

## FOLLOWING THE V ALL-RUSSIAN CONGRESS OF THE ASSOCIATION OF PEDIATRIC ALLERGOLOGISTS AND IMMUNOLOGISTS OF RUSSIA (APAIR)

### По следам V Всероссийского Съезда Ассоциации Детских Аллергологов и Иммунологов России (АДАИР)

## Analysis the level of autoantibodies in diabetic ketoacidosis in pediatric practice

SCO — краткое сообщение

<https://doi.org/10.53529/2500-1175-2023-2-44-46>**Yu. V. Bykov<sup>1,2</sup>, V. A. Baturin<sup>1</sup>**<sup>1</sup> Stavropol State Medical University, 355017, Stavropol, Mira str., 310, Russia<sup>2</sup> Children's City Clinical Hospital named G. K. Filippsky, 355002, Stavropol, Ponomareva str., 5, Russia**Keywords:** diabetes mellitus, diabetic ketoacidosis, autoantibodies, dopamine receptors, NMDA receptors.**For citation:** Bykov YuV, Baturin VA. Analysis the level of autoantibodies in diabetic ketoacidosis in pediatric practice. *Allergology and immunology in pediatrics*. 2023; 2: 44–46. <https://doi.org/10.53529/2500-1175-2023-2-44-46>

## Анализ уровня аутоантител при диабетическом кетоацидозе в педиатрической практике

<https://doi.org/10.53529/2500-1175-2023-2-44-46>**Ю. В. Быков<sup>1,2</sup>, В. А. Батурин<sup>1</sup>**<sup>1</sup> ФГБОУ ВО «Ставропольский государственный медицинский университет» Минздрава России, 355017, г. Ставрополь, улица Мира, 310, Россия<sup>2</sup> ГБУЗ ГК «Детская городская клиническая больница им. Г. К. Филиппского», 355002, г. Ставрополь, улица Пономарева, 5, Россия**Ключевые слова:** сахарный диабет, диабетический кетоацидоз, аутоантитела, дофаминовые рецепторы, NMDA рецепторы.**Для цитирования:** Быков ЮВ, Батурин ВА. Анализ уровня аутоантител при диабетическом кетоацидозе в педиатрической практике. *Аллергология и иммунология в педиатрии*. 2023; 2: 44–46. <https://doi.org/10.53529/2500-1175-2023-2-44-46>

Type 1 diabetes mellitus (DM) — one of the most common chronic autoimmune disease in childhood and adolescence [1]. This endocrinopathy is characterized by sharp decline or complete absence of endogenous insulin due to autoimmune destruction of  $\beta$ -cell pancreas [2]. Diabetic ketoacidosis (DKA) is acute and the most dangerous complication of type 1 DM [1]. DKA has severe effects for a child's body, primarily by central nervous system (CNS) damage [3]. Scientific studies have shown that maximum early screening of autoantibodies (AAB) to  $\beta$ -cell pancreas in children at the pre-diabetic stage of type 1 DM can significantly reduce the risk of DKA that will

lead to decrease in the hospitalization frequency with this complication [1].

Given the severity of CNS disorder against the background of DKA, timely diagnosis of brain dysfunction is more relevant with this complication [4]. It is shown that glutamatergic receptors (NMDAR) are involved in the brain synaptic plasticity as well as in the processes of neuronal cell survival and death [5]. AAB to NMDAR are one of the most common and clinically significant autoimmune AAB, discovered in recent years [6]. Some authors show that a high content of AAB to NMDAR causes brain neurons' damage by enhancing excitotoxicity processes primarily due to glutamate receptor

hyperstimulation [6]. On the other hand, dopaminergic dysfunction is known to lie at the root of diverse brain pathologies [7]. Dopamine receptors 1 and 2 (DAR1 and DAR2) are considered the most studied. High content of AAB to DAR2 is proven to cause brain dysfunction as this particular class of receptors to dopamine is closely related to controlling behavior [8].

Our previous works have shown the highest AAB increase to NMDAR and DAR2 in children with a chronic course of type 1 DM amid DKA, compared to children with DKA against the backdrop of newly diagnosed from of the disease [9]. Discovered high AAB content to dopamine and glutamate receptors was found in children and adolescents against the background of a long course of the disease and frequent hospitalizations with DKA manifestations [9].

**Objective** — to analyze the level of AAB to dopamine and NMDA receptors in children, depending on the clinical DKA severity.

**Materials and methods.** Open blind controlled study included 76 children (40 boys and 36 girls, an average age  $11,06 \pm 0,48$  years); 38 of them were children (I studied group) with type 1 DM and 38 conditionally healthy children (II studied group). The patients of the studied groups were divided into 3 subgroups: type 1 DKA ( $n = 22$ ); type 2 DKA ( $n = 12$ ); type 3 DKA ( $n = 4$ ). DKA severity was determined according to the severity of the clinical manifestations under the national classification, adapted to the Western criteria for DKA gradation — «International Society for Pediatric and Adolescent Diabetes (ISPAD)» (2009). There was AAB determination in blood serum to type 2 dopamine receptors (DAR2) and to type 1 glutamatergic receptors (NMDAR1). The quantitative AAB determination

in blood serum (U/ml) in the children studied was performed by the method of enzyme-linked immunosorbent assay. The Mann-Whitney criterion, the Kruskal-Wallis test and Spearman's rank correlation coefficient were used in statistical data processing. The level of statistical significance was adopted equal to  $p < 0,05$ .

**Results.** Maximum clinical impairment of consciousness level and biochemical parameters were identified in the children of type 3 DKA. All the patients with DKA were diagnosed an average increase in AAB to NMDAR1 —  $3,82 [3,0-5,59]$  U/ml, compared to the conditionally health children —  $1,12 [0,65-1,64]$  U/ml ( $p = 0,000$ ) as well as AAB to DAR2 —  $7,24 [3,84-12,19]$  U/ml, compared to the patients in the control group —  $2,13 [1,45-3,15]$  U/ml ( $p = 0,000$ ). It is found that the degree of AAB increase to NMDAR1 and DAR2 depended on DKA clinical severity (the maximum concentration with type 3 DKA). There was a positive correlation between high AAB values and impairment of consciousness level.

**Conclusion.** The high AAB values to NMDAR in the patients of type 1 DM against the background of DKA may indicate neuronal damage in the brain as a result of excitotoxicity processes through hyperstimulation of glutamatergic system that was also noted by other authors [6]. High values of AAB to DAR2 may be a consequence of dopaminergic dysfunction through a possible activation of dopamine receptors that may lead to cerebral insufficiency [8]. Practical significance of the obtained results is that maximum early screening for AAB to glutamate and dopamine receptors in patients of type 1 DM will make it possible to identify and prevent CNS damage in this contingent of patients.

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