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TESTING FIBRINOGEN DEGRADATION PRODUCTS AND IMMUNOGLOBULIN A IN SALIVA OF VEGETABLE FARM WORKERS

Research article

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Abstract

Currently, there is an increasing interest in saliva biochemical tests for assessment of the natural resistance of people working in various sectors of the economy. These methods have a number of certain advantages against the generally accepted ones due to their non-traumatic nature, safety and ease of initial sampling in comparison with blood serum analysis.

An immunodiffusion assay was carried out to examine fibrinogen degradation products and immunoglobulin A in the saliva of 161 workers of vegetable farm brigades.

The obtained results show that the levels of FDPs and immunoglobulin A are quite sensitive indicators of the response of oral mucous membranes and salivary glands to the presence of damaging etiologic factors in the external environment, which is consistent with their proven role of acute-phase proteins.

Keywords: vegetable farm workers, fibrinogen degradation products, immunoglobulin A.

ОПРЕДЕЛЕНИЕ ПРОДУКТОВ ДЕГРАДАЦИИ ФИБРИНОГЕНА И ИММУНОГЛОБУЛИНА А В СЛЮНЕ РАБОЧИХ ОВОЩЕВОДЧЕСКИХ БРИГАД

Научная статья

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Аннотация

В настоящее время повышается интерес к постановке биохимических тестов с использованием слюны для оценки естественной резистентности организма рабочих различных отраслей народного хозяйства. Эти методики имеют ряд определенных преимуществ в сравнении с общепринятыми, ввиду их не травматичности, безопасности и легкости забора исходного материала в сравнении с исследованием сыворотки крови.

Проведено исследование продуктов деградации фибриногена и иммуноглобулина А в слюне 161 рабочего овощеводческих бригад с использованием иммунодиффузного анализа.

Полученные результаты показывают, что уровень ПДФ и иммуноглобулина А являются достаточно чувствительными индикаторами реагирования слизистых оболочек полости рта и слюнных желез на присутствие во внешней среде повреждающих этиологических факторов, что согласуется с их доказанной ролью как белков «острой фазы».

Ключевые слова: рабочие овощеводческих бригад, продукты деградации фибриногена, иммуноглобулин А.

Introduction

It is known that the effects of various environmental factors at agribusiness facilities cause body reactions of general and local adaptation, which in general reduces the threshold of organism tolerance. In some cases, adaptation reaction can go beyond physiological limits and manifest itself in various degrees of severity of inflammatory processes, which, in turn, can serve as a basis for pathology development [1], [2], [3], [4].

Commonly accepted indicators of such inflammation include acute-phase proteins which are minimal in the normal condition (or may be absent at all), while their level may increase tens and even hundreds of times under inflammation [7], [8], [9], [10].

A significant part of acute-phase proteins has been well studied and used in various studies quite actively; these are fibrinogen and its degradation products (FDPs), C-reactive protein (CRP), alpha-2-macroglobulin, alpha-1-antitrypsin, ceruloplasmin, complement components, lactoferrin, etc. [11], [12]

The vast number of acute-phase proteins is synthesized in the liver, immunocompetent cells, and glandular epithelium [10], [11], [12].

Chronobiological analysis shows that various acute-phase components are released into the bloodstream in a certain sequence: FDPs, RNA, and serum-reactive protein (SRP) – from a few minutes to 3–5 hours; SRP, lactoferrin, etc. – from 6–8 to 24–72 hours; immunoglobulins – from 7 to 14 days. It becomes obvious that an increase in the level of acute-phase proteins in the blood can be regulated at different levels: transcription, translation, processing of protein precursors, and secretion of their cells [13], [14], [15], [16].

All this enriches researchers' capabilities in their assessment of the status of health of various population segments, including agricultural production workers.

At the same time, non-traumatic and bloodless technologies of human examination with no loss in research quality and informativeness deserve all attention and support.

Research methods and principles

To assess acute-phase proteins in the saliva of agribusiness workers (workers of vegetable farm brigades), we chose fibrinogen and products of its degradation (FDPs) and immunoglobulin A out of several types of these proteins: the method of their detection in mixed saliva is the most developed, and according to literature sources, they are sufficiently indicative in various body states.

We examined 161 workers: all males, most of them (132) aged 20–40 years (82%).

117 male students of Astrakhan Medical University aged 19–25 years formed a control group.

Enrollment criteria included the absence of signs of diseases of the oral cavity, respiratory tract, gastrointestinal tract, as well as the absence of complaints and any diseases of internal organs in the medical history at the time of examination.

Workers' saliva was sampled at their workplaces; the one of students – in classrooms. Saliva was sampled 2–3 hours after a meal or in the fasting state. Saliva samples were labeled and put in eppendorfs. The samples were transported to the laboratory in a chilled state (in refrigerated bags). To preserve the native protein structure, saliva was stored in refrigerators in the frozen state at temperatures from -8º to -10ºC.

Before examination, all incoming saliva samples were exposed to demucination, threefold freezing and thawing of saliva with subsequent separation of precipitated mucoids by 30-minute centrifugation at 3,000 rpm. After centrifugation, saliva samples were preserved with sodium azide to a final concentration of 0.01–0.03% to prevent microbial growth.

Antisera of the Gamaleya National Center of Epidemiology and Microbiology were used for immunodiffusion analysis.

The statistical significance of differences in two related groups was calculated with a Student's t-test. Microsoft Excel and Statistica for Windows were used for statistical analysis of the results.

Main results

3.1. Fibrinogen and its degradation products (FDPs) in the saliva of agribusiness workers

As acute-phase proteins, both fibrinogen and its degradation products are known to be uncommon components of saliva (i.e., they are absent in the normal condition). Therefore, in our study, they serve as indicators of a damaged microcirculatory barrier of the oral mucosa or salivary glands. Immunodiffusion analysis allowed to detect various FDP fragments in saliva in more than 27% of the study group – 44 out of 161 workers (Table 1).

Table 1 - FDPs in saliva of vegetable farm workers

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Examined groups	Number of examined persons	Number of persons with FDPs detected		Titer fluctuation
	absolute number	absolute number	%	
Workers	161	44	27,4	1-1/2
Control group (students)	117	6	5,1	1-1
Statistical significance	-	$p < 0,05$		

As can be seen from Table 1, the number of workers with FDPs in saliva was more than 7 times higher than the frequency of their detection in healthy individuals of the control group.

The age and, to some extent, the length of service of the persons examined are among important indicators which are quite closely related to the general level of resistance and, consequently, morbidity. All the agriculture workers were divided into 3 rank groups by these characteristics:

– by age: up to 30 years old, 31–40 years old, and 41–60 years old;

– by length of service: up to 1 year, 1–3 years, 3–5 years and more.

Table 2 presents results of the comparisons made in this regard.

Table 2 - Workers with FDPs in saliva by age and length of service

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Categories of workers	Total workers	Number of workers with FDPs	
		absolute number	%
By age:			
Aged 20-30 years	69	11	16,1
Aged 31-40 years	63	12	19,2
Aged 41-60 years	29	6	20,7
Statistical significance	-	p > 0,05	
By length of service:			
up to 1 year	18	4	22,2
1-3 years	48	9	18,7
3-5 years and more	95	16	16,8
Statistical significance	-	p > 0,05	

As is seen from Table 2, only a small, unreliable increase in the number of persons with FDPs was observed with an increment of the workers' age. By the way, other authors also found no significant differences between age groups in various control groups where the age of the persons examined ranged from 20 to 50 years.

No reliable differences regarding the content of FDPs in workers of different service-length groups were noted, either. It is possible that this may be due to some stabilization of certain individuals with FDPs due to their body adaptation to etiological factors.

3.2. Serum immunoglobulin A in the saliva of agribusiness workers

Binding to microorganisms, immunoglobulin A antibodies inhibit their adhesion to the surface of epithelial cells and thus prevent their penetration into the internal environment of the organism.

The provided data indicate quite marked differences in the amount of immunoglobulin A in the saliva of workers and in the students' saliva ($p < 0,01$).

Table 3 - Immunoglobulin A in the saliva of vegetable farm workers

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Groups examined	Number of persons examined	Number of persons with Immunoglobulin A detected			p against control group
		absolute number	%	Immunoglobulin A content, mg/ml	
Workers	161	34	21,1	0,137±0,013	0,01
Students (control group)	117	40	3,1	0,07±0,01	

Discussion

The synthesis of acute-phase proteins in various lesions is quite a well-known fact, and it is actively used for diagnosis and treatment of human health disorders. As a rule, acute-phase proteins are studied in blood serum. At the same time, it is known that acute-phase proteins are found in other biological fluids, including mixed saliva, which is anatomically and functionally associated with other organs and systems of the organism, and, above all, with blood.

Our studies have shown that such acute-phase proteins as FDPs and immunoglobulin A can be used to assess body natural resistance along with other tests. Their common feature is that they were detected in vegetable farmworkers almost constantly. It seems to us that rather high levels of FDPs and immunoglobulin A, as fast-reacting acute-phase proteins, in the saliva of vegetable farmworkers may reflect different conditions in a living organism, from the activation of adaptation mechanisms of nonspecific defense to the premorbid state or already developed illness. In contrast to FDPs, an increase in the level of immunoglobulin A in saliva, as a slower component of defense, may reflect the presence of an already developed disorder in the organism.

Conclusion

Acute-phase proteins in vegetable farmworkers can be tested to identify initial or already formed signs of harmful effects of unfavorable production factors, along with other clinical, biochemical, hematologic, immunologic and other methods. In this

regard, it seems reasonable to include a wider set of tests for acute-phase proteins of tissue and serum origin in order to reveal a more complete picture of the impact of adverse factors of the industrial environment on the human body.

It is also important to note that human saliva is a more convenient material for mass examination of people than blood serum due to non-traumatic, bloodless and quick material sampling, as well as relative epidemiological safety of methods of its sampling and analysis.

Конфликт интересов

Не указан.

Рецензия

Все статьи проходят рецензирование. Но рецензент или автор статьи предпочли не публиковать рецензию к этой статье в открытом доступе. Рецензия может быть предоставлена компетентным органам по запросу.

Conflict of Interest

None declared.

Review

All articles are peer-reviewed. But the reviewer or the author of the article chose not to publish a review of this article in the public domain. The review can be provided to the competent authorities upon request.

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