Activation of the human body exposed to high radon activity

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Radon is newly considered a risk factor for lung cancer. Traditionally, radon is used as a curative in spa. One way of balneation is radon inhalation in mines (eg Bad Gastein in Austria and Boulder mine in USA), where patients are exposed for several tens of minutes to hours to air activity in the order 10^3 to 10^4 Bq m^-3 222Rn. Even higher activities can be found in abandoned uranium mines, often in the order 10^4 to 10^5 Bq m^-3 222Rn in the poorly ventilated parts. These underground spaces are often visited by mineral collectors and montanists. In two abandoned uranium mines, the progression of surface beta activity of hair during the stay was monitored and the value and shape of the gamma dose-rate field was measured immediately after mine leaving.

Beta activity increases irregularly, due to the walking between areas with a different radon activity. The highest surface beta activity of hairs was at the end of the stay, with a maximum of 320 Bq cm^-2. After leaving the mine, activity decreases exponentially with an effective half-life of about half an hour. Gamma activity was measured after a two-hour stay in an environment with radon activities ranging from 3.7*10^4 to 2.3*10^5 Bq m^-3. The gamma field has the shape of a human figure. Especially the lungs and abdominal fat showed increased gamma. The highest gamma dose-rate was measured on hairs, up to 9 µGy h^-1. Thus, a combination of surface activation, Rn-product deposition in the lungs, and dissolution of radon in the blood and its redistribution in the body were observed.

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