

AGE-RELATED CHANGES OF IODINE/TRACE ELEMENT CONTENT RATIOS IN INTACT THYROID OF MALES INVESTIGATED BY ENERGY DISPERSIVE X-RAY FLUORESCENT ANALYSIS

V. Zaichick

*Medical Radiological Research Centre, Korolyev St., 4, Obninsk, 249036, Russia,
e-mail: vzaichick@gmail.com*

The endocrine organs, including the thyroid gland, undergo important functional changes during aging and a prevalence of thyroid dysfunction is higher in the elderly as compared to the younger population. Advancing age is known to influence the formation of adenomatous goiter and thyroid cancer. The prevalence of thyroid nodules is increased in the elderly, reaching a frequency of nearly 50% by the age of 65. Both prevalence and aggressiveness of thyroid cancer increase with age. Women are affected by thyroid nodule and cancer two to five times more often than men, but in age over 65 years a prevalence of thyroid cancer is higher in men.

In our previous studies the high mass fraction of iodine (I) and some other trace element (TE) were observed in intact human thyroid gland when compared with their levels in non-thyroid soft tissues of the human body. However, some questions about the age-dependence of TE mass fraction and their relationships in thyroid of adult and, particularly, elderly males still remain unanswered. The findings of the excess or deficiency of TE contents in thyroid and the perturbations of their relative proportions in glands of adult and elderly males, may give an indication of their role in a higher prevalence of thyroid cancer in the elderly males

In present study TE contents and the effect of age on TE contents in intact thyroid of apparently healthy male 2-80 year old was investigated. Mass fractions of Br, Fe, Cu, I, Rb, Sr, and Zn in thyroid tissue samples were determined using radionuclide-induced (^{241}Am and ^{109}Cd) energy-dispersive X-ray fluorescence analysis (EDXRF). For these TE contents and calculated I/TE content ratios some basic statistical parameters such as arithmetic mean, standard deviation, standard error of mean, minimal and maximal values, median, percentiles with 0.025 and 0.975 levels were estimated in thyroid samples of all subjects ($n=72$) and in two age-groups of males 2-35 ($n=36$) and 36-80 ($n=36$) years old. Age-related comparison of data in two groups using the Student's t -test did not show any statistically significant differences in TE contents and I/Br, I/Fe, I/Cu, I/Rb, I/Sr, and I/Zn content ratios, however the significant positive association between age and I/Fe ratio in thyroid tissue was found by the Pearson's coefficient of correlation. Obtained results for TE contents were in good agreement with most reported data for thyroid tissue.

The developed methods of radionuclide-induced EDXRF are an efficient technique for the determination of many important TE in thyroid tissue. The methods are simple, fast, multielemental, and non-destructive. Our results for Fe, Cu, I, Rb, Sr, and Zn mass fractions in intact thyroid tissue may serve as indicative normal values for males of the Russian Central European region.