Dose Assessment of Natural Radionuclides in Food Consumed in Germany

Autors: Michaela Achatz[a*], Jens Fohlmeister[a], Peggy Hofmann[a], Christian Jung[b], Anna Jäger[b]

[a]Federal Office for Radiation Protection, Köpenicker Allee 120-130, 10318 Berlin, Germany

[b]German Federal Institute for Risk Assessment, Max-Dohrn-Straße 8-10, 10589 Berlin, Germany

email: *machatz@bfs.de

From 2016 to 2021, Germany undertook its first comprehensive total diet study (BfR MEAL study), to evaluate the extent and variety of a large array of substances, for example contaminants or nutrients to which individuals are exposed through their dietary consumption (Sarvan et al., 2017). As part of the MEAL study, a detailed sampling and analytical methodology was employed to measure natural radionuclide concentrations of lead-210, uranium-234, uranium-238, radium-226 and radium-228 across a range of food categories, including vegetables, fruits, cereals, meat, fish and dairy products (Hofmann et al., 2024). These findings revealed that, although natural radionuclides are inherently present in food due to their ubiquity in the environment, the concentrations measured are within safe limits as established by international guidelines (Hofmann et al., 2025).

Here, we provide now the first dose assessments caused by these natural radionuclides in food products commonly consumed in Germany (Hofmann et al., 2025). Polonium-210 was additionally included in the dose calculations based on conservative estimates, since it is known to be an important contributor to the public annual effective dose through food consumption (UNSCEAR, 2000). Consumption rates were sourced from the Radiation Protection Ordinance (StrlSchV, 2018). This ordinance specifies assumed consumption rates for various age groups and food categories, encompassing six age groups as well as ten food groups. In this study we related 134 specific activity values of individual foods to the food groups “milk and dairy products”, “fish”, “meat, sausage, eggs”, “cereals and cereal products”, “local fresh fruit, fruit products, juices”, “potatoes, root vegetables, juices”, “leafy vegetables” and “vegetables, vegetable products, juices”. The calculated annual effective dose received by different demographic groups, such as infants, children, and adults, indicates that the dose level from natural radionuclides in food remains significantly below the recommended public exposure limit of 1 mSv/a. This analysis highlights the importance of continuous monitoring and assessment to ensure food safety and protect public health from radiological risks.

References

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