Commentary to the paper Assessment of annual effective dose from natural radioactivity intake through wheat grain produced in Faisalabad, Pakistan

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Tufail et al. [1] studied and reported the concentrations of naturally occurring radionuclides (^{40}K , ^{226}Ra and ^{232}Th) in wheat grains. The method that was used was gamma-ray spectroscopy. Determining the activity concentration of ^{232}Th by gamma-ray spectroscopy is, however, not possible. The two gammas from ^{232}Th (63.8 and 141 keV) exhibit very low intensities (0.26 and 0.02%, respectively) and cannot hence be separated from the background using the set-up described in the paper. It is, hence, probable that the authors used the gammas from thorium series radionuclides of ^{228}Ac , ^{212}Pb or ^{208}Tl . The activity of ^{228}Ac follows that of ^{228}Ra whereas the activity the latter two that of ^{228}Th (and/or ^{224}Ra). In short, they did not measure ^{232}Th .

The authors listed the activity concentrations of ^{232}Th in wheat reported by e.g. Scheibel et al. [2] and Pieterzak-Flies et al. [3] and found that “activity values for ^{40}K and ^{232}Th in Indian wheat grain samples are quite comparable to that of studied samples”. This is true with respect to Scheibel et al. [2], who employed the same erroneous method in analyzing ^{232}Th as the authors did. The survey carried out by Pieterzak-Flies et al. [3] is, however, rigorous and the analyzing methods used are correct. The authors failed to recognize the activity concentration reported by Pieterzak-Flies et al. [3] was expressed as mBq kg^{-1} , not as Bq kg^{-1} .

Market basket study of ^{40}K , ^{238}U and ^{232}Th in foods sold in Pakistan has been carried out previously by Akhter et al. [4]. The ICP-MS method used for determining ^{232}Th in this study was correct and the reported values were in-line with

e.g. values compiled in UNSCEAR 2000. The effective dose to Pakistani adult population from ^{232}Th from *all food* was $0.8 \mu\text{Sv a}^{-1}$ which is in gross contrast to the value reported by Tufail et al. [1] which was $43.1 \mu\text{Sv a}^{-1}$ from wheat consumption only.

I would like to point out that this commentary also applies to several other papers on this topic (that I find fruitless to list here). Regrettably, it is a common mistake to assume full equilibrium of natural decays series' radionuclides in biological samples, such as food. Radium uptake by vegetation is much more efficient than that of actinoids. This applies also to intake by livestock. Caution must therefore be exercised when calculating results of the natural decay series.

References

1. Tufail M, Sahiba-Javied N, Akhtar N, Akhter J (2010) Assessment of annual effective dose from natural radioactivity intake through wheat grain produced in Faisalabad, Pakistan. J Radioanal Nucl Chem 283:585–590
2. Scheibel V, Appoloni CR, Schechter H (2006) Natural Radioactivity traces in South-Brazilian cereal flours by gamma-ray spectrometry. J Radioanal Nucl Chem 270:163–165
3. Pieterzak-Flies Z, Rosiak L, Suplinska MM, Chrzanowski E, Dembinska S (2001) Sci Total Environ 273:163–169
4. Akhter P, Rahman K, Orfi SD, Ahmad N (2007) Radiological impact of dietary intakes of naturally occurring radionuclides on Pakistani adults. Food Chem Toxicol 45:272–277

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