RADON INFORMATION AND RISK COMMUNICATING ISSUE

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Abstract

The information about the cases of lung cancer due to indoor radon exposure in Albania is practically inexistent. Actually the data on radon concentration in dwellings are very low, 247 measurements (**Tushe *et al.* 2016**). The involvement of the students of the Department of Physics (Faculty of Natural Sciences), in this first survey has been successful and worthy of developing future research projects. In this context, a National Radon Action Plan is planned to be started in the 2020, having the goal of providing information on the geographical distribution of radon concentration. The Institute of Applied Nuclear Physics in collaboration with the Department of Physics (Faculty of Natural Sciences) aims to develop a strategy of radon communication considering students as moderator for the large scale target audience. The goal of this communication approach is to provide to students profound and easy to understand knowledge on radon and consider them as a fundamental part of the National Radon Action Plan. Students then will be the messengers to increase radon awareness and will perform measurements of radon concentrations in their home towns. This approach will help us to compile information on the communication tools and specific ideas for future projects.

Key words: indoor radon, radon remediation, risk communication, national radon action plan

Introduction

The natural radioactive isotopes of radon, i.e. ^{222}Rn and ^{220}Rn, can occur in significant amounts in dwellings (**Dwivedi *et al.* 2001**; **McLaughlin *et al.* 2011**). ^{222}Rn is part of the ^{238}U (half-life 4.5 billion years) radioactive decay chain as a decay product of ^{226}Ra. ^{222}Rn has a half-life of 3.8 days and has a number of short-lived decay products that decay by four alpha and four beta particle emissions (**Figure 1**). ^{222}Rn is commonly known as "*radon*". On the other hand, ^{220}Rn, commonly known as "*thoron*", is part of the decay chain of the ^{232}Th radioactive decay chain (half-life 14 billion years). Thoron has a half-life of 55.6 seconds and has a number of short-lived decay products that decay by three alpha and two beta particle emissions. These primordial radionuclides are present in the earth's crust (rocks and soils) in various amounts depending on the geological composition and can be present in the surrounding environment through the air, both indoors and outdoors.

The main source for indoor radon in dwellings or workplaces is primarily due to the presence of uranium (i.e. radium) is rocks and soil. According to **UNSCEAR (2008)** the radiation exposure due to indoor radon contribute to 50% of the worldwide average annual dose rate (i.e. about half of 2.4 mSv/y). In Albania the number of the radon data in dwellings is very low, 247 measurements (**Tushe *et al.* 2016**), therefore a national survey is fundamental for providing information on the geographical distribution of radon concentration. According to these data the population-weighted average indoor radon concentration is calculated to be 101 Bq m^{-3}, accounting to an annual effective dose rate of 1.2 mSv/y. Few studies on indoor radon concentration in workplaces such as schools and kindergartens, showed concentrations ranging from 31 to 633 Bq/m3 and accounting for a dose rate of the annual effective dose rate was found to be 1.7 mSv/y for workers and 1.3 mSv/y for public (**Dhoqina *et al.* 2019**). According to the legislative framework in Albania (**V.K.M. Nr. 957, 2015**) the reference levels of 300 Bq/m^3 for dwellings and workplaces are considered for indoor radon concentration.

Using this scientific understanding, which inform about the range of exposure situations of the Albanian population to radon, the regulatory bodies must establish communication programs in order to increase the population awareness. In this paper are considered the premises to include the radon risk communication in the didactic program at the Department of Physics (University of Tirana) in collaboration with the Institute of Applied Nuclear Physics.

Health Risks from Radon

The radon exposure is principally due to the inhalation of its short-lived solid radioactive decay products including the isotopes of polonium, bismuth, lead and thallium (**Figure 1**). The radon decay products can be attached to airborne particulate and eventually enter into the human organism through breathing.

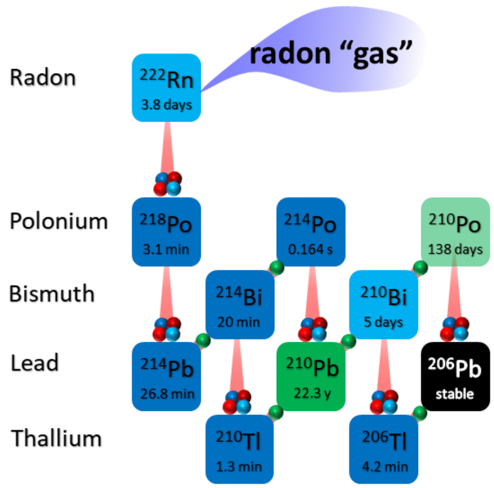

Figure 1. Radon decay scheme.

According to **IARC (2012)**, the International Agency for Research on Cancer, radon is recognized as carcinogenic radionuclide. Indeed, epidemiological studies conducted on a large scale have shown a relationship between long term radon exposure and excess relative lifetime lung cancer risk (**Darby et al, 2005; Krewski *et al.* 2005; Barros-Dios *et al.* 2012)**. On the other hand, there isn't yet established a sound evidence relating radon exposure to other cancers (**AGIR, 2009**).

Risk communication strategy

The three principal objectives of most national radon risk communication campaigns targeted at the public are to raise awareness of the risks, to encourage householders measure radon in their homes and to remediate their homes where necessary (**Fisher and Johnson 1990**). The Institute of Applied Nuclear Physics in collaboration with the Department of Physics (Faculty of Natural Sciences, University of Tirana) aims to develop a strategy of radon communication involving students. A didactic program will be established when the student will be able to learn about:

Naturally occurring radionuclides,

Radon gas,

Sources of indoor radon,

Radon measurements,

Radon health problems.

Students will be able to work directly with radon measurement using the laboratory dedicated to radon measurement (**Figure 2**). In order to increase the focus students will be trained to follow the pre-established protocol for radon measurement in dwellings using passive detectors. Each student will be furnished with at least 10 detectors, which will be his/her responsibility for distributing them at their home town. The location of the detectors will be firstly discussed in order to cover as much as possible the territories of urban areas. Which is more important, students will be able to explain to homeowners the importance of radon measurements and leaflets will be distributed to support them.

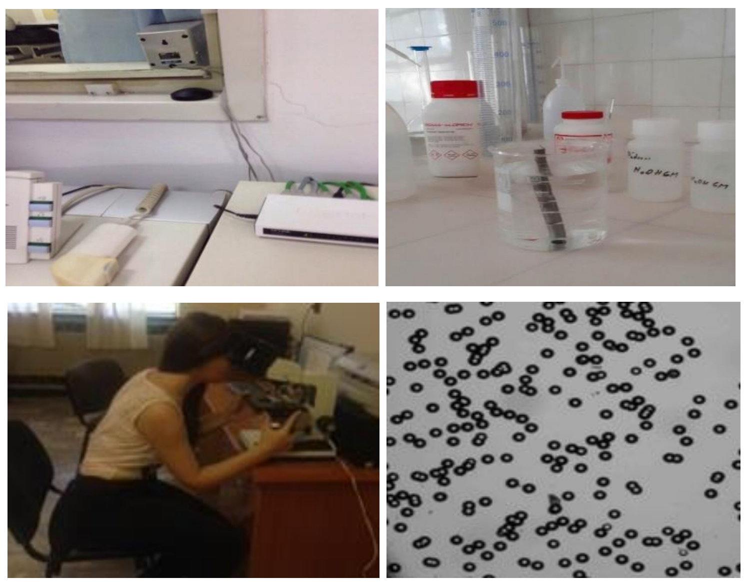

Figure 2. Involvement of students in experiments involving radiation measurements.

This approach will help us to compile information on the communication tools and specific ideas for future projects. These projects will aim to specific programs, publications and events provide opportunities to promote radon awareness, including both national events such as “Radon Awareness Days”. In this context a range of media channels will be used, including print and broadcast news media and social networking sites.

Conclusion

Radon is the second leading cause of lung cancer; can be prevented by controlling indoor radon exposure, for that reason the communication is an important process. The information about radon is low, for this reason the communication should be regular and repeated. In this process, we think the students are the best choice as partner in communication strategy. An effective risk communication strategy calls for a consideration of the demographic and socioeconomic context of the public and the students must be the target group in this process.

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