

¹³⁷Cs Environmental Half-Life Without Remediation: Impact on Radiation Dose

Antone L. Brooks¹, Bruce W. Church², Jordan N. Smith³, Sergei Y. Tolmachev⁴

¹Retired Washington State University, Kennewick, WA 99338, USA; ²Retired Department of Energy, Health Physics Consultant, West Hurricane, UT 84737, USA; ³Pacific Northwest National Laboratory, Richland, WA 99352 USA; ⁴United States Transuranium and Uranium Registries, College of Pharmacy, Washington State University, Richland, WA 99354, USA

¹³⁷Cs is an important long-term contributor to radiation dose and risk following a nuclear accident. Its high abundance (about 6 atoms per 100 fissions), the 30.17 year physical half-life and its biological availability all made it of special concern in the Fukushima accident. After this event, extensive amounts of time and money were invested to clean-up and limit the transport of ¹³⁷Cs into the food chain. However, since the biological and environmental half-lives of ¹³⁷Cs are short, they limit its availability and exposure in people. This paper demonstrates how historical data on the environmental half-life of ¹³⁷Cs in both milk and humans changes, in the absence of remedial action, and modifies dose and risk. ¹³⁷Cs activity in milk from selected dairy farms and total body burdens in the farmers exposed to fallout in Utah were determined. The activity in milk decreased each year from spring to summer, while the activity in the farmers increased with time and varied by a factor of about ten (100-1,400 Bq). Fallout provided a continuing resupply of ¹³⁷Cs into humans. If resupply were to be prevented or limited by remediation, ¹³⁷Cs would clear from the body as a function of the effective half-life of 104 days measured in Fukushima. Blocking the entry of ¹³⁷Cs would have reduced the body-burden in Utah farmers by a factor of almost ten. Data in this manuscript provides a baseline, from which the influence of remedial actions on dose and risk associated with evacuation and cleanup can be compared.

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