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**DYNAMICS OF INDICES REFLECTING IMMUNE HOMEOSTASIS AND
MARKERS OF OXIDATIVE STRESS UNDER IMPACT
OF AMBROSIA (PERGA)**

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To avoid negative influence of oxidative stress upon the processes of human homeostasis, additive quantities of antioxidants are indispensable. Biomodulative effects of ambrosia (perga) which were studied during programme of correction carried out on 29 persons aged 34-50 years, working under harmful conditions, who used ambrosia (perga) in a period of 1 month. Control group used placebo. To evaluate processes of their homeostasis, clinical analyses of peripheral blood, indices of blood lipids in blood serum were studied. Status of the immune system evaluated determining leukocyte formula, indices of cell and humoral immunity. Processes of lipid peroxidation and activity of antioxidative system were evaluated by examination of concentrations of primary and secondary lipid peroxidation metabolites, and activity of the catalase. Blood tests applying standard methodologies were studied before and after the course of treatment. All participants finished the program. Considerable positive changes established after the treatment like diminution of immunodeficiency, reduced amounts of the metabolites of lipid peroxidation, positive changes of tests of blood lipids, substantiate recommendations for more extensive usage of ambrosia (perga) as an effective biomodulative complex for rehabilitation and strengthening of health of different contingents of population and groups of high risk.

Keywords: ambrosia (perga), beepollen, immune homeostasis, lipid peroxidation, antioxidative system.

ДИНАМИКА ПОКАЗАТЕЛЕЙ ИММУННОГО ГОМЕОСТАЗА И МАРКЕРОВ ОКСИДАТИВНОГО СТРЕССА ПОСЛЕ ПРИМЕНЕНИЯ ПЕРГИ

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Для защиты организма человека от негативного воздействия окислительного стресса необходимо обеспечить его дополнительными антиоксидантами. С целью изучения биомодуляторной эффективности перги провели один курс коррекции 29 лицам 34-50 лет, работающим во вредных условиях производства, которые принимали цветочную пыльцу 1 месяц. Контрольную группу составляли 29 человек того же возраста, работающие в невредных условиях производства и которые принимали плацебо в течение месяца. Состояние процессов гомеостаза оценивали по динамике анализов периферической крови, показателей липидного обмена, показателей иммунологических тестов и свободнорадикального окисления, которые проводились до и после коррекции. Программу закончили все участники. После применения перги выявлены позитивные изменения исследованных показателей гомеостаза – снижение иммунодефицита, количества метаболитов перекисного окисления и липидов крови. Учитывая полученные данные необходимо чаще и активнее использовать пергу в качестве эффективного комплекса биомодуляторов для восстановления и улучшения состояния здоровья разных контингентов населения и групп высокого риска.

Ключевые слова: перга, пыльца цветочная, иммунный гомеостаз, перекисное окисление липидов, антиоксидантная система.

Introduction

A direct correlation exists between environmental pollution and the healthiness of population [1,2]. Ecological and industrial factors exert various negative influences upon the human organism, and the kind of them depends on their quantitative and qualitative parameters as well as the period of their action. These factors may directly or indirectly influence nervous, endocrinal, cardiovascular and other systems of organism, exhaust its safeguarding powers, weaken its immunity and in this way form endogenic risk factors of atherosclerosis, cancer and other diseases [3,4,5].

A large number of people are working under harmful industrial conditions. Acting for a long period of time, all these factors cause high indices of morbidity with temporal disablement, that is why morbidity indices of workers from enterprises of heavy industry are the highest ones among other branches of industry [6,7, 8].

Unfavourable industrial factors enlarge alterations of human homeostasis caused by oxidative stress increasing risk of cancer, ischaemic heart disease, diabetes and others [9, 10]. Risk factors of a number of noncommunicable diseases are closely interdependent. Beside traditional ones, such as tobacco smoking [11], hypercholesterolemia, arterial hypertension, overweight, new ones constantly have been found, and their detection and modification lean on new facts concerning the pathogenetic mechanisms of chronic diseases. Modification of large part of risk factors of inner and outer origin demands from the person - to achieve important changes in one's nutrition, restrict harmful habits and to use supplementary antioxidants [12, 13].

Problems of the health of able-bodied people living and working under complicated conditions of exogenous contamination force to search for non-standard, efficient and cheap measures of prophylaxis and rehabilitation. Experience of many sanatoriums and centres of rehabilitation during a long period of observation showed efficiency of nonmedicamental complexes including physiotherapy, balneotherapy, phytotherapy and bee products [14]. These complexes respectively reduced general

morbidity indices including morbidity with acute respiratory infections among them, and caused significant positive changes of altered blood indices.

To avoid negative influence of oxidative stress upon the processes of human homeostasis, additive quantities of antioxidants are indispensable. Bee pollen is native biomodulator whose ethno-cultural traditions of usage among population of many countries are in a depth of centuries but best effect for correction problem with health from using ambrosia (perga). Ambrosia (perga) is a natural derivative of pollen which the bees are fermented in the cells of their beehive and it's impossible to get artificially [15].

In present study, results of investigations carried out on the state of health of people working under impact of unfavourable factors of engineering industry as well as the results of the correction of deranged processes of homeostasis based on the ground of dynamics of the altered indices of homeostasis, applying native biomodulators of ambrosia (perga), are summarised.

Subjects and methods

During investigations, 29 workers, 9 female and 20 male among them, from enterprise of heavy industry were examined. They all weren't at the dispensary at the doctor before these investigations - neither men nor women, old-mature aged (34-50 years), working under harmful conditions of metal-processing for no less than 10 years. The control group consisted of 29 people of the same age working in no harmful conditions of production. To evaluate processes of their homeostasis, following analyses and tests were studied:

1. Clinical analyses of peripheral blood is made on the Hematology analyzer SYSMEX xt2000i (USA), lipid metabolism, humoral immunity, ceruloplasmin, indicators of lipid peroxidation: diene conjugates(DK) and malondialdehyde (MD), and antioxidant enzyme catalase (C) investigated on the analyzer Olympus 2700 (Japan), phagocytic index (PhI), phagocytic number (PN), of circulating immune complexes CiC was studied by using manual methods. The population level of common anti-

bodies (NA) against anti-bacterial antigen (CEA) was using IFA method on the spot spectrophotometer Magelan F50 (Austria). Cellular immunity was investigated using flow cytometer BD FACS Canto II (USA).

2. To evaluate status of the immune system, the leukocyte formula was determined, indices of cell immunity were estimated, including total leucocyte count, lymphocyte and monocyte percentage and absolute count, total T-lymphocyte population (CD3+), T helpers (CD4+), T suppressors (CD8+), the immunoregulatory index CD4+/CD8+, B lymphocytes (CD19+), NK cells (CD16+), phagocytosis index PhI and phagocytosis number PN, and 2 leukocyte migration inhibition reactions (LMIR). Lymphocyte populations and subpopulations were counted in percentage and in absolute numbers. To evaluate the humoral chain of immunity, concentrations of immunoglobulines (Ig) IgA, IgG, IgM in blood serum as well as populative levels of native antibodies against common enterobacterial antigen (NA against CEA) were estimated.

3. To evaluate processes of lipid peroxidation and activity of antioxidative system, concentrations of primary and secondary lipid peroxidation metabolites, diene conjugates (DC) and malonic dialdehyde (MD), as well as activity of antioxidative enzyme catalase (C), in the blood serum were studied.

All participants of the study used ambrosia (perga) during a period of 1 month in spring. Blood tests were studied before and after course of treatment.

Statistical analysis of the data was carried-out by Student's criterion in accordance with the STATGRAPH program. The hypothesis of contradictory results was accepted at $p \leq 0,05$. Indices reflecting homeostasis processes of humans were evaluated comparing with the same ones of control group persons ($n=29$) of the same age, from relatively non-contaminated district and working under non-harmful conditions, before and after course of correction by placebo.

Statistical analysis of the data was carried-out by Student's criterion in accordance with the STATGRAPH program. Reliable considered the difference in the

mean values between groups when $p \leq 0,05$. Indices reflecting homeostasis processes of humans were evaluated comparing with the same ones of control group persons (n=29) of the same age, from relatively non-contaminated district and working under non-harmful conditions, before and after course of correction by placebo.

Results and Discussion

All participants finished the program. It should be noted that 29 of them had felt significant subjective improvement of status of health including increased ability to work, quality of sleep, appetite and lighter evacuation of their bowels in cases of constipation during the period of treatment and after it.

Before the course of correction, significant changes of the indices of peripheral blood were established. All investigated indices differed from the same ones of control group, by 16-63%. Most of the indices reflecting immune state (reduced total count of leukocytes and lymphocytes, CD3+, CD4+, CD8+, CD4+/CD8+, index of phagocytosis PhI) indicated to immunosuppressive status of industrial workers comparing with the same indices of persons from control group.

Inhibition of such important reactions like phagocytosis and leukocyte migration inhibition reaction, while both of indices LMIR did not indicate to intensification of leukocyte reaction against CEA and did not differ from the same indices of control group, showed a part of compensatory reactions be suppressed. All indicated alterations reflected deep status of immunosuppression of the examined workers.

Results of investigations of lipid peroxidation processes and activity of anti-oxidative system in examined workers before treatment showed table 1.

Contents of cholesterol, low density lipoprotein and ceruloplasmin in blood serum of examined persons before treatment showed table 2.

After correction using native biomodulators of ambrosia (perga), in blood of examined workers essential activation of immune system was found: significantly increased absolute and percentage CD4+ numbers and immunoregulatory index

CD4+/CD8+ ($p < 0,05$) as well as both indices of phagocytosis, PhI and PhN ($p < 0,05$). Leucocyte reaction against CEA became significantly lower. At the antigen concentrations 25% and 50%, it has been reduced by 24 and 30%, respectively ($p < 0,05$).

Table 1

Dynamics of peroxidation of lipids and antioxidant system under the influence of ambrosia (perga)

No.	Groups	Period of investigation	(n)	Indices (M±m)		
				DK nmol/ml M±m	MD nmol/ml M±m	C nmol/l M±m
1.	Workers group	Before correction	29	9,3±0,42	9,2±0,60**	31,7±2,2**
		After correction	29	4,9±0,39*	6,5±0,37*	38,3±2,4*
2.	Control group		29	7,0±0,75	6,7±0,45	40,7±1,83

* $p < 0.05$, if comparing indices before and after correction;

** $p < 0.05$, if comparing indices after correction with indices of control group

Table 2

Dynamics of indicators of cholesterol, LDL and ceruloplasmin workers after the correction by ambrosia (perga)

No.	Groups	Period of investigation	(n)	Indices (M±m)		
				Cholesterol mM/l	LDL mM/l	Ceruloplasmin mg/l M±m
1.	Workers group	Before correction	29	7,7±0,30**	4,47±0,41* *	306,4±11,56
		After correction	29	6,1±0,29*	3,48±0,21*	248,6±6,8*
2.	Control group		29	6,0±0,21	3,2±0,12	300,7±12,3

*p<0.05, if comparing indices before and after correction;

** p<0.05, if comparing indices after correction with indices of control group

As seen from the tables of contents of metabolites of lipid peroxidation, diene conjugates (DC) and malonic dialdehyde (MD) significantly decreased, and catalase (C) activity increased significantly. Cholesterol and low density lipoprotein (LDL) was significantly decreased and the activity of ceruloplasmin decreased by 19% from baseline.

After the correction by ambrosia (perga) in the blood of workers was found the concentration IgA and IgM increased by 7-16%, respectively.

Thus, all the data obtained after administration of pollen has improved, which is correlated with the improvement of people's health.

Conclusions

1. During investigation of health status of people working at enterprise of heavy industry, significant alterations of various links of homeostasis manifesting like disturbances of cellular and humoral immunity, disbalance between lipid

peroxidation processes and activity of antioxidative system, disorders of lipid metabolism were detected.

2. Native biomodulators of ambrosia (perga) exerted positive changes, normalising altered indices reflecting immune functions and lipid peroxidation processes, improve lipid metabolism.

3. Results of the study substantiate recommendations for more extensive usage of ambrosia (perga) as an effective biomodulative complex for restitution of altered indices of human homeostasis, for rehabilitation and strengthening of the population health.

References

1. Occupational Health in the use of chemicals in the workplace. Technical Support Group on Decent Work and the ILO Office for Eastern Europe and Central Asia. Moscow: ILO, 2014.
2. Razdorozhny A.A., 2006. Occupational health and safety. M., Examin, pp: 510.
3. Prevention of occupational diseases. World Safety Day April 28, 2013. ILO, 2013.
4. Control of hereditary diseases: Rep. of a WHO Sci. group, 1996. Geneva, WHO.
5. The World Health Report 2002. Reducing risks, promoting healthy life. WHO, Geneva, pp: 7 26.
6. "The principles, rules and procedures used by the IARC in the risk assessment of carcinogenicity in humans of different factors", 2006.
7. Sun G., 1990. Free radicals, antioxidant enzymes and carcinogenesis. Free Rad Biol Med, 8: 583-590.
8. Marshall W. and C. Bangert, 2013. Clinical Chemistry. 6th edition. Publ: Bean, pp: 408.

9. Matsunami T., Y. Sato, T. Sato, S. Ariga, T. Shimomura and M. Yukawa, 2009. Oxidative stress and gene expression of antioxidant enzymes in the streptozotocin-induced diabetic rats under hyperbaric oxygen exposure. *Int J ClinExpPathol*, 3 (2): 177-88.
10. Tabur S., A.N.Torun, T. Sabuncu, M.N. Turan, H. Celik, A.R. Ocak and N. Aksoy, 2011. Non-diabetic metabolic syndrome and obesity do not affect serum paraoxonase and arylesterase activities but do affect oxidative stress and inflammation. *Eur J Endocrinol.*, 162 (3): 535-41.
11. Heloma A., E. Kahkonen and S. Kaleva, 2000. Smoking and exposure to tobacco smoke at medium-sized and large-scale workplaces. *American Journal of Industrial Medicine*, 37 (2): 214- 220.
12. Holguin F. and A. Fitzpatrick, 2010. Obesity, asthma, and oxidative stress. *J Appl Physiol*, 108 (3): 754-9.
13. Hopps E, D. Noto, G. Caimi and M.R. Averna, 2010. A novel component of the metabolic syndrome: the oxidative stress. *NutrMetab Cardiovascular Dis*, 20 (1): 72-7.
14. Tihonov A.I. and T.G.Yarnyh, 2014. Application flower pollen in medical practice. The Ministry of Health, National University of Pharmacy, Kharkov.
15. Khismatullina N.Z., 2005. Apitherapy. City: Mobile, pp: 43.

Список литературы

1. Охрана труда при использовании химических веществ на рабочих местах. / Группа технической поддержки по вопросам достойного труда и Бюро МОТ для стран Восточной Европы и Центральной Азии. – Москва: МОТ, 2014.
2. Раздорожный А.А. Охрана труда и производственная безопасность. /Раздорожный А.А. /М., Экзамен, 2006 г., 510 стр.
3. Профилактика профессиональных заболеваний. Всемирный день охраны труда 28 апреля 2013 года. МОТ, 2013.

4. Control of hereditary diseases: Rep. of a WHO Sci. group. Geneva, WHO, 1996.
5. The World Health Report 2002. Reducing risks, promoting healthy life. WHO, Geneva; 2002; p. 7– 26.
6. «Принципы, правила и процедуры, используемые МАИР при оценке риска канцерогенности для человека различных факторов» (перевод с английского проф. М.А. Забежинского, 2006 г.)
7. Sun G. Free radicals, antioxidant enzymes and carcinogenesis. Free Rad Biol Med 1990, 8:583-590.
8. Маршалл В., Бангерт С. Клиническая биохимия. 6-е издание. Изд-во: Бином, 2013, 408 с.
9. Matsunami T, Sato Y, Sato T, Ariga S, Shimomura T, Yukawa M. Oxidative stress and gene expression of antioxidant enzymes in the streptozotocin-induced diabetic rats under hyperbaric oxygen exposure. Int J Clin Exp Pathol. 2009 Nov 30; 3(2):177-88.;
10. Tabur S, Torun AN, Sabuncu T, Turan MN, Celik H, Ocak AR, Aksoy N. Non-diabetic metabolic syndrome and obesity do not affect serum paraoxonase and arylesterase activities but do affect oxidative stress and inflammation. Eur J Endocrinol. 2011; 162(3):535-41.;
11. Heloma A., Kahkonen E., Kaleva S., et al. Smoking and exposure to tobacco smoke at medium-sized and large-scale workplaces. American Journal of Industrial Medicine, Vol 37, No 2, 2000, p. 214– 220.
12. Holguin F, Fitzpatrick A. Obesity, asthma, and oxidative stress. J Appl Physiol. 2010 Mar; 108(3):754-9. Epub 2009 Nov 19.;
13. Hopps E, Noto D, Caimi G, Aversa MR. A novel component of the metabolic syndrome: the oxidative stress. Nutr Metab Cardiovascular Dis. 2010 Jan; 20(1):72-7.;
14. А.И.Тихонов, Т.Г.Ярных и др. Применение пыльцы цветочной в медицинской практике. Министерство здравоохранения Украины, Национальный

фармацевтический университет, г. Харьков. 2014. Ссылка на электронный ре-
сурс http://www.apimax.com.ua/primenenie_pilca.html

15. Хисматуллина Н. З., Апитерапия. Пермь: Мобиле, 2005. 43 с.

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