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The gut microbiota effects on systemic immunity and its relationship with hyperoxaluria in the patients with recurrent pyelonephritis

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INTRODUCTION & OBJECTIVES: The purpose of the present study was to investigate the state of the gut microbiota in the patients with recurrent pyelonephritis and their relations to inflammatory biomarkers and hyperoxaluria.

MATERIAL & METHODS: This study represents the data of the microbiological stool examination in 70 women with recurrent pyelonephritis caused by E. coli or S. faecalis., non-stone formers. The mean age in the patient population was 21-48 yrs (32.3±8.2). Recurrent pyelonephritis was defined as 2 upper urinary tract infection episodes within 6 months or 3 or more episodes during the previous 12 months.
The samples of faeces had been collecting during the presence of clinical symptoms of pyelonephritis before starting the antibiotic therapy.
The concentration of interleukins (IL) -4, -17, -18, -23 and monocyte chemoattractant protein-1 (MCP-1) were analyzed in the blood of 40 women using ELISA and STAT FAX-303 PLUS (Diaclon, France; DRG, Germany; Ukrmedservice, Ukraine).
The analysis of 24-h urinary oxalate excretions was performed by suppressed ion chromatography.

RESULTS: Microbiological studies of the colon microflora showed a lower content of Lactobacillus spp. in 53/70 (76%) in the patients with recurrent pyelonephritis. The increasing level of opportunistic bacteria was determined in 34/70 (49%) of the women. In general, all of the examined patients had the gut dysbiosis. But, we have to note, that only 28/70 (40%) of them had clinical signs of gut dysbiosis.
The blood levels of IL-4and IL-17 in the women with the deficit of Lactobacillus spp. in the gut (n=53) were significantly higher compared with the deficit-free patients (n=17): 61.45 [47.8-69.7] vs 47.05 [36.1-67.9] pg/ml (P=0.04), and 126.8 [98.7-217] vs 108.4 [76-143]pg/ml (P=0.01), respectively. The level of IL-18 was significantly lower 31.5 [29-41] vs63.7 [31.7-198] pg/ml (P=0.001).
Moreover, in the patients with the deficit of intestine lactobacillus spp., we observed the high level of hyperoxaluria (110.8±39 vs 55.5±29mg/day, p<0.0001) and significant increase of episodes of frequent pyelonephritis recurrences (5.8±3.8vs3.1±2.9per year, p<0.0001).
The quantitative content of Lactobacillus spp. in the patients' intestine was significantly correlated with the level of daily urinary oxalate excretion (R=-0.72; P<0.0001) and the blood level of IL-17 (R=-0.36; P=0.04). That is, the less the number of Lactobacillus spp. in the composition of intestinal in the women was, the more the levels of hyperoxaluria and IL-17 occurred.
In addition, we identified a moderate direct correlation between the blood level of IL-17 in the patients with recurrent pyelonephritis and daily oxalate excretion (R=0.54, P=0.03).

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CONCLUSIONS: Thus, the frequent use of antibacterial medicinal products by the patients with the recurrent pyelonephritis leads to the destruction of the normal composition of gut microbiota, and, primarily, due to the fact that the content of Lactobacillus spp. is deceased. In turn, the deficit of Lactobacillus spp. violates the immune response and oxalate metabolism with formation of hyperoxaluria.
The use of lactic acid bacteria may be useful for both to prevent the recurrences and reduce the urinary oxalate excretion in the patients with pyelonephritis.