The paper shows the necessity of choosing an enterosorbent for acute enteric infection (AEI) in children. It presents the basic properties of polymethylsiloxane polyhydrate as one of the drugs for enterosorption.

**Objective.** To evaluate the efficiency of using polymethylsiloxane polyhydrate in children with AEI.

**Subjects and methods.** A total of 148 children aged 1 month to 15 years with AEI of different etiologies were examined. 50 of them received polymethylsiloxane polyhydrate (a study group), 48 took dioctahedral smectite (Comparison Group A), and 50 used colloidal silicon dioxide or kaolin (Comparison Group B). The etiology of AEI was clarified using bacteriological and molecular genetic studies. The time to relieve clinical symptoms of this condition was estimated.

**Results.** No significant differences were found in the duration of the main symptoms of AEI in its treatment with polymethylsiloxane polyhydrate versus the other tested enterosorbents.

**Conclusion.** Polymethylsiloxane polyhydrate can be regarded as one of the effective and safe enterosorbents, which may be recommended as part of combination therapy for AEI in children in the first month of life.

**Key words:** diarrhea, acute enteric infection, polymethylsiloxane polyhydrate, rotavirus infection, salmonellosis, enterosorbents.
Despite the improvement of the living conditions, implement preventive and curative interventions in most regions, acute intestinal infections (AII) today remains one of the most frequent problems in pediatric practice. The prevalence of complications and lethal outcome maintained at a high level [1-3]. The complications were directly associated with the development of marked dehydration and infectious-toxic shock, and lesions of the pancreas, liver, kidneys, central nervous system, heart, lungs [3-5]. There were also reports of significant adrenal disfunction and vascular pathology in the AII [4, 6]. Overall, according to the literature, complications occur in approximately 10% of patients [4].

The lack of adequate starting therapy is one of the most important factors that significantly increase the risk of AII complications [5]. It is obvious that the treatment should be started immediately after the first examination of the child. This most often occurs empirically in the outpatient setting, until the results of laboratory and instrumental investigations confirming and clarifying the diagnosis. Treatment delay within days and sometimes hours leads to an increase in the severity of the condition, complications and increase the risk of adverse outcome, even if there are initially mild course and the absence of chronic underlying diseases [5]. In these cases substantially increases the disease duration, worsening the prognosis.

It is now generally accepted that the basis of starting therapy of AII in children should be enterosorbents and oral (rarely parenteral) rehydration [7-10, 11].

Rehydration formulations to compensate the loss of fluid and electrolytes, improve the health of patients, but do not eliminate the cause of diarrhoea, have little effect on the frequency of stool and duration of AII [12]. Antibacterial or antiviral drugs act directly on the etiological factors. But when applying them in the absence of other components of therapy often increases toxicity until the development of infectious toxic shock as a result of accumulation of products of disintegration of bacterial cells. Other often observed unwanted effects are antibiotic associated diarrhea, associated with the growth of the pathogenic bacterium *Clostridium difficile*, which significantly worsens the condition of patients. Antibiotics have a very negative impact by frequently reported viral diarrhea.

An additional adverse factor is a food allergy, allergic reactions on ongoing therapy, pathogens, and cellular debris.

In this regard, it is obvious that the primary goal of treatment of the AII is enterosorption. Adsorbent preparation should bind and remove a variety of bacterial cells, viruses, breakdown products of pathogens, allergens, toxins from the gastrointestinal tract and thereby reduce the stool frequency and volume, improve the general condition of the patient, reduce duration of illness. However, enterosorbent must not damage the epithelium of the intestine, prevent the absorption of nutrients, to disturb the natural microcenosis and have toxic effects. Especially it is about young children, to the greatest extent in the first year of life.

Currently, the pharmaceutical industry offered a fairly wide range of adsorbents, which are recommended according to their instructions, if you have diarrhea. According contained substance they can be divided into carbon-based products (based on activated carbon), silicon (dioctahedral smectite, polymethylsiloxane polyhydrate, kaolin, kaopectate and others), fibrous
(lignin, pectin, alginate) and polymer (polyvinylpyrrolidone). In childcare the most commonly used silicon-containing adsorbents. They characterised high adsorption ability and no damaging effect on the intestinal mucosa.

To date, of these drugs the most researched and frequently prescribed is dioctahedral smectite [8-10, 12]. However, in everyday practice, for the pediatrician is often necessary to have a choice of alternative treatment regimens due to individual intolerance or refusal of the child taking a medicine because of organoleptic characteristics.

The aim of this study is to assess the effectiveness of the polymethylsiloxane polyhydrate in children with AII.

**Materials and methods**

A randomized, prospective, open simple comparative study, in which we included 148 children with AII at the age from 1 month to 15 years, we observed at the hospital (123 children) and outpatient (25 children). Most patients were up to 3 years (65%). Clinical symptoms often consistent with gastroenteritis (78%) moderate (84%). Severe form was seen in 9% of children. All patients were investigated for the etiological diagnosis by bacteriological and molecular genetic methods. Polimerase chain reaction (PCR) rotavirus infection was diagnosed in 55 (37%) children, norovirus – 7 (5%), while one-three time bacteriological culture of feces on selective medium demonstrated in 18 (12%) salmonellosis. In the specification of a species of Salmonella was more frequently found Salmonella Enteritidis [in 15 (10%) patients], rare – Salmonella Typhimurium [3 (2%) children]. Mix AII salmonellosis-rotavirus etiology was noted in 4 (3%) patients, rotavirus-noroviruses – 3 (2%). 75 (51%) of children etiological factor could not be established. In 31 (21%) children diagnosed a combination of AII with acute respiratory infections: respiratory syncytial (5%), parainfluenza (7%). Adenoviruses, which can cause both the respiratory and gastrointestinal symptoms, identified in 7 (5%) children.

All patients after the first examination was prescribed treatment in accordance with standard recommendations: rehydration and enterosorption therapy, if indicated (heamocolitis, moderate and severe form of the AII with invasive diarrhea; children of the first year of life) an antibiotic in combination with a probiotic [7, 8, 13, 14].

Patients were randomized into 3 groups by the method of the envelopes depending on the assigned treatment. The experimental group included 50 children treated with polymethylsiloxane polyhydrate in doses presented in table. 1. In the comparison group A included 48 patients treated with dioctahedral smectite according to the standard scheme [8]. The comparison group B consisted of 50 patients who were prescribed kaolin or silicon dioxide colloid in doses according to instructions. All children included in the study, therapy was administered no later than the third day from the onset of the first symptoms of the AII.

Table 1. The scheme of polymethylsiloxane polyhydrate prescription at the AII children depending on age

<table>
<thead>
<tr>
<th>Age</th>
<th>Single dose, g (volume)</th>
<th>Day dose, g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mild</td>
<td>moderate and severe</td>
</tr>
</tbody>
</table>
The compared groups were fully comparable for age, main and concomitant illnesses, severity of disease, timing of treatment given the basic treatment.

Statistical processing of results was performed using Statistica, version 6.1. The significance of differences was determined using Z-test, the differences were considered significant at $p < 0.05$.

Results and discussion

Mild forms of AII in children included in the study, occurred in the period from 1 to 7 days. Significant differences in the average duration of major symptoms in the compared groups were not observed (table 2). Most of the children on the background of complex therapy vomiting ceased on the second day, the appetite improved on the third day, the stool was normalized in 5-6 days.

Table 2. The duration of the main clinical symptoms of AII (day) depending on the therapy ($M \pm m$)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Experimental group ($n = 50$)</th>
<th>Comparison group A ($n = 48$)</th>
<th>Comparison group B ($n = 50$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intoxication</td>
<td>$1,9 \pm 0,3$</td>
<td>$1,8 \pm 0,3$</td>
<td>$2,3 \pm 0,2$</td>
</tr>
<tr>
<td>Fever</td>
<td>$2,5 \pm 0,3$</td>
<td>$1,9 \pm 0,4$</td>
<td>$2,4 \pm 0,3$</td>
</tr>
<tr>
<td>Appetite lost</td>
<td>$2,5 \pm 0,6$</td>
<td>$2,1 \pm 0,5$</td>
<td>$2,3 \pm 0,5$</td>
</tr>
<tr>
<td>Nausea</td>
<td>$1,9 \pm 0,2$</td>
<td>$1,7 \pm 0,2$</td>
<td>$1,8 \pm 0,4$</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>$6,0 \pm 0,3$</td>
<td>$5,2 \pm 0,5$</td>
<td>$5,8 \pm 0,9$</td>
</tr>
</tbody>
</table>

There has not been a single case of individual intolerance of the polymethylsiloxane polyhydrate or refraining from it due to the organoleptic properties. However, in two cases, dioctahedral smectite has been replaced by another drug of similar action in consequence of the taste unacceptability by patients, what was the reason to exclude them from the study. There were no other undesirable episodes requiring correction treatment in the compared groups.

Currently, the main drug recommended as enterosorbent in the AII in children remains dioctahedral smectite. Efficacy and safety it was confirmed in many Russian and foreign studies, including placebo-controlled [8, 11-13, 15]. However, in everyday practice, the pediatrician should have a choice of drugs from some similar pharmacological properties, but differ in chemical composition and organoleptic features.
In the appointment of alternative regimens in such cases it is necessary to take into account the sorption capacity of the drug, the degree of selectivity of action, the possibility of income from the intestines into the bloodstream. For children one of the important properties of the drug is its taste.

A drug with pre-defined properties can be obtained by chemical synthesis. Synthetic adsorbents, the most common polymethylsiloxane polyhydrate. Its matrix structure with a fixed size of the pores allows to adsorb medium size molecules, which include toxins, bacteria, products of disintegration of proteins, lipids, food allergens, heavy metals, bilirubin, urea [16]. In the studies [17] it was shown that this drug safely binds and removes viruses and pathogenic bacteria. Protective action prevents the occurrence of erosive-ulcerative lesions of the mucous membrane of the gastrointestinal tract, eliminates the symptoms of irritable bowel. Reviews of the polymethylsiloxane polyhydrate confirm its ability to restore the microflora of the intestine and stimulate peristalsis. Preparation proved to have anti-inflammatory and regenerating action on the mucous membrane of the intestine and stomach, prevents the development of erosions. Its efficacy in AII in children was confirmed in the study.

The duration of treatment is determined individually. The duration of therapy for acute disease is from 3 to 14 days and even months, if chronic (if indicated) – and more. The drug is taken between doses of other drugs and food (after 2 hours after ingestion of food or drugs or for 1.5–2 h before admission). The daily dose divided into 3-4 reception.

Polymethylsiloxane polyhydrate completely eliminated from the intestines, does not affect the absorption of vitamins and minerals. Valid for use from the first month of life. Available in the form of a paste or gel for the preparation of suspension, has a neutral taste. The drug is effective in diseases accompanied by intoxication from the accumulation of metabolites: in chronic diseases of the liver and kidney, sepsis. Polymethylsiloxane polyhydrate also removes various allergens.

During the clinical observations showed that in children with atopic dermatitis in the OKA, about 80% of cases there is an exacerbation of allergic reactions. In the appointment of the polymethylsiloxane polyhydrate the frequency of exacerbations in these patients was reduced by 47%.

Thus, when AII for children in the complex therapy should be prescribed adsorbents. Of a polymethylsiloxane polyhydrate can be considered one of effective and safe drugs in this group that can be recommended to patients with the first month of life.

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