes in organs and tissues – the elimination of these changes and their consequences is realized by plastic and the other sanogenetic processes connected between them [5, 55]. In this regard, the most of the authors consider the stimulation and increase of efficiency of sanogenetic mechanisms and antisystem carrying restoration to the task of CPT [5, 13, 28, 55].

Particularly important is the use of CPT for normalization of changed interrelated metabolic processes and mechanisms of intra - and intercellular signaling, which are components of the pathological system [8, 12, 29, 80, 81]. As pathochemical processes underlie the pathophysiological mechanisms, their correction is mandatory. Both kinds of pathogenetic therapy are complementary and should enter CPT in various forms of dysregulatory pathology [29, 33, 53, 72].

In the basis of principles of CPT is to achieve optimal balance and synchronization of the studied regulatory systems. It is known that the basis of the nosological forms is morphological substrate, but clinical manifestations are realized through the formation of secondary functional disorders of regulatory mechanisms, which in turn closes and creates a vicious circle of pathological system [15, 19, 23, 27, 55, 58]. Therefore, the concept of therapeutic effect must be based on the formation of a new functional stereotype that provides: the decrease of the degree of

dysregulation disorders; the formation of new connections functionally-dynamic system, aimed at compensation of the morphological defect; the termination of development of the pathological process.

Thus – to overcome (break) the vicious circle of persistent state dysregulation by unidirectional and single-action is impossible, it needs a complete correction, which includes activities aimed at the restoration of the hierarchical interaction of the functional parts of the regulatory system, also it needs to fill up the increased needs of the metabolism in conditions of chronic stress and to provide antioxidant protection in conditions of hypoxia and hypoergosis [33, 57].

1.4.1. Sano - pathogenetic possibilities of physical therapy.

One of the main scientific directions of regenerative medicine is to develop technologies of restoring of functional reserves of the organism, weakened as a result of adverse environmental factors, and activities, and as a result of illness[1, 5, 15, 26, 28].

Several authors' conducted studies have shown that the methods of physical therapy integrative affect many pathophysiological mechanisms of occurrence and development of various pathologies. Physical factors in contrast to medications, are physiological for the body, mobilize its reserve capacity, almost without causing side effects [9, 27, 28].

Physical factors stimulate own protective forces of an organism, represent mainly regulatory and the training effect on different system, cause homeokinetics effect. Therefore, V. S. Ulashchik (2003) believes that one of the most important principle – the principle of optimally small dosing [83].

Timely and correct application of physical methods of treatment of the disease contributes the most to the rapid development of compensatory-adaptive reactions, optimization of the vegetative tone and reactivity of the organism, stimulation of protective mechanisms and restoration of disturbed functions of organs and systems.

Single reflex-humoral mechanism of action of physical factors provides the directionality of the reactions of a systemic nature in close dependence on the initial

functional state of the system (the system), it is possible to see improvement of mechanisms of self-regulation of homeostasis. The same physical factor under similar conditions influence differently on the response of an organism at different states of its most important functional systems. In this context physiotherapy can be attributed to the treatment of "functional regulation" [9, 33, 83].

It is proved that physical factors have the potential to effectively influence on regulatory and compensatory system, contributing to the sanogenesis. In this regard, the role of natural and preformed physical therapeutic factors in CPT, which are characterized by a pronounced influence on the adaptive reserves of the body, becomes critical [8, 9, 15, 27, 33, 83].

SECTION 2
ISSUES, METHODOLOGY OF RESEARCH OF CORRECTION AND REHABILITATION IMPACT

As mentioned above, representatives of the operator professions, including drivers of vehicles, are in conditions of long-term informative stress because of their professional activity which is connected with the information overload combined with a lack of time or lack of information under conditions of high motivation of behavior.

The body's response to stressors includes an integrated restructuring of many processes in the body through the manifestation of adaptive reactions, and in their long and / or intense impact there is a reduction of functional reserve that contributes to the development of sustainable dysregulation.

Due to the mechanisms and systems of humoral and autonomic regulation ensures a measure of activation of processes of self-regulation of the activities of the functional systems of the body, the violation of which forms the substrate dysregulation pathology. That is why, as a somatic realization of dysregulatory states, it is advisable to identify a number of parameters, as a last – autonomic dysregulation and disorders of the metabolism of the humoral stress continuum.

These biochemical markers of intention of adaptation processes may be also attributed to the metabolism of catecholamines, indicators of the cycle of nitric oxide and uric acid [5, 30, 73].

Catecholamines play an important role in the body, providing adaptation to acute and chronic stress. They represent the essential elements of the reaction of fight or flight [73].

Recent evidence suggests that uric acid is a part of the antioxidant defense system of human blood plasma. According to Aksentiychuk S. L. uric acid acts not

only as the end product of nitrogen metabolism, but also as a management molecule broad-spectrum (vegetative tone, lipid, protein metabolism, etc.). On the other hand, high levels of uric acid in plasma is associated with a high risk of coronary heart disease and ischemic stroke [5, 79, 80].

In recent decades it was found that a simple chemical compound — viz nitric oxide (N0) serves as a versatile regulatory agent in normal and pathological conditions [30]. To date, it is shown that the agent is involved in the regulation of vascular tone as an antagonist of the adrenergic nervous system, inhibits platelet aggregation and their adhesion to vascular walls [30].

Therefore, the determining factor is their regulatory effect on the balance of certain biochemical homeostasis links: catecholamine- hormonal regulation, nitric oxide – humoral, uric acid – metabolic, however, together with regulatory they may show toxic effects due to the cumulative effects [20, 81].

Thus, the grounding for an integrated system of prenosological diagnosis based on the study of additional mechanisms for the formation of dysregulatory states for contingent of professional drivers of vehicles, depending on the length of their seniority and corrective rehabilitation therapy, it was determined the basis of the study. The interaction of the regulatory impact of the nervous system was studied, implemented through the integrative activity of the autonomic, adaptive responses and humoral-hormonal-metabolic link in the antagonistic regulation of functions.

2.1. Contingent and methods of research

The research was carried out in the "Ukrainian research Institute for medicine of transport" of Ukrainian Ministry of health in the period of 2005 – 2014 [8, 16, 20, 21, 27-34].

The inclusion criteria of professional drivers in the groups of observations have been established the duration of the experience more than 10 years, as according to the literature exactly this period (10±2 years) of professional experience is critical for the manifestation of the transport operators of various diseases. All the drivers at the time of the survey did not find clinical signs of the emergence or exacerbation of diseases.

The bulk of the conducted research (330 drivers of medical vehicle and urban transport of Odessa) was formed during a General preventive medical examinations.

There are following research methods: clinical, cytochemical (the total content of catecholamines in erythrocytes of blood by the Kolomiets' method), biochemical (content of NO2 - in plasma and urine by spectrophotometry method, determination of uric acid in serum and urine by the standard method using tungsten phosphate reagent), functional - it is study of integral indices of vegetative homeostasis according to the parameters of heart rate variability and galvanic skin reactions according to cardiointervalography and electropunctural diagnostic, definition of General adaptive reactions and the functional state of the organism [8, 20, 36].

The autonomic status was studied by cardiointervalography (CIG). In accordance with international standards to conduct a rapid assessment of HRV we recorded RR-intervals during 5 minutes. The research was carried out through a computer system of the company "Solveig", Kiev. Starting study for estimating the basal properties of the regulatory systems of the patient was conducted after a period of adaptation to the conditions of research within 5-10 minutes.

Following the existing recommendations for the study of made intermittent KIG non-parametric (statistical) and parametric (spectral) analysis techniques were included [82].

We considered the following statistics: R-R (average duration of RR intervals) reflects the final result of numerous regulatory influences on the sinus rhythm of the existing balance between the parasympathetic and sympathetic divisions of the autonomic nervous system, SDNN (standard deviation of the values of normal RR intervals), characterizes the state of mechanisms of regulation, and it is an integral indicator of the effects on HRV of each of the divisions of the autonomic system, RMSSD (Square root of average of squares of differences of values of successive intervals R-R), pNN 50 % (percentage of consecutive RR intervals, the difference between them exceeds 50ms) – there is an opinion that the value of the last indicators to be determined primarily by the parasympathetic division of the ANS and are a reflection of the sinus arrhythmia associated with respiration [27].

It is known that the spectral method of analysis of HRV is the most appropriate for the assessment of parasympathetic and sympathetic activity for short periods of time (5 min). In this study, we studied the following indicators: high-frequency oscillations (HF) - the power in this range, mainly associated with respiratory movements and reflects the vagal control of heart rate (parasympathetic activity); low frequency oscillations (LF) – the power in this range is influenced by changes both sympathetic (mainly) and parasympathetic activity; very low frequency oscillations (VLF) – it presumably represents the humoral regulation (renin-angiotensin-aldosterone system, catecholamine concentration in plasma); fluctuations in the metabolic activity of the central oscillators; simpato-vagally index (LF/HF) – this indicator characterizes the ratio or balance of sympathetic and parasympathetic influences on the heart rate [83].

In our study we also used indicators of analysis of HRV according to R. M. Baevsky, such as the amplitude of fashion (AMO) and the index Baevsky. The mode amplitude (AMO) – is the number of R-R intervals in % corresponding to the range of mode, it reflects a measure of the mobilizing effect of the sympathetic division.

The Baevskiy index, or index of tension of regulatory systems (JN=AMO/(2BP x Mo)) reflects the degree of centralization of heart rate control [1].

Definition and analysis of the results of electric resistance was performed using the automated complex of computer MIT-1 SPD (development of MEDINTEKH, Kyiv). Electroskin resistance was measured in representative biologically active points (BAP) [32].

We have developed a diagnostic algorithm for the identification and evaluation of the results of the study and it included:

1 – the measurement of galvanic skin response in classic represetative acupuncture points (12 symmetrical pairs)

2 – determination of the average values of galvanic skin response of examined patient's parameters, it was on the right side of the body +parameters of left side.

3 – calculating of the lateral asymmetry (coefficient of lateral asymmetry: the absolute value of CLA - the difference between the parameters of galvanic skin response, was on the right side of the body and the parameters of the left side, the direction vector of CLA indicators on the right side of the body is dominated by normal – vector "+", and on the left side of the body the vector “-“ is dominated.

4 – determination of parameters of galvanic skin response corresponding to the boundaries of individual physiological range of the studied individual (the average value ± 7% from this value).

5 – calculation and analysis of these indicators within groups and in the whole group.

The next stage is the main direction of research (after defining and analyzing the results of the previous survey), it was to determine the corrective influence of the developed rehabilitation systems.

On the organization methodology the study met the Consensus position on biomedical ethics, and was conducted in compliance with the principles of evidence-based medicine.

To elucidate the role of age-related and professionally determined factors of male drivers they were ranked into three groups:

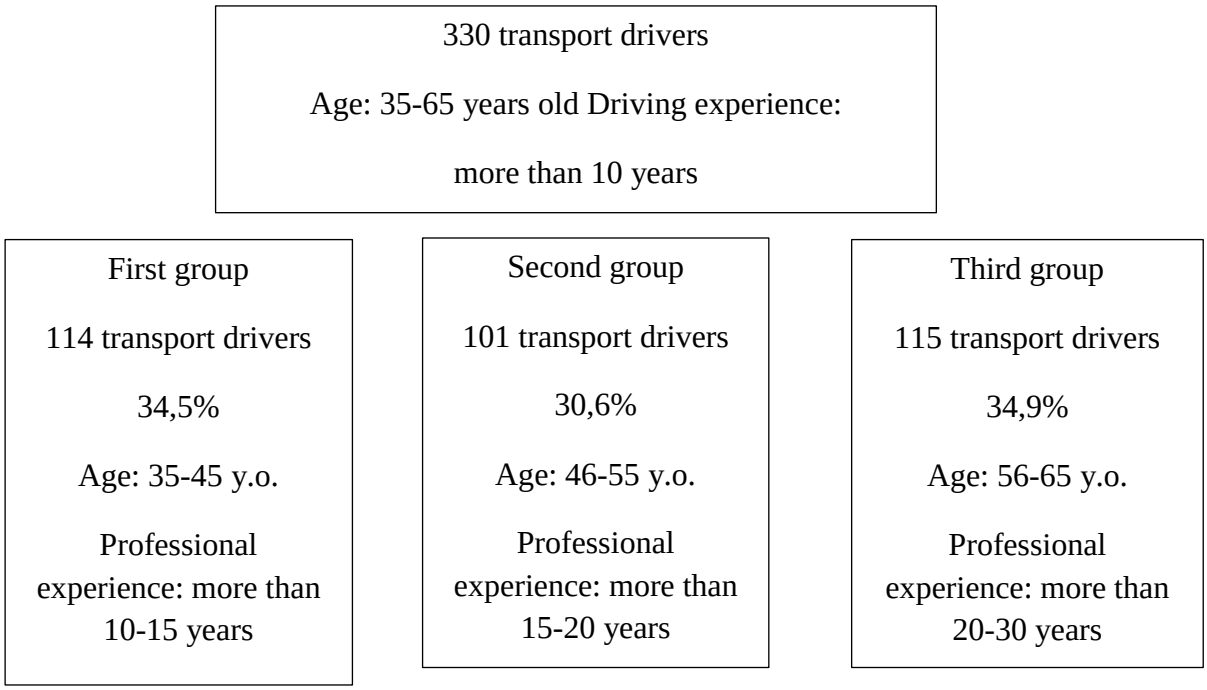


Fig. 2.1. Characteristics of the contingent of drivers depending on the age and duration of professional experience

The first group of 114 people (34,5 %) in the age of 35-45 years and experience of more than 10 -14 years, the second group of 101 people (30.6 per cent) in the age of 46-55 years and experience of more than 15-24 years, the third group of 115 people (34,9 %) in the age of 56-65 years of experience more than 25-30 years (Fig. 2.1.).

The control group consisted of 28 almost healthy persons (the same three age categories: I -10 persons, II – 8 persons and III -10 persons). To eliminate the influence due to professional factors in the composition of the control group it was composed of representatives of different professions.

After the initial examination, to determine the effectiveness of the developed rehabilitation complex, all drivers, each of the three groups were further divided into subgroups, depending on RK. Surveyed drivers have received the appropriate complex in the outpatient setting (on the basis of the department of rehabilitation treatment of medical clinical center of the professional health care of Ukrainian Research Institute of transport medicine, Odessa).

The subgroup who received the RK No 1 included 128 persons, selected in the composition of each of the above age groups (I-a subgroup of n=42, II-a subgroup n=38, III-a and subgroup n=48). Representatives of the subgroups who received the RK No. 2 – 102 men (I-subgroup n=36, II -subgroup n=33, III -subgroup n=33). And drivers, the course of rehabilitation treatment which included the use of the RK №3 – 100 (I -C subgroup, n=36, II -subgroup is n=30, III -subgroup n=34).

2.2. The principles and methods of medical rehabilitation

Considering the possible mechanisms of therapeutic effects on the state of dysregulation, we put achievement of the optimal balance and synchronization processes of adaptation and autonomic homeostasis, a functional link of interaction between the main regulatory systems of the body in the basis for the creation of complexes of the rehabilitation effects.

The principles of acupuncture is in full compliance with the pointed above, acupuncture is currently moved from the empirical to scientific methods of restorative treatment [35, 69]. Adaptogenic effect of acupuncture is manifested in the increase of resistance not only to the current stress factor, but in relation to other potentially pathogenic influences of the phenomenon of ‘’cross-resistance’’[69, 72]. The mechanism of action of acupuncture corresponds to the multilevel, systematic approach of regulation of functionally-dynamic system and has an integrative effect, which contributes to the "integration of disparate functions". harmonizing and soft sedative effect of acupuncture on the nervous system should also be noted [72, 84].

It is also known that the syndrome of the energy deficit is the cause of adaptation and the anabolic processes of the organism. That's because in conditions of energy insufficiency of the organism, the correction of organic and functional disorders will be effective only if an adequate replenishment of oxygen of the substrate balance of the needs of metabolism [33]. Taking into account that the pathogenesis which had neurodynamic changes in the autonomic nervous system, and also due to the imbalance of nitrogen metabolism strengthening of free radical oxidation of lipids can have additional damaging effects on cell membranes, we carried out an oxygen therapy on the basis of singlet-oxygen mixtures (SOM) [27 – 29, 33, 35]. With the aim of substrate provision and metabolic processes, we have introduced mixture a number of biologically-active substances and metabolites (vitamin-amino acid complexes) in the composition of singlet-oxygen, the use of

which is due to the need of correction and stimulation of metabolic processes (Patent for invention. 78886, 25.04.2007).

However, the current tactics of medical rehabilitation, in addition to continuity and phasing provides an integrated and comprehensive approach to stimulation of mechanisms of sanogenesis, which are described as three basic levels of exposure: 1st – physical or functional, which is competent to include acupuncture, 2nd- chemical (includes diet, phyto -, API-, hirudotherapy, the removal of toxic metabolic products, microecological therapy (among other techniques include singlet-oxygen therapy); 3rd – information involving the use of psychosomatic techniques, chronotherapy (biorhythmology), homeopathy [9, 83]. Thus, the elite techniques of rehabilitation meet the described system, however, information level is bad represented, and established dysregulation dictates, in our opinion, that physical rehabilitation factor should be included in rehabilitation, this factor has a strong restoring rythm (non-specific energizing of energy-information effect) effect. Light therapy possesses described properties of a relatively unexplored method of rehabilitation therapy.

As monotherapy and in combination with the above methods, we used the light therapy. It is proved that our body converts light into electrochemical energy which activates a chain of biochemical reactions in cells, stimulates metabolic processes. Various studies have shown biostimulation effect of this light emission: when it exposed to the skin and the stimulation of photosensitive cellular structures. This starts a chain of cellular reactions and the launch of the so-called 'secondary responses', which not only discuss the effects of light on the skin, but also spread throughout the organism [74, 83, 85].

To conduct light therapy, it was used a source of polychromatic, non-coherent, polarized light. Polarized light of device includes visible and infrared part of the spectrum of sunlight (400 to 2000 nm) without the UV range, making the light safe for eyes and skin [9, 25, 28, 33, 85].

Thus, the principles of chosen complex of pathogenetic approach to rehabilitation correcting influence lies in the balancing of the processes of control and

adaptation by correcting the pathophysiological mechanisms of dysregulation, complemented by activities aimed at the correction of pathochemical violations.

2.3. Methods of mathematical analysis

Processing of digital data was performed by methods of variation statistics using student's t-test to assess the difference between the absolute values and the nonparametric criterion of angular transformation of Fisher's argument of the normal distribution for indicators of relative values.

SECTION 3
DIAGNOSTICS AND CORRECTION OF DYSREGULATION OF DRIVERS OF TRANSPORT BY THE PFYSICAL METODS

3.1. Estimation of dysregulation states of the motor transport drivers

Studying of exchange state HHMR (total catecholamines, nitric oxide, uric acid) of drivers depending on the age and professional experience has established a progressive trend of violations of their metabolism and phasing of these changes [21].

The drivers aged from 35 to 65 years and the with duration of professional experience from 10 to 30 years or more (I - III groups of observations) stated the characteristic restructuring of metabolism in the metabolic cycles of URIC ACID and the products of the NO cycle, which was the progressive increasing of their synthesis (I<II<III groups) from less than the control parameters in the first group, to the significantly higher in the III group.

Most different from each other (the reliability of this difference is $p < 0.001$) were parameters of the synthesis and excretion of URIC ACID representatives of the I and III groups. Index of using URIC ACID in individuals of these groups was 0.08 and 0.20 standard units (the representatives of the control group - 0.1 standard units and NO-2 of 1.05 and 1.28 standard units. (control - 1.59 standard units), that shows the intensity of involvement of URIC ACID and NO, as regulatory molecules in terms of their intensive excretion in individuals with a relatively young age and the least long term of employment and deposit of NO and URIC ACID-2 of representatives of the third group (56-65 years of age, duration of professional experience more than 25-30 years). Intermediate position occupied by the parameters of synthesis and excretion of URIC ACID and NO-2 in persons of II group, however, the tendency towards deposition of these metabolites, along with the increase in their synthesis. We can assume that the representatives of this group increased formation

of uric acid and nitrite due to not only aging, but also long-term stress, as a professional factor, which can be regarded in these conditions as the biochemical equivalent voltage adaptive resource metabolism data control molecules and increase their role as regulatory factors, but the excretory system is not to provide complete elimination of data of potentially hazardous metabolites.

During of the professional experience more than 25-30 years (age 56 years or more) individuals of the third group were watched the decompensation of the adaptation processes of metabolism GHSR data in the form of a significant increase of their content in blood ($P < 0.001$ compared to control showings) by reducing the excretion of URIC ACID and enhanced excretion of NO-2 ($P<0,001$ compared to control showings). Established metabolic defect of URIC ACID and NO-2 with members of this group create the preconditions for cumulative adverse impact of these metabolites on hemodynamics, autonomic homeostasis, musculoskeletal apparatus [31].

By the side of system of catecholamines it was noted a sharp increase of their content in the erythrocytes of the blood of drivers in groups I and II, with a clear upward trend with persons of II group. We can assume that in these groups we observe the response to the influence of stress factors, a response that has compensatory-adaptive nature, however, the voltage of these processes increases with the duration of the impact of unfavorable occupational factors and age of the surveyed drivers. We have observed the depletion of adaptive resources of the data with persons of group III, which was manifested by a sharp decrease in the total content of catecholamines in erythrocytes of blood $p<0,01$, and in the same age group in the control group showed an opposite trend (the excess of this indicator relative to other age groups).

Therefore, identified metabolic investigated HHMR can be viewed as a plastic response of metabolism to the influence of unfavorable factors of professional work of drivers (main factor is information stress) in the framework of adaptive responses, which, however, in stress sensitive conditions leads to the disruption of adaptive

resources, which can be interpreted as a secondary pathogenetic mechanism of formation and further development of dysregulation pathology.

The conducted research allowed to establish the role of studied HHMR as an independent factor in the development of dysregulatory states.

An important feature in the implementation of functional and/or pathological effects of the impact of each selected HHMR is the duality of their influence. In particular, each of them, depending on various factors, can act as an antioxidant or prooxidants and to show how protective and toxic effects. Therefore, to evaluate the role of lensed violations of these metabolic systems (physiological or pathological significance) in the pathogenesis of dysregulation of processes of different levels and origins helps the analysis of their changes during rehabilitation correcting influence.

One of the main directions of the research conducted was to identify the pathogenetic basis of General and specific reactions of the organism to the action of harmful production factors (first of all - high stress voltage), to develop and justify criteria and methods that allow to objectively diagnose pathology in the premorbid period and to serve as objective criteria of the effectiveness of the corrective influence.

To solve this problem (because the nature of the condition underlying the regulatory processes, contingent professional drivers of vehicles evaluated at the prenosological stage) investigated the condition of vegetative homeostasis according cardiointervalography and electropunctural diagnostic and General adaptive reactions of the organism (GAR), and establishes the nature of the functional state of the body based on a modified classification of R. M. Baevsky.

One of the most informative methods of assessing systemic regulatory processes of the organism admits the study of the state of GNH as one of the markers of adaptation and stress. Since heart rate variability (HRV) correlates with the major risk factors and is a sensitive indicator of autonomic software, an early predictor of centralization of heart rate regulation, reducing the effectiveness of the regulation of the cardiovascular system - HRV study opens up the possibility of predicting maladaptation and syncope states [40].

Studying the state of autonomic balance according cardiointervalography and electropunctural diagnostic have shown that prolonged exposure to negative occupational factors of the driver leads to disruption of autonomic balance. Changes have the nature of the phase, each phase are connected with the exposition of adverse impact of production factors of labor for drivers, as evidenced by the trend of violations in each selected group.

The study showed that after prolonged activation of both divisions of the ANS in individuals of I and II groups (peak figures become representatives of group II) drivers of III group, after 25-30 years of professional experience, maintained a high level of parasympathetic (vagal) effects on cardiac rhythm and depleted the activity of the sympathetic amphotropic system.

This study is first that established the violation of physiological age dynamics of the ANS activity during prolonged influence of stress conditions. If healthy elderly individuals have the activity of the parasympathetic influence that decreases in comparison with younger age, drivers over the age of 56-65 years remain high settings of relevant indicators. But during this sympatho-parasympathetic ratio reduces and there are rising rates, which reflect the state of humoral regulation of cardiac activity and the activity of the Central oscillators. That is, the set metabolic GGMR is a component system disorders of the nervous system. It is known that the catecholamines - it is neuromancer participating in system effects of excitation of sympathetic NS, nitric oxide (NO) in the mechanisms of its physiological effects are believed as an antagonist of the adrenergic effects of VNS, uric acid, which is called the two-faced Janus of biochemistry, shows its vegetotropic properties are also ambiguous (it is proved that the peripheral effects of URIC ACID causing a sympathomimetic reaction, through phosphodiesterase inhibition and/or blockade of adenosine receptors, while the Central effect of URIC ACID manifested by direct activation of the nuclei of the vagus nerve, which causes activation of the parasympathetic reactions ANS).

It should be noted that individuals of I and II age groups, their activation of the sympathicoadrenal system level of ANS appears significantly higher than in persons

of the third group. Sympathicoadrenal system activation is obligately accompanied by increased synthesis and, hence, utilization of catecholamines. The latter process is very energy intensive, which creates additional conditions for the development and strengthening of bioenergy hypoxia of the brain. It is also known that excess catecholamines creates the conditions for ' Hyper recovery ', which leads to the accumulation of free radicals. Hypoxic changes in the brain and superoxide stress potentiate the development of encephalopathy and can be considered as secondarily-formed conditions for deepening and somatization disorders regulatory activity of the excitatory system.

The results of a study of heart rate variability that we have received allowed us to supplement existing data on the physiology and pathophysiology of the processes of formation of professional fatigue and 'burnout' , which are the most topical problems of occupational medicine. The literature suggests that on the basis of mathematical analysis of cardiac rhythm is possible to differentiate manifestations of the state 'fatigue', associated with increased tone of the parasympathetic nervous system and lowering the tone of the sympathetic segment of ANS- from manifestations of the condition 'voltage', which are characterized by increased tone of both divisions of the ANS that can mask fatigue [46]. Accordingly, it is possible to argue that there was neurodynamic changes in the autonomic nervous system of ANS of drivers that shows in the first place, the influence of neuro-emotional stress, due to the nature of their professional activities, with a further predominance of the processes of fatigue as a manifestation of decompensation.

Among other methods that allow to objectify the state of a system of regulatory processes through the study of autonomic homeostasis, secrete the definition of galvanic skin responses. The results of experimental studies and other literature data indicate that sensory characteristics of the skin zones of visceral sensitivity reflect changes of the physiological condition in general [37, 76]. Morphological and physiological features of human skin determine its role in the integral system of regulation of physiological functions of the body – they are reflex changes of skin

sensitivity and segmental repercusiones nature are accompanied by viscero - cutaneous and vasomotor reflexes.

The literature data allow us to conclude that for practical realization of the system principle in the prenosological diagnostics and activities relative to the correction of the identified changes in the condition of integration processes of regulation it is possible to use indicators galvanic skin reactions, allowing for the biophysical parameters of representative (diagnostic) of biologically active points to determine the presence and the depth of the systemic dysregulation continue to be applied as an algorithm governing physiopuncture therapy. The researchers first isolated non-invasiveness, portability and accessibility of this method and nosological diagnostics of functional state of man.

The literature also presents the results of a survey by the electropunctural diagnostic representatives of professions with a high level voltage of labor (among which, some data about the drivers of vehicles). At the same time, literature data regarding the informativeness and feasibility of using galvanic skin reactions in medical practice is very controversial, and the methodology of the study and interpreting the results have a lot of doubt.

Analysis of standard and proposed indicators galvanic skin response of drivers was carried out according to the task depending on the age and vocational experience showed a number of characteristic features that Supplement the existing data. The value of the average value of GSR of the FORMER representatives of the first group with high confidence (P0,001) than the control data, and notes the predominance of sympathetic activity. As shown by the results of the analysis of variation series of the values of the representatives of the SECOND group – in contrast to other groups, individual GSR values differed by significant diversity and a wide range of values, which confirms the imbalance in the regulation of VNS. The analysis of the CLUSTER among representatives of the SECOND group also shows the increasing incidence of dysregulation. KLA ranges from '-' to 6 ' of ' 37 CONV. units IN the THIRD group the changes of skin galvanic reactions have universally oriented nature of most patients. Figure of the average value of GSR change of representatives of

this group was significantly (P0,001) lower than control values. Therefore, we can state the reduced activity of the sympathetic division of the ANS, which is exacerbated by a pathological change of direction of the orientation vector of asymmetry, which takes the opposite direction, recorded the prevalence of ESO-s.

The evaluation of electric skin resistance and highlighting of indicator CLUSTER allowed us to Supplement understanding of the mechanisms of effector-effectorne interactions of regulatory systems of NS. The study of skin galvanic reactions, as the equivalent of the sympathetic reflex has allowed us to identify that in addition to the development of imbalance in ANS activity, which has the above-described stage-dependent duration of effect of adverse factors, there is also a phasic change in the coefficient of lateral asymmetry (CLAS) the interaction of each of the hemispheres of the brain with the acceptor and effector divisions of the receptor areas of the skin.

Hence, our studies show that stressful working conditions significantly influence the parameters of vegetative homeostasis according cardiointervalography and electropunctural diagnostic. The changes are phasic, each phase associated with exposure adverse effects that correlate with experience. If the experience is from 10-15 years, stated the activation of both divisions of the ANS, which is intensified when your experience is more than 15-20 years of professional experience more than 25 years was accompanied by the imbalance of activity of divisions of the ANS (the predominance tone of parasympathetic tone and reduce the tonic influence of the sympathetic nervous system), which are persistent dysregulatory violations in the professional experience which is more than 25-30 years.

Phasic changes in the magnitude and orientation vector of the coefficient of lateral asymmetry (CLAS) of drivers allow you to register the violations of functional lateralization in the interaction of Central and peripheral departments of the nervous system and the systemic nature of the violations, which proves the possibility of using this ratio for the objectification disorders integrative systems of the body and check the stage of formation dysregulatory processes.

Therefore, the study of autonomic homeostasis in the study of sympathetic skin reflex according to electropunctural diagnostic and indicators of heart rate variability according cardiointervalography down to vehicle drivers depending on the age and professional experience allowed us to show that a high level of efferent vagal activity is a protective compensatory response of the neuroendocrine mechanisms of regulation for a long (from 10 to 25 years) actions together adverse occupational factors, which on the background of the depletion of the galvanizing influence of the sympathetic division of the ANS takes on the character of dysregulation and becomes resistant relatively to drivers with professional experience more than 25-30 years.

A study of the status of adaptation processes of the human body, as a result of integrative influence of regulatory systems are one of the recognized methods of determination of efficiency of medical rehabilitation and further forecast. For the evaluation of General adaptive reactions of the organism, we used the method of L. H. Harkavy, which is based on the study of leukogram of peripheral blood.

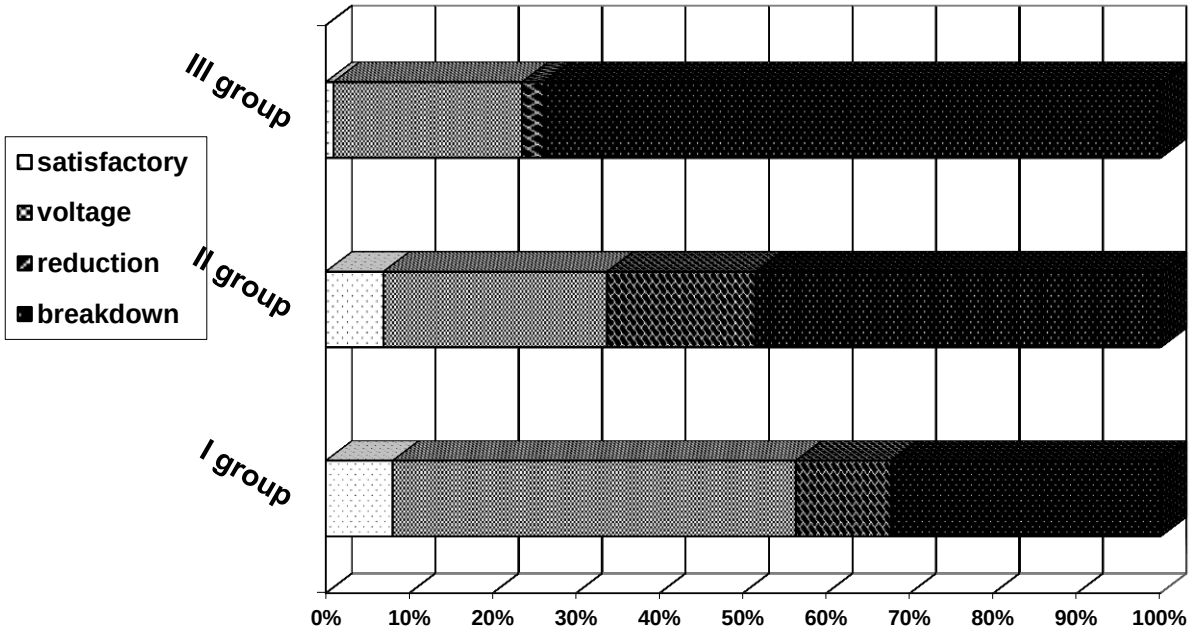
The study of general adaptive reactions of the surveyed population of drivers with the experience of professional activity for more than 10 years has established the prevalence (63.1 % of drivers) General adaptive reactions of the organism, which are pathological (reaction 'reactivated', 'acute stress' and chronic stress). It should also be noted that when registering a favorable adaptive responses - 'training' and 'activation' in 86.9 % of cases were detected signs of their inferiority, which may indicate stress and further depletion of adaptive resources and considered as a poor prognostic criterion.

Additional opportunities for interpretation identified adaptation reactions according to the method of L. H. Harkavy. opened our proposed mapping of HOARAU with classification of the functional States of the organism (Baevsky R. M., 1986).

According to this classification the group of physiological General adaptive reactions of the organism corresponds to the state of satisfactory adaptation, group General adaptive reactions of the organism signs of inferiority reactions - the state of tension of adaptation processes and pathological group General adaptive reactions of

the organism is subject to additional allocation: the reaction is reactivated and indicates a decline of adaptive mechanisms and reactions of acute and chronic stress States the failure of compensatory mechanisms.

Analysis of General adaptive reactions of the organism of drivers depending on age and professional experience showed (Fig. 3.1.), among the representatives of each of the identified state of satisfactory adaptation according to General adaptive reactions of the organism (T, CA, PA) were recorded less often, and there is a reduction from the I to III group.



	I group	II group	III group
satisfactory	8	6.9	0.9
voltage	48.3	26.8	22.6
reduction	11.4	17.8	2.6
breakdown	32.3	48.5	73.9

Fig. 3.1. The ratio of the levels of adaptation down to drivers of different levels of experience and age groups

General adaptive reactions of the organism, which has certified the voltage of adaptation (T (n/n) CA (n/a), PA (n/p)) is the most frequently recorded in persons of group I, and least of all it was recorded in the group of the representatives of the THIRD group. In the first group the percentage of responses is the vast majority of others (48.5 %). The reaction corresponding to the reduction of adaptation (PR) in the

examined contingent met relatively few that probably characterizes the short duration of this stage of formation dysregulation of the surveyed contingent, and their transition to the next stage, the disruption of adaptation. The failure of adaptation on the characteristics of General adaptive reactions of the organism were observed most frequently in persons of the THIRD group of drivers (73.9%). The representatives of the other two groups of the percentage of individuals who have also noted the failure of adaptation did not differ significantly. However, structurally, this functional status in individuals, the first group was formed due to acute and chronic stress ratio was 1:2, and II - 1:7. In the II group observation of adaptation breakdown insignificantly exceeds the percentage of General adaptive reactions of the organism that characterize the voltage of adaptation processes.

Thus, the study of tasks on assessing the state of autonomic balance (according to the heart rate variability and parameters of galvanic skin reactions), and the definition of adaptive resources of the organism down to vehicle drivers depending on the age and professional experience has allowed to state their breach regulatory ANS function and objective manifestations of maladjustment. A study of the development of processes of autonomic dysregulation revealed their first stages associated primarily with the duration of professional experience were examined.

In accordance with the tasks of the research we studied the structural features of the brain (autopsy material) drivers of vehicles of a similar age who worked in this capacity from 10-30 years (Fig. 3.2, 3.3).

The study found that drivers with experience of professional activity from 10-30 years in all parts of the cerebral cortex determined by diffuse dystrophic changes in the form, ganglion-cell expansion and deposition, lysis chromatopelma substance of neurons, the phenomenon of satellitosis and neuronophagia, the heterogeneity of the distribution of gliocytes, paresis or spasm of the vessels of the ICR. In General, the revealed structural and functional changes can be considered as manifestations of encephalopathy in all the cases under study.

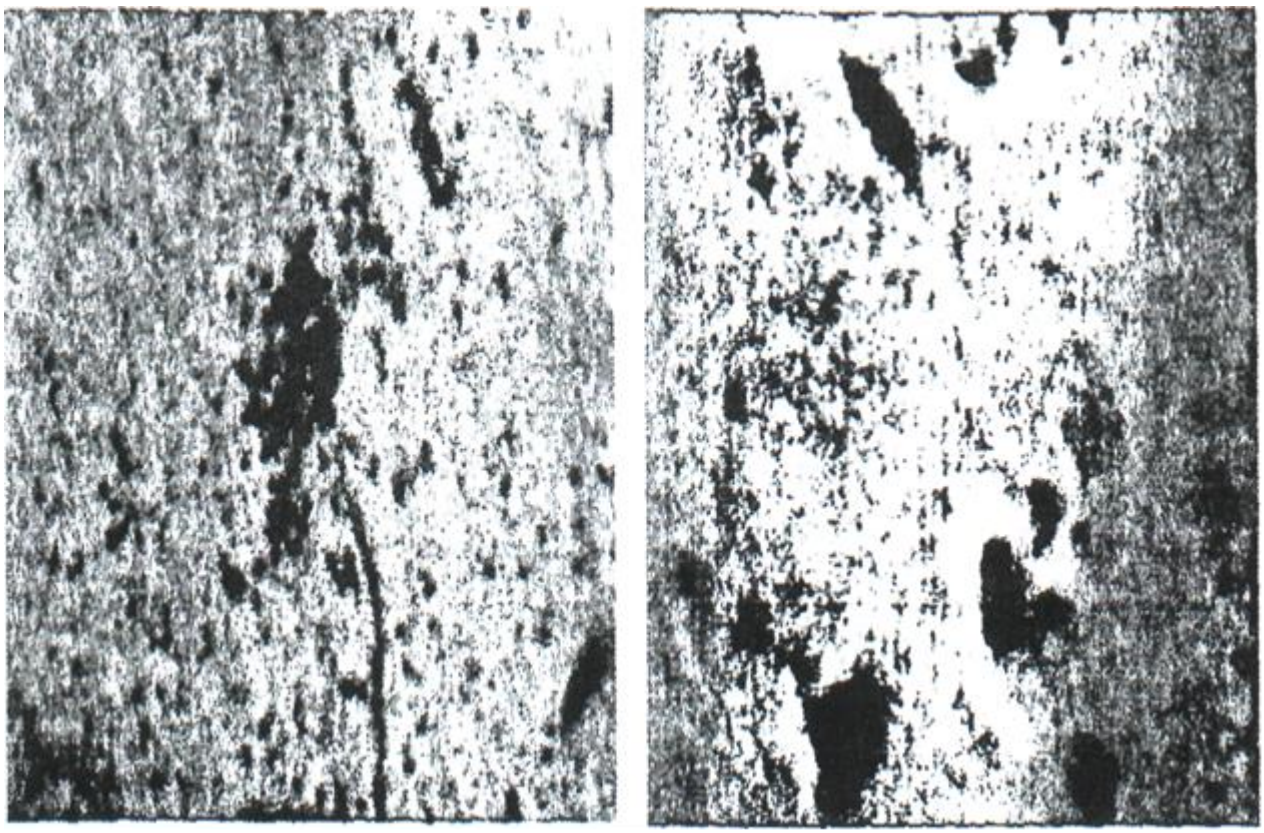


Fig. 3.2. The frontal lobe of the brain of the driver who died from pancreatic necrosis.
Glial nodule in the deep layers of the cerebral cortex. Env.: Nissl. X200.
Fig. 3.3. The temporal lobe of the brain of the driver, who died from a coma of unknown etiology.
The group of dystrophic changes of neurons. Env.: Nissl. X200.

Thus, a comprehensive study of the state of the integrated regulatory processes of drivers of transport depending on their age and professional work experience allow us to conclude that the violations are due to not only age peculiarities of changes in neural and biochemical regulatory systems, it is primarily the effects of long and intensive influence of adverse production factors, among which in the first place is an informational stress (significant increase of amount of information processing with the purpose of decision-making 2) reduce the time allotted for such work brain 3) high motivation to make the optimum decision). Therefore, it can be argued that changes in the state of examined drivers show the influence of neuro-emotional stress, due to the nature of their professional activities, with further transition of compensatory reactions in maladaptive and requires adequate therapeutic correction [16].

On the basis of research and existing pathogenetic approaches we have outlined the concept of formation of primary dysregulatory functional state of the organism in individuals of operator’s professions: 'Long stress limitative influence of adverse factors of environment (including production) causes imbalance and dysfunction of the divisions of the ANS and stress biochemical continuum, which causes the dysregulation of the neurovascular unit, transport options and creates conditions for the development of hypoxia. Hypoxia and persistent neurohumoral imbalance lead to structural brain damage (encephalopathy). Damage is the morphological substrate of the nervous regulation, in turn, requires more active and compensatory rearrangements of the work of the nervous system, which deepens the imbalance of interaction of departments of ANS and a violation of the processes of synthesis-exchange-selection of biochemical stress continuum'. The result is a vicious circle of persistent dysregulation of the condition for which correction is needed is a comprehensive system of pathogenetic sanogenetic effects [28].

3.2. Correction of dysregulation states of the motor transport drivers by the physical methods

In accordance with this, we have suggested a system of restorative influence, which involves the resumption of control and hierarchical interactions of the parts which regulate the functional systems, that, in general, should contribute to the correction or elimination dysregulatory violations.

Thus, base complex, that we used – RC N1. 1 included the use of reflexology in the form of a corporal, auricular and cephalic acupuncture combined with oxygen-substrate therapy, represents the use of singlet-oxygen mixture containing a number of biologically active substances and metabolites [27 – 29, 33, 35].

Since the action professionally determined factors from the contingent of drivers is also associated with disorders of biorhythm due to the activity of all organs and systems of the body, for medical rehabilitation of driver motorists it was also used the method of light therapy (in the form of PILER-light), which was used as monotherapy in the composition of the RC №2. In available literature there are some data that allow to suggest that polarized light can affect the body indirectly, which leads to hemic, analgesic, sedative and other effects [27, 35, 85], which can be effective in rehabilitation.

Correction and rehabilitation complex No. 3 included the combined use of acupuncture, oxygen-substernal therapy and light therapy.

Methodological approaches to the application of each of the methods responded to the above recommendations [33]. The course of each of RC was 15 sessions: the first 10 sessions daily, the next 5 were alternated through the day. The total duration of the correction and rehabilitation of the course is 5 weeks.

Examination of contingents of the control and main groups before and after exposure found that the influence of the designed complexes in the study of the integral system of regulation of the functional state of the organism and adaptation of

drivers of motor vehicles was, mainly, normalizing and depended primarily on the nature and intensity of the initial changes of indicators that were correlated with exposure of the action of unfavorable factors of working conditions. However, the analysis of the dynamics of these parameters under the influence of each of the applied RC in general contingent of drivers of motor transport with professional work experience more than 10 years showed statistically significant differences before and after the impact, as recorded very high values of average error magnitude. This circumstance led to further statistical analysis after further standardization of the contingent according to age and seniority of professional activities (selected among the three stages - age groups of drivers), which in turn brings the importance of the duration of effect of adverse factors on the formation of dysregulatory violations.

The analysis of indicators of total blood catecholamines demonstrated that in excess of their content only the effect of the RC № 1 and RC № 3 contributed to their normalization. However, with the depletion of catecholaminergic systems the representatives of the third group of observations- there is the most expressive and normalising effect noted after the application of the RC № 2. It should be noted that the RC №2, primarily acts on biorhythmic component control, most effectively influenced the renewal of resources of sympathicoadrenal system. This allows us to assert that the complexes act on different components of the mechanism (system) of regulation that is laid down the principle of diverse effects that we have behind implemented in the developed complexes and is the most effective.

The study of the dynamics of indicators of exchange of the uric acid and NO2 - under the influence of the developed by us differentiated complexes of rehabilitation also demonstrated predominantly facilitative effect (Fig. 3.4., Fig. 3.5.). If to consider separately the concentrations of NO2 - and uric acid in the blood and urine from the representatives of the surveyed groups, should be considered primarily a normalizing influence character of RC that is applied, however, additional analysis of UI captures the essential features of the dynamics of the parameters of the use of these metabolites.

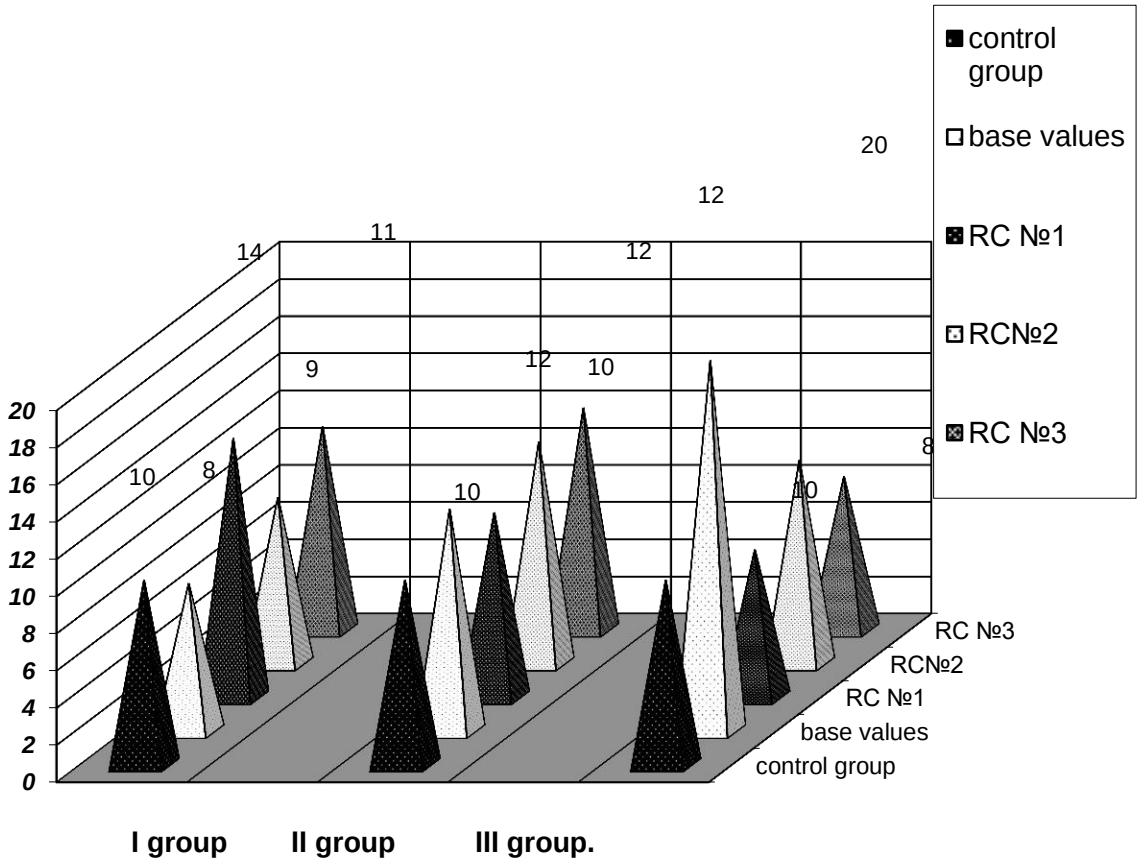


Fig. 3.4. Dynamics of utilization index of uric acid in the process of rehabilitation of drivers of motor vehicles

So, only at the most expressed decline of UI - for the representatives of I group – it was registered its increase after a rehabilitation, and at a moderate decline, - it assisted the further decline of UI, thus, the more it was close to the indexes of control the more substantial was his further decline.

It should also be note that the UI of uric acid and nitrite were changed to normalize after carrying out different rehabilitation complexes in the following order, from more expressed to less expressed: RC№1 >RC№3 >RC№2. The application of the RC №2 affected enough significantly on the excretion of these metabolites but they were significantly increase initially.

The results of the study suggest that in the case of a significant reduction of utilization it is possible to speak about high voltage activity of biochemical mechanisms, which provide compensation for and elimination of dysregulation, so the normalization of the exchange of regulatory molecules significantly enhances

their efficiency and reduces the tension of the metabolic system and prevents the development of maladjustment.

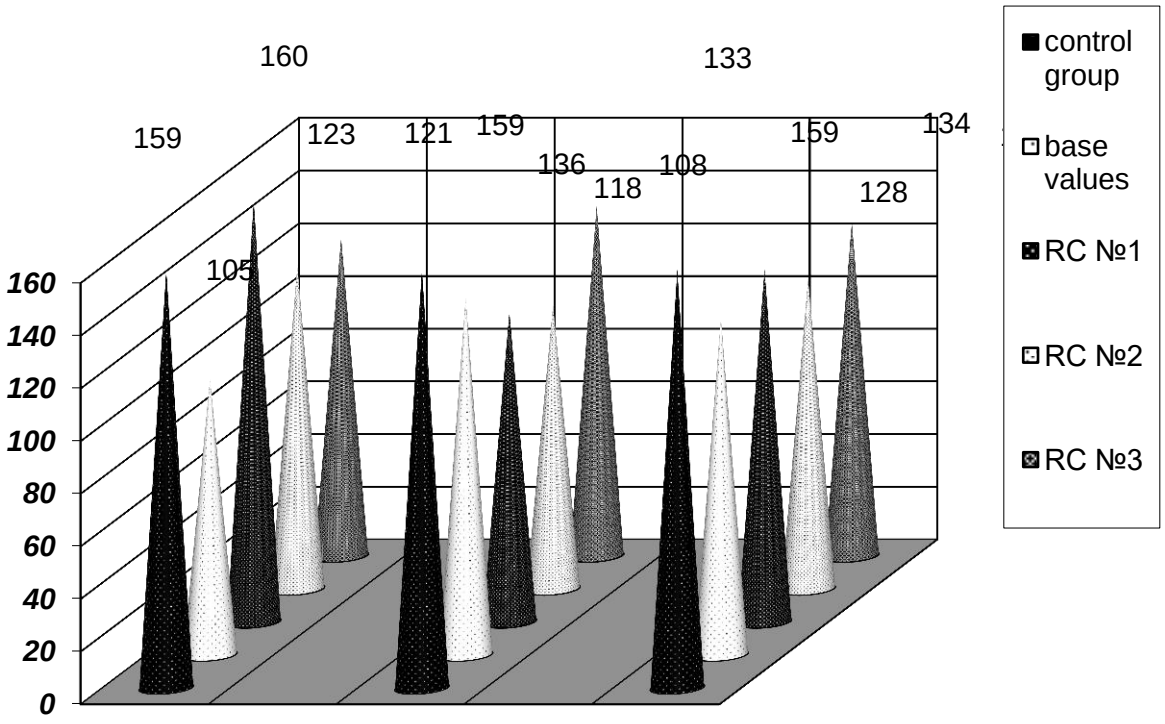


Fig. 3. 5. Dynamics of utilization index of nitrite in the rehabilitation process of drivers of motor vehicles

Along with this, a slight decline in utilization of data of regulatory molecules on the background of other objective signs of improvement in the manifestations of systemic dysregulation is probably a limit of the compensation of violations of the biochemical regulation system, which can be interpreted as a decline in adaptation, that is why the use of RC with regulatory and normalizes substrate deficiency action facilitates the ability to compensate the adverse external effects, which in particular is manifested by a decrease of UI.

In the case of a significant increase of UI (primarily due to the increase in the content of metabolite in the blood, with insufficient elimination), which certifies the failure of adaptation and provoke a negative cumulative effect of metabolites, the application of the developed approximation RC helps to normalize UI and reduction of metabolic disorders, which are caused by age-related changes.

Analysis of corrective rehabilitative effect on the state of vegetative homeostasis according to CIG and ED showed that the dynamics of the studied parameters of HRV and the GSR depends primarily on the direction and intensity of initial violations (which have phasic nature) and specific features of influence of each of the designed RC (Fig. 3.6. – 3.7.).

In particular, with the predominance of sympathetic cardiac activity and a compensatory increase of vago-insular tone of the VNS (the representatives of I and II groups) the nature of the effects observed was expressive and normalizing after the application of the RC№1. Depending on changes of initial parameters (with increased activity of the sympathoadrenal level of VNS (Baevsky index, mode amplitude, LF) it was stated a decrease in initially elevated parameters (P<0,001) indicators of vagal activity (RMSSD, pNN50, HF) also was significantly decreased (P<0,05-0,001) with respect to the original indicators).

After application of the RC №3 the indicators were close to the parameters of the control group of similar age. The influence of the RC №2 on the nature of the data changes of CIG in individuals of second group was less significant and after its application all disrupted parameters remained significantly elevated.

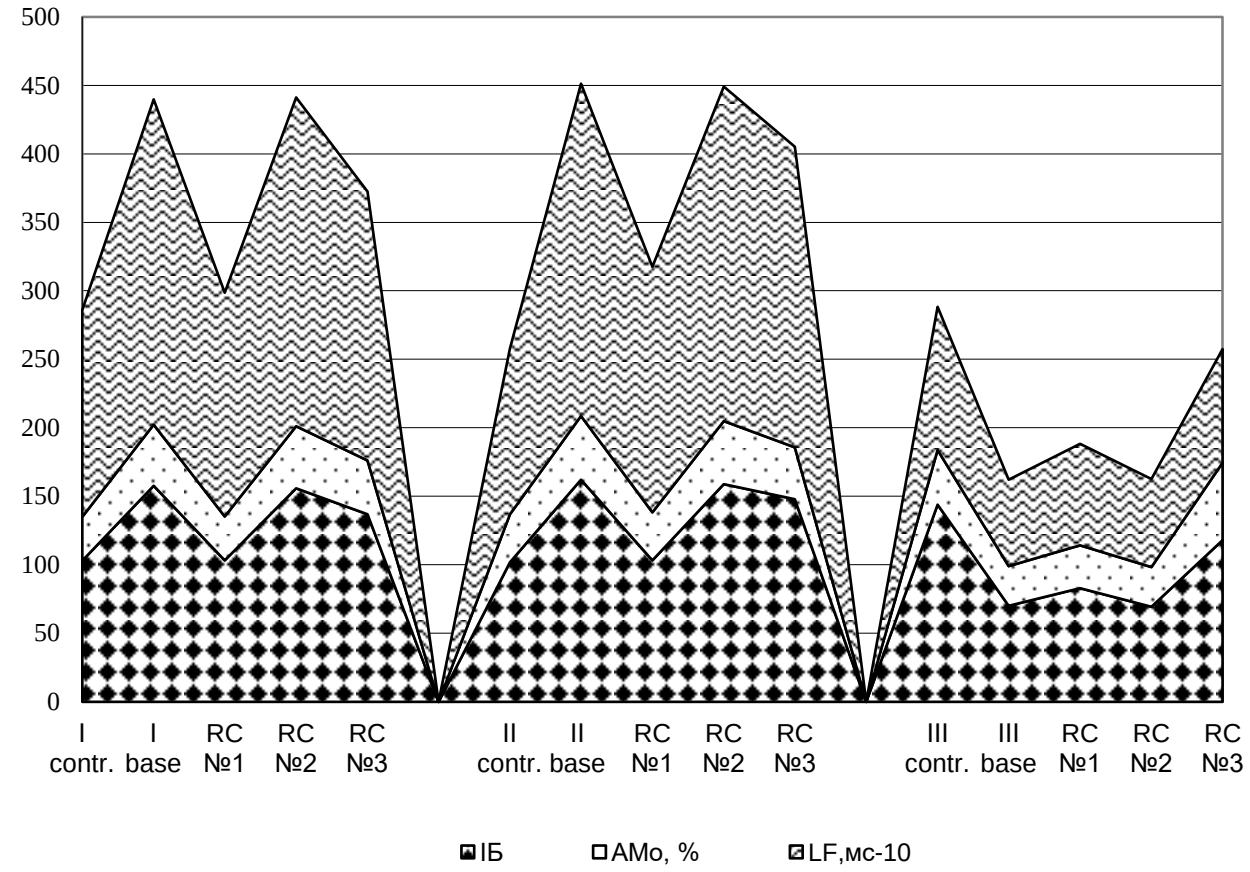


Fig 3.6.. Dynamics of CIG indicators characterizing the sympathetic activity of the VNS which is influenced by the rehabilitation of drivers of motor vehicles

Therefore, with the predominance of sympathetic cardiac activity and increase of vago-insular tone of the ANS (the representatives of I and II groups) the effectiveness of RC decreased in the following order of RC№1, RC№ 3, RC№2.

However, with the depletion of activity of catecholaminergic systems at the representatives of the third party (work experience is more than 25-30 years) RC №2 most effectively contributed to the resumption of activity sympathetic link of VNS. However, if we consider the balance of both parts of the VNS of individuals of this group after different types of rehabilitation effects, the closest to the state of eutonia stated the condition of CIG indicators after the application of the RC №3. In fact, except of a significant increase in activity of the sympathetic division, after the application of the RC №3 it was also noted a statistically significant decrease in initially elevated indices of activity of the parasympathetic division of the VNS.

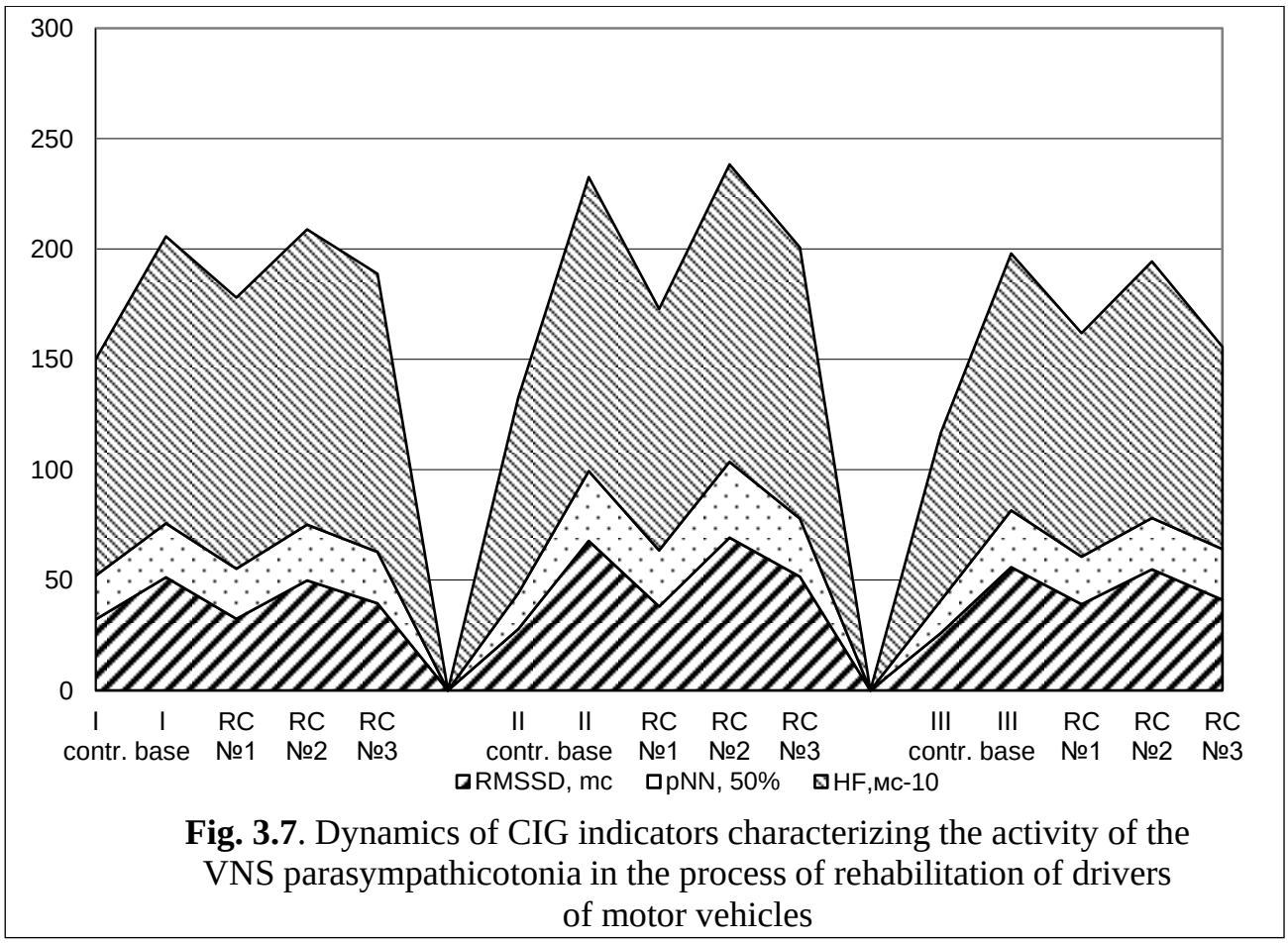


Fig. 3.7. Dynamics of CIG indicators characterizing the activity of the VNS parasympathicotonia in the process of rehabilitation of drivers of motor vehicles

The analysis of dynamics of indicators of electric skin resistance according to the GSR showed that their dynamics is associated with the nature of the changes in the indices of heart rate variability, according to CIG.

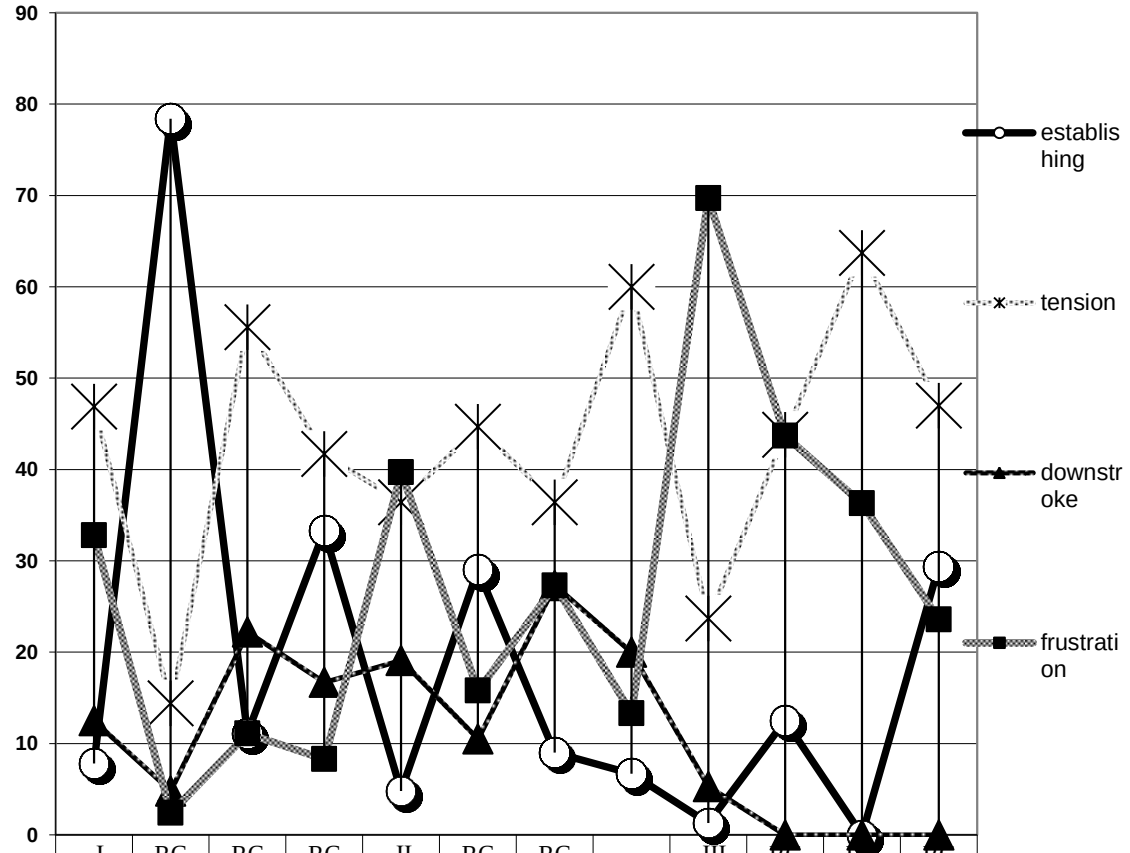
In particular, with an increase in the initial values of the GSR (GSR-d, GSR-s, AV GSR and IPC), the use of RC №1 led to their decrease most effectively. But, on the contrary, when these parameters were reduced, the normalizing effect of the used complexes was in the following order, in the order of its growth: RC№1 <RC №2 <RC №3. The stimulating effect of the RC №2 was the most significant, in view of initially close position to control value. It should be noted that according to the analysis of the GSR indicators, the application of RC №2 held the most significant concrete data on the basis of the data that ensued in their increase, regardless of the initial values.

The use of RC №1, on the contrary, mainly led to a decrease in the initial parameters of these indicators.

The CLA index, which characterizes the voltage of regulatory processes (with initially high parameters) decreased after application of RC № 1 remaining at a level higher than the reference values and continued to grow after the influence of RC №2 and RC № 3. The third group, with destabilization of regulatory processes with the depletion of catecholamine systems, observe the restoration of the initially negative values of the SC after the application of RC №3 and RC № 1 and the deepening of the dysregulation (further decrease in the parameters of the CLA) which were observed in the application of RC № 2.

The use of each of the complexes contributed to a significant decrease in the number of pathological GAR in the representatives of each of the age and experience groups (Fig. 3.8.).

However, with the deepening of the desadaptative processes that were recorded in the II and III observation groups after the corrective rehabilitation effect, GAR with inferiority features that display significant activity and stress of the adaptation processes were more often established. This phenomenon confirms the well-known hypothesis of the stories transition of one GAR to another, according to a consistent series: "training" - "quiet activation" - "re-activation" - "acute stress" - "chronic stress." Consequently, along with a decrease in the phenomena of disruption and reduction in adaptation in these groups, the manifestations of the tension of adaptation processes remain, which requires the continuation of the rehabilitation effect and additional examination with the involvement, according to the indications, of medication.



	I group	RC №1	RC №2	RC №3	II group	RC №1	RC №2	RC№3	III group	RC №1	RC №2	RC №3
establishing	7.8	78.4	11.1	33.3	4.8	29	9	6.7	1.3	12.5	0	29.4
tension	46.9	14.4	55.6	41.7	36.4	44.7	36.4	60	23.7	43.8	63.7	47
downstroke	12.5	4.8	22.2	16.7	19.1	10.5	27.3	20	5.3	0	0	0
frustration	32.8	2.4	11.1	8.3	39.7	15.8	27.3	13.3	69.7	43.7	36.3	23.6

Fig. 3.8. Correlation of adaptation levels among drivers of vehicles before and after rehabilitation.

Therefore, the analysis of influence of developed RC on the indicators of adaptive reactions and autonomic homeostasis has shown that the dynamics depends primarily on the direction and intensity of the initial violations, which, in turn, have a phasic character and duration are determined by the influence of adverse factors and composition of complexes.

Thus, the results of the analysis of efficiency of the developed RC show that during the formation of dysregulatory states with a high level of activation of both divisions of the VNS and the preservation of sufficient functional reserve of adaptive resources of the organism in their functional value (in our study - the representatives of I and II age groups) the use of the RC №1 is optimum.

The state of dysregulation with a predominance of parasympathetic tone and a decrease in the tonic influence of the sympathetic nervous system and exhaustion of adaptive resources of the organism in terms GAR (the study – representatives of III group) the highest efficiency was noted after effect of the RC №3. With the deepening of dysregulation effectiveness of corrective rehabilitation of influence decreases.

CONCLUSION

According to WHO about 1.3 million people are killed in the world every year in automobile accidents [41]. Among the causes of emergencies leading place is taken by 'the human factor', and the transport sector is among the most threatened in their creation [42, 39, 41].

However, along with increasing relevance of interventions in time to install and fix the deterioration of the health carrier of the number, and the population in general, we have to admit the decline of the preventive direction of medicine [56].

According to the sanitary-hygienic studies, including employees ' DP 'Ukrainian research Institute of transport medicine' – the conditions of the operator's labor lead to a negative impact on the body of an employee of the complex of adverse factors [19, 39, 43-49]. Among them special place takes informational stress (as operator activity associated with information overload combined with a lack of time or lack of information in conditions of high motivation of behavior) [4, 9, 16, 64, 67].

Giving psychophysiological characteristics of the working conditions of the driver (which relates to the operator's contingent), most authors emphasize that this profession requires simultaneous tracking of the real enough dynamic environment outside the cabin and vehicle control, fast and accurate response to the sudden appearance of new objects in the peripheral visual field [39, 44, 45, 48, 49, 62]. Such neuro-emotional stress sharply increases the likelihood of diseases of the nervous system, heart and vessels, up to disabling or fatal outcomes. Lack of exercise, feeding disorders, shift work, adverse physical and chemical factors of the working environment aggravated the negative effect of psycho-emotional stress [44, 46, 48, 51-53].

In view of the above – the influence of adverse working conditions on the health of operators of transport (including vehicle drivers) should also be considered from the standpoint of the role of acute and chronic stress. Adverse production

factors (mainly factors of informational stress), causing a nonspecific adaptive response of the organism and leading to stress, reducing its capacity can be considered as etio-forming factors and dysregulation from the margin of the body's adaptation reserve, depends on the time reversibility of the results of their effects on the body [5, 7, 25, 28, 40].

Mechanisms and systems of humoral and autonomic regulation provide a measure of activation of processes of self-regulation of the activities of the functional systems of the body, the violation of which forms the substrate dysregulation pathology [1, 20-25]. That is why, as main markers dysregulatory states, we studied the metabolic state of biochemical stress continuum, autonomic regulation and the character of nonspecific adaptive reactions.

The term 'dysregulatory state' we used in our works to refer to intermediate states of health, with the basis of the violation of the hierarchical mechanisms of regulation and the permanent current (unlike dysregulation syndrome). Also, in addition to violations of the regulatory mechanisms there is h a landmark character of the formation and accumulation of changes in dysregulatory states that through the mechanisms of sanogenesis transferred to pathogenic. I.e., dysregulatory states have a progressive (but potentially reversible) nature with possible transformation in dysregulation pathology [8, 16, 20, 21, 26-34].

Thus, the basis of the presented to your attention study was supposed rationale for an integrated system of prenosological diagnosis based on the study of additional pathogenic mechanisms for the formation of dysregulatory conditions in the operator's contingent of professional drivers of transport (depending on the length of their seniority and age) and corrective rehabilitation therapy. Depending on the vegetative, humoral and hormonal-metabolic disorders, disorders of adaptive reactions were established and systematized the criteria for identifying dysregulatory states and developed a comprehensive rehabilitation techniques of differentiated medical correction.

In the Department of rehabilitation state enterprise "Ukrainian research Institute for medicine of transport" of Ukrainian Ministry of health in the period

2005-2014, we examined 330 drivers of sanitation and urban transport in the city of Odessa, with professional experience more than 10 years [28]. Depending on the age and duration of service, the contingent was divided into three representative experience-age group (criteria described above). The control group consisted of 28 almost healthy persons of similar age, other occupational categories.

The carried out research showed that under the influence of adverse factors of production environment (primarily – chronic informational stress) operators of transport develops complex of progressive dysregulatory disorders.

Persons have been examined the imbalance of synthesis-exchange-selection is investigated humoral-hormonal and metabolic regulation systems (nitric oxide, total catecholamines, uric acid), which correlated with the duration of their professional experience. If experience is from 10-15 years it was noted the intensification of metabolism of uric acid and nitrite simultaneously increasing their excretion and accumulation of total catecholamines in the blood, this phenomenon is intensified when experience is more than 15-20 years. Increase experience more than 25-30 years was accompanied by accumulation of uric acid and nitrite and lower levels of total catecholamines blood.

Patients were also recorded the stage of disturbances of autonomic homeostasis, correlated with work experience: if experience is 10-15 years, there was the activation of both divisions of the ANS, which is enhanced as the work experience of more than 16-20 years; the professional experience over 25 years has been accompanied by an imbalance of activity of divisions of the ANS (predominance of parasympathetic tone of the and a decrease in the tonic influence of the sympathetic nervous system). The depletion of the mobilizing effects of the sympathetic division of the ANS, along with impaired humoral mechanisms of regulation contribute to the acquisition of a resistant nature dysregulatory disorders of drivers with professional experience of more than 25 years. Moreover, in the control group and according to the literature the nature of involutive changes of HRV indexes has the opposite character with increasing age, there is a decrease in parasympathetic influences and sympathetic.

The results of the study of autonomic homeostasis in the study of sympathetic skin reflex according to electropunctural diagnostic and indicators of heart rate variability according cardiointervalography of vehicle drivers depending on the age and professional experience has shown that a high level of efferent vagal activity is a protective compensatory response of the neuroendocrine mechanisms of regulation for a long (from 10 to 25 years) actions together adverse occupational factors, which on the background of the depletion of the galvanizing influence of the sympathetic division of the ANS takes on the character of dysregulation and becomes resistant relatively to drivers which professional experience is more than 25-30 years.

The study of general adaptive reactions of the organism found in 63% of cases the prevalence of adaptive reactions of a pathological nature (reaction 'reactivated', 'acute stress' and 'chronic stress'), and a favorable adaptive response ('training', and 'activation') in 87.5% of cases had signs of inferiority, which indicates the voltage of adaptive resources.

Comparison of adaptive responses of leucogram according to the classification of the functional states of the organism according to R. M. Baevsky has allowed to establish that general adaptive reactions of the organism that characterize the intensification and stress adaptation processes, often recorded down to individuals way with experience from 10 to 15 years. Among drivers whose with 16 to 20 years of experience along with the reactions of stress a sharp increase in the ratio of reactions of reduction of adaptation. Breakdown of adaptation according to the characteristics of leukogram stated most often down to people with the most experience from 21-30 years.

Morphological studies showed that the structural basis of dysregulatory disorders down to drivers way with professional experience more than 10 years changes in the cerebral cortex in the manifestations of encephalopathy: ganglion cell rarefactions and deposition, lysis chromatopelma substance of neurons, the phenomenon of satellitosis and neuronophagia, inhomogeneity of gliocytes, paresis or spasm of the vessels of the ICR.

Thus, the study has allowed to establish that the transport operators with professional experience more than 10 years found changes in physiological regulatory mechanisms due to long and intensive exposure to adverse production factors and not only of involutional transformations. The compensatory nature of the original changes, prolonged psycho-emotional stress becomes maladjustment that requires adequate time and nature of the therapeutic activity.

Depending on the vegetative, humoral and hormonal-metabolic disorders, disorders of adaptive reactions selected criteria of the stages of dysregulation, which can be interpreted as dysregulatory state.

When there was the experience more than 10-20 years it was stated dysregulatory state 'Voltage', which was manifested by activation of the studied metabolic system (increasing synthesis of uric acid and nitrite, along with enhancing their excretion and increased levels of total catecholamines of blood), an excessive level of activation of sympathoadrenal and parasympathetic divisions of the autonomic nervous system, a high level voltage adaptive reactions, tendencies to the depletion of adaptive resources of the organism.

Studying drivers with experience more than 21-30 years it was stated dysregulatory condition of 'Burnout', which was manifested by the processes of accumulation of toxic metabolites and reduced activity of the investigated metabolic systems (deposition of uric acid and nitrite, the decrease in the level of total catecholamines of blood), a predominance of parasympathetic tone and a decrease in the tonic influence of the sympathetic nervous system, reaction of exhaustion and failure of adaptive resources of the organism.

Generalization of the obtained results allows us to formulate the concept of dysregulatory states and the principles of correction and rehabilitation impact: the long influence of adverse factors (primarily, information stress), leads to an imbalance of hierarchical work divisions of the ANS and other regulatory systems. This leads, in particular, impaired regulation of vascular tone, transport functions of blood and lymphatic systems with the intensification of processes of synthesis-exchange-allocation and the subsequent accumulation of toxic metabolites. At the

same time the increased need for oxygen and substrate provision metabolism of regulatory molecules in conjunction with the violation of the transport function of the circulatory system create preconditions for development of bioenergy (secondary functional) hypoxia. Hypoxia and the continued influence of the factors in the development of dysregulation leads to structural modifications of the relevant parts of the brain (encephalopathy). Damage of the substrate of the nervous regulation requires activation and compensatory adjustments in the work of nervous system. This, in turn, is aggravated by the imbalance of activity of departments of VNS and reorganization exchange of regulatory molecules. The result is a vicious cycle of dysregulation to overcome (break) which is unidirectional and single-action is impossible, it is needed a complete correction, which would include activities aimed at the restoration of control and the consequences of oxygen deficiency of the substrate.

The principles of therapeutic interaction of such a complex should be based on the formation of a new functional stereotype, which provides: the restoration of control, elimination or reduction dysregulatory disorders, the formation of new connections functionally-dynamic system, aimed at compensation of the morphological defect and the consequences of substrate and oxygen deficit of the central and peripheral parts of the nervous system in hypoxia.

As established disorders are recorded at different levels in the hierarchy of intelligent control systems it is evidence of a systemic dysregulation that requires complex methods of correction, including actions aimed at restoring the homeostatic balance of both functional and metabolic systems.

With this in mind, we have developed a range of restorative treatment - RC No. 1, consisting of differentiated schemes of acupuncture (corporal, auricular and craniopuncture), warming of biologically active points and the subsequent massage with needle cushion corresponding to the formula segmental zones of skin projections of the meridians, combined with oxygen-substrate therapy, represents the use of singlet-oxygen mixture containing a number of biologically active substances and metabolites [27 – 29, 33, 35].

As monotherapy (RC No. 2) and in combination with the above methods ((RC No. 3), we used the light therapy - in the form of PILER-light. Light therapy is today recognized around the world and uses in the prevention, treatment and rehabilitation.

Correction and rehabilitation complex No. 3 (RC No. 3) included the combined use of acupuncture, oxygen-substernal therapy and light therapy.

Methodological approaches to the application of each of the methods responded to the above recommendations [33]. The course of each of RC was 15 sessions: the first 10 sessions daily, the next 5 were alternated through the day. The total duration of the correction and rehabilitation of the course is 5 weeks.

Examination of contingents of the control and main groups before and after exposure found that the influence of the designed complexes in the study of the integral system of regulation of the functional state of the organism and adaptation of drivers of motor vehicles was, mainly, normalizing and depended primarily on the nature and intensity of the initial changes of indicators that were correlated with exposure of the action of unfavorable factors of working conditions.

The study found that the impact of the designed complexes in the study of the integral system of regulation of functional state of organism and of adaptation of the operators of motor vehicles was, mainly, normalizing and depended primarily on the nature and intensity of the initial changes of indicators that were correlated with exposure of the action of unfavorable factors of working conditions.

It is established that in the "Exertion" integrated application of acupuncture reflexology and oxygen-metabolic therapy harmonizes the processes of vegetative and biochemical regulation of sanogenetic and provides the necessary inertia for the self-regulation of homeostasis and adaptation. An additional attraction to this complex light therapy helps to restore the activity catecholaminergic systems and general adaptive resources of the body in a state of "Burnout".

The study found that the use of treatment course of the oxygen-substrate therapy and integrated reflexology reduces excessive level of activation of autonomic responses, restores the biochemical processes of regulation and thereby resolve

dysregulatory violations and tension adaptation mechanisms, while maintaining sufficient adaptive resources of the organism. When decompensation of the functional reserves of the organism – strain and failure mechanisms of adaptation, the additional use of light therapy provided restoration of afo- and trophotropic balance the VNS and nonspecific adaptive reactions of the organism.

Thus, in the result of the research was pathogenetically substantiated and developed methodical approaches to diagnostics and the medical correction dysregulatory conditions of the transport operators. Based on the studies it was developed the pathogenetic approach to treatment assignment developed by the rehabilitation center for medical correction dysregulatory states with regard to their features and stages of development.

REFERENCES

1. Bayevskiy R.M. *Prognozirovaniye sostoyaniy na grani normy i patologii* [Prognostication of states at the verge of norm and pathology]. Moscow, Meditsina, 1979. 295 p.

2. Bodrov V.A. *Informatsionnyi stress. Uchebnoye posobiye* [Informative stress. A manual for higher educational establishments]. Moscow, PER SE, 2000. 352 p.

3. Zagurovskiy V.M. Stress and its consequences (pre-hospital and early hospital stages) Electronic resource. *Meditsina neotlozhnykh sostoyaniy* 2014; 7 (62). Access mode: http://www.mif-ua.com/archive/article/39740.

4. Kalnysh V.V. Psychophysiologic aspects of study of reliability of operator activity. *Ukrainskyy zhurnal z problem medytsyny pratsi* 2008; 3 (15): 81-88.

5. Kryzhanovskiy G.N. Some general pathological and biological categories: health, disease, homeostasis, sanogenesis, adaptation, immunity. New approaches and presentations. *Patogenez* 2003; 1 (1): 11-14.

6. Gogenko A.I., Gorsha O.V., Savchenko V.M. Pathogenetic classification of dysregulatory conditions of operators of transport (report 1). *Actual problems of transport medicine* 2013; 31 (1): 125-133.

7. Gozhenko A.I. Dysregulation as a basis of homeostasis pathophysiology. *Klinichna ta eksperymentalna patolohiya* 2004; 3 (2): 191-193.

8. Gorsha O.V. Improvement of medical rehabilitation of drivers by correction of the disregulatory disorders, manifested as violation of vegetative balance and urinary acid exchange. *Medychna hidrolohiya ta reabilitatsiya* 2008; 6 (3): 36-41.

9. Socrut V.M., Kazakova V.M. (eds.*) Fizychni chynnyky v medychniy reabilitatsii* [Physical factors in medical rehabilitstion]. Donetsk, DonNMU; DOCTMO, 2008. 576 p.

10. Yakovlev G.M., Novikov V.S., Khavinson V.Kh. *Rezistentnost', stress, regulyatsiya* [Resistence, stress, regulation]. Leningrad, Nauka, 1990. 237 p.

11. Agadzhanyan N.A., Bayevskiy R.M., Berseneva A.P. *Problemy adaptatsii i ucheniye o zdorovye* [Problem of adaptation and study of health]. Moscow, RUDN, 2006. 284 p.

12. Akmayev I.H. Neuroimmune endocrinic interactions: their role in the dysregulatory pathology. *Patologicheskaya fiziologiya i eksperimentalnaya terapiya* 2001; 4: 3-10.

13. Anokhin P.K. *Fiziologiya funktsional'nykh sistem* [Physiology of functional systems]. 1995, p. 12.

14. Baevskiy R.M. Self-regulation of biological rhythms as one of adaptation mechanisms of organism to the changes of external environment. *Adaptivnoe samoregulirovanie funktsii*. Moscow, 1977, p. 49-62.

15. Garkavi L.Kh., Kvakina Ye.B., Ukolova M.A. *Adaptatsionnye reaktsii i rezistentnost' organizma* [Adaptative reactions and organism resistance]. Rostov-Don, Rostov. University, 1990, 224 p.

16. Gorsha O.V., Panov B.V., Hozhenko Ye.A. Modern pictures of forming informative stress, as dysregulation pathologies at cars drivers. *Aktualnye problemy transportnoy meditsiny* 2010; 1 (19): 12-22.

17. Zagurovskiy V.M. Reaction on severe stress and violations of adaptation in disaster medicine. Electronic resource. *Meditsina neotlozhnykh sostoyaniy* 2011; 6 (37). Access mode: http://www.mif-ua.com/archive/article/22681.

18. Kryzhanovskiy G.N., Merculov Yu.A. Dysregulatory pathology of the nervous system, pathological disinhibition and mitotic catastrophe of neuron. Electronic resource. *Zhurnal nevrologii i psikhiatrii im. S.S. Korsakova* 2006; 7. Access mode: http://www. mediasphera.ru/journals/korsakov/

19. Horsha O. V., Horsha V.I., Zukow W. et al. Restoration treatment of vegetative dysregulation for drivers of motorists. Rozdzial. Regenerujace leczenie wegetatywnego rozregulowania kierowcow automobilistow. *Education, tourism and health for people.* Lviv, Poznan, Warsaw, 2010. R. 189-194.

20. Gorsha O.V., Nasibullin B.A., Gozhenko A.I. State of the regulator systems of organism of drivers according to data of vegetative balance . *Aktualnye problemy transportnoy meditsiny* 2007; 4(10): 61-66.

21. Gorsha O.V., Gozhenko A.I., Nasibullin B.A. Peculiarities of nitrogen oxide cycle metabolism in drivers with long job experience. *Medychna khimiya* 2007; 9 (4): 66.

22. Krizhanovskiy G.N., Kurneshova L.Ye., Pivovarov V.V. et al. Health and its polyfunction estimation. *Integrativnaya antropologiya* 2003; 2: 46-51.

23. Sologub M.I. *Kletochnye mekhanizmy adaptatsii*. [Cellular mechanisms of adaptation. Lectures] GAFC im. P.F. Lesgafta. SPb., 2002. 54 p.

24. Alderman M. Serum uric acid as a cardiovascular risk factor for heart disease. *Current Hypertension Reports* 2001; 3: 184-189.

25. Gorsha O.V., Gorsha V.I., Zukow W.; Zukow W. et al. (eds) Restoration treatment of vegetative dysregulation for drivers of motorists. Education, tourism and health for people. Lviv, Poznan, Warsaw, 2010. p. 189-194.

26. Gozhenko A.I. Homeostasis and adaptation — basic conceptions of modern medicine. *Gomeostas: fiziologiya, patologiya, farmakologiya i klinika*. The 2nd Intern. Scientific. Conf. Theses of reports. Odesa, 2005: 3-5.

27. Gorsha O.V., Panov B.V. Rehabilitation measures at the operators of the transport systems. *Teoriya i praktika kurortnoi spravy*. Scientific. Conf. of medical workers of UZ ta SKZ of Ukraine, the 14–15th of May. 2008, Khmilnyk. Materials. Khmilnyk, 2008, 58-59 p.

28. Gorsha O.V. Complex system of estimation and corection of physical methods of dysregulatory conditions of drivers. Thesis for MD degree. Speciality 14.01.33 “Medichna reabilitatsiya, fizioterapiya that kurortologiya”. Yalta, 2011. 27 p.

29. Gorsha O.V., Gorsha V.I. System of complex medical rehabilitation of operators of transport. *Perspektyvy rozvytku systemy medychnoi reabilitatsii.* Scientific. conf. with international participation, the 16–17th of May. 2013, Khmilnyk a set of materials. Khmilnyk, 2013, 57-58 p.

30. Gorsha O.V., Nasibullin B.A., Gozhenko Ye.A. Estimation of regulation systems of functional state of drivers' organism according to the data of vegetative status. *Medychna reabilitatsiya, kurortologiya ta fizioterapiya* 2008; 53 (1): 19-23.

31 Gorsha O.V., Nasibullin B.A., Gozhenko A.I. Features of exchange of some handling molecules at drivers of motor transport with the job experience over 10 years. *Aktualnye problemy transportnoy meditsiny* 2007; 3(9): 98-103.

32. Gorsha O.V. Dermogalvanic reactions — a criterion of state of adaptation resources of organism of transport industry operators. *Zbirnyk naukovykh prats spivrobitnykiv KMAPO im. P.L. Shchupyka* 2010; 19 (3): 103-109.

33. Gorsha O.V., Nasibullin B.A., Hozhenko O.A. *Vidnovlyuvalne likuvannya operatoriv transportnykh zasobiv z rozladamy diyalnosti vehetatyvnoi nervovoi systemy*. [Resuscitation treatment of operators of transport vehicles with desorders of vegetative nervous system. Metod. Recommend]. Kyiv, 2010. 23 p.

34. Gorsha O.V., Savchenko V.M., Shchupilenko L.I. Pathogenetic classification of dysregulation states at the operators of transport (report 2). *Aktualnye problemy transportnoy meditsiny* 2014; 3 (37): 7-15.

35. Samosyuk I.Z. (ed.) *Mnogofunktsionalnaya klinicheskya diaznostika* [Multifunctional clinical diagnosis]. Kyiv. NMTs "MEDINTEKh", 2000. Iss. 2. 158 p.

36. Eckberg D.L. Physiological basis for human autonomic rhythms. *Annals of Medicine* 2000; 32; 5: 341-349.

37. Akimova T.A., Khaskin V.V. *Ekologiya. Chelovek — Ekonomika — Biota — Sreda* [A man — economic – biota – environment]. Moscow, YUNITI-DANA, 2000. 30 p.

38. Kundiev Yu.I., Nagorna A.M. Profesionsl morbidity in Ukraine in long-term dynamics. *Ukrainskiy zhurnal z problem medytsyny pratsi* 2005; 1: 3-11.

39. Ponomarenko A.N., Evstafyev V.N., Skiba A.V. et al. Sanitay-hygienic aspects of exploitation of motor transport. *Aktualnye problemy transportnoy meditsiny* 2007; 3(9): 39-41.

40. Lucini D., Fede G.Di, Parati G., Pagani M. Impact of chronic psychosocial stress on autonomic cardiovascular regulation in otherwise health subjects. *Hypertension* 2005; 46: 1201-1206.

41. Traffic accidents statistics in 2014: where and why. Electronniy resource. Infolight — informational and analytic center. Access mode http://infolight.org.-ua/content/statystyka-dtp-u-2014-roci-de-ta-chomu

42. Panov B.V., Ponomarenko A.N., Gozhenko A.I. Priorities of psychophysiologic researches in labour medicine at transport. *Aktualnye problemy transportnoy meditsiny* 2008; 2: 21-28.

43. Bashkireva A.S. Model of biological age on the indexes of mental capacity in otsenke ускоренного старения водителей автотранспорта. *Uspekhi gerontologii* 2012; 3. C. 448-455.

44. Panov B.V., Zaritskaya L.P., Psyadlo E.M. Ground of methodical approaches to improvenet of health care in motor transport industry. *Aktualnye problemy transportnoy meditsiny* 2007; 1: 27-38.

45. Umanskiy V.Ya., Dudnik I.N., Portas O.V. Estimation of industry factors in drivers and system of measures for improvement of their labour. *Aktualnye problemy transportnoy meditsiny.* Odessa, 2000: 273-277 p.

46. Bashkireva A.S. Features of psychical adaptation and incidence of neuropsychic disorders in commercial drivers. *Meditsina truda i promyshlennaya ekologiya*- 2003; 9:18-25.

47. Kerefova Z.Sh., Zhilova A.A., El'garov A.A. Influence of occupational conditions heart disease incidence in drivers. *Meditsina truda i promyshlennay ekologiya* 2007; 5: 18-23.

48. Mamchik N.P., Kameneva O.V. *Vozdeystvie kompleksa faktorov proizvodstvenoy sredy na zdorove voditeley avtobusov* [Influence of a complex of unfavourable facors of occupation environment on bus drivers health]. Electronic resource. Access mode: http://niiot.ru/article/article16.htm.

49. Bohr P.C. The contribution of cognitive and psychomotor evaluation tools to the assessment of driving potential. *The American journal of occupational therapy* 2008; 62 (2): 159-172.

50. Shafran L.M., Dumskiy V.P. Psychophysiology of workers of transport: prospects of development. *Aktualnye problemy transportnoy meditsiny* 2008; 2 (12): 8-10.

51. Valutsina V.M., Lunin A.N., Mikhaylova T.V. Influence of labour conditions on the state of health in drivers of heavy dump lorry of technological transport. *Aktualnye problemy transportnoy meditsiny*. Odessa, 2000: 58-59 p.

52. Mamchik N.P., Kameneva O.V. Complex hygienic estimation of labour conditions of drivers. *Meditsina truda i promyshlennaya ekologiya* 2002; 7: 16-18.

53. Panov B.V., Starchevs'ka T.V., Kochet O.M. Spa treatment of railway transport workers suffering from essential hypertension. Bulletin of V.V. Pidvysotskyy VIII readings. Materials. Odesa, 2009, 171 p.

54. Melnichenko P.I. Hygiene with the bases of ecology of man. Moscow, GEOTAR-Media, 2010. 752 p.

55. Gozhenko A.I. Patogenesis and sanogenesis in the modern theory of disease. Bulletin of V.V. Pidvysotskyy VIII readings to 150 anniversary of hos birthday : VI Scientific. conf. 31 of May.–1 of June. 2007. Theses of reports. Odesa, 2007, 8-11 p.

56. Pokrovskiy V.I. Modern problems of ecologically and occupation associated diseases. *Meditsina truda i promyshlennaya ekologiya* 2003; 1: 2-6.

57. Zilov V.G. Self-egulation of organism in therapy effects. *Vestnik Rossiyskoy akademii meditsinskikh nauk.* 1996; 12: 23-26.

58. Meerson F.Z. Adataptation medicine: machinisms and protective effects of adaptation. Moscow, Hypoxia Medical LTD, 1993. 331 p.

59. Moncada S., Palmer R.M.J., Higgs E.A. Nitric Oxide : Physiology, Pathophysiology, and Pharmacology. *Pharmacological Reviews* 1991; 43: 109.

60. Veyn A.M. (ed.) *Vehetativnye rasstrroystva : klinika, diahnostika, lechenie* [Vegetative disorders: clinic, diagnosis, treatment]. Moscow, 2003. 752 p.

61. Pankov D.D., Rumyantsev A.G. To the question about definition of terms “neurocirculatory dystonic“ and “border-line state». *Pediatriya* 2003; 2: 98-100.

62. Lisobey V.A. *Zabolevaemost rabotnikov transporta* [Morbidity of transport workers]. Odessa, Chernomorye, 2005. 262 p.

63. Mileryan V.E., Mileryan E.A. *Psikholohiya truda i profesionalnoho obrazovaniya. Izbranye nauchnye trudy*. [Psychology of labour and occupational education. Some scientific works] Kyiv. NPP “Interservis”, 2013. 290 p.

64. Kalnish V.V., Doroshenko M.N., Pyshnov G.Yu. Features of influencing the information loading on people, being in different mental conditions. Electronic resource. *Ukrainskiy meditsinskiy zhurnal* 2014; 5 (103). Access mode: http://www.umj.com.ua/article/80695/osobennosti-vliyaniya-informacionnoj-nagruzki-na-lyudejnaxodyashhixsya- v-razlichnyx-psixicheskix-sostoyaniyax.

65. McNiece K.L., Poffenbarger T.S., Turner JL. et al. Prevalence of Hypertension and Pre-Hypertension among Adolescents. *Journal of Pediatrics* 2007; 150 (6): 640-644.

66. Vale S. Psychosocial stress and cardiovascular diseases. *Postgraduate Medical Journal* 2005; 81:429-435.

67. Khananashvili M.M. *Informatsionye nevrozy* [Information neuroses]. Leningrad, 1974. 135 p.

68. Nakanishi N., Yoshida H., Nagano K. et al.. Long working hours and risk for hypertension in Japanese male white collar workers. *Journal of Epidemiology & Community Health* 2001; 55 (5): 316-322.

69. Vasilenko A.M. Rehabilitation of reflex therapy: questions of terminology and classification. *Refleksoterapiya* 2002; 1(1): 43-46.

70. Deter H.-Ch. Towards a new strategy to implement psychosomatic knowledge in medical practice. H.-Ch. Deter. *BioPsychoSocial Medicine* 2008; 2 (1): 2-3.

71. Ukraintseva Yu.V., Berlov D.N., Rusalova M.N. Individual conduction and vegetative signs of evotional stress in a man. *Zhurnal vysshey nervnoy deyatelnosti* 2006; 56 (2): 183-192.

72. Vasilenko A.M. Elements of modern theory of reflex therapy. *Refleksoterapiya* 2002; 3(3): 28-37.

73. Zhilova I.I., Kerefova Z.Sh., Elgarov A.A. Myocardial infarction in drivers and job performance. *Meditsina truda i promyshlennaya ekologiya* 2007; 5: 7-10.

74. Novitskiy V.V., Goldberh Ye.D., Urazova O.I. (eds) *Patofiziologiya*. [Pathophysiology. A textbook in 2 volumes. 4th ed., process. and add.] Moscow, GEOTAR-Media, 2009, Vol 1. 848 p.

75. Sele G. *Stress bez distressa* [Stress without dystress]. Riga : Vieda, 1992. 110 p.

76. Izmerov N.F., Kasparov A.A. *Meditsina truda. Vvedenie v spetsialnost : posobie po poslediplomnoy podhotovki vrachey* [Occupational medicine. Introduction into the speciality. A manual for post-graduation training doctors]. Moscow, Medicine, 2002. 392 p.

77. Nasibullin B.A., Gorsha O.V., Burlachenko V.P. Morphological correlates of influences of unfavorable factors of motor transport on its workers with occupation experience over 10 years. *Visnyk morfolohii* 2008; 14(1): 230-231.

78. Petersen A., Barrett R., Morrison S.Nhanced postural stability following driver training is associated with positive effects in vehicle kinematics during cornering. *Human factors* 2008; 50 (1): 159-172.

79. Seidova G.B. Urinary acid as one of criteria of metabolic syndrome. *Efferentnaya terapiya* 2006; 11 (4: 24-31.

80. Franse L., Pahor M., DiBari M. et al. Serum uric acid, diuretic treatment and risk of cardiovascular events in the Systolic Hypertension in the Elderly Program (SHEP). *Journal of Hypertension* 2000; 18: 1149-1154.

81. Matlina E.Sh. *Klinicheskaya biokhimiya katekholaminov* [Clinical biochemistry of catecholamines]. Moscow, Meditsina, 1967. 303 c.

82. Tits Morbert U. *Klinicheskoye rukovodstvo po laboratornym testam* [Clinical guidance on laboratory tests]. Moscow, Yunimed-press, 2003. 335 c.

83. Suri M.F., Qureshi A.I. Prehypertension as a risk factor for cardiovascular diseases. Journal of Cardiovascular Nursing 2006; 21 (6): 478-484.

84. Ulaschik V. S. Molekulyarnyie aspektyi deystviya lechebnyih fizicheskih faktorov (vvedenie v problemu) / V. S. Ulaschik. *Meditsinskie novosti* 2003; 1: 30-38.

85. Molostov V. D. *Igloterapiya*. Rostov–n/D, Feniks, 2000. – 480 p.

86. Popova E. V. Otsenka klinicheskoy effektivnosti svetoterapii polyarizovannyim polihromaticheskim svetom apparata Bioptron v kompleksnom lechenii bolnyih s nevrologicheskimi oslozhneniyami saharnogo diabeta, osteohondroza pozvonochnika. *Uspehi sovremennogo estestvoznaniya* 2013; 7: 173-174.

NOMENCLATURE

BAP - biologically active point

HRV - heart rate variability

MR - medical rehabilitation

VNS - vegetative nervous system

HF - high-frequency vibrations of the spectrogram

HHMR - humoral-hormonal and metabolic regulation

ACP – acupuncture

AS - acute stress

RTA - road traffic accident

BI - the Baevsky index

UI - utilization index

SI- strain index

IPC - individual physiological corridor

ED - electropunctural diagnostic

GSR - galvanic skin response

GSR –d - the parameters of galvanic skin response registered on the right side of the body

GSR –s - the parameters of galvanic skin response registered on the left side of the body

CIG – cardiointervalography

CLA - the coefficient of lateral asymmetry

CPT - complex pathogenetic therapy

NS - nervous system

LF - low-frequency fluctuations of the spectrogram

AR - adaptive response "preactivate"

Δx - variational sweep

RC - rehabilitation complex

RT – reflexotherapy

CA - adaptive response "calm activation"

TC - total catecholamines

UA - uric acid

SOT - singlet-oxygen therapy

AV GSR - the average value of GSR

T -adaptive response “training”

GAR - general adaptation reaction

CNS - central nervous system

AR - adaptive response “chronic stress”

MA - mode amplitude

NO - nitrogen oxide

NO2 – nitrites

pNN50 % - the percentage of consecutive RR intervals, the difference between which exceeds 50 ms

SDNN - the standard deviation of normal intervals RR

RMSSD - the square root of the average of the squares of the difference values of successive intervals R-R

R-R - the average duration of RR intervals

CONTENT

Gorsha O. V., Gorsha V. I. Diagnostics and correction of disregulation states by physical methods. Nicolaus Copernicus University, Toruń, Poland, Ukrainian Research Institute for Medicine of Transport, Odesa, Ukraine. 2017. 80 p. Bibliography of 86 items. ISBN 9781387266524. DOI http://dx.doi.org/10.5281/zenodo.1000404
PBN Poland https://pbn.nauka.gov.pl/sedno-webapp/works/832669

ISBN 9781387266524
DOI http://dx.doi.org/10.5281/zenodo.1000404
PBN Poland https://pbn.nauka.gov.pl/sedno-webapp/works/832669

Nicolaus Copernicus University, Toruń, Poland
Str. Lwowska 1, 87-100 Toruń, Poland
www.umk.pl

80 p. Number of characters: 130 000 (with abstracts). Number of images: 10 x 1000 characters (lump sum) = 10 000 characters.
Total: Number of characters: 140 000 (with abstracts, summaries and graphics) = 3,5 sheet publications.

ISBN 9781387266524

ISBN 9781387266524