

RESEARCH CONCERNING THE NATURAL RADIOACTIVITY OF SOME FOOD PRODUCE IN THE SIBIU COUNTY AREA

**C. Marutoiu¹, I. Gogoasa², Cecilia Sitoianu¹, Olivia Florena Marutoiu¹,
I. Gergen², Dana Velimirovici³**

¹Faculty of Agriculture Sciences, Food Industry and Environmental Protection,
“Lucian Blaga” University Sibiu, 7-9, Dr. I Rațiu Street, 2400, Sibiu, Romania.

²Banat’s University of Agricultural Sciences and Veterinary Medicine, Faculty of
Food Processing Technology, Calea Aradului nr. 119, Timișoara, RO-300645

³University of Medicine and Pharmacy “Victor Babeș”, Blvd.C.D. Loga Nr.49, RO-
300 041 Timișoara, Roumania.

Abstract

In this paper we present the results of measurement of natural radioactivity of some food produce such as: milk, meat, fish, bread, potatoes, fruits, and eggs produced in the Sibiu County area. We measured α - and β -global activities, Ra – 226 radioactivity and K – 40 radioactivity of some foods from agricultural production of the years 2000-2005.

Keywords: *natural radioactivity, α -global activity, β -global activity, Ra – 226 radioactivity, K – 40 radioactivity, and foods*

Introduction

Knowing the natural radioactive content of foods is a problem of main concern nowadays both for the establishment of some national and local reference values and for the monitoring of the impact of certain social and human activities on the natural radioactive fund and, implicitly, on the quality of food.

Using phosphate fertilisers to fertilise agricultural lands can lead to an accumulation of natural radionuclide of the uranium series in the soil and to their transfer into plants (Chisoila 1988, UNSCEAR data 1993, SRRp data 1994).

Natural radioactivity is the result of natural nuclides that can be found in different concentrations; they have different concentrations,

different toxicity, and high halving times (SRRp data 1994, Marcu 1997).

^{40}K is a radionuclide with significant concentrations in foods; it has low radio toxicity and is the main component of β -global radioactivity (STAS 10115-1984).

^{226}Ra is a radionuclide with high toxicity; it can be found in small amounts in foods, it is a product of disintegration of the natural series of ^{238}U , and it can be found in the α -global radioactivity (Toader 1993).

Experimental

In order to carry out the experiment, we sampled different food produce of plant and animal origin from different localities in the Sibiu County. Food produce from the agricultural production of the years 2000-2005 were analysed in the laboratories of the Institute for Public Health in Sibiu and of the Lucian Blaga University in Sibiu. In all the samples we measured α - and β -global radioactivity, ^{226}Ra radioactivity and ^{40}K radioactivity.

Experimental measurements were made in accordance with present laws and on the ground of recommendations in literature (STAS 10115-1984, Manescu 1985, STAS 12540-1991, Dumitrescu 1997).

In order to measure α -global radioactivity we used a TC - 256 TENNELEC measuring equipment of the α -type with semi-conductor detector.

β -global radioactivity was measured with a ROBOTRON 20050 RFT measuring equipment of the β -type with plastic scintillator.

Measurement of ^{40}K was done in the acid solution of the produce ashes by calculus after we dosed through flam-photometry the mixture of potassium natural isotopes.

Results and Discussion

Experimental results in measuring radioactivity of food produce are shown in table 1.

Analysing experimental results we can see that the monitored radionuclide potassium-40 and radium-226 have different contributions to global radioactivity and different radio toxicity levels.

In the food produce we studies, potassium-40 was found in considerable amounts, but it has no radio toxicity.

Table 1. Natural radioactivities of some food produce groups

Analysed produce	Average values of measured radioactivity [Bq/kg, Bq/l]			
	α -global	β -global	^{226}Ra	^{40}K
Milk	0.090	38.5	0.0016	29.7
Meat	0.242	107.0	0.0050	79.8
Fish	0.668	95.6	0.0090	54.2
Bread	0.359	36.4	0.0065	30.0
Potatoes	0.226	156.2	0.0010	89.8
Fruits	0.078	40.6	0.0082	27.5
Eggs	0.312	32.5	0.0078	30.3

Radium-226, a radionuclide with high toxicity (it is a product of disintegration of uranium which, in its turn, disintegrates in descendents with high radio toxicity, radon-222) has low activity that should not be ignored.

Alpha-global radioactivity given by radionuclide of the uranium and thorium radioactive series, as radium-226 has an important contribution at the level of α -global radioactivity, has higher levels in fish, eggs, and potatoes, but below world reference levels.

Betha-global radioactivity values correspond to the values of potassium-40 radionuclide and have maximal values in potatoes, fish, and meat.

As a conclusion, we can say that food produce we analysed are not radioactively contaminated.

Conclusions

Radioactive compounds present in the Sibiu County come from rain water that leaches them from the soil land carries them to the plants where they are concentrated; they are not a threat as concentrations are below admitted limits.

References

- Chiosilă I. (1988). *Radiațiile și viața: în viziunea unui biolog*, Bucuresti, Editura Paco, 1998
- Dumitrescu H., Milu C. (1997). *Controlul fizico-chimic al alimentelor*, Editura Medicală, București.
- Marcu Ghe., Marcu Teodora (1995). *Elemente radioactive. Poluarea mediului și riscurile iradierii*, Editura Tehnică, București.
- Marcu Ghe. (1997). *Introducere în radiochimie*, Editura Tehnică, București.
- Mănescu S. 1985). *Tratat de igiena*, vol. II, (Igiena radiațiilor), Editura Medicală, București.
- Toader M.(1993). Ra - 226 dans les aliments, *Romanian Jurnal of Biophysics*, 3(2), 107-111.
- *** (1994). Radioactivitatea naturală în România, *Societatea Română de Radioprotecție (SRRP)*, București.
- *** (1984) STAS 10115-84, Laptele și produsele lactate, Determinarea conținutului de K-40.
- *** (1991) STAS 12540-91, Lapte și produse lactate, Determinarea conținutului de Ra-226.
- *** (1993). Source and Effects of ionizing radiation. United Nations Scientific Committee on the Effects of Atomic Radiation, *UNSCEAR* (E 88, IX, 7), New York, United Nation.