

# cf mtDNA as promising biomarker of radon-induced lung cancer

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**Motivation and Aim:** In recent years, liquid biopsy is becoming an important tool for assessing the progress or onset of lung disease. Liquid biopsy is a non-invasive procedure able to isolate free circulating DNA from body fluids [1]. Cell free circulating mitochondrial DNA (cf mtDNA) have been used not only as a biomarker of carcinogenesis but also as a biomarker of exposure to radiation. Radon is a colorless, odorless, tasteless gas that is the radioactive decay product of uranium, and source of high linear energy transfer  $\alpha$ -particles, which can affect the human body. According to the World Health Organization, radon is the second leading cause of lung cancer after smoking [2]. Many areas of Kazakhstan are characterized by an increased level of radon hazard [3]. However, the influence of environmental factors, including radon, on the level of cf mtDNA is still not studied at the moment. Research in this area can contribute to the development of "preventive diagnostics" aimed at identifying potential health risks associated with the influence of an adverse environmental factors or an unhealthy lifestyle.

**Methods and Algorithms:** 207 subjects were examined including 41 radon-exposed lung cancer patients, 40 lung cancer patients without radon exposure and 126 healthy controls exposed/not exposed to high level of radon. Total cell free circulating DNA from blood samples was extracted and used to detect cf mtDNA copy number by quantitative real-time polymerase chain reaction (qRT-PCR).

**Results:** Among the 62 healthy individuals (control), the median of cf mtDNA copy number was  $1.21 \times 10^5$  copies/ml. The median of cf mtDNA copy number in 64 healthy individuals living in the areas with high level of radon (radon) was  $5.14 \times 10^5$  copies/ml. The median of cf mtDNA copy number in 41 lung cancer (LC) patients living in the areas with low level of radon was  $3.05 \times 10^5$  copies/ml. The median of cf mtDNA copy number in the 40 radon-induced lung cancer (RLC) patients was  $4.14 \times 10^6$  copies/ml. The data indicate that the level of cf mtDNA in the radon-induced lung cancer patients was significantly higher than that of the other study participants. In addition, a correlation was found between the cf mtDNA copy number in the blood plasma of patients with radon-induced lung cancer and annual effective doses of radon.

**Conclusion:** We have shown for the first time that cf mtDNA can be an indicator of the impact of radon on the human body. Moreover, we believe that cf mtDNA is a promising biomarker for liquid biopsy of radon-induced lung cancer.

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## References

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