EFFECTS, POTENTIAL AND ADVANTAGES OF SORBILACT – A COMBINATION PREPARATION FOR INFUSION

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In the literature review the current state and problems of fluid therapy are described; comparison of different preparations for infusions is given. The application of Sorbilact – complex medicine on the sorbitol basis – is considered in details; effects, potential and advantages of preparation, as well as the results of clinical research are described.

Key words: polytrauma, shock, cerebral edema, meningoencephalitis, acute renal failure, stimulation of intestinal tract, chronic pulmonary heart, infusion therapy, detoxification therapy, Sorbilact, mannitol, rebound syndrome.

Infusion therapy is a field of medicine devoted to management of body functions by means of targeted impact on morphological composition and physiological properties of body tissues via administration of organic and inorganic transfusion drug products. The main purpose of the infusion therapy is restoration of impaired homeostasis which determines its main tasks: replenishment of volume of blood circulation (VBC), hypovolemia management, restoration of water-electrolytic balance and acid-base balance, improvement of microcirculation, management of disorders of blood rheological and coagulatory properties, metabolic disorder management, detoxification and parenteral feeding [3].

According to various authors [17, 24], up to 30–40% of patients staying in multiprofile hospitals require infusion-transfusion therapy, at that, the major part accounts for patients with planned surgeries; in case of road traffic and other accidents this number exceeds 80%.

It should be noted that among all transfused solutions, more than 55% account for the products made in Ukraine. Despite of apparent diversity of registered medicinal products a rather short list of infusion products is used in the clinical practice. Until recently this list has included simple (physiologic sodium chloride solution, glucose solutions) and few complex (Ringer's solution, Ringer-Lockes solution etc.) solutions, dextran solutions (polyglucin, rheopolyglucin), polyvinylpyrrolidone solutions (hemodez), protein preparations (gelatinolum, albumin, protein). Over the last years this list has changed qualitatively: due to discovery of polyvinylpyrrolidone (PVP) thesaurismosis, manufacture and usage of polyvinylpyrrolidone derivatives has been prohibited in many countries including Ukraine; dextran usage has been reduced substantially, which is attributable to their severe adverse effects, such as a high anaphylactogenicity (in 60 – 70% of cases) and an ability to provoke "a dextran syndrome" (renal and pulmonary injuries and hypocoagulation). Drug products containing blood plasma native proteins (albumin, protein) are used more and more seldom due to their high allergenicity, pyrogenicity, their ability to aggravate tissue interstitial edema, primarily pulmonary edema, and due to risk of transmission of haemoinfections. On the other hand, synthetic crystalline amino acids and hydroxyethyl starches have become a common practice. The former allowed to solve the problem of parenteral feeding. The latter quickly superseded dextrans being much more effective products intended for prompt restoration of VBC and hypodynamic balance. But along with this, among unsolved problems, there occurred to be detoxification and dehydration therapy, improvement of hemorheology and microcirculation, correction of acid-base balance and some others [12].

In the recent years, specialists from different branches of medicine have more often given priority to a new domestic complex infusion product – Sorbilact – developed by the members of the Institute of Blood Pathology and Transfusion Medicine of the National Academy of Medical Sciences of Ukraine, which is based on a nontoxic hexatomic alcohol - sorbitol.

Sorbitol is widely used in the food manufacturing industry and medicine. Sorbitol is quickly included into the general metabolism, 80–90% of it is transformed in liver and converted to glucose, a part of which is used for prompt energy demands, another part accumulated in the form of glycogen, 5% is deposited in the cerebral tissue and cross-striped muscles, and 6 – 12% is excreted with urine.

Besides sorbitol represented in the product in hypertonic, as related to blood plasma, concentration (1095 mmol), Sorbilact contains cations (Na^+, K^+, Ca^{2+}, Mg^{2+}), anion $C1^-$ and lactate-anion; total osmolarilty of Sorbilact is 5.5 times higher than that of blood plasma (1.7. Osm). Owing to high osmolarity, Sorbilact provokes fluid shift from intercellular space into the blood stream, which is accompanied by the increase in VBC due to plasma volume increase and contributes to improvement of microcirculation and tissue perfusion. Owing to the pronounced osmotic diuretic effect of sorbitol associated with the absence of natural mechanisms of reabsorption of polyatomic alcohols in the proximal renal tubules, there is observed a pronounced diuretic action of these drug products. In addition, sorbitol, partially metabolized to fructose, contributes to normalization of carbohydrate and energy metabolism. Sorbitol also stimulates fatty acid oxidation via non-ketogenic metabolic route and contributes to easier inclusion of ketone bodies into Krebs cycle, which has an especially beneficial impact on the improvement of functional state of hepatocytes, which is the place of glycogen depot replenishment.

It is important to note that sorbitol intensifies the

intestinal motility owing to the direct impact on the neuroreceptor system of intestinal wall and enhancement in synthesis and secretion of villikinin, cholecystokinin and vitamins of group B. Lactate-anion contributes to correction of acid-base balance of blood plasma and, by taking part in the reactions of carbohydrate-energy metabolism, restores and stimulates cell functions of reticular endothelial system, liver and kidneys. All this determines the broad spectrum of Sorbilact effects, namely: anti-shock, energy, detoxification, diuretic, stimulation of intestinal peristaltics, and neutralization of metabolic acidosis [20].

By the present, biological properties and effects of Sorbilact on the human body have been established, optimal and maximum allowable doses have been determined, indication scope has been scientifically justified and product safety has been proven. For the period of 7 years of Sorbilact usage in the clinical practice (and it is more than 10 million of the product bottles), there has been reported no serious, life-threatening complications associated with the product administration. At the present time Sorbilact is recommended for application in different branches of medicine by a certain number of outstanding Ukrainian scientists, among whom are: in general surgery - member of AMS of Ukraine M.P. Pavlovskiy [19], member-corr. of AMS of Ukraine M.P. Zakharash [14]; in oncology – professor V.V. Ganul [6]; in urology – member of AMS of Ukraine A.F. Vozianov [1]; in the infectious disease clinic – member of AMS of Ukraine Zh.I. Vozianova [2], professor V.V. Gebesh [7, 8]; in neurosurgery – member-corr. of AMS of Ukraine – N.E. Polishchuk [20]; in intensive care – member-corr. of AMS of Ukraine V.I. Cherniy [26], chief anaesthesiologist of MoH of Ukraine, professor F.S. Glumcher, and professors I.P. Shlapak [28, 29], A.I. Treshchinskiy [23], M.A. Georgiyants [9].

As of today, Sorbilact is used in many branches of medicine, such as: abdominal surgery (for example, in patients undergone abdominal aortic aneurysm surgery); oncology; neurosurgery (in severe craniocerebral trauma, acute cerebrovascular disease, cerebral tumour and inflammatory brain diseases accompanied by cerebral edema and swelling) [20, 23, 25]; neurology (in cytomegaloviral, herpetic and other encephalitises of viral etiology); pediatrics; pulmonology [12, 13]; traumatology [21]; resuscitation and intensive care (in polytrauma, shock of various genesis, cerebral edema) [22, 26, 29]; treatment of infectious diseases (in meningococcal disease and bacterial meningitis, hepatitis, leptospirosis) [2, 8] and in the postoperative period aimed at prevention and treatment of enteroparesis [19].

It is known that in pathogenesis of most diseases, endogenous intoxication syndrome is given a leading position (focus of inflammation, areas of ischemia or tissue destruction of any origin may be sources of endogenous intoxication), which is characterized by staging: stage I – development of endotoxicosis; stage II is characterized by toxemia; stage III (terminal) is characterized by multiple organ failure syndrome associated with injuries of efferent organs and systems. Until recently the main components of detoxification therapy have been crystalloid solutions (electrolytes, glucose) and colloid solution (neohemodez). However, multiple-dose administration led to the development of a severe complication – PVP-thesaurismosis conditioned by the toxic impact of polymer macrofractions on the cells of reticular endothelial system. Application of Sorbilact opens new prospects in respect of the detoxification therapy. As it has been mentioned previously, this preparation contains cations Na^+, K^+, Ca^{2+}, Mg^{2+}, anion $C1^-$, organic lactate-anion and sorbitol in hypertonic, as related to blood plasma, concentration. Such a combination of components and their concentrations determines the detoxification effect of Sorbilact as it fulfills the following main tasks: it intensifies tissue perfusion in a pathologic focus, which contributes to rapid elimination of toxic factors into the blood stream; increases VBC resulting in lowering of toxic substance concentrations in the blood stream; binds circulating toxins, quickens their elimination from the body via forced diuresis; in addition, this preparation exerts a nephroprotective action and has an ability to enhance the diuresis in acute renal failure (ARF). It is significant that lactate-anion contributes to correction of plasma acid-base balance and stimulates functions of liver and kidneys RES.

It should be noted that in presence of certain pathological states (increased intracranial pressure (after traumas and surgeries), cerebral edema, acute renal or hepatorenal failure, ascites (associated with combination therapy), quick elimination of toxins in case of intoxications, surgeries with application of artificial circulation and some others), there is often used mannitol [30] that exerts effects similar to Sorbilact. Mannitol as well as Sorbilact is referred to pharmacological group of osmotic diuretics, provokes reduction of blood viscosity, fluid replacement from tissues into the blood stream and exerts a pronounced diuretic effect due to increase of blood plasma osmotic pressure and reduction of water reabsorption. Mannitol is slightly metabolized in the liver producing glycogen. However, according to the findings of clinical studies, effects of Sorbilact are more versatile, which is attributable to the multicomponent composition of its solution (it exerts not only diuretic, anti-edemic and detoxification effects but it also contributes to the restoration of acid-base balance (owing to sodium lactate that is included into product composition), improvement of metabolism in the body, replenishment of glycogen depot in the hepatocytes, early recovery of intestinal motility in posttraumatic or post operative periods; it has an anti-ketogenic action; when used in combination with amino-acid mixtures and immunonutrients, it covers total energy needs in the early postoperative period). Moreover, administration of Sorbilact does not cause rebound syndrome, which is often observed when traditional diuretics are used and which is attributable to staging of their pharmacodynamics; complications are observed very rare (as a rule, they are developed due to considerable

overdose of the product).

Development of rebound syndrome is of extreme importance in case of cerebral edema that could be met in neurosurgical and neurologic practices. The first phase of action of osmotic diuretics is characterized by a prompt (within 15–30 minutes) reduction of intracranial pressure. There is observed a simultaneous reduction of intratissue pressure in those brain regions where vascular regulation and permeability of blood-brain barrier (BBB) are not damaged; at the same time, in brain regions where BBB is damaged, intratissue pressure may be increased by 10–25%. Phase II (30–90 minutes after administration of osmotic diuretic) is characterized by maximum reduction of cerebrospinal fluid pressure (up to 50%) and intratissue pressure (up to 88%), which is accompanied by increase of cerebral blood flow values by 20–40%. The third phase (2.5–3.5 hours post drug product administration) is characterized by restoration of baseline cerebrospinal fluid pressure, while changes of intratissue pressure values may be diverse. In particular, in the aftereffect phase (upon rebound syndrome occurrence), cerebrospinal fluid pressure in 65% of cases and intratissue pressure in 45% of cases exceed baseline values. Absence of this severe complication is a characteristic property of Sorbilact and it is attributable to a versatile action of the product itself as well as to transformations of its component – sorbitol – in the body.

Literature data on advantages and disadvantages of Sorbilact and mannitol is summarized in Table 1.

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Table 1

COMPARATIVE CHARACTERISTIC OF SORBILACT AND MANNITOL

Indicator	Drug Product	
	Sorbilact	**Mannitol**
Pharmacological group	**Osmotic diuretics**	
Product composition	200 g of sorbitol, 19 g of sodium lactate, 6 g of sodium chloride, 0.1 g of calcium chloride, 0.3 g of potassium chloride, 0.2 g of magnesium chloride and 1 L of water for injection.	1 ml of solution contains: mannitol 0.1 g or 0.15 g or 0.2 g; excipients (sulfacyl sodium, trypaflavine), sodium chloride, and water for injection.
Pharmacokinetics and pharmacodynamics	Part of the sorbitol is used for the urgent energy needs; 80–90% is utilized in the liver and accumulated in form of glycogen, 5% deposited in the brain tissue and skeletal muscles, 6–12% eliminated with urine. Sodium lactate is transformed into sodium hydrogen carbonate in the blood stream, which is resulted in gradual increase of the blood alkali reserve, at that no rapid pH fluctuation is occurred; 50% of sodium lactate are not metabolized and excreted with urine.	Mannitol has a pronounced diuretic effect attributable to the increase of osmotic plasma pressure and lowering of water reabsorption. Diuresis is accompanied by elimination of substantial amount of sodium without sufficient impact on potassium elimination. Half-life is about 100 minutes. It is slightly metabolized in the liver producing glycogen. About 80% of administered dose is excreted with urine within 3 hours.
Effects	Similar to that of mannitol, plus: - antishock effect; - metabolic acidosis neutralization; - replenishment of glycogen depot in the hepatocytes; - anti-ketogenic effect; - intestinal-peristaltic-stimulating effect; - body energy coverage (usage in combination with amino acids and immunonutrients).	- Blood viscosity reduction; - detoxification effect; - diuretic effect; - anti-edemic effect.
Adverse effects	Due to solution hyperosmolarity, development of dehydration events is possible during product administration. Development of dyspepsia (in case of overdosing) is possible in patients with decompensated liver diseases.	Hypohydration, electrolyte imbalance (hypokalemia, hyponatremia), aggravation of circulatory inefficiency, pulmonary edema, rebound syndrome, headache, nausea, vomiting, diarrhea, urticaria and tremor may be observed. Mannitol presence in the circumvascular tissues may result in skin edema and necrosis. Side effects in overdosing are extremely pronounced.
Interaction with other medicinal products	It is prohibited to mix with phosphate- and carbonate containing solutions.	It potentiates a diuretic effect of saluretics and other diuretic products. When combining with neomycin, there is an increased risk of development of oto- and nephrotoxic reactions. In simultaneous use with Digitalis products, there is a high probability of increase of toxic activity of the latter due to the hypokalemia.

Accumulated experience of Sorbilact usage opens great prospects of its administration as a component of infusion therapy and allows to recommend this product for application in the clinical practice.

disaster medicine, inclusion of this product into scheme of the antishock therapy contributes to lowering of a dose and reduction of duration of sympathomimetic administration, earlier initiation of enteral nutrition feeding, reduction of intestinal flora translocation syndrome in the early postshock period. Moreover, they established efficiency of Sorbilact usage in restoration of energy metabolism in patients with severe polytrauma, which was evident of significant improvement of neutrophil phagocytosis indices (a very important link in the nonspecific immunity) and as consequence – of decrease in incidence of infectious complications (from 86.6 to 45.1%) and multiple-organ-failure syndrome (from 63.3 to 25.5%) [21].

One of the major principles of traumatic shock management is the infusion-transfusion therapy, which, as of today, assumes rational combination of blood components and solutions for infusion. It has been proven by numerous studies and clinical observations that progression of concomitant injury depends on how adequate was the antishock therapy in the acute period of response to the trauma. Optimal electrolytic composition of Sorbilact ensures correction of lesions induced by the shock [10, 24, 28, 29]. Product antishock effects are attributable to the metabolism of sorbitol containing in it, which contributes to correction of stress glycemia, cell energy deficit, and potentiation of reparation processes. In addition, it is important to note that in acute posttraumatic and postshock periods, sorbitol utilization is not disturbed. Sodium lactate that is also one of the components of Sorbilact contributed to enhancement of buffer capacity of hydrocarbonate blood system, which ensures gradual neutralization of acid products and their renal and pulmonary elimination, and removal of manifestations of metabolic acidosis accompanied by severe impairments of haemodynamics. Hemodynamic activity of Sorbilact is expressed in increase of VBC, stabilization of central haemodynamics and optimization of organ blood flow [9, 28, 29].

Sorbilact is a rather effective product in management of multiple organs, primarily renal and hepatic, failure often accompanied by shock states [24]. Clinicians also take advantage of osmodiuretic effect of Sorbilact in management of already emerged ARI as this product provokes forced diuresis in case of excretion oliguresis. High efficiency of Sorbilact in prevention and treatment of ARI (authors used its sublimate model) has been confirmed experimentally [1]. In the course of the study it has been established that in simultaneous administration of sublimate and Sorbilact to experimental animals, neurotoxic effect of sublimate was reduced considerably - up to complete elimination of ARI syndrome developing under control, which has been confirmed by dynamics of indices of integral renal function, renal transport, acid-excretory function, fibrinolytic and proteolytic urine activity and status of lipid peroxidation of renal cortex.

Complex of antishock effects of Sorbilact has determined close attention to it when treating patients with a polytrauma. According to the results of the study conducted in the Ukrainian center of emergency and

Based on the obtained results, authors of the experiment have made a conclusion that nephroprotective activity of Sorbilact is attributable to increase of glomerular filtration rate due to normalization of renal haemodynamics, and this, in its turn, contributes to reduction of renal azotemia and restoration of tubular processes.

Sorbilact is also successfully used as a source of carbohydrates in parenteral feeding in early posttraumatic

period; intrinsic property of the product is to stimulate intestinal motility, which is especially important in concomitant abdominal injuries and hypoxic enteropathy as it reduces considerably hypercatabolic reactions in the body in response to a trauma [19].

Roshchin G.G. et al. in their methodological recommendations attribute Sorbilact to drug products of choice in pre-hospital management of patients with haemorrhagic shock. In literature sources, there are also evidences of Sorbilact application perspectiveness in the intensive therapy of septic shock including children [12].

Thus, as of today, indications for usage of Sorbilact in severe polytrauma are as follows: traumatic shock management, prevention and treatment of acute renal and hepatorenal insufficiency, coverage of energy needs in parenteral feeding, postoperative enteroparesis management and preparation of gastrointestinal tract to early enteral feeding.

There are available literature data on application of Sorbilact in patients who underwent abdominal aortic aneurism surgery [17]. The authors of the above data have established that Sorbilact infusion in patients during aortic aneurism surgery allows to reduce lesions of renal blood flow after aortic compression, as was evidenced by a higher level of glomerular filtration in comparison with the control group of patients. Moreover, Sorbilact administration contributed to increase in values of central venous pressure (preloading). Notwithstanding that in the course of the study no significant difference was revealed in values of minute blood flow volume in patients receiving Sorbilact and in patients of the control group, data on reduction of the systemic vascular resistance in patients receiving Sorbilact were indicative of more favourable conditions for myocardium for the whole period of aortic compression. The authors have made a conclusion of appropriateness of Sorbilact administration during abdominal aortic aneurism surgery. According to G.G. Roshchin, owing to its detoxification, antishock and rheological properties, Sorbilact has been included into the standard of care for serious patients with destructive forms of acute pancreatitis in the phase of toxemia and multiple organ failure.

Also, owing to the peculiarities of its pharmacodynamics, Sorbilact has found an application in treatment of patients with ischemic diseases of lower extremities, in particular with critical ischemia of lower extremities that is the phase of regional circulation

decompensation characterized by such manifestations as rest pain, subfascial edema, trophic disorders and decrease in regional popliteal arterial pressure up to 50 mm Hg and lower. Sorbilact in such patients is used with the purpose of preoperative preparation or for treatment of states associated with the development of reperfusion syndrome. High effectiveness of this therapy allowed the authors to recommend Sorbilact for wide application [27].

Certain authors used Sorbilact during surgical management of oncological patients [6, 15, 18]; results of conducted clinical studies are indicative of appropriateness of administration of this drug product in intensive preoperative preparation of patients with the esophageal cancer, which is characterized by the presence of syndromes of dehydration and alimentary cachexia. At that, special attention is paid to replenishment of VBC, and energy, rheological, alkalinizing and detoxification properties of the given infusion product.

Based on the clinical application, it has been also established that using Sorbilact in the postoperative period as compared to the traditional schemes of intestinal stimulation, the flatulence phase in patients was not observed, and spontaneous bowel movement was observed 36 hours earlier than in the control group [14, 16]. This contributed to the prevention of respiratory complications as conditions for normal diaphragm rise were provided.

Use of Sorbilact in the neurosurgical hospital is of special interest. The most common complication after brain surgeries, in particular cerebral tumor surgeries, is a cerebral edema. Among causes leading to its development there are excessive blood flow and worsened outflow, cerebral blood flow disorder, hyperhydration and hypoosmolarity of blood, hypoxia and hypercapnia, angiospasm of subarachnoid cistern arterioles as well as usage of pharmacological products provoking dilatation of brain vessel etc. [25]. Hypotonic solutions of electrolytes and glucose are not applicable for cerebral edema management as they contribute to edema enhancement, as well as hypotonic and vasodilating products enhancing steal syndrome. In such cases usage of osmodiuretics (for example, mannitol) is justified, however, when using such products, there is a high probability of development of rebound phenomenon, i.e. change of a phase of prompt reduction of intracranial pressure to a phase of cerebral blood flow enhancement; rebound syndrome has been considerably less pronounced when Sorbilact is administered.

There are also literature data on efficacy of Sorbilact administration after intracranial haematoma surgeries (craniocerebral trauma, hemorrhagic stroke), inflammatory processes (brain abscess, meningoencephalitis), as well as during conservative management (ischemic stroke due to thromboembolism of the middle cerebral artery) [20]. Treatment efficacy has been studied by the authors with due account taken of up-to-date examination techniques, such as computerized tomography, magnetic resonance imaging and computerized axial tomography. Based on the findings of the conducted studies, the authors have concluded that Sorbilact advantages are attributable not only to its osmotic pressure but also to other pharmacodynamic effects; so, it has been recommended as an efficient product in the complex treatment of cerebral edema.

Study on Sorbilact application in the complex treatment of patients with meningitis of both bacterial and viral etiology (meningococcal, pneumococcal, herpetic and enteroviral) has much in common with the above mentioned works [7]. According to the study findings, in the group of patients receiving Sorbilact they observed disappearance or decrease in number of events associated with increased intracranial pressure (headache, vomiting, stiff neck and other symptoms) 1 – 3 days earlier than in the control group; they also observed normalization of pressure and composition of the cerebrospinal fluid and picture of fundus of the eye, recovery of intestinal peristaltics, functions of kidneys, liver, myocardium, water-electrolytic balance and acid-base balance. The authors noted that they observed no persistent residual events (headache, general weakness, vegetovascular dystonia and asthenoneurotic syndrome) in patients of treatment group in contrast to the control group, where such events occurred.

By the present time, some aspects of application of Sorbilact in the internal disease clinic, in particular in pulmonology and allergology, have been studied.

It is well known that in the pathogenesis of COPD, endotoxicosis takes a leading position considerably aggravating the course of disease leading to decompensation of the chronic pulmonary heart and development of multiple organ failure. However, adequate detoxification therapy allows to solve the problem of endotoxicosis reduction successfully, and it should be an obligatory addition to the etiological treatment. According to the clinical study data [4, 5, 13], 5 - 7 day regimen of Sorbilact administration leads to a pronounced positive effect (reverse of tachycardia, fever reduction, normalization of leukocytosis, reduction of content of malondialdehyde and other LPO products in patients' blood) as compared to other detoxification drug products, such as neohemodez exhibiting a less pronounced positive effect. Such properties of Sorbilact as improvement of microcirculation and rheological properties of blood as well as correction of acid-base balance and water-electrolytic balance are also very important for fulfillment of detoxification therapy. In the course of treatment of patients with exacerbations of pyoinflammatory process in COPD aggravated by bronchopulmonary changes and chronic pulmonary heart, usage of Sorbilact allows not only to reduce the severity of endotoxicosis but also to reverse completely manifestations of toxic syndrome.

N.I. Gumenyuk et al. suggest that Sorbilact may be used successfully in pathogenetic treatment of patients with decompensated chronic pulmonary heart disease (CPH). The main factors of the development of circulatory decompensation in patients with CPH are as follows: bronchial obstruction conditioning the increase of intrathoracic pressure, extrathoracic blood storage with edema development, heart contractility impairment due to

infectious-toxic and anoxic myocardium damage; increase of haematocrit level due to compensatory erytrocytosis, platelet hyperaggregation, which, as a whole, leads to impairment of rheological properties of blood, increased risk of microthrombosis in pulmonary vessels and increase of pulmonary arterial resistance. According to the results of clinical studies, Sorbilact is capable to impact effectively on each of the mentioned links. Moreover, advantage of Sorbilact administration in patients with decompensated CPH is attributable to this product ability to provoke active tissue dehydration without causing an increase of haematocrit level. In the Institute of Phthisiology and Pulmonology named after F.G. Yanovskiy of AMS of Ukraine, there has been conducted a comparative study of diuretic properties and impact exerted on hemoconcentration degree of furosemide saluretic and Sorbilact solution for infusion. Based on the study results, it has been established that furosemide as compared with Sorbilact exhibits a more pronounced diuretic effect but at the same time it leads to even higher haemoconcentration. While Sorbilact has moderate osmodiuretic properties, and at that, due to active tissue dehydration, it exhibits a haemodilutional effect [5]. In addition, they evaluated safety of Sorbilact usage in COPD patients with stagnant circulatory insufficiency. It has been established in the course of the study that intravenous administration of Sorbilact has no adverse reactions and it does not worsen cardiac output (according to the data of echocardiography) [4].

There is also data in some literature sources that Sorbilact may be efficient in treatment of allergic diseases, in particular drug allergy. In this context, a work fulfilled by Gorovenko N.G. et al. [11] seems rather convincing. In the course of this trial Sorbilact was used for treatment of patients with urticaria and bronchial asthma. Based on the data of clinical laboratory examinations, the authors have made a conclusion of appropriateness of Sorbilact administration in the complex treatment of allergic diseases as this product stabilizes haemodynamics, normalizes clinical and biochemical indices, improves renal and hepatic functions, increases diuresis and has a pronounced detoxification effect.

Fluid therapy is indicated to most hospitalized patients both of therapeutic and of surgical profiles. Clinical medicine is in critical demand of drug products intended for efficient fulfillment of such tasks as detoxification, improvement of microcirculation, correction of water-electrolytic and acid-base balances and so on. A complex infusion product - Sorbilact - developed by the Ukrainian specialists is one of the products that comply with the above mentioned requirements. Researches carried out in leading Ukrainian clinics of surgical, trauma, therapy, oncology, pediatric, infectious and other profiles, demonstrated the efficacy of this product for detoxifying and antishock therapy; proved their opportunities in the treatment of diseases associated with impaired blood rheological properties and coagulation, as well as with energy, metabolic and other disorders. Nevertheless, it is reasonable to carry out further clinical studies aimed at revelation of additional abilities of Sorbilact and other fields of its application.

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SORBILACT®

COMPOSITION:

sorbitol – 200 g,
7% sodium lactate solution – 281 g (270.3 ml),
sodium chloride – 6 g,
calcium chloride – 0.1 g,
potassium chloride – 0.3 g,
magnesium chloride – 0.2 g,
water for injections up to 1 L.
Package: 200 ml and 400 ml of Sorbilact® in glass bottles of 250 ml and 500 ml.

PHARMACOLOGICAL GROUP

Complex solution for infusions, the main pharmacologically active components of which are sorbitol (in a hypertonic concentration) and sodium lactate (in an isotonic concentration).

PHARMACOLOGICAL PROPERTIES

Sorbilact® has antishock, energy, detoxification, diuretic and intestinal-peristaltic-stimulating effect, contributes to neutralization of metabolic acidosis.

PHARMACOKINETICS

Sorbitol is quickly included into the general metabolism. 80-90% of sorbitol is utilized in the liver and accumulated in form of glycogen, 5% deposited in the brain tissue, heart muscle and cross-striped muscles, 6-12% eliminated with urine. Sorbitol is metabolized in the liver into fructose that is subsequently transformed into glucose and then glycogen. Part of the sorbitol is used for the urgent energy needs, and the rest is deposited as glycogen.
The hypertonic sorbitol solution has a high osmotic pressure and a pronounced diuretic effect.
After being administered into the bloodstream, sodium lactate is broken down into sodium, CO_2 and H_2O, which create sodium bicarbonate that increases the blood alkali reserve. Unlike in administration of bicarbonate solution, metabolic acidosis correction by sodium lactate takes place more slowly as it is being included in the metabolism, without rapid pH fluctuations. Only half of the administered sodium lactate (L isomer) is considered to be active, while the other half (D isomer) is not metabolized and then eliminated with urine. The effect of sodium lactate is observed 20-30 minutes after administration.

INDICATIONS

Sorbilact® is recommended as a product for reduction of intoxication, correction of acid-base balance, improvement of renal and hepatic functions, stimulation of intestinal peristaltics, improvement of hemodynamics in cases of traumatic, operative, hemolytic, toxic and burn shock; in the postoperative period, especially after abdominal surgeries, in postoperative enteroparesis (prevention and treatment); in acute renal and hepatic insufficiency (on early stages);
in acute and exacerbation of chronic pyelonephritis; in chronic hepatitis;
in increased intracranial pressure in case of cerebral edema.

CONTRAINDICATIONS

Sorbilact® is not used in the presence of alkalosis, pronounced cardiovascular decompensation, and hypertensic crisis.

ADVERSE EFFECTS

In critical overdosing, alkalosis or dehydration states are possible (due to the solution hyperosmolarity).

INTERACTION WITH OTHER MEDICINAL PRODUCTS

Sorbilact® is prohibited to mix with phosphate- and carbonate containing solutions.

SPECIAL WARNINGS FOR USE

The product should be prescribed with due account taken of blood and urine osmolarity as well as of acid-base balance. Administration of Sorbilact® in patients with diabetes mellitus must be conducted under control of blood sugar levels.

POSOLOGY AND MOTHOD OF ADMINISTRAION

Sorbilact® is administered intravenously by drop infusion (at a rate of 30-40 drops/minute) or by stream infusion:
– in traumatic, burn, postoperative and hemolytic shock, 200-400 ml and 600 ml (3-10 ml/kg) is administered in a single dose by stream infusion at first, then by drop infusion under diuresis control;
– in chronic hepatitis, 200 ml (3.5 ml/kg) is administered by drop infusion as a single dese and repeatedly, daily or every other day. Besides this, the product is administered:
– in acute hepatorenal insufficiency, 200-400 ml (2.5-6.5 ml/kg of body mass) by drop or stream infusion (subsequent doses after 8-12 hours);
– in post-operative intestinal paresis prevention - a single dose of 150-300 ml (2.5-5.0 ml/kg of patient's body mass) is administered by drop infusion; subsequent infusions at 12-hour intervals are allowed during the first 2-3 days after operative treatment;
– for treatment of post-operative paresis - a dose of 200-400 ml (3.5-6.5 ml/kg of body mass) is administered by drop infusion, at 8-hour intervals, until intestinal motility is normalized;
– in cerebral edema for reduction of intracranial pressure, decrease of cerebral edema, improvement of cerebral blood circulation and oxygen consumption - doses of 5-10 ml/kg of body mass are administered by stream infusion at first, and then by drop infusion (60-80 drops/minute).
In case of severe dehydration, intravenous administration of Sorbilact® should only be conducted by drop infusion (not exceeding 200 ml of solution per day).

STORAGE CONDITIONS AND SHELF-LIFE

Store in a dry, protected from light place at temperatures ranged from 2 to 24°C. Shelf-life: 2 years.

REGISTRATION CERTIFICATE OF MOH OF UKRAINE
NO. UA/2401/01/01

/YURIA-PHARM logotype/

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