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## **Psoriasis, chronic eczema and atopic dermatitis in males: functioning of sympathoadrenal and vagoinular systems**

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**Key words:** *Psoriasis, Eczema, Atopic Dermatitis, Males.*

Psoriasis, chronic eczema and atopic dermatitis are the most common diseases among patients of dermatovenereological profile. The study of the etiology and pathogenesis of chronic dermatoses, and the grounded choice of their treatment are extremely important problems of modern medicine.

**Aim** of this work was to study the peculiarities of functioning of sympathoadrenal and vagal-insular systems in male patients with psoriasis, chronic eczema and atopic dermatitis.

**Materials and methods.** 115 healthy males and males who suffered from psoriasis, chronic eczema and atopic dermatitis were examined. The men were distributed in the study groups depending on their age and the presence of chronic dermatoses. We investigated levels of adrenaline, norepinephrine, dioxyphenylalanine, dopamine in urine, as well as the levels of insulin and cortisol in blood. The calculation of hormones and mediators ratios of the sympathoadrenal and autonomic systems was performed.

**Results.** Sympathoadrenal system was less active and its reserve capacity was lower in males with psoriasis, chronic eczema and atopic dermatitis. We also fixed the acceleration of biosynthesis of catecholamines. The speed of transformation of dioxyphenylalanine and dopamine to their metabolites was higher in patients with psoriasis, chronic eczema and atopic dermatitis. The high tension of glucocorticoid function of adrenal glands and increased activity of autonomic system; the intensive violations of autonomic homeostasis; the reduction of activity of compensatory organism reactions were found in male patients with chronic dermatoses. The disorganized relationships in neurogenic link of adaptation in patients with chronic dermatoses were fixed. An antagonistic relationship was also revealed between different branches of nervous system in patients with psoriasis, chronic eczema and atopic dermatitis. These data reflected the violations of adaptation in patients with chronic dermatoses.

**Conclusions.** The obtained results indicate the existence of irregularities in the functioning of the sympathoadrenal and autonomic systems. The results of investigation substantiate the feasibility of corrective measures in male patients with chronic dermatoses (such as psoriasis, chronic eczema, atopic dermatitis), by the using of drugs that improve metabolism in the brain.

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## **Псоріаз, хронічна екзема та атопічний дерматит у чоловіків: функціонування симпатoadреналової та вагоінсулярної систем**

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Псоріаз, хронічна екзема та атопічний дерматит – найпоширеніші захворювання серед пацієнтів дерматовенерологічного профілю. Вивчення етіології та патогенезу цих хронічних дерматозів, а також обґрунтований вибір оптимальної їх терапії є надзвичайно актуальною проблемою сучасної медицини.

**Мета роботи** – вивчити особливості функціонування симпатoadреналової та вагоінсулярної систем у хворих на псоріаз, хронічну екзему та атопічний дерматит чоловіків.

**Матеріали та методи.** Обстежили 115 здорових і хворих на псоріаз, хронічну екзему та атопічний дерматит чоловіків, яких включили в дослідні групи залежно від їхнього віку та наявності хронічного дерматозу. Вивчали добову екскрецію адреналіну, норадреналіну, ДОФА, дофаміну з сечею, рівень інсуліну та кортизолу в сироватці крові. Виразовували коефіцієнти співвідношення рівнів гормонів і медіаторів симпатoadреналової та вагоінсулярної систем.

**Результати.** У чоловіків, які хворі на псоріаз, хронічну екзему та атопічний дерматит, встановили зниження активності та резервних можливостей симпатoadреналової системи при прискоренні біосинтезу катехоламінів на етапах перетворення ДОФА в дофамін і дофаміну в норадреналін. У пацієнтів із хронічними дерматозами встановили високий ступінь напруження глюкокортикоїдної функції надниркових залоз і підвищення активності вагоінсулярної системи; виражене порушення вегетативного гомеостазу; зниження активності компенсаторних реакцій організму. Встановили високий ступінь напруження ендокринної ланки та дискоординовані взаємовідносини в нейрогенній ланці адаптації в пацієнтів із хронічними дерматозами. Антагоністичні взаємовідносини виявлені також між елементами нейрогенної ланки адаптації (симпатичним і парасимпатичним відділами) у хворих на псоріаз, хронічну екзему та атопічний дерматит.

**Висновки.** Результати свідчать про наявність порушень у функціонуванні симпатoadреналової та вагоінсулярної систем, доводять доцільність здійснення корегувальних заходів у чоловіків, які хворі на хронічні дерматози (псоріаз, хронічну екзему, атопічний дерматит), шляхом застосування препаратів, що поліпшують обмін у головному мозку.

**Ключові слова:** *псоріаз, екзема, атопічний дерматит, чоловіки.*

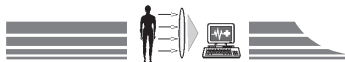
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## **Psoriasis, chronic eczema and atopic dermatitis in men: functioning of sympathoadrenal and vagoinular systems**

*Н. Ю. Резніченко*

Psoriasis, chronic eczema and atopic dermatitis represent the most widespread diseases among patients of dermatovenereological profile. The study of the etiology and pathogenesis of these chronic dermatoses, as well as the substantiated choice of their therapy are extremely important problems of modern medicine.

**Цель работы** – изучить особенности функционирования симпатoadреналової и вагоінсулярної систем у больных псоріазом, хронічною екземой и атопічним дерматитом мужчин.



**Материалы и методы.** Обследовано 115 здоровых и больных псориазом, хронической экземой и атопическим дерматитом мужчин. Мужчины были распределены в исследуемые группы в зависимости от их возраста и наличия хронического дерматоза. Изучалась суточная экскреция адреналина, норадреналина, ДОФА, дофамина с мочой, уровень инсулина и кортизола в сыворотке крови. Проведён расчёт коэффициентов соотношения гормонов и медиаторов симпатoadренальной и вагоинсулярной систем.

**Результаты.** У больных псориазом, хронической экземой и атопическим дерматитом мужчин установлено снижение активности и резервных возможностей симпатoadренальной системы при ускорении биосинтеза катехоламинов на этапах превращения ДОФА в дофамин и дофамина в норадреналин. У больных хроническими дерматозами мужчин установлена высокая степень напряжения глюкокортикоидной функции надпочечников и повышение активности вагоинсулярной системы; выраженные нарушения вегетативного гомеостаза; снижение активности компенсаторных реакций организма. Установлена высокая степень напряжения эндокринного звена и дискоординированные взаимоотношения в нейрогенном звене адаптации у пациентов с хроническими дерматозами. Антагонистические взаимоотношения выявлены также между элементами нейрогенного звена адаптации (симпатическим и парасимпатическим отделами) у больных псориазом, хронической экземой и атопическим дерматитом.

**Выводы.** Результаты свидетельствуют о наличии нарушений в функционировании симпатoadренальной и вагоинсулярной систем, обосновывают целесообразность проведения корректирующих мероприятий у мужчин, больных хроническими дерматозами (псориазом, хронической экземой, атопическим дерматитом), путём применения препаратов, которые улучшают обмен в головном мозге.

**Ключевые слова:** псориаз, экзема, атопический дерматит, мужчины.

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The most urgent problems of medicine in general and dermatology in particular include psoriasis and chronic allergic skin disease (eczema, atopic dermatitis). Despite the differences in etiology and pathogenesis these diseases have similar mechanisms of development. First of all it concerns age-related changes of the human body, gender peculiarities, hormonal changes and activity of the nervous system [1,2]. Currently, we find in the literature a large amount of data on newly conducted research relevant to the etiology and pathogenesis of psoriasis, chronic eczema, atopic dermatitis. Reports of Ukrainian and foreign authors say about new ideas on the effective management of chronic dermatological diseases. But, unfortunately, at the moment there are no effective methods of control of psoriasis and chronic allergic diseases of the skin, which could provide prolonged remission [1–3]. A significant gap in the modern data on the pathogenesis of chronic eczema, atopic dermatitis and psoriasis is lack of information about the influence of various components of the nervous and endocrine systems. Therefore, we believe, that further investigation of sympathoadrenal and autonomic systems in patients suffering from chronic dermatological diseases is extremely necessary.

**The objective of investigation**

To study the peculiarities of sympathoadrenal and autonomic systems functioning in male patients with psoriasis, chronic eczema and atopic dermatitis.

**Materials and methods**

We examined 115 males, who either suffered from psoriasis, chronic eczema and atopic dermatitis, or did not have any manifestations of dermatological pathology and formed control group. The examined men were divided into 2 groups according to their age: group I – 25–44 years old (17 persons); group II – 45–64 years old (98 persons). 45–64-year-old males were divided into 2 subgroups according to presence or absence of dermatological diseases. Subgroup A consisted of 33 healthy males, subgroup B included 65 males with psoriasis, chronic eczema and atopic dermatitis. We investigated the levels of adrenaline (A), norepinephrine (NA), dioxypheylalanine (DOPA), dopamine (DA) in urine, as well as the levels of insulin (I) and cortisol (C) in blood. The activity of sympathoadrenal system was checked by levels of catecholamines and dioxypheylalanine. Their concentration reflects the activity of

suprarenal glands and hypothalamus. The calculation of ratios of hormones and mediators of the sympathoadrenal and autonomic systems was performed. To compare the data in different groups we used paired Student’s t-test with the calculation of arithmetic mean value (M) and the standard error of the arithmetic average (m). The normality of data distribution was checked using the Shapiro-Wilk test at the significance level of 0.01. When we evaluated the received data, the level of significance was taken as 0.05 (the differences between the data were considered reliable at  $p < 0.05$ , with only exception – the Shapiro-Wilk test). Statistical processing of results was performed using software Statistica 6.1 (StatSoft Inc., № AGAR909E415822FA).

**Results and discussion**

The levels of adrenaline, norepinephrine, dioxypheylalanine, dopamine in urine, and the levels of insulin, cortisol in blood were evaluated in males of different research groups and subgroups (the obtained results are presented at Table 1). The ratios of hormones and mediators (A/NA, DA/DOPA, NA/DA, NA/I, C/I, DOPA/DA+NA+A), which reflect functioning of sympathoadrenal and autonomic systems, are shown on Figure 1.

Table 1

**Levels of adrenaline, norepinephrine, dopamine, dioxypheylalanine, cortisol and insulin in males according to the age and presence of chronic dermatosis**

Indicator	Group I	Group II	
		Subgroup IIA	Subgroup IIB
Adrenaline, nmol/day	35.9±0.36	35.4±0.96	30.1±0.7#
Norepinephrine, nmol/day	82.22±0.63	92.21±1.39*	91.5±0.69
Dopamine, nmol/day	1678±13.8	1625±30.3	1411±17.2#
DOPA, nmol/day	193±1.7	210.8±2.67*	172.4±2.2#
Cortisol, nmol/L	274.8±1.4	321.2±2.7*	376.4±2.8#
Insulin, mIU/mL	6.91±0.02	7.17±0.07*	7.35±0.02#

Notes: \* – statistically significant differences ( $P < 0.05$ ) when compared with group I; # – statistically significant differences ( $P < 0.05$ ) when compared with subgroup IIA.

The presented data show that the excretion of adrenaline, dioxypheylalanine and dopamine in patients with psoriasis, chronic eczema and atopic dermatitis was significantly lower than

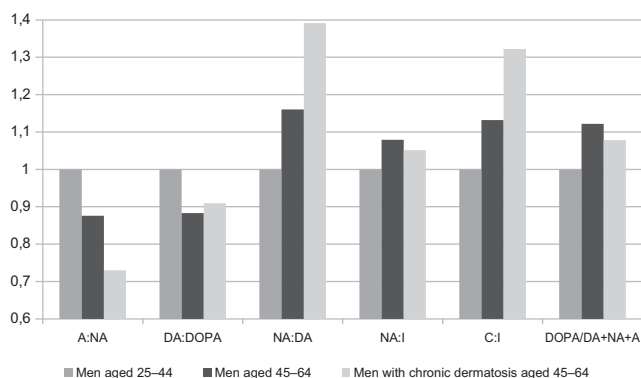


Fig. 1. The ratio of hormones and mediators in males from different groups (the ratios of group I are taken per 1 for convenience).

in healthy men. These results indicate the decrease in functional activity and reserve capacity of the sympathoadrenal system of patients with chronic dermatoses. At the same time we fixed the acceleration of the synthesis of catecholamines at the stages of dioxyphenylalanine-dopamine and dopamine-norepinephrine (coefficients of activity of synthesis norepinephrine/dopamine were higher in patients with psoriasis, chronic eczema and atopic dermatitis than in healthy males). The activity of the enzymes dioxyphenylalanine-decarboxylase and dopamine-beta-oxidase in patients with chronic dermatoses was greater than their activity in healthy males. The reduced ratio of dioxyphenylalanine/dopamine+norepinephrine+adrenaline (in comparison with males from subgroup IIA) indicated a higher transition speed of dioxyphenylalanine into catecholamines. A marked dissociation in the activity of units of the sympathoadrenal system was observed, which was evidenced by the prevalence of tonus of nerve link over the hormonal one (ratio adrenaline/norepinephrine was significantly lower in patients with psoriasis, chronic eczema and atopic dermatitis than in healthy males). Acceleration of biosynthesis of catecholamines at the stages of dioxyphenylalanine-dopamine and dopamine-norepinephrine in combination with reduced activity and backup capabilities of sympathoadrenal system was a consequence of depletion of catecholamines, and, primarily, norepinephrine in tissues (feedback mechanism).

The results of the study of excretion and biosynthesis of catecholamines grounded the conclusion that reverse reaction of sympathoadrenal system to the action of the stressor was unusual in nature and manifested itself by a decrease in the activity of sympathoadrenal system with a predominance of the nervous link tonus above hormonal one in patients with psoriasis, chronic eczema and atopic dermatitis.

Levels of cortisol and insulin in blood of patients with psoriasis, chronic eczema and atopic dermatitis were significantly higher than the levels in healthy males. The coefficient norepinephrine/insulin was almost the same and the index cortisol/insulin was

higher than in healthy males.

The results of the quantitative analysis confirm the high tension of endocrine system and indicate the discoordinating nature of its relationship with the elements of neurogenic link of adaptation (antagonistic – with the nervous link of adrenergic system and synergistic with parasympathetic link). Antagonistic relationships occur between the elements of neurogenic link of adaptation (sympathetic and parasympathetic departments).

Previous investigations [4–6] concerned the functioning of the central and autonomic nervous system in healthy males of different ages. The decrease in the index adrenaline/noradrenaline in men aged 45–64 years was the result of the increased excretion of noradrenaline, which indicated the prevalence of tone and reactivity of nervous link of adrenergic system over hormonal link. The results of other studies [4–6] showed the increase in functional activity and the reserve capacity of sympathoadrenal system, which was accompanied by dissociation of the activity of its links (noradrenaline type of dissociation). The studies of the functional state of autonomic nervous system in men of older age groups revealed synergistic increase in activity of its sympathetic and parasympathetic links.

So, our research for the first time showed that males with psoriasis, atopic dermatitis and chronic eczema aged 45–64 years had the expressed disturbances of autonomic homeostasis, which was manifested by inhibition of the sympathetic nervous system activity and increased tone and reactivity of the parasympathetic nervous system, a high degree of tension of the adrenal glands glucocorticoid function.

### Conclusions

1. The study showed the decrease in activity and reserve capacity of the sympathoadrenal system, the acceleration of biosynthesis of catecholamines at the stages of transformation of dioxyphenylalanin to dopamine and dopamine to norepinephrine (which to some extent indicated a decline in tissue catecholamine reserves); a high degree of tension of the glucocorticoid function of the adrenal glands and increased activity of autonomic system; the significant violations in autonomic homeostasis (which manifested by inhibition of the sympathoadrenal system activity and increased tonus and reactivity of the parasympathetic system); the decrease in the activity of compensatory organism reactions in males with psoriasis, chronic eczema and atopic dermatitis.

2. The fixed violations of sympathoadrenal and autonomic systems functioning grounded the necessity of nootropic drugs using in complex treatment of males, who suffered from psoriasis, chronic eczema and atopic dermatitis.

**Prospects for further research:** to study the effectiveness of correction of the sympathoadrenal and vagal-insular systems functioning violations on clinical course of chronic dermatoses.

**Conflict of Interest:** authors have no conflict of interest to declare.

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