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Circumpolar conditions impact on the schoolchildren health

Human organism is tightly conjoint with our environment being a part of biosphere. Proper biological functioning and potential opportunities realization of any organism highly depends on environmental conditions which can as provide normal development so lock and deform the «biological clock» functioning and cause the whole range of shifts up to pathological deceases and conditions [2, 4, 7, 10, 14, 18].

It is definitely that extreme climate and geographical conditions of circumpolar area such as cold, surge, humidity, high helio-atmospheric activity, photoperiodicity disturbance, often and great ionosphere disturbance, increasing to the North magnetic field strength and uncertainty have an adverse impact on any organism formation including child's, his physiological systems state and development.

Moreover not a particular ecological factor but cumulative effect of all meteorological elements, not ordinary process of climate periodic variations and magnitudes but their often sudden and rapid changes impact the human organism in circumpolar area.

Climate conditions of circumpolar area contribute to rearrangement of many human body functional systems and form the new body state at the last – adapted, which succeed only by biosocial price.

The base of this phenomenon is a long lasting adaptation with generation of systemic structural track. Adaptation is a process of supporting the functional state of body homeostatic systems that provides its maintenance, development, efficiency, maximum life time within adequate and inadequate environmental conditions [7, 8].

Children development is characterized by significant morphofunctional changes of all organs and systems. Herewith the genetic programme provides sequence of qualitative and quantitative changes and determinates elective sensitization of physiological systems at different milestones in child's development.

So called sensitive periods of development are characterized by functional imbalance between structural alterations and functional opportunities [16]. Especially that regards the teenagers as their growth is accompanied by complex psychological and physiological transformations connected with hormone changes characterized by adaptation mechanism intenseness that makes the organism more sensitive to environmental forcing [17].

Weather factors are also very important for human daily life. Healthy child's organism without weather sensitive features answers the rapid meteorological changes with adequate physiological reaction. The result of negative meteorological changes influence is a disadaptive reaction that is progressive weather sensitiveness with bad mood and negative emotional reactions (insomnia or hypersomnia, depression, fear, aggression), paracenesthesia, asthenia, headache, increase or decrease in arterial pressure, dysorexia, vegetal imbalance, acute exacerbation of chronic diseases.

Child's weather effect influence depends doubtless on meteorological tolerance that is individual limit of negative meteorological effects acceptability. Meteotropic reactions are the result of misbalance between human body and environment [9].

Daily periodicity of day and night alternation is also one of the important ecological factors that form the biological rhythms organizing associated and coordinated activity of all organs and systems, regulation of biochemical and immunological processes daily activity, hormonal system activity, integrative brain activity.

Circumpolar evident seasonal asymmetric of photoperiodicity demonstrating the long daylight during the spring-summer period (from mid May till mid July –

«biological polar day») and short daylight during the autumn-winter period (till 4,5 hours – «biological polar night») can contribute the desynchronization of biological rhythms [1]. Biorhythms' desynchronization (desynchronoze) under the disadaptive distresses or diseases may course serious health problems [15]. Symptomatically it is presented by decreased mental and physical activity, sleep disturbance, emotional instability, and uncertain behavior. Sensorial deprivation and hard depressive disorders can proceed during the polar night. Solar radiation that is increasing during the polar day can initiate nerve excitation, acrimony and than hyper alertness and nervous prostration, increase in arterial pressure, changes in all body systems. Such changes especially impact the children [6]. Anomaly of photoperiodicity undoubtedly impacts the child's CNS, physiological systems state and development and higher nervous activity in particular that is presented by changes of bioelectrical brain activity measures and psychoemotional state. EEG rhythms' changes of the northern 16-17 years old schoolchildren especially during the periods of daylight increasing and decreasing indicate that strong sensory stimulation and deprivation produce adaptive CNS changes, instability of corticosubcortical relations and are accompanied by high level of anxiety. Periods of maximum and minimal daylight duration can be considered more favorable for brain development and cognitive activity elaboration [5]. So, photoperiodical violations impact not only the general human well-being, his physical and mental activity but also the adaptive capacity to ever-changing environmental conditions.

In disregard of the most scientists' opinion that the polar night with the «polar intenseness syndrome» as a regional variant of the chronic fatigue syndrome (reported by V.P. Kaznacheev in 1971) is the most unfavorable period in circumpolar areas there are researches confirming that child's organism functional degradation in the North is possible even in other periods. So, seasonal increase of children chronic somatic pathology falls mainly on autumn and spring periods; hemodynamics indices have the most contrast results in spring (May) and autumn (October), decrease of immunologic reactivity is registered in April and October [13]. Adaptive potential of children from circumpolar areas is also

decreasing within these months [12]. Seasonal dynamic of schoolchildren functional state indices greatly depends on lifestyle, diet, physical and study level.

Diet is very important for human adaptation to the North conditions as body energy expenditure increases. All types of metabolism – protein, carbohydrate, lipid, microelement, and vitamin are involved in the long adaptation process under the North extreme conditions. Herewith it is very important to increase lipid role in the organism energy supply and to use protein actively as energy-related material. Besides, «Polar metabolic type» is formed in the North that is characterized by the carbohydrates role decrease, lipids role increase and proteins in less degree. It is very important to eat more fish, seafood, meet, milk food, cereals and beans and to minimize sugar, salt and carbohydrates.

Local natural resources should be used for rational diet at most. It is well known that the northern plants contain more vitamins (some in tens of times) and BAAs than the southern plants. Foods of animal origin produced in the North have more proper protein. The northern fish have a very high content of polyunsaturated fatty acids which are very important for cardiovascular diseases prevention [2].

Regular exercise is an effective way to improve body resistance to diseases and environmental negative effects. A person going in for sports without overwork and with well-balanced training of all the systems gets an advanced persistence. Physical activity influences the many life support systems - cardiovascular, respiratory, and activates metabolism [4].

It is very important for schoolchildren to keep regular hours for successful adaptation within the Northern environment as the day and night circadian cycle is the important regulator of living body’s physiological rhythms. Light conditions and light lasting actions were changed after the introduction of lamplight and electricity. Evening and even night light exposure is an essential part of schoolchildren modern life style. But night light exposure provokes behavior and health disorganizations as the light at night restrains the night secretion of melatonin in the conoid body which participates in all life activities and controls many body functions. Schoolchildren organisms experience numerous

neuroendocrine overloads during the physiological growth such as pubescence, somatic development, reproductive system cycle, stresses, light intensity and etc. That is why it is possible to minimize negative environmental impacts by conducting the social synchronizing factors such as sleep-wake and rest-work schedules [3].

On the base of long-term research of schoolchildren health in the circumpolar areas the scientists proved that the two-shift study process is unacceptable. The school programme should have two times more lessons of physical training than the central regions schools. The development of special circumpolar areas school project which will take specific study and physical training of healthy schoolchildren into consideration is necessary [11].

As can be seen from the above the regulation of schoolchildren's balanced diet, study hours, physical activity and rest makes it possible to adapt to the extreme circumpolar conditions and to preserve health and high working efficiency.

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