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THE POSSIBILITIES FOR EXPLOITING THE MINERAL WATERS IN THE SANDANSKI AREA AS A MEANS OF PROPHYLAXIS IN CASES OF RADIOACTIVE POLLUTION OF THE ENVIRONMENT

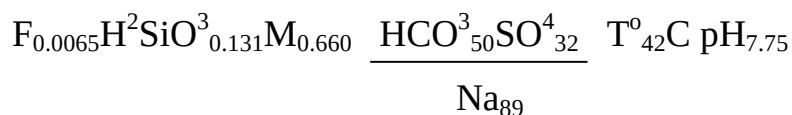
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Despite significant advancement in the administration of nuclear power, as well as the efforts of scientists, constructors, and mechanical engineers, no perfect guarantee for the flawless operation of atomic power-stations be presently given. While at the beginning of the twentieth century sources of radiation were mainly an object of scientific research, they have since become part of many other spheres of human activity, including power engineering, medicine, different branches of industry, agriculture, and transport. Because of this, the number of people who may be subjected to radiation when a certain accident occurs is continuously growing. The danger for the health of the population is especially great when a serious accident occurs in atomic power-stations (like the one that occurred in the Chernobyl Atomic Power-station in 1986). In such cases, there is a long-lasting pollution of air, water, soil, and foodstuffs with radioactive substances. Such pollution has an exceedingly unfavorable impact on the human organism. When inhaling air polluted with radioactive substances, consuming foodstuffs and drinking water also polluted with radioactive substances, particles absorbed by the human organism can rise several times above the body's level of determined radiation tolerance. Furthermore, the risk that malignant disease can appear is much higher because radiation is the strongest carcinogenic and mutagenic factor. The danger of serious diseases is mainly determined by the radioactive particles, which are selectively and lastingly incorporated into different organs and systems (strontium – 89, strontium – 90, iodine – 131, caesium – 137, and others). In such cases, mineral water which chemical composition is conducive to the decorporation of radioactive substances from the human organism can be used as a means of prophylactics.

There are more than eighty mineral springs along the Struma River Valley located in thirteen different areas. For the most part, these waters have mineralization ranging from 500 to 2600 mg/l, and its active reaction – pH from 6.2 to 9.0. The temperature of the waters is usually about 60° C and only six of the springs are cold.

In the Sandanski area the whole debit of mineral waters runs up to about 1500 l/min. The mineral waters of the different springs have almost an

identical chemical composition. Also they are all characterized by high concentration of fluorine, silicon, sodium sulphate, and others. According to Kurlov's formula the physico-chemical characteristics of the mineral water of Sandanski is:



It can be seen from the formula that according to the composition of biologically active microcomponents – colloidal metasilicon acid and fluorine – these mineral waters are classified as follows:

V grade – silicon waters (these are mineral waters which contain over 50 mg/l of metasilicon acid).

VII grade – fluoric waters (these mineral waters contain more than 1.5 mg/l of fluorine).

The mineral water in the Sandanski area has one of the highest concentrations of metasilicon acid in Bulgaria (131 mg/l). Additionally, the ratio of metasilicon acid to fluorine (20:1) makes it one of its kinds. Only the mineral water in the Pavel Banya area has a higher content of fluorine (about 13 mg/l, compared to 6.5 mg/l); however, its metasilicon acid content is much lower – 87 mg/l. along with the climate conditions of the area and the abundance of mineral springs, the mineral waters in the city of Sandanski and its surrounding villages has been exploited for bathing and drinking treatment of people who suffer from diseases of the upper respiratory system, the lungs, kidney stones, as well as diseases of the locomotory system, and others. The fluorine content, which is closed to the determined acceptable levels for using certain mineral waters for medical purposes, allows this mineral water to be used for complex fluorine prophylaxis against tooth cavities, physioprophyllaxis in the healing of broken bones, and others. The specific feature of the mineral water in the Sandanski area, i.e. its ratio of biologically active components appears to be a possible means of prophylactics against radioactive substances, which enter the human organism.

During the mutual continuous research from 1990 to present conducted by experts of the Ministry of Health, the National Center of Radiobiology and Radioactive Protection, and the South-West University “Neofit Rilski” in Blagoevgrad, the radio protective and decorporative abilities of the fluorine mineral waters in the Sandanski area were empirically proved. As a result of

this research, twenty Ukrainian children were accepted in Bathsanatoria #1 and #2 each year for a 2-month period of time from 1990 to 1995. The first group of children (age 7-9) had continuous bath treatment in 1990 and 1991; the second group (age 9-11) in 1992 and 1993; and the third group (age 11-13) in 1994 and 1995.

The results of this research show that mineral waters with a higher content of fluorine and metasilicon acid can successfully be used as a means of prophylactics against radioactive substances that enter the human organism. The decorporative abilities of the natural fluorine mineral water in the Sandanski area are basically the result of specific ratios among the different components in it and, most of all, of its biologically active microcomponents (fluorine and metasilicon acid). Fluorine and metasilicon acid speed up the expulsion of the radionuclides, which are selectively incorporated into the bone system. These are basically the radioactive isotopes of strontium (strontium – 89 and strontium - 90), radium – 226, and others.

Research revealed that the absorption of the mineral water's fluorine is twice that of artificially fluoridated water. Moreover, there have been seen no cases of allergic reaction or toxic effects. The use of the mineral water in the Sandanski area as a means of prophylactics in cases of pollution of the environment caused by radioactive substances has the following important priorities:

- Bath and water treatment with mineral water, which has such a content of fluorine and metasilicon acid, has an individual prophylactic and medical effect.
- Using this mineral water in determined dosage, no sideeffects are observed. No organ injury, allergic reaction or toxic effect has been observed, as there would have been when applying some medical radioprotective means.
- In some cases, when the concentration of radioactive substances absorbed into the human organism is not high and no early somatic radiation injuries have appeared, the usage of this mineral water can prevent the application of medical therapy.
- When radiation injuries do appear in the organism, and the inevitable medical therapy has started, the effectiveness of the treatment is increased by a certain dosage of this mineral water. Conditions for applying the medicine in smaller dosage and for shorter periods of time can also result.

- The bath treatment with the mineral water from the Sandanski area is accepted very well by people. This water doesn't contain sulphuretted hydrogen, which usually gives an unpleasant smell to some mineral waters.
- Compared to the other methods of prophylactics and treatment in case of radiation injury of the organism, the bath treatment has a much higher economical effectiveness; additionally, there is almost no possibility of negative after – effects in the human organism.

The mineral water of the Sandanski area will have an especially great importance in cases of radioactive pollution of the environment because of serious accidents in nuclear power-stations (Chernobyl - 1986). In such cases, this mineral water can be bottled in glass or plastic bottles by a soft-drink workshop, and transported to different towns and villages in the country.

The usage of that mineral water as a means prophylactics in cases of radioactive pollution of the environment is particularly necessary for those towns and villages which use drinking water from open reservoirs, such as rivers, artificial lakes, and others.