Content of Fibronectin and Glycosaminoglycans in Blood Serum of Rats with SiO_2-Induced Inflammation after Radon-Containing Water Bath

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In animals with SiO_2-induced inflammation, exposure in radon-containing water promoted normalization of fibronectin content on days 3 and 10 and reduced the content of glycosaminoglycans on days 3 and 20 compared to the corresponding values in intact animals and rats with SiO_2-induced inflammation not exposed to radon.

Key Words: *SiO_2-induced inflammation; fibronectin; glycosaminoglycans*

There is no consensus on the effects of radon therapy. The safety of radon procedures is doubted [5]. The possibility of placebo effect cannot also be excluded because of low radon concentration in mineral water [2]. At the same time, clinical efficiency of radon therapy was demonstrated in numerous studies [1,3,6,7]. There are ample data on positive effects of radon baths in chronic inflammatory diseases induced by various etiological factors. Despite long-term use of radon therapy, its effects on the main components of the extracellular matrix are still poorly understood.

Here we studied the effects of radon-containing mineral water on extracellular matrix components in animal experiments.

MATERIALS AND METHODS

The study was performed on 46 male Wistar rats weighing 250-260 g obtained from Nursery of Institute of Cytology and Genetics, Siberian Division of Russian Academy of Sciences. The experiments were approved by Ethical Committee of Research Center of Clinical and Experimental Medicine.

The animals were divided into 4 groups: group 1 (n=5) comprised intact rats, group 2 (n=14) included rats without inflammation exposed to mineral water; group 3 consisted of rats with SiO_2-induced inflammation (II) and exposed to mineral water. Animals of groups 2 and 3 were placed for 20 min into radon-containing mineral water from Belokurikha resort (radon concentration 270 Bq/liter, water temperature 35°C). Group 4 (n=15) consisted of rats with II not exposed to mineral water. II was modeled by intravenous injection of SiO_2 suspension in a dose of 35 μg/kg body weight in 0.8 ml 0.85% NaCl.

The rats of groups 2 and 3 were decapitated under ether narcosis on days 3, 10, and 20 of radon therapy, while group 4 rats were sacrificed on days 14, 20, and 30 of II.

The blood was obtained during decapitation, the serum was separated and frozen at -18-20°C until analysis.

The content of fibronectin (FN) was evaluated using IMTEK test system for FN assay by EIA. Measurements were performed on Multiscan MCC/340 P plate reader. The content of glycosaminoglycans (GAG) in blood serum was measured by the orcin

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method [4], the measurements were performed on PD-303S Apel spectrophotometer.

The data were processed statistically using Student *t* test.

RESULTS

Serum content of FN in rats with II was higher than in group 2 animals, but did not differ from that in group 1 rats (Fig. 1). On day 3 of radon therapy, serum content of FN in rats with II significantly surpassed that in intact animals (187.5±11.2 and 122.5±24.04 mg/liter, respectively, $p<0.05$). On days 10 and 20 of radon therapy, no differences between these groups by this parameter were observed.

There were no significant differences between rats with II on day 3 of radon therapy and rats with II on day 3 of the disease. However, on day 10 of radon therapy FN content was maximum in group 3 rats (215.0±95.0 mg/liter), but reduced in group 4 animals (120.0±9.5 mg/liter). Low FN content on day 10 of radon therapy was also noted in group 2 rats (97.5±16.0 mg/liter).

In group 3, FN content virtually did not differ from that in group 1 rats on days 3 and 10 of radon therapy.

The content of GAG in blood serum on day 3 of radon therapy in group 3 animals was lower (1.05±0.15 mmol/liter) than in rats of group 2 (2.48±0.30 mmol/liter; $p<0.001$) and group 4 rats on day 3 of inflammation (2.52±0.50 mmol/liter; $p<0.05$; Fig. 2).

On day 10 of radon therapy, GAG concentration in group 3 rats was lower (3.15±0.08 mmol/liter) that in group 4 on day 10 (3.54±0.15 mmol/liter; $p<0.05$). Lower content of GAG was also observed in group 3 on day 20 of radon therapy: GAG concentration in blood serum was significantly lower (2.42±0.15 mmol/liter) than in group 2 (3.16±0.29 mmol/liter; $p<0.05$) and group 4 (3.27±0.08 mmol/liter; $p<0.001$).

Thus, in rats with II the content of FN increased on day 3 after radon therapy, and did not differ from control values on days 10 and 20. The content of GAG in rats with II at all terms of radon therapy was lower that in rats with II not exposed to radon. Moreover, in rats with II the content of GAG was reduced on days 3 and 20 of radon therapy compared to the corresponding values in intact animals.

Thus, balneotherapy with radon-containing mineral water produces modulating effects on the major extracellular matrix components in chronic inflammation.

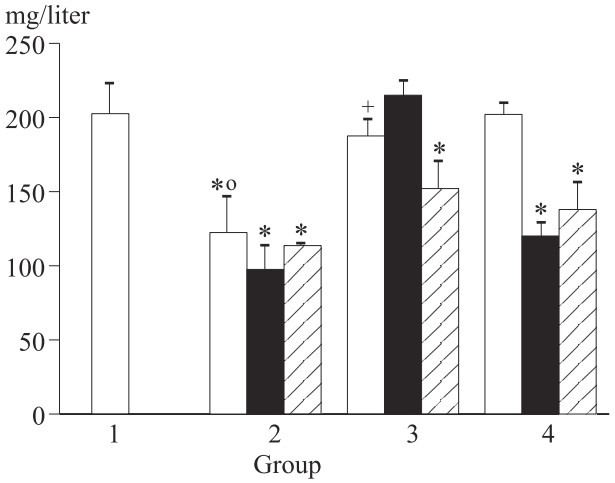

Fig. 1. Serum FN content in rats with II after radon therapy. Here and on Fig. 2: light bars: day 3; dark bars: day 10; shaded bars: day 20. $p<0.05$ compared to: *group 1, +group 2, °group 4.

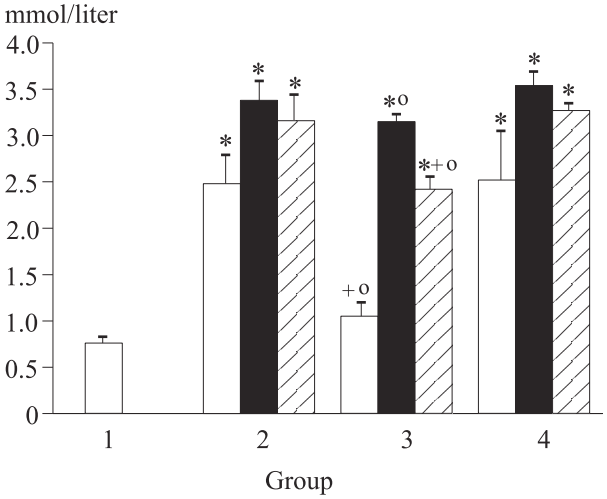

Fig. 2. Serum GAG content in rats with II after radon therapy.

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