SORPTIVE PROPERTIES OF NATURAL MINERAL SORBENT TOWARDS HEPATITIS-B-SURFACE ANTIGEN

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One definite problem of nowadays civilization is the pollution of environment, specially water supplies. It is most actual because of the higher necessity of fresh drinking water which makes people take care of water purity. Usually water is polluted with industrial toxic by-products but there are also certain dangerous biological agents such as microbes, viruses (Adeno, Coxsackie, ECHO), etc. inducing infectious diseases (dysentery, cholera, typhus, hepatitis, polyomyelitis, etc.). Some authors (13) report water infections of hepatitis including viral hepatitis type B.

Viral hepatitis B is widely disseminated all over the world. There are data (11, 20, 21) of the existence of nearly 175 000 000 carriers of hepatitis-B-surface antigen (HBSA).

In 1976 Popvassilev (Bulgaria) established carriers of HBSA in Sofia (1% of all investigated healthy people) and Varna (2,8%).

Patients with viral hepatitis (type B) secrete viruses 2—3 weeks after the invasion. They are capable of secreting viruses for a period of weeks, months, even years (12). HBSA is disseminated in the environment by all secretions and excretions of man, mainly by faeces and urine (16, 17, 22). Thus it enters the sewerage and then is distributed in the environment due to its high stability (1, 12). The role of patients with viral hepatitis B to spread around viruses is greater; there is a tendency of prevailing of the relative percent of type B amidst all cases of hepatitis (3, 5, 10, 15, 18).

Analysing all aforementioned data it can be concluded that the pathogenic viruses inducing hepatitis B gradually become definite factors for intensive pollution of environment, specially waters. There is only one alternation: either to keep clean the environment or to find out ways and methods of effective cleaning of waste waters. Various materials and products are applicable in this field, specially those with certain adsorptive properties. Natural mineral sorbents (NMS) are widely used in these processes (2, 4, 9, 14).

The object of our study is to investigate the sorptive property of NMS from North-Eastern Bulgaria towards HBSA.

Material and methods

NMS from the town of Kaolinovo was applied in our experimental research work. NMS (Kaolinite) was fractionated in advance (method of Sabanin). The size of the particles varied from 5 to 10 microns. Purified HBsAg after a single gelfiltration via Sepharose 6B column (6) was applied in the study. All collected fractions were subjected to protein determination (method of Lowry) and titre of RCB (reaction complement binding).

A dynamic method of adsorption was suggested. The column with 0,5 cm high NMS was preliminarily sterilized at 160° C for 90—120 minutes. The passed filtrate was collected in a sterile flask; after that the protein amount and antigen titre was determined.

After the experiments of HBsAg sorption onto NMS were carried out, the corresponding elluation of same antigen onto same NMS was worked out. To do that we mixed NMS from the column with 3 ml elluative solution. The suspension was stirred 5 minutes at room temperature, followed by a 20-minute centrifugation at 4500 r/min. The supernatant was subjected to a protein determination and RCB-titration. The applied elluative solutions were: phosphate buffer with pH 7,0; saline solution with pH 6,0—9,0; veal serum and distilled water.

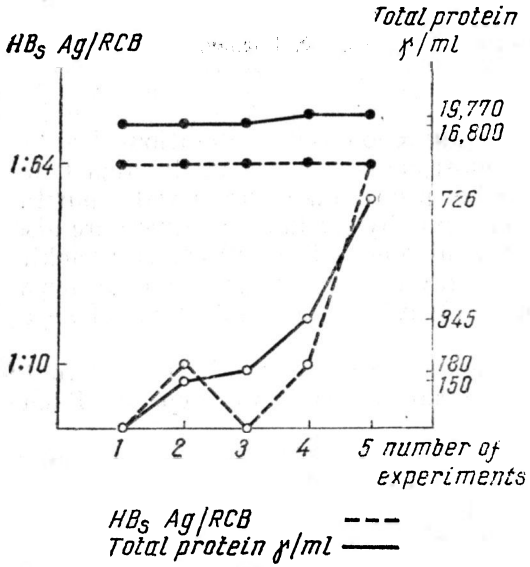

Fig. 1

Results and discussion

Fig. 1 presents the results of HBsAg-sorption onto NMS with the kynetics of the sorptive process. The dynamics of the process itself is registered by means of sorptive curves of total protein and RCB-titre. It is obvious that NMS is quickly saturated; after 5th experiment HBsAg-titre (RCB) reaches its initial values. The level of the total protein (Lowry) increase in coordination with HBsAg.

Most expressed elluative properties (according to our study) shows the phosphate buffer with pH 7,0. Maximum elluation of HBsAg and small percent elluation of total protein is provided by using this solution. The rest elluative solutions do not appear out to be so effective concerning HBsAg elluation because they hinder the complementary properties and RCB-performance (table 1).

Conclusions

Our study and its results are interesting concerning the applied fractionated NMS, being a possible model of probable concentration of HBSA.

1. Dynamic sorption of HBSA with NMS is suggested for the first time in our country.

2. NMS from Kaolinovo shows an expressed adsorptive activity towards HBSA. It can be applied in our future researches to concentrate HBSA in waste waters and by-products.

Table 1

Elluative solutions	pH	Protein gamma/ml	Reaction Complement binding
Normal phosphate buffer	7,0	105	1:64
Saline solution	9,0	882	—
Destilled water	5,0	1300	anticomplement
Saline solution	6,0	4140	anticomplement
Native veal serum	8,5	30592	anticomplement

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СОРБЦИОННЫЕ ВОЗМОЖНОСТИ ПРИРОДНОГО МИНЕРАЛЬНОГО СОРБЕНТА ПО ОТНОШЕНИЮ К ПОВЕРХНОСТНОМУ АНТИГЕНУ ГЕПАТИТА

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РЕЗЮМЕ

Сделаны первые попытки изучения сорбционных свойств природного минерального сорбента из северовосточной Болгарии по отношению к В поверхностному антигену гепатита (HBsAg). Эксперименты показывают, что использованный природный сорбент обладает хорошими сорбционными свойствами по отношению к HBsAg. Получается быстрое насыщение, позволяющее использовать сорбент в ежедневной практике для очистки концентрации HBsAg от биопродуктов и сточных вод.