The average person leaving the house every day is exposed to the dangers of assault, traffic accident, injuries due to tripping on uneven streets, or even from exposure to harmful sunlight. But even in his own apartment the man is not safe. Apart from the fact that a large number of accidents occurring in homes, in confined spaces person is exposed to the toxic effects of a gas, which few people know, and he knows how it works. This is a radioactive gas radon 222Rn, naturally occurring in the earth's crust and which easily penetrates through the cracks and micro-cracks in the materials of construction of buildings and get into the inside. In turn, the fact that the radon is 8 times heavier than air makes it stops in such a confined space and does not float to the top and evaporates through the ceiling, like for example heat. Its concentration increases depending on the length of time with no ventilation of the room. The average Pole spends at home approx. 5,000 hours per year, which is a long enough period of time to toxic gas can cause adverse effects.

How radon causes harmful effects to the man? As the gas moves along with the air to the human respiratory system, and because it is radioactive, there is degradation, which emits high-energy particles, which in turn bombard the surrounding lung tissue transmit them the energy causing damage. Examples of such defects are changes in the sequence and structure of the DNA strands, materialized in the form of eg. a mutation of the type of structural aberration or numerical. A characteristic effect of cytogenetic aberrations are so called micronuclei, that manifest themselves during cell division when chromosomes (aneugenic effect) or their fragments (clastogenic effect) will be lost / damaged. The residue chromosomal form in the cytoplasm the characteristic structure of circular shape - micronuclei. One of the extremely important phenomena occurring during genotoxic stress in the cell is the activation of the p53 protein. This protein is involved in the regulation of many cellular processes, in particular, the activation of DNA repair mechanisms and induction of apoptosis in response to DNA damage, which have a degree (as at present is thought) that exceed the capacity of DNA repair systems. Typically in the cell the protein is inactive. The activation involves phosphorylation and also increasing its synthesis. Important is the fact that the p53 protein is frequently mutated in tumor cells undergoing conversion. It is estimated that mutations of different kinds of proteins found in approx. 50% developed malignant tumors. Because mutant p53 protein has a longer half-life compared to the protein correctly, its presence in tumor cells promotes the formation of autoantibodies in a subject. This phenomenon is increasingly tried to use for the development of screening tests (biomarkers) for early detection of cancer.

In our project, we decided to investigate the relationship between the level of exposure to radon and the frequency of micronuclei in peripheral blood lymphocytes residents, as well as the concentration of autoantibodies against p53 in their serum. The observation of an increased incidence of micronuclei in peripheral blood lymphocytes help us to determine the effect of the risk to the body by exposure to radiation from radon. Additionally, due to the fact that some lymphocytes in the body cells are long-lived, it caused that damage can to accumulate, so it can be said that the micronucleus test may determine the effect of exposure to the organism in the long-term exposure to radon concentration. In turn, detection of autoantibodies p53 protein in the human body, qualifies him to a group of a greater risk for cancer. There are some data available in the literature about the genotoxic radon action in the laboratory in vitro and in vivo, however, the data on the mutagenic effects in humans exposed in the living environment are not available. Accordingly, we plan to conduct our research among the residents of selected cities in Poland, where there are naturally high concentrations of radon in homes. In these residents they will be analyzed their blood samples for frequency of micronuclei in peripheral blood lymphocytes and the level of p53 in the serum. Our goal is to determine the correlation between the concentrations of radon in the air of living environment, and selected parameters of mutagens and the level of p53.

The study will be conducted in the following stages:

1. From the analyzed cohort of residents Kowar will be selected the person for which data for concentrations of radon in their homes are available (based on the results of the measurements that are being performed as part of the statutory IMP / 2015). Depending on the level of radon in homes, selected residents will be divided into groups: exposed to radon concentration in the range of 0-100 Bq / m3 and several groups of compartments above 100 Bq / m3 for maximum concentrations measured.
2. In all residents will be conducted surveys (questionnaire including personal data, exact address, work history and job description, data on smoking habit, drugs and alcohol intake, and exposure to radiation therapy) and evaluated: frequency of micronuclei in peripheral blood lymphocytes (micronucleus assay with inhibition of cytokinesis) and p53 levels in blood serum (commercially available ELISA kit).
3. Detailed analysis of statistical data received will help to determine the correlation between exposure to radon, a mutagenic effect and the level of p53 in selected cohorts of people.