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The state of individual components of humoral immunity of guinea pig blood in the dynamics of the formation of experimental periodontitis and immobilization stress and correction of their disorders by thioacetam

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Abstract

The research found a rapid increase in the level of immunoglobulin M, starting from the 3rd day of the experiment in comparison with the control values, which clearly indicates its activation in particular, and stimulation of humoral immunity in general. In the later stages (on the 5th and 15th days) of the formation of experimental periodontitis (EP) and immobilization stress (IS), an increase of this indicator by 93.5% and 94.2% was found, respectively, against group I guinea pigs ($p \leq 0,05$).

Regarding the content of immunoglobulin G in the blood, the highest growth rates were recorded in the fourth group of guinea pigs with EP and IS (on the 15th day), which indicates a direct dependence of the duration of damaging factors on the level of these indicators and the body's ability to the protective response.

The results of the treatment showed the effect and the reduction of the activity of the studied classes of immunoglobulins. Thus, the use of thioacetam led to a significant decrease in

the content of Ig M and G in the blood, respectively, by 33.8% ($p \leq 0.05$) and 41.7% ($p \leq 0.05$) in EP and IS compared with the group of animals were not exposed to this drug, which indicates the immunocorrective effect of this drug on the studied tests.

Key words: periodontitis; stress; immunoglobulins M, G; thioacetam

Стан окремих компонентів гуморального імунітету крові морських свинок в динаміці формування експериментального пародонтиту та іммобілізаційного стресу та корекція їх порушень тіоцетамом

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У роботі встановлено стрімке зростання рівня імуноглобуліну М, починаючи з 3-ї доби експерименту в порівнянні з показниками контрольних величин, що свідчить очевидно про його активацію зокрема, та стимуляцію гуморального імунітету в цілому. У більш пізні етапи (на 5 та 15- і доби) формування експериментального пародонтиту (ЕП) та іммобілізаційного стресу (ІС) виявлено також підвищення цього показника відповідно на 93,5% та 94,2% напроти І групи морських свинок ($p \leq 0,05$).

Щодо вмісту імуноглобуліну G у крові, то найвищі показники зростання фіксувалися в четвертій групі морських свинок з ЕП та ІС (на 15-у добу), що говорить про пряму залежність тривалості пошкоджуючих чинників на рівень цих показників та здатність організму адекватно відповідати захисною реакцією на їх дію.

Результати проведеного лікування показали ефективність та зниження активності досліджуваних класів імуноглобулінів. Так, застосування тіоцетаму призвело до значного спаду вмісту Ig M та G у крові відповідно на 33,8% ($p \leq 0,05$) та 41,7% ($p \leq 0,05$) при ЕП та ІС порівняно з групою тварин, які не піддавалися впливу цього препарату, що говорить про імунокоригуючий вплив цього лікарського засобу на досліджувані тести.

Ключові слова: пародонтит; стрес; імуноглобуліни М, G; тіоцетам.

Состояние отдельных компонентов гуморального иммунитета крови морских свинок в динамике формирования экспериментального пародонтита и иммобилизационного стресса и коррекция их нарушений тиоцетамом

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В работе установлен стремительный рост уровня иммуноглобулина М, начиная с 3-х суток эксперимента по сравнению с показателями контрольных величин, что свидетельствует о его активации в частности, и стимуляцию гуморального иммунитета в целом. В более поздние этапы (на 5 и 15-е сутки) формирование экспериментального пародонтита (ЭП) и иммобилизационного стресса (ИС) выявлено также повышение этого показателя соответственно на 93,5% и 94,2% в сравнении I группы морских свинок ($p \leq 0,05$).

Относительно содержания иммуноглобулина G в крови, то самые высокие показатели роста фиксировались у четвертой группы животных с ЭП и ИС (на 15-е сутки), что говорит о прямой зависимости длительности повреждающих факторов на уровень этих показателей и способности организма адекватно отвечать защитной реакцией на их действие.

Результаты проведенного лечения показали эффективность и снижение активности изучаемых классов иммуноглобулинов. Так, применение тиоцетама привело к значительной регрессии уровня иммуноглобулинов М и G в крови соответственно на 33,8% ($p_1 \leq 0,05$) и 41,7% ($p_1 \leq 0,05$) при ЭП и ИС по сравнению с группой животных, которые не подвергались влиянию этого препарата, что говорит об иммунокорректирующем влиянии этого лекарственного средства на исследуемые тесты.

Ключевые слова: пародонтит; стресс; иммуноглобулины М, G; тиоцетам.

Introduction. The development of generalized periodontitis (GP) occurs against the background of complex disorders of the body homeostatic balance and is accompanied by its intoxication and sensitization, the reduction of the protection against infection, the development of complications. Despite some progress in the conservative and surgical treatment of periodontal disease, the number of patients with this pathology is growing, which

has a high social and economic significance of this pathology [5]. Until recently, GP remains one of those diseases in the treatment of which radical success has not yet been achieved [6], which encourages scientists to seek new approaches and methods of prevention and treatment.

Currently, it is established that the body's susceptibility to various inflammatory diseases and the peculiarities of their clinical course is associated with the state of the immune system, which is actively involved in the body's defense mechanisms [1]. Humoral factors of local protection include immunoglobulins (Ig) classes A, M, G, which in the serum indirectly indicate the state of the local immune system.

The aim of the study was to determine the level of immunoglobulins M, G in guinea pig blood under conditions of experimental periodontitis (EP) and immobilization stress (IS) and to evaluate the effect of thiocetam.

Material and methods of research. Experimental studies were performed on 50 guinea pigs (males), weighing 0.18-0.21 kg, kept on the standard diet of the vivarium of Danylo Halytsky Lviv National Medical University. Guinea pigs were divided into five groups (10 in each): the first - intact animals - control; the second (experimental) group - animals with experimental periodontitis under conditions of immobilization stress (3rd day), the third group included guinea pigs with EP and IS on the 5th day of the combined model process, to IV - animals with EP and IS 15th day (before use of thiocetam) and up to V - animals on the 15th day of experiment with EP and IS after the use of thiocetam.

Experimental periodontitis was modeled by the method of ZR Jogan (1983) [4]. Immobilization stress was reproduced by the method of PD Horizontov (1996) [3]. We selected fixed days (3rd, 5th and 15th) for studies that corresponded to the classic stages of acute inflammation. To correct disorders in group V, the drug was administered thiocetam at a rate of 250 mg / kg intramuscularly from the 6th day of the experiment for 10 days.

All experiments on laboratory animals carried out with following the European Convention for the protection of vertebrate animals used for experimental and other scientific purposes (Strasbourg, 1986), Council Directive 2010/63 / EU, the Law of Ukraine 3447- IV "protection animals from the cruelty," the general ethics of animal experimentation adopted by the first national Congress on bioethics in Ukraine (2001).

All groups of guinea pigs were determined the content immunoglobulins M and G in the blood by the method of Chernushenko KF, Kogosova LS [2]. Statistical processing of the obtained digital results was carried out according to the Student's method.

Results of the study and their discussion. As a result of the conducted researches it is established that in guinea pigs at EP and IS shifts of immunoglobulins M and G in different periods of its formation are observed.

The results of the study showed that the level of immunoglobulins M increased rapidly in animals of the second and third groups in this combined experimental model by 78.5% ($p \leq 0.05$) and 93.5% ($p \leq 0.05$), respectively, compared with control values, which indicates the activation of the synthesis of immunoglobulins M in particular, and the stimulation of humoral immunity in general. At a later stage (on the 15th day) of the formation of EP and IS, a further increase of this indicator by 94.2% was found in contrast to the group of guinea pigs ($p \leq 0.05$).

Determination of another indicator of humoral immunity - immunoglobulin G in the blood showed a similar nature and unidirectionality, namely its growth by 65.3% ($p \leq 0.05$), 73.4% ($p \leq 0.05$) and 85.7% ($p \leq 0.05$) during all days (3rd, 5th and 15th) of the experiment compared with the control group of animals.

As can be seen from the data obtained, the highest level of immunoglobulins M and G in the blood was in the fourth group of guinea pigs with EP and IS (on the 15th day), which indicates a direct relationship between the duration of damaging factors and their ability to the protective response.

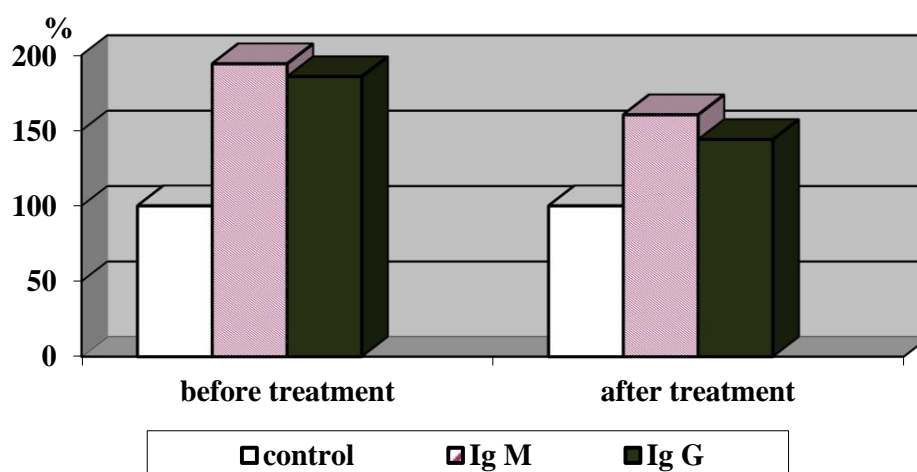


Fig. 1 - The effect of thiocetam on the level of immunoglobulins M, G in the blood of guinea pigs in the dynamics of the formation of EP and IS (% of control)

The results of the treatment showed the effect and the reduction of the activity of the studied classes of immunoglobulins. Thus, the use of thiocetam led to a significant decrease in the content of Ig M and G in the blood, respectively, by 33.8% ($p \leq 0.05$) and 41.7%

($p \leq 0.05$) in EP and IS compared with the group of animals were not exposed to this drug, which indicates the immunocorrective effect of this drug on the studied tests (fig.1).

Conclusions. Thus, the study of immunoglobulins M and G in the blood of intact guinea pigs and animals with experimental periodontitis and immobilization stress in different periods of their development showed increased activity of the humoral immune system, which is important for characterizing changes in functional state of the immune system, their role in the course, the activity of the immunopathological process and pathogenesis, diagnosis and treatment of EP and IS.

The drug thiocetam has a corrective effect on the immune system in the blood of animals with EP and IS, but requires further both experimental and clinical studies to study its effects and possible use in practical medicine.

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