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Influence of Ecotoxicants on Immune System of the Aral Sea Region People's Health

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Abstract: The Aral Sea problem, as the largest environmental disaster in the world, has acquired an acute character. Intense desertification, sustainable irreversible degradation of the environment and deterioration of living conditions caused an increased incidence of new socio-economic and environmental situations that require legislative solutions and legal regulation of social protection of the population living in ecologically unfavorable areas. To assess the immune status used standard immunoassay method for the determination of immunoglobulin A, M, G, E. on the results of the study we found that the content of the class IgE women zone eco-catastrophe in all age groups were significantly lower than in women zone of ecological crisis, while male the zone of ecological disaster, on the contrary, there was increased concentration of it, especially in the young and the oldest age groups, in which the figure reached a peak (At mean values) in excess of the normal levels, which may constitute a risk of formation, in the future of allergy. The concentration of IgG, M level in men environmental crisis zone was higher than that of similar groups in the zone of ecological disaster, which indicates the probability of a large environmentally induced immunological stress the population of the area adjacent to Aral. At the same time, the analysis of the frequency of pathologically reduced content of IgM, G in males and female's zone eco-disaster set its highest frequency, compared to the population of eco-zone crisis.

Key words: Immunoglobulins · Environmental crisis · Aral Sea · Immune deficient

INTRODUCTION

Human ecology is a science that focuses on the relation of human with all environmental factors and specifies optimal ratios of these relations. Modern civilization exerts unprecedented pressure on nature and a man had become a primary cause of ecological crisis worldwide. Environment contamination with the industrial emissions, increased production, agricultural chemicals and other anthropogenic processes, have a negative impact on humans, animals, plants, soil, reduces the atmosphere transparency, increases the humidity, increases the number of foggy days, reduces visibility, causes corrosion of metals and, on top of that, results in the change in ecological balance, sometimes irreversible [1]. The problem of survival and preservation of natural biosphere can be solved only by compromising and search of optimal solutions. Therefore, the scientists around the world face the problem of researching the impact of ecology and the environment on the human organism and to finding effective methods of ecologically conditioned diseases prevention.

In Kazakhstan, ecology and human health is one of live issues [2]. Impact of eco-technological factors in the era of progress had grown dramatically and amounted to catastrophic scale. For example, in Central Kazakhstan region alone, industrial facilities emitted 1 million 124 thousand tons of harmful substances to the atmosphere, including 116 thousand tons in Karaganda and 800 thousand tons in Temirtau. The total volume of the harmful substance discharge amounted to 135 million 458 thousand m^3 a year [3]. The average daily concentrations of sulfur dioxide, carbon monoxide, formaldehyde, hydrogen sulfide, phenol, mercury, nitrogen oxides, dust, soot and others in some places are far above the permissible levels.

Kazakhstan scientists also studied the relation between West Kazakhstan region population's cancer morbidity and Kokchetau area carcinogens pollution [4].

Deteriorating environmental situation in the northern region of Kazakhstan contributes to continuous growth in the total population morbidity, including cancer. In this regard, the scientists of Kazakhstan carried out research work on the medical and social assessment of the

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population health status in conditions of long-term toxic effects of radiation. In addition, children and adults health screening tests had been carried out in the regions of Northern Kazakhstan adjacent to the areas of rockets start-up and falling [5].

Leading anthropogenic factor affecting people in Zhambyl biogeochemical region is industrial emissions of phosphate fertilizers (Phosphorus pent oxide, phosphine in combination with "widespread" pollutants). Analysis of the health showed a significant increase in certain diseases due to exposure to emissions of phosphorus production is 20-22 nosological forms; in this vein, the basic methodological approach to health and the environment must be scientifically sound socio-hygienic monitoring with active participation of doctors.

Due to techno genic environmental pollution in the East Region of the Republic of Kazakhstan, adverse ecological conditions had formed. It goes in parallel with the similar trend concerning other groups of diseases [6].

South Kazakhstan region is an environmentally disadvantaged region of Kazakhstan. Some researchers [7] reported on the growth of neonatal pathology, liver disease and cancer as an indicator of the ecological situation in the region.

The Aral Sea problem, as the largest environmental disaster in the world, has acquired an acute character. Based on the decision of the Supreme Council of the Republic of Kazakhstan dated 18 January 1992 "On urgent measures on radical transformation of the Aral Sea region population's living conditions" the Kazakh part of the Aral Sea region declared an ecological disaster zone. Intense desertification, sustainable irreversible degradation of the environment and deterioration of living conditions caused an increased incidence of new socio-economic and environmental situations that require legislative solutions and legal regulation of social protection of the population living in ecologically unfavorable areas [8].

One of the recognized crisis regions of Kazakhstan is the Aral Sea region. Sanitary and environmental situation in the Aral Sea region is currently continuing to deteriorate. Aral Sea level continues to fall; there is a process of further desertification of the Syrdarya river delta. By 2000, more than half of 1.5 million hectares of soil had been dried, salinized and devastated. Overall arid climate of Aral Sea region leads to increase its continental traits, increased difference between summer and winter air a temperature, which worsens the existing difficult conditions in the plains [9, 10].

The impact of pesticides on human health presents a great problem for public health. According to the Ministry of Health of the Republic of Kazakhstan, the amount of pesticide use in agriculture of Aral Sea region is more than 500 tons per year. Over the last 8-10 years, the use of pesticides in the Aral Sea has decreased by 5 times. Extremely poor conditions of storage and uncontrolled use continue to pollute the environment of the region. Therefore, organ chlorine pesticides are found in high concentrations in soils, groundwater and river water of the Syr-Darya and in the blood of the examined indigenous peoples.

In recent years, in the world in general and in the Aral region in particular is paid much attention to heavy metals influence on the human body, especially lead. Lead enters the environment with exhaust gases of vehicles, used as fuel leaded gasoline, the emissions of the processing industry, with drainage water and dust from the dried bottom of the Aral.

Deteriorating environment had an effect on health of the population. Numerous studies conducted by scientists of Kazakhstan and Karakalpak region, showed that the state of the health of Aral region population continues to deteriorate in the recent decades [10]. The overall morbidity of the population since 1990 had increased by more than 3 times. Almost as many times increased the level of congenital anomalies, tumors, diseases of the respiratory and digestive system, by more than 2-fold increase in the incidence of blood and blood-forming organs and endocrine system.

In the Aral Sea region, more than half of pregnant women suffer extra genital diseases and there are large numbers of abortions. The study indicated an adverse effect of Aral region's environmental factors on the somatic, gynecological diseases, the etiology and structure of miscarriage. In this case, poor health of women is reflected in the health of their children, as in the Aral Sea region the infant mortality rate is 2.5 times higher than the national average indicators and ranges in Chalkarsk district of Aktobe region 28.7; Aral and Kazalinsk areas 35.7 and 29.7 per 1000 live births.

The results of the research in environmentally disadvantaged Aral Sea region there is a significant slowing of puberty girls. The obtained preliminary results of a study of the physical development of children aged 3-6 years, the Aral and Kazalinsk, Zhanakorgan (Control) areas of Kyzylorda oblast showed that height, weight and chest circumference of boys and girls in some age groups

experienced areas is lower than in the control area, as well as those of their peers in Alma-Ata. In addition, there is an increase in the percentage of chronic diseases of the urinary system, in the structure of which the pyelonephritis is still on the first place. However, there is a significant reduce in the number of acute processes and an increase in chronic and sub acute forms of oligosymptomatic pyelonephritis [10]. Thus, the environmental condition in the various regions, of Kazakhstan and neighboring countries remains unfavorable. The results of studies of domestic scientists suggest a progressive increase in the number of environment-related diseases in the population living in ecologically unfavorable region of Kazakhstan Aral Sea region. In this regard, the current study of the health status of the population in the zone of ecological crisis, Aral Sea region is important.

It is known that the immune system is a dynamic, constantly updated system with complex mechanisms of regulation and interaction with many systems of the body. The sensitivity of the individual parts of the immune system to any factors is different, but in any case it is a critical target for a large number of factors eubiotics and physical nature.This fact causes the formation of the body changes prenosological immune reactivity, which on the one hand, are markers of disadvantage of living conditions and on the other provide the basis for a subsequent development of disease, chronic or worsening of existing diseases. However, the assessment of the situation, when revealed aftereffects, leave no room for preventive measures. When predicting the health status of the population is very important to identify prepathological state, including immunopathology of primary importance and eventually leads to the development of inflammatory, allergic, autoimmune diseases, cancer.Thus, environmental factors cause immunological adjustment of the organism population (Immunotoxic, immunosuppressive and immunostimulatory effects with the development of hypersensitivity and autoimmune reactions) contribute to the initiation of environment-related diseases.

Aim of the study: to estimate status of humoral immunity in population of Aral Sea region.

MATERIALS AND METHODS

During study, the study population was divided Aral Sea region by sex, age and analyzed separately in the zone of ecological disaster zone and the ecological crisis.

In this paper general-clinical, immunological methods of research were used.

Blood sampling was carried out on-site survey in equipped treatment room. Take away 3-5 ml of whole blood in EDTA tube. Blood serum was separated by centrifugation after the initial settling for clot formation. Serum was decanted into a Cry vial and frozen. Samples were stored at -15 ° C -20 ° C until the moment of the study (Up to 1 month, which allowed manufacturers of kits).All laboratory methods were carried out in the laboratory shared research center of Karaganda State Medical University on their own equipment.

To assess the immune status used standard immunoassay method for the determination of immunoglobulin A, M, G and E. Chromogenic ELISA kits were used for the production Alkor Bio (Russia) and ELISA robotic station Evolis and Tecan. Control materials producer were used.

DISCUSSIONS

As a result of investigations it was found that in the zone of ecological disaster content IgM exceed those figures in women compared with its concentration in the male population, IgA content is not much different from its concentration in men, with the exception of a slight decrease in this indicator in the age group 40 49 years old (Tables 1,2).

At the same time, the lowest concentration of immunoglobulin class A (Average 1,38 ± 0,50 g / l) was observed in the youngest age group of women (18-29 years). On the contrary, in this age group showed the highest content of immunoglobulin class E (66, 17 ± 17,2 U / L).

The concentration of IgM and IgG between the age groups of women, on average, was not of a pronounced difference.

The content of immunoglobulin G was slightly higher on the relevant age subgroups in women than in men.

The content of immunoglobulin E in women at all ages examined ecological disaster area was much lower than in men.

In men, the zone of ecological disaster, the highest levels of immunoglobulin E class (100, 54 ± 113,0 IU / L) is traced in the oldest age group (40-49 years) higher than at the average level, its generally accepted normal levels. In contrast, in the same age were low concentration IgG (8,01 ± 2,8 g / l). Also, the lowest concentration of

Table 1: Contents of immunoglobulins in women Aral Sea region,, M ± m

	age	IgE IU / l	IgM g / l	IgA g / l	IgG g / l
Zone eco-disaster	18-29	66,17±71,2	1,67±0,97	1,38±0,50	9,0±3,5
	30-39	62,11±63,14	1,68±0,70	1,51±0,61	8,99±3,61
	40-49	63,16±70,1	1,64±0,79	1,49±0,62	8,86±3,61
Eco-zone crisis	18-29	84,03±88,4	1,84±0,71*	1,50±0,59	10,33±5,51
	30-39	84,03±85,5	1,88±0,74***	1,50±0,76	13,59±10,5**
	40-49	87,44±98,11	1,86±0,67**	1,46±0,57	12,54±7,02*

Note * P=0.05 ** p=0.02 **** p=0.01

Table 2: Contents of immunoglobulins in males Aral Sea region, M ± m

	age	IgE IU / l	IgM g / l	IgA g / l	IgG g / l
Zone eco-disaster	18-29	84,11±101,4	1,30±0,56	1,47±0,56	8,45±9,84
	30-39	72,7±76,0	1,17±0,56	1,53±0,56	8,71±3,36
	40-49	100,54±113,02	1,38±0,64	1,67±0,67	8,01±2,8
Eco-zone crisis	18-29	72,25±77,02	1,54±0,5***	1,53±0,62	14,19±9,41***
	30-39	76,81±85,37	1,56±0,55***	1,47±0,56	15,84±6,4***
	40-49	72,74±80,90	1,49±0,55	1,52±0,59	15,9±10,2***

Note * P=0.05 ** p=0.02 **** p=0.01

the immunoglobulin class M (1,17 + 0,56 ± g / l) fixed to the age group (30-39 years) and immunoglobulin A (1,47 ± 0,56 g / l) - 18 in a group -29 years.

In the area of environmental crisis in women, similar to the area of eco-catastrophe indicated higher levels of immunoglobulin class M in all age groups than men, respectively [3].

IgA content in women of the area in these age groups did not differ among themselves and the content of it in the relevant age groups of men. In this case, the lowest concentration of it (1,46 ± 0,57 g / l) was observed in the oldest age group of women (40-49 years) and men - in the middle age group (30-39 years) and was 1 47 ± 0,56 g / l.

IgG concentration in women eco-zone crisis was lower than in men of the area, with the lowest concentration (10,33 ± 5,51 g / l) was observed in the youngest age group (18-29 years) and the highest (13,59 ± 10,5 g / l) - in the middle group (30-39 years). In men, low levels of IgG (14,19 ± 9,41 g / l) was observed in young adults (18-29 years).

Compared with men, eco-zone crisis IgE content of the women had, on average, lower by more than 10 international units, but still did not exceed the generally accepted normal values for the content of this indicator. The highest level of IgE (76, 81 ± 85,37 IU / L) was in the middle age group of men (30-39 years).

Thus, based on the results of this study, found that the content of the class IgE women zone eco-catastrophe in all age groups were significantly lower than in women zone of ecological crisis, while male the zone of ecological disaster, on the contrary, there was increased concentration of it, especially in the young and the oldest age groups, in which the figure reached a peak (At mean values) in excess of the norm, which may constitute a risk of formation, in the future of allergy. That is proved earlier data founds, of previous researches [9, 10].

The concentration of IgG, M levels in men at environmental crisis zone was higher than that of similar groups in the zone of ecological disaster, which indicates the probability of a large environmentally induced immunological stress the population of the area adjacent to Aral. At the same time, the analysis of the frequency of pathologically reduced content of IgM, G mail and female's zone eco-disaster set its highest frequency, compared to the population of eco-zone crisis. Our getting results are comparative and totally complained to literature data [9, 10].

CONCLUSIONS

Increasing level of immunoglobulin E affects women at ecological crisis zones and men of older age group zone of ecological disaster Aral Sea region that can be attributed to them at risk of formation of allergic diseases.In our research development of immunedeficiency syndrome in all studied people, is revealed development of immune pathological of different genesis: decreasing of anti-infective immunity and decreasing activity of allergic response, during the complex influence of toxic environmental factors: dust -

salt aerosols, heavy metals, radioactive source [1, 4]. In our hypothesis, decreasing of adaptive- compensatory reactions can be mechanism development of immune pathology in the connectivity with imbalance of intercellular metabolic processes, disturbance of receptor function, disturbance of signalization processes, bringing to forming of pathological processes with different genesis on molecular-cellular level during the influence of environmental toxicants of different source.

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