INVESTIGATING THE BIOLOGICAL ACTION OF WATER TREATED IN PERMANENT MAGNETIC FIELD («MAGNETIC» WATER)

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One of the possible mechanisms of action of magnetic field on the organism of man and animals is through water (2, 5). Some authors accept that magnetic field causes primary changes in the water, and through the latter affects the structures and functions of the systems it is contained in (13, 22). In this respect Piccardi's statement is noteworthy: «It may be that external forces influence living organisms only through water and water systems» (22). Sent-Derdi (15) supports an analogical standpoint. The effect of water, treated in advance in a magnetic field, is of particular interest («maganetic» water). A number of researches prove its biological activity. It has been demonstrated that «magnetic» water stimulates the growth and development of plants (6, 16, 18, 19). Moreover, there is available evidence of a favourable effect on patients with cholelithiasis, nephrolithiasis and atherosclerosis as well as on animals with experimentally produced models of the above diseases (3, 4, 7, 12). The infeluence exerted by «magnetic» water on single hematologic indicators has been also investigated (9, 11).

It is of definite interest to study the influence of magnetic water on integral indicators, such as weight, capacity for performing work and rectal temperature. In the only literature report surveyed (9), dealing with the effect of magnetic water on body weight of test animats, it has been establidhed that giving water treated in a permanent magnetic field, at 5000 gauss magnetic induction (H), caused no changes whatsoever. In a number of researches (1, 8, 10), a considerable reduction of rectal temperature has been recorded under the effect of permanent magnetic field (PMF). The latter fact led us to presume a possible rise in the resistance of the organism againts thermal effects. According to data submitted by Shishlo (20), Tishankin (17). Reno and Nutini (23) and others, PMF decreases the energetics of the organism. Lowering of the energetic demands of the organism secures more favourable conditions for restoring the impaired homeostasis, and in this respect PMF might be considered as an adaptogenic factor. Having in mind the possibility of PMF to accomplish its action by way of changes in the water, determination of the effect of «magnetic» water on the resistance of animals to high temperature proves of utmost importance.

It is the purpose of this worki to find out the influence of water, processed in PMF, on a) some hematologc and biochemical indicators in experimental animals, b) the resistance of animals to single and chronic thermal influence, and c) weight and maximum capacity for work of the animals.

Material and Methods

Water was administered per os using a sound, at 2.5 ml daily dose, over a period of 75 days. The remaining quantity of water was received by the animals in glass bowls. Water was processed in a device, fed by a selenium monophase current rectifier. Dynamic processing of water was resorted to, securing its flow between the poles of the apparatus at velocity 0.50—0.55 m/sec. By modifying the current intensity, a permanent magnetic field was created, at 500, 1000 and 6000 gauss magnetic induction.

Thermal effect was realized by placing the animals in a thermostat at 40°C, for 30 minutes, and securing ventilation of the chamber. To determine maximum working capacity, the «swimming till exhaustion» test was applied (14). Since performance depends largely on the water temrepature (24), the latter was maintained practicall constant — $18.0 \pm 0.5_0$ C.

Determination was made of the following indicators: 1) body weight; 2) hemoglobin — photometrically as cyanomethemoglobin; 3) erythrocytes — counting chamber; 4) staining index; 5) mean hemoglobin content per erythrocyte; 6) leukocytes — counting chamber; 7) total solubie protein in serum — photometrically, using a biuret reagent; 8) protein fractions — electrophoretically after Graber — Bourten (21); 9) total serum cholesterol — after Mrskos — Tovarek; 10) serum cholinesterase activity — after Pravdich — Neminskaya, as modified by F. Kaloyanova; 11) Na^+ and K^+ serum content — through flicker photometry; 12) serum Cl^- content — mercury-metrically according to Shales; 13) Serum lactate dehydrogenase activity (LDH) — using the Optimierter UV test; 14) serum glutamate dehydrogenase activity (GDH) — with the Boeringer test; 15) succinic dehydrogenase activity — in 10 per cent tissue homogenate of liver; 16) rectal temperature — using electrothermometer, type TEMP-60.

The study was carried out on 216 white rats, divided up into groups as shown in the Table.

Distribution of Rats in Groups

Groups	Background	Single thermal treatment	Chronic thermal treatment	Weight and capacity for work
I. Control, ordinary drinking water	30	15	22	21
II. Experimental, „magnetic" water 500 gauss	—	—	—	18
III. Experimental, „magnetic" water 1000 gauss	20	15	20	20
VI. Experimental, „magnetic" water 6000 gauss	20	15	—	—

Results and Discussion

In the rats receiving magnetic water, as compared to controls, the hematological indicators determined are within normal limits. Total protein content in the serum of rats experimented upon is lower than in the controls ($P=0.007$), but nevertheless, it remains within normal limits. Changes in

the protein profile are relatively slight. Serum cholinesterase activity is practically equal in all the groups. Rather marked changes are noted in the content of blood serum cations. A reliable reduction of Na^+ ($P=0.009$) and K^+ ($P=0.001$) is found in the animals of the experimental groups. The rectal temperature in animals drinking «magnetic» water is lower than in the controls. The difference between I and III group is 0.58^0 ($P=0.008$), and between I and IV group — 1.20^0 ($P=0.001$).

Following single time thermal treatment, in the rats given 1000 gauss «magnetic» water the number of leukocytes is reliably higher ($P=0.002$), while total protein content is lower ($P=0.022$) in comparison with controls. A certain redistribution takes plase in the protein fractions, and the proportion of albumins in the test animals shows a slight increase at the expense of gamma -globulins. Accordingly, the albumin/globulin ratio in them is higher (0.95 and 0.87 resp.) as compared to the control group. Serum cholinesterase activity is virtually equal in the three groups. Both prior to and after thermal treatment, the amount of Na^- and K-ions in the control rats is higher ($P<0.001$) than that in the experimental animals, but nevertheless it remains within normal limits. Cl^- quantity in the experimental groups shows a reliable increase ($P=0.036$). The absolute rise of rectal remperature subsequent to thermal effect in the rats drinking «magnetic» water is lower — accordingly $+3.9°$ and $3.1°$ for group III and IV, and $4.1°$ for group I (Fig. 1). While in the rats on «magnetic» water regime, the thermal treatment produces no appreciable changes, in the control rats torpidity, adynamia and slight cyanosis is observed.

Insofar as rectal temperature is concerned the changes recorded in chronic thermal theatment are characteristic. During the first six days, prior to placing the rats in a thermostat, the temperature falls and up to 30 days it is maintained at a lower level than in the beginning of the experiment. Along with that, from the 6 th to 22 nd day, it is lower in the rats experimented upon as compared to controls. In the same period, the rectal temperature too shows a fall when measured after thermal treatment; in the test animals it displays lower values than in the controls.

Within ten days of the beginning of the experiment, Na serum content increases as compared to the starting level both in group I and III ($P<0.01$), whereas K^+ level shows a fall ($P<0.001$). Among the test animals, Cl^- concentration displays a reliable fall ($P<0.01$) while in the controls a tendency towards rising is detectable. Differences in the content of electrolites observed at ten days in both experimental and control rats are reliable — $P<0.01$ for Na^+, $P<0.01$ for K^+, and $P<0.001$ for Cl^-, with the values in the experimental group being closer to the initial ones. At 30 days, the differences referred to disappear, but Na^+ concentration is still higher than the initial one ($P<0.001$).

The activity of serum LDH and GDH, and succinic dehydrogenase in liver homogenate within ten days of beginning the experiment is lower as compared to the starting level in the control rats, and higher in the test animals. At the 30 th day, a sharp increase in the activity of the above enzymes is observed in the control rats, with its values exceeding not merely the starting level, but also that in the experimental groups. The reduced GDH activity among the animals experimented upon within 30 days of the onset of themal treatment is noteworthy.

The original weitht of the rats was the following: controls — 133.6±1.5 g experimental group II — 132.2±0.6 g, experimental group III — 128.0± 1.1 g. From the 15 th day onwards till the end of the experiment (75 days), the weight gain among the test animals is substantially greater than that of

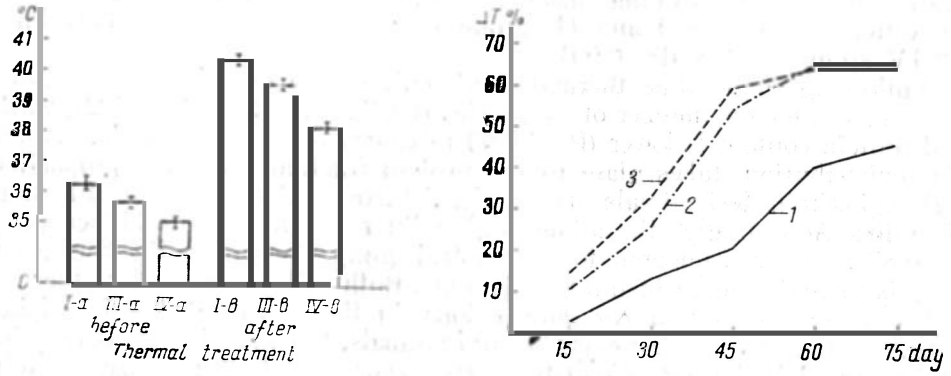

Fig. 1. Changes in rectal temperature after thermal effect.

Fig. 2. Weight gain in rats: 1 — controls; 2 — drinking «magnetic» water, 500 gauss; 3 — drinking «magnetic» water, 1000 gauss.

the controls (Fig. 2). The greatest is the difference at 45 days — between group I and II it is 34.2 per cent, and between group I and III — 38.9 per cent. Differences in all instances are statistically relia le except for those between group I and II at 15 days.

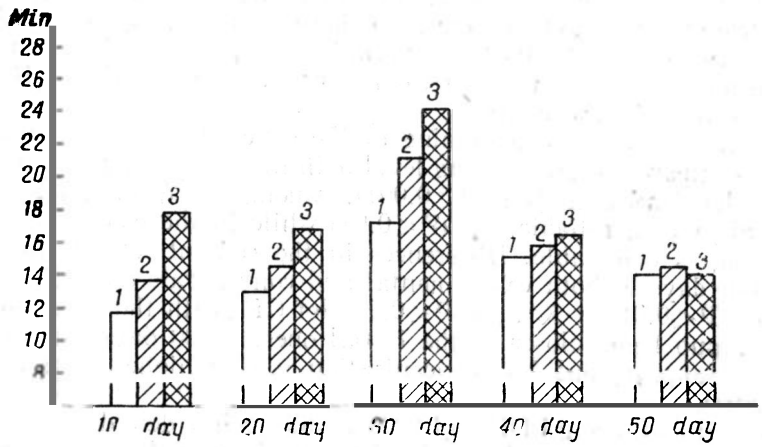

Fig. 3. Maximum fitness of rats (swimming time in minutes): 1 — controls; 2 — drinking «magnetic» water, 500 gauss; 3 — drinking «magnetic» water, 1000 gauss.

Assessment of the maximum capacity for work of the animals shows tha- the swimming time among the rats on «magnetic» water drinking regime is longer than that of the controls (Fig. 3). The differences are statistically re

liable at the 10 th, 20 th and 30 th day of the experimental period ($P<0.05$). Rather more strongly manifested effect is noted when 1000 gauss «magnetic» water is used.

Conclusions

1. The biological activity of water treated in a permanent magnetic field at 1000 gauss induction is slightly higher than that of water passed through a permanent magnetic field, at 6000 gauss induction.

2. In the rats receiving «magnetic» water for a period of 45 days, total protein, Na^+ and K^+ in the serum, and rectal temperature are reliably reduced. Hemoglobin and total cholesterol chow a tendency to decrease. All changes referred to above are within normal physiological limits.

3. Water treated in permanent magnetic field modifies, up to a certain extent, the unfavourable effect of high temperature during single time treatment. In comparison with control rats, in those experimented upon weaker changes in electrolite content, and a smaller absolute rise of rectal temperature are recorded.

4. The combined influence of high temperature and water processed in PMF, under conditions of chronic experiment, exerts an unfavourable effect on the rats experimented upon — weight gain decreases, and the cativity of glutamate dehydrogenase is inhibited.

5. Giving the rats to drink water treated in PMF, as compared to control rats, leads to an increase of weight gain and maximum capacity for work, estimated in the course of swimming exertion. A better pronouced stimulating effect is being exerted by water, treated in a magnetic field at 1000 gauss induction.

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ИЗУЧЕНИЕ БИОЛОГИЧЕСКОГО ДЕЙСТВИЯ ВОДЫ, ОБРАБОТАННОЙ В ПОСТОЯННОМ МАГНИТНОМ ПОЛЕ («МАГНИТНАЯ ВОДА»)

Б. Стефанов, С. Солакова

РЕЗЮМЕ

В 75-дневном опыте на 216 крысах было изучено влияние воды, обработанной в постоянном магнитном поле с индукцией 500, 1000 и 600 Гс, на некаторые гематологические и биохимические показатели, вес и максимальную работоспособность (оценена во время плавания), устойчивость к однократному и продолжительному термическому воздействию. Было установлено достоверное снижение содержания общего белка, Na^+ и K^+ в сыворотке крови, ректальная температура, повышение прироста веса и времени максимального плавания. При однократном термическом воздействии у подопытных крыс наблюдались более слабые изменения в содержании электролитов, меньший абсолютный прирост ректальной температуры. Комбинированное воздействие высокой температуры воды, обработанной в постоянном магнитном поле, в хроническом опыте влияет неблагоприятно на экспериментальных крыс — прирост веса уменьшается, угнетается активность глютаматдегидрогеназы. По данным показателям большая биологическая активность воды, обработанной в постоянном магнитном поле, наблюдалась при индукции 1000 Гс.

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