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Sobol E. V., Sheiko V. H.

THE STATE OF CELLULAR LINK OF SYSTEMIC IMMUNITY UNDER INFLUENCE OF GEOCHRONOCLIMATIC FACTORS

Sumy state pedagogical university named after A. S. Makarenko (town Sumy)
icenntt@gmail.com

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Introduction. The optimal functioning of holistic organism in the conditions of adaptation is provided by the concerted reactions of the different functional systems. Thus in the process of adaptation reactions forming the separate functional systems have different importance that is predefined by their functional reserves. Physical and psychoemotional overload considerably increase the risk of development of immune-dependent diseases [1,2,3,4].

The immune system is the most difficult system of our organism which tenderly reacts to the slight changes of external and internal environment. Research works of the last years in sphere of immunology showed that the immune system not only determins firmness to the pathogens but also provides an immunological supervision for maintenance of internal homoeostasis. Because of functions violations of any link of the immune system there can be different pathosiss and diseases [5].

Among reasons that cause disorders of immune status we can single out influence of different bacterial, viral and other infections and also various pathosiss and extreme states of organism [3,4,6]. Geochronoclimatic factors belong to such extraordinary conditions.

Modern society is informatively-cybernetic, but also it has another feature – the rapid moving of human beings to long distances by means of speed transport systems: airplanes, helicopters, trains, cars. Movement through a few time, climatic and geographical zones is a complex exogenous factor that causes stress-reaction of organism of modern human.

Purpose of research. Thus, the aim of our research is finding out of indexes of cellular link of systemic immunity of people that overcame over 6500 km and crossed few climatic zones and 6 time zones as well.

Object and research methods. 50 volunteers who were divided into two groups took part in research: the first control group contained 25 persons, the second experiment group contained 25 persons. All volunteers were practically healthy people ages from 25 to 45. Study was conducted observing norms and laws of Ukraine about Bioethics [7].

The participants of an experiment group overcame 6500 kilometres in 8 hours and 40 minutes, departing by airplane from "Boryspil" International airport (Ukraine) and arriving to the "Shoudu" International airport (Beijing – the capital of People's Rebublic China). Beijing is located in a monsoon-subtropical zone and in GMT+08:00 time zone and Kyiv is located in a mildly-continental climatic zone and in GMT+02:00 time zone. The difference of time between Kyiv and Beijing is +6 hours [8]. Therefore duration of trip was 14-15 hours.

General amount of leucocytes, relative and absolute amount of neutrophils, monocytes, lymphocytes, all subpopulations of T-lymphocytes (T-helpers/inducers, T-suppressors/cytotoxic), B-lymphocytes by means of the methodology of monoclonal bodies was researched [5].

All researches were conducted on base of the madical service of "Eurasia Erlebnisreisen" GmbH, Lahr (Germany).

All results which we got were statistically worked according to generally accepted methodologies [9,10].

Research of indexes of peripheral blood in both groups were conducted before the beginning, and in an experiment group right after flight and in twenty-four hours after flight.

Research results and discussion. Research results are presented in **table.**

General amount of leucocytes of volunteers of the second group practically did not differ from control one, except indexes that were got after twenty-four hours after flight; where reliable reduction of general amount of leucocytes was traced as compared to control in 10 %.

Different changes of content of lymphocytes in peripheral blood of volunteers of the second group were traced in particular right after flight a tendency to the absolute increase of lymphocytes in 10 % as compared to control and in 12 % as compared to a initial data was traced.

In twenty-four hours after flight reliable reduction of absolute amount of lymphocytes is traced in peripheral blood of volunteers of the second group in 15 % compared to a control group and in 14 % compared to initial data.

The cellular link of system immunity is formed by T-lymphocytes and all subpopulations of T-lymphocytes (T-helpers/inducers (CD4), T-suppressors/cytotoxic (CD8)).

So the absolute amount of T-lymphocytes in an experiment group from the time after the flight increased in 12% as compared to control group and by initial data. The relative number of T-lymphocytes in the experiment group right after the flight did not change as compared to control group and by initial data as well.

It should be stressed that absolute amount of T-helper/inducers (CD4) right after the flight in the experiment group increased in 9% and 8% as compared to control group and in comparison with initial data. The relative amount of T-helper/inducer (CD4) right after the flight decreased in 3% and 4% as compared to control group and in comparison with initial data.

The absolute amount of T-suppressors/cytotoxic (CD8) in volunteers of the second group right after the flight increased in 28% and 33% in comparison with control group and initial data. The same tendency was traced in relative indexes, namely, an increase in T-suppressors / cytotoxic in 14.6% and 19% as compared with control group and initial data.

Table.

The state of indexes of cellular link of systemic immunity

Indexes	Control group (practically healthy people) (n=25) M±m	Experiment group (n=25) M±m		
		Before flight	Right after flight	In twenty-four hours after flight
Leucocytes, G/l	8,12±0,12	7,9±0,1	7,8±0,19	7,29±0,11*
Lymphocytes, G/l	2,3±0,15	2,27±0,13	2,54±0,14	1,96±0,11*
Lymphocytes, %	28,4±0,16	28,7±0,16	32,6±0,21	26,9±0,21
T-lymphocytes, G/l	1,68±0,1	1,68±0,12	1,88±0,15	1,44±0,11*
T-lymphocytes, %	73,2±0,21	74,0±0,28	74,02±0,25	73,46±0,22
T-helpers/inducers, G/l	1,08±0,08	1,09±0,09	1,18±0,08	0,94±0,03*
T-helpers/inducers, %	64,29±0,46	64,88±0,54	62,77±0,76	65,27±0,87
T-suppressors/cytotoxic, G/l	0,53±0,07	0,51±0,09	0,68±0,09	0,44±0,06*
T-suppressors/cytotoxic, %	31,55±0,47	30,36±0,89	36,17±0,65	30,6±0,22
B-lymphocytes, G/l	0,32±0,02	0,31±0,03	0,39±0,05	0,30±0,08
B-lymphocytes, %	14,2±0,54	13,66±0,43	15,35±0,55	15,31±0,51

Note: *- p<0,05, that is expected in relation to the indexes of control group.

Lymphocytes with membrane marker CD19 (B-lymphocytes) in volunteers of the second group right after the flight are characterized by a tendency to increase both absolute and relative indexes as compared to control and with initial data (absolute increased in 22% and 25,8%; relative increased in 8% and 12.4%), while the specified changes were not reliable.

In twenty-four hours after flight reliable reduction of absolute amount of lymphocytes with membrane marker CD3 (T-lymphocytes) has reliably decreased as compared to control indexes and with initial data, in particular in 14%. Relative indexes of the amount of lymphocytes with the membrane marker CD3 in twenty-four hours after the flight did not changed.

The absolute amount of lymphocytes with membrane marker CD4 (T-helper/inductors) in twenty-four hours after flight has reliably decreased in 13% as compared to control indexes while the relative amount of this subpopulation of lymphocytes has not changed.

The lymphocytes with membrane marker CD8 (T-suppressors/cytotoxic) in twenty-four hours after the flight were characterized by a reliably decrease in the absolute amount as compared to control indexes and by initial data in 17% and 14% accordingly. The relative amount of lymphocytes with the membrane marker CD8 has not changed in twenty-four hours after the flight, but the tendency to its reduction should be noted.

Subpopulation of lymphocytes with membrane marker CD19 (B-lymphocytes) in twenty-four hours after the flight did not undergo reliably changes in both absolute and relative characteristics but we identified a tendency to decrease in absolute indexes.

One should stress the fact that in twenty-four hours after the flight all the parameters of the nonspecific and cellular links of systemic immunity were characterized by a general decreasing in absolute indexes and the relative indexes were stable, indicating the functional strain of the researched links but without forming deep immune disorders.

Thus, flight, that lasted 8 hours and 40 minutes from “Boryspil” International airport (Ukraine) to the “Shoudu” International airport (Beijing – capital of People’s Republic China), and overcoming distance 6500 kilometres and 6 time zones caused tendency of general reduction in amount of leucocytes, reduction of absolute amount of neutrophils, monocytes, lymphocytes of all subpopulations that specify violation of protective functions of cellular link of systemic immunity under act of geochronoclimatic factors, that coincide with the stress theory of adaptation period.

Conclusion. Protective functions of cellular link of systemic immunity are diminished under influence of geochronoclimatic factors and are in need of immunoprophylactic measures.

Prospects of further research. Influence of geochronoclimatic factors on the indexes of humoral links of systemic immunity should be analysed.

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СТАН КЛІТИННОЇ ЛАНКИ СИСТЕМНОГО ІМУНІТЕТУ ПІД ВПЛИВОМ ГЕОХРОНОКЛІМАТИЧНИХ ФАКТОРІВ

Соболь Є. В., Шейко В. І.

Резюме. Оптимальне функціонування цілісного організму в умовах адаптації забезпечують узгоджені реакції різних функціональних систем. При цьому в процесі формування адаптаційних реакцій окремі функціональні системи мають різну значимість, що зумовлено їхніми функціональними резервами. Особливістю сучасного середовища є швидке переміщення людини на великі відстані за допомогою швидкісних транспортних засобів: літаків, гелікоптерів, потягів, автомобілів. Саме таке переміщення через декілька часових, кліматичних та географічних поясів і є комплексним екзогенним фактором, який викликає

стрес-реакцію організму сучасної людини. До таких надзвичайних умов належать і геохронокліматичні фактори, під впливом яких порушуються захисні функції клітинної ланки системного імунітету.

У статті досліджено зміни клітинної ланки системного імунітету у осіб, які перетнули 6500 км, тобто декілька географічних, часових та кліматичних поясів. Показано, що під впливом вказаних факторів відбулося зниження абсолютного числа лейкоцитів. Вміст лімфоцитів зазнав різнонаправлених змін: відразу після перельоту – виявлена тенденція до збільшення абсолютних значень, через добу після перельоту – до зменшення. Одразу після перельоту вміст Т-лімфоцитів (CD3) майже не зазнав змін, однак через 24 години відбулося зменшення їх абсолютних чисел. Відмічено зростання абсолютної кількості Т-хелперів/індукторів (CD4) відразу після перельоту та через добу, при одночасному зменшенні їх відносного вмісту. Одразу після перельоту абсолютна та відносна кількість Т-супресорів/цитотоксичних (CD8) збільшилася, як і вміст В-лімфоцитів (CD19). Через 24 години після перельоту відмічена тенденція до зниження абсолютних чисел В-лімфоцитів, відносні значення залишились на тому ж рівні.

Ключові слова: адаптація, геохронокліматичні фактори, клітинна ланка, системний імунітет.

СОСТОЯНИЕ КЛЕТОЧНОГО ЗВЕНА СИСТЕМНОГО ИММУНИТЕТА ПРИ ВОЗДЕЙСТВИИ ГЕОХРОНОКЛИМАТИЧЕСКИХ ФАКТОРОВ

Соболь Е. В., Шейко В. И.

Резюме. Оптимальное функционирование целостного организма в условиях адаптации обеспечивают согласованные реакции разных функциональных систем. При этом в процессе формирования адаптационных реакций отдельные функциональные системы имеют разную значимость, что обусловлено их функциональными резервами. Особенностью современного общества есть быстрое перемещение человека на большие расстояния с помощью скоростных транспортных средств: самолетов, вертолетов, поездов, автомобилей. Именно такое перемещение через несколько часовых, климатических и географических поясов и есть комплексным экзогенным фактором, который вызывает стресс-реакцию организма современного человека. К таким чрезвычайным условиям принадлежат и геохроноклиматические факторы, под влиянием которых нарушаются защитные функции клеточного звена системного иммунитета.

В статье исследованы изменения клеточного звена системного иммунитета у людей, которые пересекли 6500 км, то есть несколько географических, часовых и климатических поясов. Показано, что под влиянием указанных факторов произошло снижение абсолютного числа лейкоцитов. Содержание лимфоцитов претерпело разнонаправленные изменения: сразу после перелета – выявлена тенденция к увеличению абсолютных значений, а через сутки после перелета – уменьшение. Сразу после перелета содержание Т-лимфоцитов (CD3) почти не изменилось, однако через 24 часа произошло уменьшение их абсолютных чисел. Отмечено увеличение абсолютного количества Т-хелперов/индукторов (CD4) сразу после перелета и через сутки, при одновременном уменьшении их относительного содержания. Сразу после перелета абсолютное и относительное количество Т-супресоров/цитотоксичных (CD8) увеличилось, как и содержание В-лимфоцитов (CD19). Через 24 часа после перелета отмечена тенденция к снижению абсолютных чисел В-лимфоцитов, относительные значения остались на том же уровне.

Ключевые слова: адаптация, геохроноклиматические факторы, клеточное звено, системный иммунитет.

THE STATE OF CELLULAR LINK OF SYSTEMIC IMMUNITY UNDER INFLUENCE OF GEOCHRONOCLIMATIC FACTORS

Sobol E. V., Sheiko V. H.

Abstract. The optimal functioning of holistic organism in the conditions of adaptation is provided by the concerted reactions of the different functional systems. Thus in the process of adaptation reactions forming the separate functional systems have different importance that is predefined by their functional reserves. The feature of modern environment is the rapid moving of human beings to long distances by means of speed transport systems: airplanes, helicopters, trains, cars. Movement through a few time, climatic and geographical zones is a complex exogenous factor that causes stress-reaction of organism of modern human. Geochronoclimatic factors belong to such extraordinary conditions under the influence of which the protective functions of the cellular link of systemic immunity are violated.

In the article are changes of the cellular link of systemic immunity in volunteers who crossed 6500 km that is several geographic, time and climatic zones has researched. It was shown that under the influence of these factors there was a decrease in the absolute number of leukocytes. The content of lymphocytes has undergone various changes: right after the flight – a tendency to increase the absolute values, in twenty-four hours after the flight – to decrease.

The content of T-lymphocytes (CD3) almost did not change right after the flight however in twenty-four hours after the flight there was a decrease in their absolute numbers. The increase in the absolute number of T-helper/inducers (CD4) was noted right after the flight and in twenty-four hours after the flight with a simultaneous decrease in their relative content. Right after the flight the absolute and relative number of T-suppressors/cytotoxic (CD8) increased as well as the content of B-lymphocytes (CD19). In twenty-four hours after the flight a tendency to decrease in the absolute numbers of B-lymphocytes was observed, the relative values remained at the same level.

Key words: adaptation, geochronoclimatic factors, cellular link, systemic immunity.

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