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STATE OF HORMONES AND NEUROMEDIATORS WITHIN ENERGY METABOLISM IN PATIENTS WITH ADVANCED AND COMPLICATED PSORIASIS CONDITIONS

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Until now the issues of etiology and pathogenic mechanism of the psoriatic disease have been far from clear understanding in domestic medicine as well as in the whole world. The article discusses the study of some indices reflecting the conditions of hormones and neuromediators in patients with psoriatic pathology. The task of the research was to evaluate the concentration of blood serum hormones and neuromediators that can influence energy metabolism. The methods used to carry out the research were the following: fluorometry, enzyme immunoassay (EIA), immunoenzymometric methods, immunoradiometric assay (RIA). The results obtained by studying the amount of hormones in the blood serum that can influence energy metabolism in patients with psoriatic pathology, showed essential and dynamic rate changes. Activation of the neuroendocrine system within psoriatic pathology is closely connected with the state of the sympathoadrenal system, its hormones and neuromediators. Long-term increase in the rating values in psoriasis can result in profound disorders in the system tissue and cellular levels of neurohumoral regulation, as well as in the breakdown of protection-adaptation mechanisms. The recourse of the psoriatic pathology is accompanied with activation of the hypothalamus, hypophysis, adrenal and thyroid glands, and with the underlying stimulation of the sympathoadrenal system. Dynamic changes in hormone and neuromediators metabolism indicate the acceleration in all types of metabolism during the psoriasis development, including energy metabolism as well.

Key words: psoriatic condition, hormones, neuromediators, metabolism, energy exchange, arthropathy.

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Introduction

It is commonly known that an organism can exist only in case of relatively stable internal environment. The mechanisms providing homeostasis in complex multicellular organism are based on the universal interdependence of energy and integrity processes that are regulated by the neuroendocrine system in cooperation with the immune system [1]. Neuroendocrine system belongs to the category of functional super-systems, which has complex structural organization, built-up on the basis of the strict hierarchical control of its subsystems. Neuroendocrine system reliability is specified by the feedback – either negative or positive, that makes the basis of each its chain functioning [1, 2, 3, 4]. It supports the metabolic state of cells, organs and the entire organism in the optimal level by way of the adaptation and protective-accommodative mechanisms. It also provides their safe functioning, self-renewal and regeneration [1]. Data of relevant literature indicate that, until now, the issues of etiology and pathogenic mechanism of the psoriatic disease have not been cleared up enough in Ukraine as well as in the whole world [2, 3]. No convincing proofs were suggested by neurogenic, hereditary, parasitic, infectious, autoimmune, metabolic, and endocrine and other theories of the psoriasis occurrence [2, 3, 4, 5]. This necessitates further complex study of the mechanisms of cooperative interaction between the integrative homeostatic control systems on condition of the development of psoriatic pathology and taking into account the state of metabolic, bioenergetic processes, as well as the functions of the internal organs and tissues [2, 3]. The analysis is indicative of

the fact that only the complex study of the condition of the nervous, endocrine, immune as well as bioenergetic processes enables clinicians to outline approaches in establishing the mechanisms of psoriasis development. [2, 3].

Based on above facts, the present research was aimed to study the hormone and neuromediator metabolism in patients with advanced and moderate stable stage of psoriasis and in cases of the complicated forms — psoriatic arthritis, psoriatic erythrodermia.

Material and methods

The study of some indices of the hormone and neuromediators concentrations was performed in 153 in-patients with psoriatic pathology who took the course of therapy at the Regional Dermatovenerological Dispensary, Kharkiv. The patients were aged from 18 to 53 (88 males and 65 females). The control group in the clinical trial included healthy individuals of the same age and sex (12 males and 9 females). All the patients with psoriasis were divided into three groups, as it was prescribed by the programme of the study. The first group included 38 men and 27 women with advanced stage of the disease, the second group included patients with steady-state stage of the disease (35 men and 24 women), and the third one — patients with complicated forms of psoriasis (psoriatic arthritis, psoriatic erythrodermia), 15 men and 14 women. The task of the research was to specify the blood serum hormones and neuromediators concentration, which influence energy metabolism. The hormones were supposedly as following: adrenocorticotrophic hormone (ACTH), somatotrophic hormone (STH), thyrotrophic hormone (TTH), thy-

roxin (T₄), triiodothyronine (T₃), glucagon, parathyrine (PT), aldosterone and cortisol. They were tested in the blood serum with immunological and enzymatic assay (IEA) methods, Stat Fax 303 panel being used. Thus, T₄ was tested with IEA method and reagents of АЛКОР БІО (ALCOR BIO, Russia), STH, TTH, T₃, cortisol – with Immynotech (Czech Republic), aldosterone – with CJS-BJO inter (France), glucagon – with Amersham (England), parathyrine – with ORJOM (Finland). Neuromediators – adrenalin, noradrenaline, dopamine, DOPA (dihydroxyphenylalanine) – were tested with fluorometry method [6, 7, 8]. Cyclic 3,6-adenosine monophosphate was tested with the radio immunological analysis and «Amersham» (England) reagents. Statistical processing of the given results was carried out by methods of variable-based statistics and the estimated probability by Student-Fisher criterion.

Results and discussions

The results of the study of the blood plasma concentrations of hormones that can influence energy metabolism in patients with psoriatic pathology, showed their essential and dynamic rate changes due to adenylate cyclase transmitter cascade (Table 1); it was indicative with advanced and moderate stable stages of psoriasis, as well as with complicated forms. Advanced stage of the disease was characterized by the increase in the amount of adrenocorticotrophic hormone (ACTH) to 70,51%,

somatotropic hormone (STH) – up to 179,67%, thyrotropic hormone (TTH) – up to 132,71%, thyroxin (T₄)– to 151,27%, triiodothyronine (T₃)– to 57,84%, glucagon – to 46,22%, parathyrine (PT) – to 72,93%, cortisol – to 33,07%, aldosterone – to 131,42%, as to be compared with the group of healthy control individuals. The data received show that psoriatic pathology develops to the advanced stage of the disease with the activation of hypothalamo-pituitary-thyroido-adrenal neuroendocrine complexes. During the moderate stable of the disease these data essentially decrease compared with the advanced stage and complicated forms of the psoriatic pathology. Apart from that, it must be noted that complicated psoriasis (psoriatic arthritis and psoriatic erythrodermia) was accompanied with more evident changes in hormone metabolism. Thus, the amount of ACTH in the blood plasma increased to 89,75%, STH – to 233,33%, TTH – to 198,76%, T₄– to 170,26%, T₃– to 100%, glucagon – to 87,84%, PT – to 121,19%, cortisol – to 78,01%, aldosterone – to 121,04%, when compared with the group of healthy control individuals. Analysis of the dynamic changes in the hormones concentration confirms the presence of disorders in protein, carbohydrate, mineral and energy metabolism that is accompanied with activation of intracellular metabolic processes that, in turn, are closely connected with cyclic adenosine monophosphate (cAMP) synthesis.

*Table 1
Blood plasma concentration of hormones influencing energy metabolism by means of cyclic adenosine monophosphate (cAMP) in patients with psoriasis*

Hormons	Test group, M±m			
	advanced stage	moderate stable stage	complicated forms	Control group
ACTH, (nmol/l)	70,51 * 42,34±3,58	27,66 * 31,70±2,42	89,75 * 53,7±3,24	24,83±2,66
STH, (nmol/l)	179,67 * 13,76±1,62	90,04 * 9,35±0,85	233,33 * 16,4±1,57	4,92±0,53
TTH (nmol/l)	132,71 * 7,54±0,58	73,76 * 5,63±0,46	198,76 * 9,68±0,72	3,24±0,24
T ₄ (nmol/l)	151,27 * 184,56±9,24	113,45 * 156,78±7,34	170,26 * 198,51±10,47	73,45±6,27
T ₃ (nmol/l)	57,84 * 25,84±1,37	32,07 * 21,62±1,54	100,0 * 32,74±1,86	16,37±1,46
Glucagon (pg/ml)	46,22 * 98,73±4,62	29,36 * 87,35±4,26	87,84 * 126,83±5,75	67,52±3,83
PT (pg/ml)	72,93 * 45,62±3,75	39,27 * 36,74±2,53	121,19 * 58,35±4,12	26,38±1,42
Cortisol, (nmol/l)	33,07 * 436,27±20,18	14,52 * 375,46±15,18	78,01 * 583,62±24,43	327,85±14,17
Aldosterone, (pg/ml)	131,42 * 19,58±1,63	93,26 * 16,35±1,44	121,04 * 27,16±1,48	8,46±0,78
cAMP (nmol/l)	84,21 * 23,45±1,27	40,29 * 17,86±1,62	122,70 * 28,35±2,14	12,73±1,24

Note: * deviation is likely (p<0,05) with control.

Increase in the amount of cAMP in advanced, moderate stage and in case of complicated forms of psoriasis by 84,21%, 40,29%, 122,70% correspondingly indicates the rise in adaptation and protection-accommodative mechanisms to support the homeostatic function of the body in the patients with psoriatic pathology that is accompanied with activation of oxidizing and bioenergetic processes, in

which central and peripheral internal secretion by endocrine glands (hypothalamus, pituitary gland, adrenal glands, thyroid gland and pancreas) is involved. The results of the research showed that activation of neuroendocrine system in psoriatic pathology which was closely connected with the state of the sympathoadrenal system, its hormones and neuromediators [7, 8]. Being both the hormones of

the adrenal medulla and neuromediators, catechol amines (adrenaline, noradrenaline) and their precursors, dopamine, dihydroxyphenylalanine (DOPA) influence the development of the necessary conditions that can provide human body's vital activity in the time of critical permissible load, disorders and malconditions; they can also be important means of activation of the protection-accommodative mechanisms to support homeosta-

sis. During the study the increase in the concentration of adrenaline, noradrenaline, dopamine and DOPA (Table 2) was observed in the blood serum of the patients with psoriatic pathology. In the advanced stage of the disease the adrenaline concentration increased by 91,13%, noradrenaline –by 43,85%, dopamine –by 25,41%, while DOPA decreased by 42,06%, compared with the control group.

*Table 2
Blood serum concentration of neuromediators influencing energy metabolism*

Indicators	Group supervision, M±m			
	advanced stage	moderate stable stage	complicated forms	Control group
Adrenaline (nmol/l)	91,13 * 4,53±0,38	58,22 * 3,75±0,44	105,06 * 4,86±0,42	2,37±0,24
Noradrenaline (nmol/l)	43,85 * 49,66±2,74	20,85 * 41,72±3,10	69,26 * 58,43±4,37	34,52±2,93
Dopamine (pg/ml)	25,41 * 148,57±6,18	12,13 * 132,83±4,37	38,71 * 164,32±5,75	118,46±7,13
DOPA (nmol/l)	42,06 * 9,34±0,85	22,09 * 12,56±1,35	49,32 * 8,17±0,76	16,12±1,43

Note: * deviation is likely ($p < 0,05$) with control.

In the moderate stable stage of the disease these data were less obvious, whilst in the complicated forms of psoriasis their rate was much higher: adrenaline increased by 105,06%, noradrenaline – by 105,06%, dopamine –by 38,71% with DOPA being decreased by 49,32%. Analysis of the dynamic rate changes in the hormones concentration indicate their cooperative interaction in the development of psoriatic pathology that can be characterized as a long-term chronic stress, accompanied with activation of oxidizing and bioenergetic processes. It is important to notice that long-term increase in the rating data in psoriasis can result in profound disorders in the system tissue and cellular levels of neurohumoral regulation, as well as in the breakdown of protection and adaptation mechanisms.

Conclusions

The results of the research have proven the course of the psoriatic pathology is accompanied with activation of functioning of hypothalamus, pituitary gland, adrenal glands and thyroid gland with underlying sympaticoadrenal system. These conditions can contribute to some disorders in adaptation and protection-accommodative mechanisms, which are associated with the increase in oxidizing and bioenergetics processes by means of adenylate cyclase intercellular mediator system, cAMP (cyclic adenosine monophosphate), that was suggested previously. Activation of neuroendocrine system is mostly detected in the patients with complicated forms of psoriasis and in the advanced stage of the disease, and it is less frequent in the moderate stable stage of psoriasis. Dynamic rate changes in the

concentration of hormones and neuromediators indicate the activation of all the types of metabolism, including energy metabolism in psoriasis.

Prospects of further researches

The results presented in this article will be aimed at improving the management of psoriatic disease according to identified pathogenetic disorders.

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Реферат

СТАН ГОРМОНІВ І НЕЙРОМЕДІАТОРІВ ЕНЕРГЕТИЧНОГО ОБМІНУ У ХВОРИХ НА РОЗПОВСЮДЖЕНИЙ І УСКЛАДНЕНИЙ ПСОРИАЗ

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Ключові слова: псоріатична хвороба, гормони, нейромедіатори, метаболізм, енергетичний обмін, артропатія.

До теперішнього часу, питання етіології і патогенезу псоріатичної хвороби повністю не розкриті як в нашій країні, так і в усьому світі. У статті розглянуто вивчення деяких показників гормонального і нейромедіаторного стану у хворих на псоріатичну патологію. Завдання дослідження передбачали визначення вмісту у сироватці крові гормонів і нейромедіаторів, які впливають на енергетичний обмін. Дослідження проводились методом флюорометрії, ІФА, імуноферментними методами, методом радіоімунного аналізу. Результати дослідження у хворих псоріатичною патологією вмісту гормонів в плазмі крові, що впливають на енергетичний обмін, показали значні їх динамічні зміни. Активація нейроендокринної системи при псоріатичній патології тісно поєднана із станом симпатoadреналової системи, її гормонів і нейромедіаторів. Тривале підвищення рівнів оціночних показників при псоріазі здатно привести до глибоких порушень системного тканинного і клітинного рівнів нейрогуморальної регуляції і зриву захисно-приспосувальних механізмів. Перебіг псоріатичної патології супроводжується активацією гіпоталамуса, гіпофіза, наднирників і щитоподібної залози, на фоні стимуляції симпатoadреналової системи. Динамічні зміни обміну гормонів і нейромедіаторів вказують на прискорення всіх видів обміну речовин і енергії в умовах розвитку псоріазу.

Реферат

СОСТОЯНИЕ ГОРМОНОВ И НЕЙРОМЕДИАТОРОВ ЭНЕРГЕТИЧЕСКОГО ОБМЕНА У БОЛЬНЫХ С РАСПРОСТРАНЁННЫМ И ОСЛОЖНЁННЫМ ПСОРИАЗОМ

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Ключевые слова: псориатическая болезнь, гормоны, нейромедиаотры, метаболизм, энергетический обмен, артропатия.

До настоящего времени, вопросы этиологии и патогенеза псориатической болезни полностью не раскрыты как в нашей стране, так и во всем мире. Целью исследования явилось изучение некоторых показателей гормонального и нейромедиаотрного состояния у больных с псориатической патологией. Задачи исследования предусматривали определение содержания в сыворотке крови гормонов и нейромедиаотров, влияющих на энергетический обмен. Исследования проводились методом флюорометрии, ИФА, иммуноферментным методом, методом радиоиммунного анализа. У больных с псориатической патологией содержание гормонов в плазме крови, влияющих на энергетический обмен, показали значительные динамические изменения. Активация нейроэндокринной системы при псориатическом патологии тесно связана с состоянием симпатoadреналової системы, ее гормонов и нейромедиаотров. Длительное повышение уровня оценочных показателей при псориазе способно привести к глубоким нарушениям системного тканевого и клеточного уровней нейрогуморальной регуляции и срыва защитно-приспосовительных механизмов. Течение псориатической патологии сопровождается активацией гипоталамуса, гипофиза, надпочечников и щитовидной железы, на фоне стимуляции симпатoadреналової системы. Динамические изменения обмена гормонов и нейромедиаотров указывают на ускорение всех видов обмена веществ и энергии в условиях развития псориаза.