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# HYGIENIC ASSESSMENT OF RADIATION SAFETY OF FOOD AND WATER IN THE KASHKADARYA REGION OF THE REPUBLIC OF UZBEKISTAN

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### Abstract

This article examines the radiological profile of food and drinking water samples collected in the Kashkadarya region of the Republic of Uzbekistan. All food and drinking water samples contain varying amounts of natural and man-made radionuclides. In accordance with current sanitary regulations, the content of cesium-137 and strontium-90 radionuclides in the food samples, as well as the total alpha and beta activity in drinking and river water samples, was determined. The results indicate no signs of contamination of the studied samples with man-made or natural radionuclides. The need for systematic radiological monitoring is emphasized for the timely detection of potential deviations and the minimization of radiation risks, since current understanding of the biological effects of ionizing radiation suggests that even small doses can increase the likelihood of stochastic effects (genetic, carcinogenic, etc.) that manifest themselves many years after exposure.

**Keywords:** Radiological monitoring, food radionuclides, alpha and beta total activity, drinking water, cesium-137, strontium-90.

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### Introduction

Providing the population with safe food and drinking water is one of the main tasks of the Republic of Uzbekistan. Radioactive substances enter the body through the lungs with inhaled air, through the gastrointestinal tract with contaminated water and food, through wounds and scratches on the skin, and even through intact skin. One of the main tasks of radiation safety is the creation of an effective radiation monitoring system for food products and drinking water. Common artificial radionuclides used in modern industries include cesium-137 and strontium-90, which can pose a risk of internal radiation exposure in the event of a radiation incident. The main route of radionuclides entering the human body is through the food chain with human consumption. They accumulate primarily in muscle tissue and bones and are the main man-made contributor to the internal radiation dose. To monitor the level of artificial radionuclides entering the human body, food products and water were sampled in the Kashkadarya region. Its content is determined in food products and drinking water. The obtained research results made it possible to track the dynamics of its accumulation in the body and estimate the internal radiation dose.

**The aim of the study** is to investigate the accumulation of cesium-137 and strontium-90 in agricultural products and livestock products produced in the Kashkadarya region of the Republic of Uzbekistan, and to assess drinking water for radiation safety indicators.

### Materials and methods

To determine the content of zirconia-137 and strontium-90 in food products, the following basic procedures were performed: sampling, sample preparation and preparation of counting samples, measurement of the specific activity of cesium-137, strontium-90, calculation of measurement results and errors, determination of compliance with radiation safety criteria.

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Measurements of the specific activity of radionuclides in selected samples of food products were carried out using the gamma-spectrometric method on a spectrometer-radiometer MKGB-01 " Radek " in the research and testing radiological laboratory (R&TRL) of the Center for the Development of Professional Qualifications of Medical Workers (CRPCMR) of the Ministry of Health of the Republic of Uzbekistan .

Sample preparation and measurements were carried out in accordance with the “ Methodology for measuring the specific activity of natural radionuclides, cesium-137, strontium-90 in samples of environmental objects and products of enterprises using the MKGB-01 “RADEK” gamma and beta radiation spectrometer-radiometer and the MKSP-01 “RADEK” gamma spectrometer.

The alpha and beta total activity of water was measured using a UMF-2000 radiometer according to approved methods.

Before sampling, the equivalent dose rate (EDR) was measured at the sampling points for food and water using a field radiometer-spectrometer of the Identifier type .

NIIRL has a Certificate of Approval from the Inspectorate for Supervision in the Field of Technical Regulation under the Agency for Technical Regulation of Uzbekistan No. ML/2098, valid until October 5, 2027, which confirms the legitimacy of the activities and the laboratory.

### Results

During the study, 27 locally produced food samples and 9 water samples were collected in the Kashkadarya region during the summer and fall of 2025. Prior to sampling, exposure dose measurements were taken, which ranged from 0.09 to 0.17  $\mu\text{Sv} / \text{h}$ .

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The results of the food research are presented in Table 1.

**Table 1. Content of Cs -137 and Sr -90 in locally produced food products of the Kashkadarya region for 2025**

No.	Types of samples examined	Quantity studied samples	Specific activity of cesium-137, Bq/kg		Specific activity of strontium-90, Bq/kg	
			fact	SanRandN standard	fact	SanRandN standard
1	Agricultural plants (fresh vegetables, fruits, herbs, melons, etc.)	10	1.7±0.4	120	0.06 ±	40
2	Plant products (dried apricots, apples, grapes, almonds, walnuts, etc.)	7	3.8±1.9	150	1.07 ±	40
3	Farm animals (beef, chicken, turkey, lamb)	5	7.1±4.2	160	0.08±	40
4	Livestock products (chicken and turkey eggs, sour milk, etc.)	5	2.9±1.7	80	0.11±	40
5	Total:	27				

Table 2 presents the results of measuring drinking water for alpha and beta total activity.

**Table 2 Average values of total alpha and beta activities of water in the Kashkadarya region for 2025**

No.	Water type	Quantity studied samples	Specific total alpha activity, Bq/kg		Specific total alpha activity, Bq/kg	
			fact	norm according to regulatory documents	fact	norm according to regulatory documents
1	drinking water	5	0.07± 0.002	0.1	0.9± 0.002	1.0
2	surface fresh waters	4	0.05± 0.001	0.1	0.8± 0.002	1.0

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### Discussion

In Uzbekistan, there are currently no preconditions for food contamination with man-made radionuclides, as evidenced by the obtained study results. The lowest amounts of cesium-137 were detected in locally produced annual agricultural crops. Slightly higher amounts were detected in cattle meat from local livestock farms due to a longer accumulation time. Strontium-90 was detected in trace amounts in food products.

In general, the content of cesium-137 and strontium-90 in agricultural products and locally produced livestock products does not exceed the regulatory requirements according to SanPiN 0366-19 “Hygienic standards for food safety”. In the waters of the Kashkadarya region, the specific total alpha and beta activity of water corresponded to the standard values according to SanPiN 0193-06 “Radiation Safety Standards (NRB-2006) and Basic Sanitary Rules for Ensuring Radiation Safety (OSPORB-2006)”

### Conclusion

Although no radiological indicators exceeding regulatory limits have been detected in agricultural products, local livestock products, or waters in the Kashkadarya region of Uzbekistan, ongoing monitoring of environmental factors and control for hygienic radiation safety is necessary to minimize the associated risk. According to the modern concept of the biological effects of ionizing radiation, any dose, no matter how small, increases the risk of stochastic (genetic, carcinogenic, etc.) effects that may manifest themselves many years after exposure.

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