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Indoor radon survey in Novi Sad

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Radon-222 is a noble gas resulting from the decay of naturally occurring uranium-238. It is an alpha particular emitter that decays with a half-life of 3.8 d into a short-lived series of progeny that have been referred to as radon daughters or radon progeny.

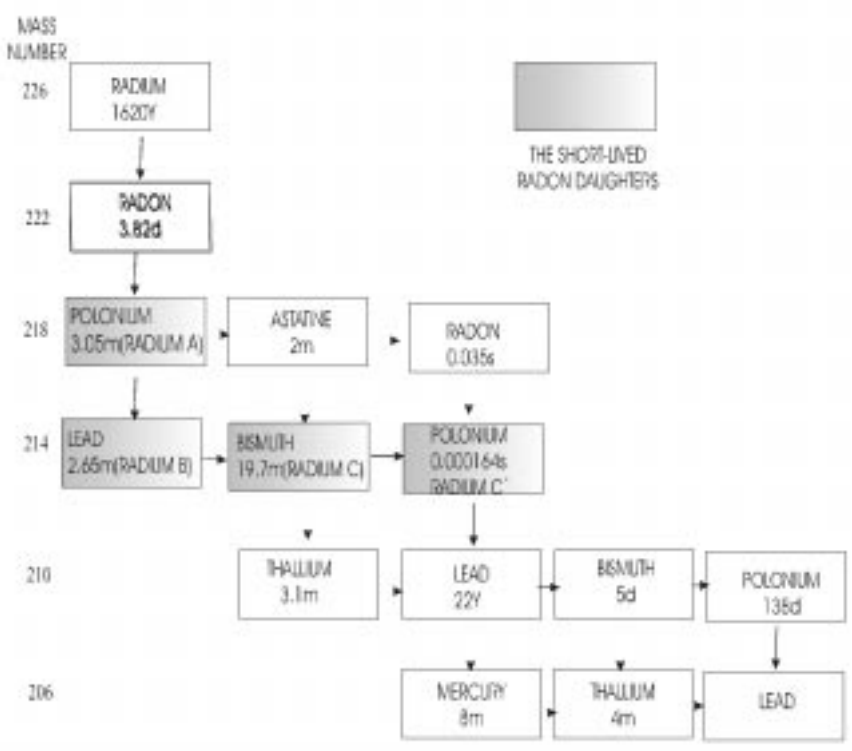

Figure 1. The radon-decay chain

These daughters can attach to walls, floors, or airborne particles that can be inhaled. Unattached radon daughters can also be inhaled and then deposited on lung tissue. After lung deposition these radon daughter isotopes, because of their short half-lives, decay before they can be cleared by the action of mucous in the bronchial tubes. Three of these daughter isotopes, polonium-218, polonium-214, and bismuth-214, emit alpha particles. This highly ionizing radiation, although limited in its ability to penetrate cells, can kill, damage, or transform the sensitive cells in the lung (1). Such a transformed cell has the potential to develop into a cancerous one.

Radon was detected to be present in the indoor air, as early as the 1950s, but the potential health implications received little attention until the late 1970s. It is a naturally-occurring, odorless, colorless radioactive gas which is given off by traces of uranium in soil and rock. It is found at varying levels all over the world. In outside air, radon is present in low concentrations. But in enclosed spaces (such as homes) it can sometimes build up to levels where corrective action should be taken (2). Radon can also be a problem in other types of buildings like small office buildings and schools.

Epidemiological studies have been conducted to assess the general population's risk of lung cancer associated with indoor radon. Complementary animal and laboratory studies have been carried out to address uncertainties in assessment of the risks associated with indoor radon (3). As a result, a rich body of evidences on radon and lung cancer that addresses all facets of the problem within of the framework of exposure, dose, and response has been gained.

During the winter months 1999/2000 indoor radon activity concentrations were measured in 50 schools and nursery schools in Novi Sad attended in total by about 15000 pupils.

During the sampling by active charcoal, the room to be surveyed was closed for 48h. By measuring gamma activity of radon daughters, radon activity concentration was determined.

In 82% of schools indoor radon activity concentrations were below 100 Bqm^{-3}. In 16% of measured samples indoor radon activity concentrations were between 100-200 Bqm^{-3}. There was one object in which activity concentration exceeded 200 Bqm^{-3}, and no object with activity concentration higher than 400 Bqm^{-3} (which is proposed SRJ action level (4-8).

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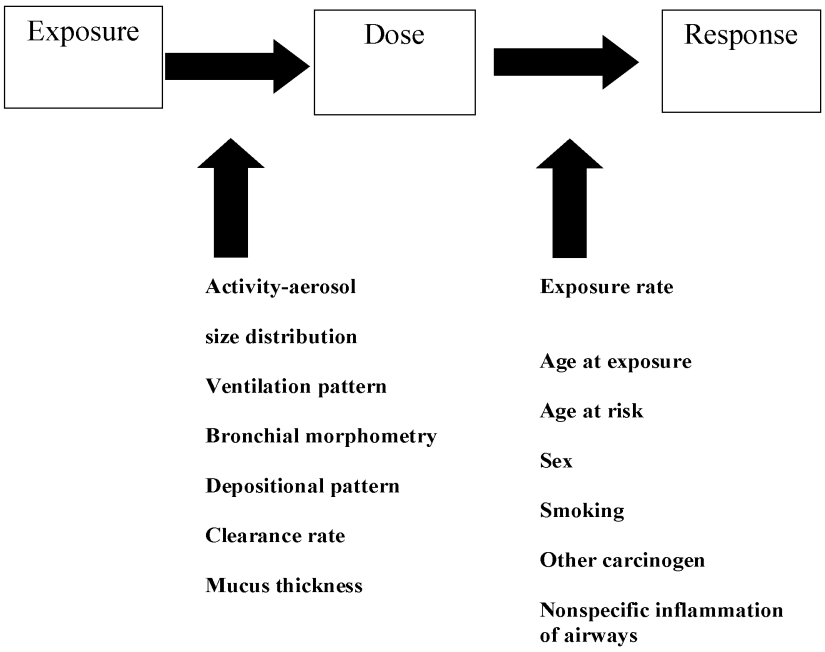

Figure 2. Factors influencing the relationship between radon exposure and lung-cancer risk. Modified from NRC (1991)

In most cases, indoor radon activity concentration can be significantly reduced by appropriate ventilation rate.

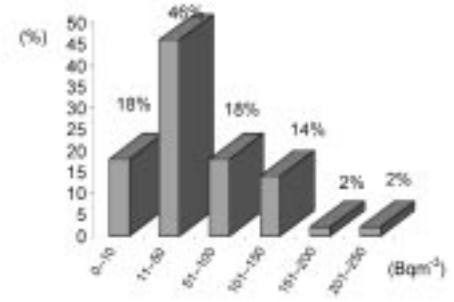

Figure 3. Frequency distribution of ^{222}Rn indoor activity concentration [Bqm^{-3}]
The distribution of activity concentrations is roughly lognormal (5). An arithmetic mean of 47 Bqm^{-3} , and a geometric mean 25.5 Bqm^{-3} were obtained

This paper is a part of the project whose aim is studying of ^{222}Rn activity concentration of indoor facilities in Novi Sad and corresponding health risk assessment. This project is partly financed by City Department of Environmental Protection of Novi Sad , to which we express our appreciation.

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