

Regeda-Furdychko M. M. Evaluation of the influence of thiotriazoline on the cytokine status disturbances in the blood serum under the condition of experimental contact dermatitis and experimental pneumonia. *Journal of Education, Health and Sport*. 2020;10(1):25-30. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.01.003>  
<https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.01.003>  
<http://dx.doi.org/10.5281/zenodo.3608016>

The journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. § 8. 2) and § 12. 1. 2) 22.02.2019.

© The Authors 2020;

This article is published with open access at Licensee Open Journal Systems of Nicolaus Copernicus University in Torun, Poland

Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike. (<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 20.12.2019. Revised: 25.12.2019. Accepted: 14.01.2020.

## **Evaluation of the influence of thiotriazoline on the cytokine status disturbances in the blood serum under the condition of experimental contact dermatitis and experimental pneumonia**

**M. M. Regeda-Furdychko**

**Lviv Medical Institute**

### **Abstract**

The aim of our research was to determine the character of the disturbances content level of pro-inflammatory interleukin-6, tumor necrosis factor- $\alpha$  and anti-inflammatory cytokine interleukin-10 (IL-10) in the serum of guinea pigs and estimation of thiotriazoline influence on the cytokine profile in the conditions of formation of combined pathology - experimental contact dermatitis and experimental pneumonia.

It has been determined significant advantage of pro-inflammatory cytokine activity, which increasing according the development of the combined pathological process and, simultaneously, reducing the anti-inflammatory IL-10. It has been detected corrective action of thiotriazoline on the investigated indices of cytokine profile.

**Key words: contact dermatitis; pneumonia; cytokines; thiotriazoline.**

**Оцінка впливу препарату тіотриазоліну на зрушення цитокінового статусу в сироватці крові за умов формування експериментального контактного дерматиту та експериментальної пневмонії**

**М. М. Регеда-Фурдичко**

**Львівський медичний інститут**

Метою нашого дослідження було визначення характеру порушень вмісту рівня прозапальних інтерлейкіну-6 (ІЛ-6) і фактору некрозу пухлин- $\alpha$  (ФНП- $\alpha$ ) та протизапальних цитокінів інтерлейкіну-10 (ІЛ-10) у сироватці крові морських свинок та оцінка впливу препарату тіотриазоліну на цитокіновий профіль за умов формування експериментального контактного дерматиту та експериментальної пневмонії.

Встановлено суттєву перевагу прозапальної активності цитокінів, яка зростає по мірі розвитку комбінованого патологічного процесу, і, водночас, зниження протизапального ІЛ-10. Виявлено коригуючу дію тіотриазоліну на досліджувані показники цитокінового профілю.

**Ключові слова:** контактний дерматит; пневмонія; цитокіни; тіотриазолін.

**Оценка влияния препарата тиотриазолина на сдвиг цитокинового статуса в сыворотке крови при условиях формирования экспериментального контактного дерматита и экспериментальной пневмонии**

**М. М. Регеда-Фурдичко**

**Львовский медицинский институт**

Целью нашей работы было определение характера нарушений содержимого уровня провоспалительных интерлейкина-6 (ИЛ-6) и фактора некроза опухолей -  $\alpha$  (ФНП- $\alpha$ ) и противовоспалительных цитокинов интерлейкина-10 (ИЛ-10) в сыворотке крови морских свинок и установления влияния препарата тиотриазолина на цитокиновый профиль при условиях формирования экспериментального контактного дерматита и экспериментальной пневмонии.

Установлено существенное преимущество воспалительной активности цитокинов, которая растет по мере развития комбинированного патологического процесса, и, в то же время, снижения противовоспалительного ИЛ-10. Обнаружено корректирующее действие тиотриазолина на исследуемые показатели цитокинового профиля.

**Ключевые слова:** контактный дерматит; пневмония; цитокины; тиотриазолин.

**Introduction.** Virtually all processes occurring in the body are controlled by a complex of intercellular and cell-matrix interactions, which are regulated by various signaling molecules, including cytokines (CCs). Cytokines are particularly important in maintaining homeostasis and in initiating, regulating, and completing response to damage [1, 2]. They regulate and determine the nature of the immune response. The acute inflammatory response is initiated as a result of the tissue macrophages activation and secretion of inflammatory cytokines, including tumor necrosis factor -  $\alpha$  (TNF- $\alpha$ ), interleukin-1 and interleukin-6 (IL-6), which are the reasons of many local and systemic changes obtained during the acute inflammatory response activation [2]. The course and intensity of the inflammatory response is controlled by several CCs. The features of providing an inflammatory infection with cytokine are very actual subject of scientific research. The pathogenetic balance between pro- and anti-inflammatory cytokines is crucial in determining the outcome of the disease [3].

In the practical work of the doctor very often there are combinations of pathologies that complicate each other. In an experimental study, we described diseases that are common in clinical medicine – contact dermatitis and pneumonia.

Nowadays, experimentalists and clinicians have attracted the attention with their researches. They are concerning to the influence of medicine that has immune and antioxidant properties. So the research of thiotriazoline influence on the treatment of experimental contact dermatitis (ECD) and experimental pneumonia (EP) and on the indicators and cytokine status should be provided.

**The aim of our research** was to determine the character of the disturbances content level of pro-inflammatory TNF- $\alpha$ , IL-6 and anti-inflammatory cytokine interleukin-10 (IL-10) in the serum of guinea pigs and estimation of thiotriazoline influence on the cytokine profile in the conditions of formation of combined pathology - ECD and EP.

**Materials and methods.** Researches were conducted on guinea pigs, divided into six groups: I - control, II – 4<sup>th</sup> day of experiment, III – 8<sup>th</sup> day of contact dermatitis development and experimental pneumonia, IV – 10<sup>th</sup> day and V - 18<sup>th</sup> day of model processes and VI group - guinea pigs with ECD and EP after treatment with thiotriazoline during 10 days (from 8<sup>th</sup> to the 18<sup>th</sup> days of the experiment). For the purpose of detailed analysis and interpretation of cytokines indicators in different days of the experiment, two periods of development of ECD and EP were distinguished: early and late. The chosen days of ECD and EP were due to the classical stages of the inflammatory process. Early period included groups of animals on the 4<sup>th</sup> and 8<sup>th</sup> days of experiment. The late one – guinea pigs on the 10<sup>th</sup> and 18<sup>th</sup> days of ECD and EP.

Experimental contact dermatitis was simulated by method of V. A. Volkovoj (2010) [4]. EP was called by the method of V. N. Shlyapnikov, T. L. Solodov (1998) [5]. Thiotriazoline was administered intramuscularly at a dose of 100 mg per 1 kg of weight daily from the 8<sup>th</sup> to the 18<sup>th</sup> days of the experiment. The study material was collected under ether anesthesia. The IL-6, IL-10 and TNF- $\alpha$  concentration in the blood serum was defined for all groups of guinea-pigs. It was made using hard-phase immune-enzyme analysis (ELISA), by means of the test-system “Diaclone” (France). Numerical results were adapted with static method using Student’s criteria.

**Results of the study and their discussion.** During the study of some indicators of the cytokine profile in the ECD and EP, it was found that in all investigated days of the experiment, there were probable changes in the concentration of both pro-inflammatory and anti-inflammatory cytokines in comparison with the group of intact animals.

Thus, in the dynamics of the development of the model process (4<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> and 18<sup>th</sup> days) the level of IL-6 was increased by 27.4% ( $p \leq 0.05$ ), 35.4% ( $p \leq 0.05$ ), 46.7% ( $p \leq 0.05$ ) and 50.0% ( $p \leq 0.05$ ) compared to control values.

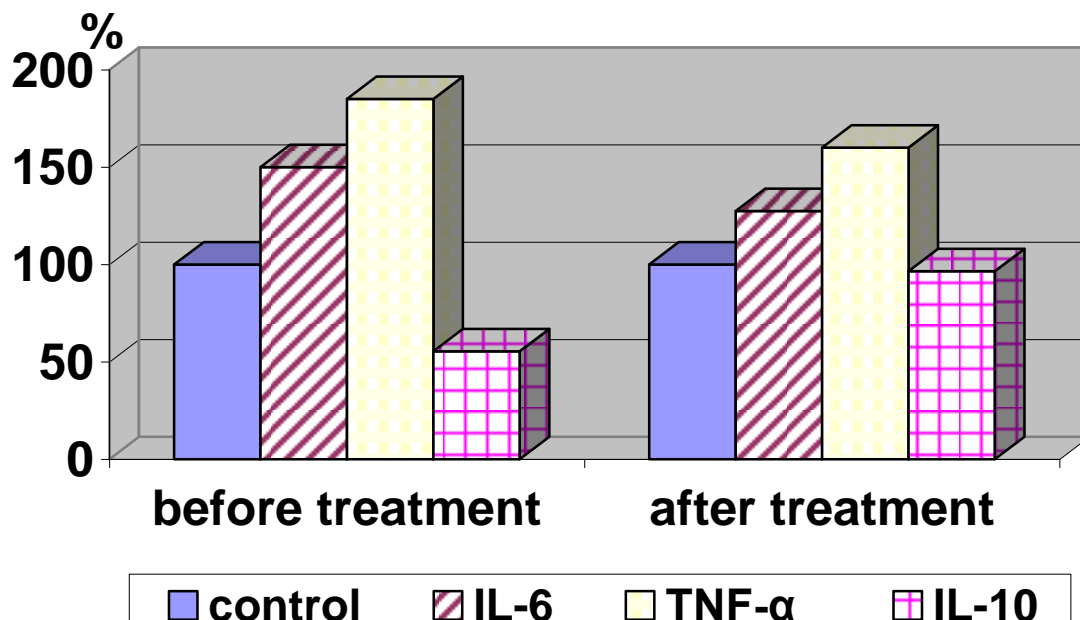
A similar results were observed with the definition of the next pro-inflammatory cytokine in the blood of TNF- $\alpha$ . It was found that in all periods of the combined pathology formation, that included the 4<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> and 18<sup>th</sup> days of the experiment, there was an increasing in the content of tumor necrosis factor in the blood by 45.0%, 57.5%, 72.0% and 85.0% ( $p \leq 0.05$ ) in comparison with the control group.

Consequently, the final results of the cytokine profile in blood serum in ECD and EP conditions showed an increasing of pro-inflammatory pool level, depending on the duration of combined pathological processes, especially the most pronounced in animals of the fifth group.

Studying the anti-inflammatory factor in the serum of guinea pigs with ECD and EP, we observed the following picture: an index of IL-10 declines by 21.7%, 23.9%, 33.7% and 44.6% ( $p \leq 0.05$ ), respectively, on the 4<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup> and 18<sup>th</sup> days of this combined model compared to the first group of animals.

Thus, the study of cytokines (TNF- $\alpha$ , IL-6 and IL-10) showed an increase in proinflammatory and a decrease in anti-inflammatory interleukins, indicating an imbalance between pro- and anti-inflammatory CCs.

The using of thiotriazoline resulted in a decreasing of interleukin-6 by 22.5% ( $p_1 \leq 0.05$ ), TNF- $\alpha$  by 24.3% ( $p_1 \leq 0.05$ ), and growth of interleukin-10 by 41.1% ( $p_1 \leq 0.05$ ) compared to the values of the guinea pig group that didn't take these medicine (fig.1).



**Fig. 1.** The influence of thiotriazolin on the level of cytokines indexes in guinea pigs' blood in the ECD and EP formation dynamics

**Conclusions.** It has been determined significant advantage of pro-inflammatory cytokine activity, which increasing according the development of the combined pathology and, simultaneously, reducing the anti-inflammatory IL-10. It has been detected corrective action of thiotriazoline on the investigated indices of cytokine profile in the conditions of formation experimental contact dermatitis (ECD) and experimental pneumonia.

#### REFERENCES

1. Mikhailovskaya N. S., Kulinich T. A., Kulinich A. V. The impact of the migrated community-acquired pneumonia on the development of kardiovaskularnih complications in

patients with ischemic heart disease. *Achievements of clinical and experimental medicine*. 2014. No. 2. P. 12-16.

2. Moudgil KD, Choubey D. Cytokines in autoimmunity: role in induction, regulation, and treatment. *J Interferon Cytokine Res*. 2011 Oct;31(10):695-703. doi: 10.1089/jir.2011.0065. Epub 2011 Sep 23.

3. Palomo J, Dietrich D, Martin P, Palmer G, Gabay C. The interleukin (IL)-1 cytokine family—balance between agonists and antagonists in inflammatory diseases. *Cytokine* 2015;6:25-37.

4. Volkova V.A., Kuchynska I.V., Tiupka T.I. Study of the therapeutic efficacy of a new ointment with a lipophilic complex of the Tremulin aspen bark under conditions of non-allergic contact dermatitis in rats. *Pharmacology and drug toxicology*. 2010;7–12.

5. Shlyapnykov V.N., Solodova T.L. et al. Eksperimentalnye modeli ostrykh pnevmoniy, vyzvanykh uslovno-patolohicheskimi bakteriyami I ikh assotsiatsiey: metod. ukazaniya sost. Saratov, 1998. 30 p.