

Effect of Radon on Dendritic Cells of the Central Lymph and on Process-Forming Bone Marrow Cells of Rabbits

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The phenotypic parameters of dendritic cells of the central lymph and of red marrow cells with processes in rabbits are compared using the light-optical and morphological methods and an original technique of lymph sampling. The effect of radon on the time course of the number of the above-mentioned cells is explored. Two major types of cells with processes are identified in the red marrow: cells with one process and cells with two or more processes. These cells and the corresponding types of dendritic cells of the central lymph are not identical, which does not rule out their common origin. The number of above-mentioned cells correlates with the activity of radon.

Key Words: *dendritic cells; marrow cells with processes; lymph*

All antigen-presenting cells reaching the lymph nodes are known to be endowed with processes, that is, they are dendritic cells [6]. It has been also demonstrated that dendritic cells of the central lymph are phenotypically diverse [2]. Identification and the origin of dendritic cells are a major focus of interest of researchers [3,5-10].

In the present study we compared the morphological characteristics and the quantitative responses of dendritic cells of the central lymph and of process-forming cells of the red marrow (RM) of rabbits receiving radon baths with different radon content, i.e., with different activity.

MATERIALS AND METHODS

The study was carried out on 150 male chinchilla rabbits weighing 2.0-3.5 kg. The experimental animals were divided into groups as follows: 1) intact rabbits; 2) animals receiving radon baths from the Belokurikha springs; 3) animals receiving radon

baths from the Iskrovsko-Ul'yanovskoe springs. The radon content is higher at the latter spa than at Belokurikha [1]. Dendritic cells of the central lymph and cells with processes of the RM were examined in smears stained after Romanovsky-Giemsa using a Leitz light microscope ($\times 400-600$). The central lymph and RM were taken *intra vitam* from cisternae of the thoracic duct and sternum, respectively, under local Novocain (0.25%) anesthesia. The method of lymph sampling (Pat. № 4944468/30, approved by the Research Institute of State Patent Expertise of Russia, priority date 07.14.91) was used. Cells were counted by continuously scanning the smear; the cell count was

TABLE 1. Number of Dendritic Cells of the Central Lymph and of Process-Forming Cells of the RM in Intact Animals (Rabbits) and in Animals Exposed to Radon Baths with Different Radon Contents ($X \pm s_x$, %)

Smear	Group of animals		
	1	2	3
RM	1.7 ± 0.25	3.1 ± 0.18	4.5 ± 0.63
Central lymph	2.0 ± 0.9	4.7 ± 0.35	5.1 ± 0.46

Note. The differences are reliable at $p \leq 0.05$.

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Fig. 1. Type 1 process-forming cell of RM. RM smear. Here and in Figs. 2 and 3: staining after Romanovsky-Giemsa; obj. 60, oc. 10.

expressed as a percentage of the other cells of the central lymph and RM. The diameter of the cell body and the length of the processes were measured using an ocular- and object-micrometer. The numerical data were statistically processed. The animals received radon baths according to the routine protocol. After the completion of the experiment the animals were sacrificed by injecting sodium thiopental solution into the ear vein. The study was performed in October.

RESULTS

In RM smears derived from animals of three experimental groups two major types of cells with processes were identified according to the phenotypic specificities: cells with one process (Fig. 1) and cells with two or more processes (Fig. 2). Type 1 process-forming cells have a body of an oval or a droplike shape. One unbranched process originates from the body. The cell body diameter is from 14 to 30 μ . A lumpy nucleus occupies an appreciable area of the cytoplasm. At the site of origin of the process the cell membrane gradually narrows and evaginates, and its two fragments merge into one process some distance away.

The process tapers slightly. The length of the processes in this type of cell ranges from 15 to 120 μ . The cells maintain contacts with surrounding cells of the RM via these processes. The processes are bent. The described process-forming cells are unattached, "unsettled," cells, like dendritic cells of the central lymph of the corresponding type [2], and are morphologically comparable with them. However, dendritic cells of the central lymph have a body of an irregular shape and a denser nucleus, and their processes more markedly taper from base to apex.

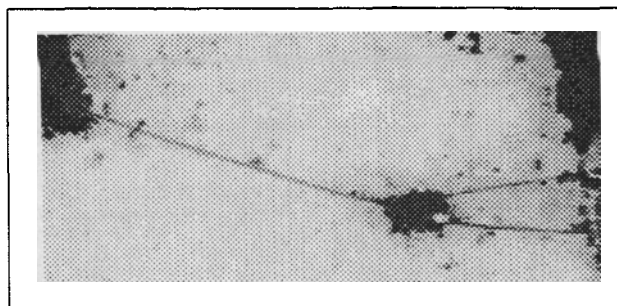


Fig. 2. Type 2 process-forming cell of RM (smear).

Type 2 process-forming cells of the RM (Fig. 2) are characterized by a body of a round shape with thin "filiform" unbranched compact processes. Most frequently there are three such processes. The cell nucleus is compact and occupies a large part of the cytoplasm. Two processes branch off the cell body in one direction, while a third departs in the opposite direction. The diameter of the processes does not alter from base to apex. Their length ranges from 28 to 90 μ . The cell body diameter is 15 to 20 μ . These are attached, "settled" cells and correspond to reticular cells of the RM. Type 2 process-forming cells of the RM to a certain extent correspond to the type 2 dendritic cells of the central lymph (according to an earlier proposed classification [2]), shown in Fig. 3. However, there are differences between the above-mentioned cell types. Type 2 dendritic cells of the central lymph (Fig. 3) have a body of an irregular shape with loose processes, and these cells are "unsettled." The cell body diameter is from 10 to 18 μ , and the length of the processes is 25-87 μ . Dendritic cells of the central lymph with branching processes usually have a loose, light nucleus.

The number of process-forming cells of the RM and of dendritic cells of the central lymph increases for radon balneological procedures as compared to the group of intact animals, the increase being higher in the third group. Rabbits of this group received radon baths from the Iskrovsko-Ul'yanskoe springs, which are more active than the baths from Belokurikha springs (Table 1). In this case the number of type 2 cells (dendritic) increases in the central lymph, whereas the number of type 1 process-forming cells increases in the RM.

The aforementioned changes in the morphological parameters and quantitative correlations between the number of dendritic cells of the central lymph and process-forming cells of the RM are attributed to the effect of radon on the receptor area of the skin where the cells of Langerhans are located. They exhibit complete phenotypic identity to cells with processes found in an RM cell culture [11] and are precursors of dendritic cells cir-



Fig. 3. Type 2 dendritic cell of central lymph (smear).

culating in the peripheral lymph [3,6,10,12]. It was previously shown that the therapeutic effect of balneoprocures (sulfide waters) is due to a change in the metabolism in epidermal cells of Langerhans [4].

Thus, dendritic cells of the central lymph and process-forming cells of the RM of the described types do not exhibit a complete morphological (phenotypic) similarity, which does not rule out the hypothesis of their common origin.

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