ENTEROSGEL®
Tasteless Intestinal Absorbent Gel

Enterosgel for **Toxicology**

USE IN TOXICOLOGY

Enterosorption has been known for a long time as a method of detoxification which, thanks to its simplicity, can be used for supporting optimum elimination in a wide variety of situations.

Such treatment can be performed using the enterosorbent **Enterosgel**, a silicon-organic detoxifying agent that is capable of binding toxic substances in the gastrointestinal tract. Enterosgel has a solid porous globular, sponge-like structure with a defined set of pores, which allows it to actively bind only the average molecular weight toxic substances. Enterosgel removes substances that may damage the gut barrier from the intestinal lumen and creates ideal conditions for the restoration of mucous membranes thus leading to a fuller recovery of the damaged epithelial layer. In this manner, Enterosgel can reduce levels of toxemia and endotoxins by absorbing toxic substances spreading from the tissues and cleansing the lymphatic system.

The detoxifying effect of Enterosgel-mediated enterosorption is due not only to its direct binding of toxic substances in the lumen of the gastrointesinal tract but also to its general detoxifying action. The use of Enterosgel enterosorbent has supportive effects on the regional lymph nodes bringing the structural and functional liver units back to a normal state. Enterosgel promotes normalisation of the microanatomical organisation of hepatic lymph nodes, as well as the structural and functional state of the liver. The latter is confirmed by increased functional activity of liver parenchymal cells, enhanced liver regeneration and regression of hepatic fibrosis (Fig. 1).

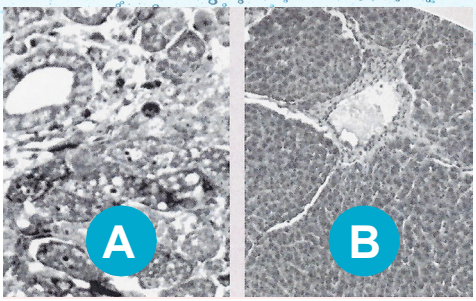


FIGURE 1

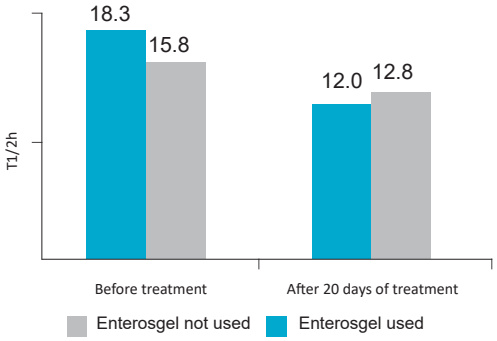
Enterosgel protective effect on liver cells in toxic hepatitis.

A. Enterosgel not used. Fatty and balloon dystrophy of hepatocytes, necrosis of liver parenchymal cells and lesions of the hepatic parenchyma around central veins. Hematoxylin and eosin staining. Objective 20x, ocular 10x.
B. Enterosgel used. Layers of connective tissue. Absence of poly-morphism of parenchymal cells, hepatocyte dystrophy or necrosis development. Van Gizon staining. Objective 10x, ocular 10x.

ENTEROSGEL IMPROVES LIVER CLEANSING FUNCTION IN PATIENTS WITH CHRONIC INTOXICATION

The application of Enterosgel to treat patients with chronic intoxication by toxic substances, arsenic, lead and mercury toxicity, or aromatic solvent intoxications (such as benzol and its homologues xylene or toluene) promotes the increased activity of liver monooxygenase (reduced antipyrine half-life as judged by the antipyrine elimination test), reduction of membrane toxic products of lipid peroxidation (PLP) such as malonyldialdehyde or dienic conjugates and increased antioxidant protection. The antipyrine elimination test reflects the hydroxylase activity in liver microsomes and the cleansing function of the liver in general. Thus, the antipyrine half-life (T1/2 h) before treatment was, on average, 18.3h reaching its peak of 24.0 h in critically ill patients. After treatment the antipyrine half-life was decreased down to 12.0h ($p < 0.05$). Figure 2 shows the results of the antipyrine test using treatment dynamics regime. An insignificant reduction of antipyrine half-life was observed in the reference group (15.8 and 12.8 before and after treatment, respectively, $p > 0.05$). Treatment also resulted in significantly improved correlation between the PLP and antioxidant protection parameters, which attests to the improvement of cell wall structure and function.

FIGURE 2
Results of the antipyrine test in patients with chronic intoxications following Enterosgel treatment.

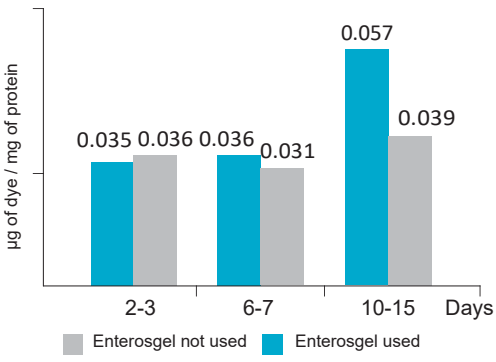


ENTEROSGEL ASSISTS THE DETOXIFICATION FUNCTION OF SERUM ALBUMIN

Enterosgel helps to maintain the optimal detoxification function of serum albumin even when its blood concentration is low, thus reducing the risk of pronounced endogenous intoxication and its related complications (Figure 3). Patients who were taking Enterosgel demonstrated significantly improved dynamics (i.e., 1.62-times higher, $p < 0.05$) of toxin-binding capacity of albumin, as compared to baseline value.

These results attest to the clinical effectiveness of Enterosgel enterosorption in restoration of the normal functioning of the body's natural detoxification systems in patients with alcoholic liver disease.

FIGURE 3
Restoration of the albumin toxin-binding ability in patients with alcoholic liver disease.



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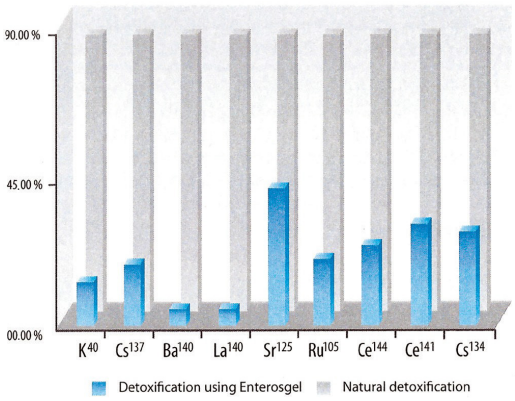
DOSING ENTEROSGEL FOR DETOXIFICATION

For detoxifcation, enterosorption should be administered orally 3-4 times per day between the meals and away from the intake of medications or supplements (1.5-2 hours before and not sooner than 2 hours after a meal). Single adult dose is 15 g (1 tablespoon), and the daily adult dose is 45-60 g. The duration of the treatment course depends on the severity of intoxication. Treatment of mild forms can last from 7 to 10 days, while treatment of more pronounced cases can take from 2 to 3 weeks. Enterosgel can be used as monotherapy to treat heavy metal toxicities (including tubulointerstitial nephritis), since co-administration of chelators and penicillins is not recommended.

In order to prevent exacerbations of chronic intoxications by toxic substances, organic solvents or heavy metal burdens the patient possesses, periodic prophylactic detox courses with Enterosgel may be indicated, such as twice a year, with the duration of each treatment being 10-14 days. In case of continuous exposure to a toxic substance, the year-round preventative use of Enterosgel via intermittent enterosorptions may be indicated, such as 10 day courses employed each month (30g per day as a single oral dose or divided into 2 equal doses).

FIGURE 4
Decreasing radionuclide level in the body due to natural detoxification or by using Enterosgel enterosorbent (over 15 day period) in those with Acute Radiation Sickness (ARS) after the Chernobyl Nuclear Power Plant Disaster.



ENTEROSGEL EFFECTIVENESS IN ELIMINATION OF RADIOISOTOPES (A CASE EXAMPLE)

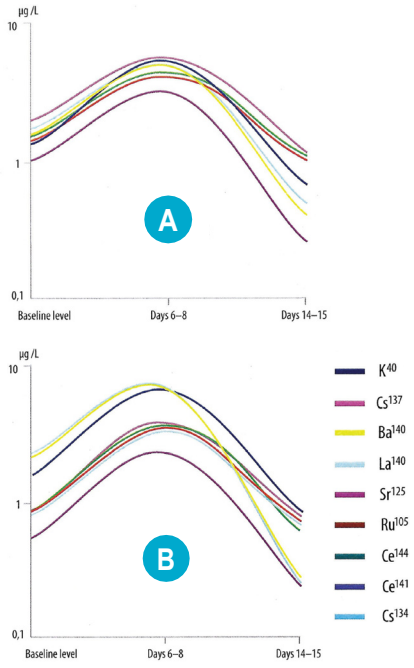
The gastroinstestinal tract and kidneys are the main routes for eliminating the majority of incorporated radionuclides, hence, these are the most exposed organs to the harmful effects of radiation. The same holds true for the liver as the majority of radionuclides are actively re-incorporated in the intestinal lumen after their release from the tissue depot. It was calculated that owing to natural detoxification the body eliminates 1.07% of the total amount of radionuclides released into the intestinal lumen with bile and gastric juice.

This attests to active re-incorporation of radionuclides within the intestinal lumen. The calculation indirectly suggests the necessity of radionuclide enterosorption in order to reduce their re-incorporation within the intestinal lumen. The administration of Enterosgel enterosorbent promotes active elimination of radionuclides from tissues and their release in faeces in the absorbed form. This justifies the use of Enterosgel enterosorbent in subjects working around sources of radiation pollution (Figure 4). The administration of Enterosgel enterosorbent allows effective detoxification, direct and indirect re-incorporation of radionuclides and improves liver function. A study on the elimination of Cs134-137 conducted in patients with chronic hepatitis has shown that the level of radioactive cesium was reduced 7.4-fold in Enterosgel-treated patients, while such reduction was only 2.3-fold in subjects who did not receive Enterosgel.

The accelerated elimination of radionuclides is due not only to their direct binding by Enterosgel within the intestinal lumen, but also to a general detoxifying effect of the enterosorbent. A 2-4-fold increase of radionuclide level was observed in blood, faeces and urine of patients in days 6-8 of treatment (Figure 5). By the end of the treatment course the radionuclide level in blood, faeces and urine was decreased several fold as compared to baseline values.

The coefficients of elimination for different radionuclides varied and were from 5.4 to 100. Such variations are due to radionuclide release from depot into the body fluids thanks to the general detoxifying effect of Enterosgel. While the increased activity of radionuclides in the faeces can be explained by their direct binding in the gastrointestinal tract, their increase in the urine attests to the indirect mechanisms of elimination which are likely due to the functional improvement of the natural detoxifying systems. of hepatic lymph nodes, as well as the structural and functional state of the liver. The latter is confirmed by increased functional activity of liver parenchymal cells, enhanced liver regeneration and regression of hepatic fibrosis (Fig. 1).

FIGURE 5
Dynamics of radionuclide content in the faeces (A) and in the urine (B) in the course of treatment.



*References available on request

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P: 1800 110 158 | E: Support@RNLabs.com.au | www.RNLabs.com.au