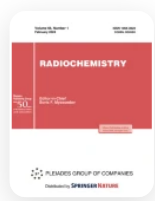


[Home](#) [Radiochemistry](#) [Article](#)




Determination of Uranium Concentration in Blood Samples of Cigarette and Hookah Smokers by Means of Track Radiography Detecting Daughter and Fission Products

Published: 07 August 2023

Volume 65, pages 371–377, (2023) [Cite this article](#)

Radiochemistry

Aims and scope

[I. T. Al-Alawy](#) , [H. A. Kadhim](#) , [A. A. Hasan](#)  & [A. F. Mkhaimer](#)  48 Accesses [Explore all metrics](#) →

Abstract

The uranium concentration in blood samples of cigarette and hookah smokers and nonsmokers was measured using a CR-39 track detector by registration of ^{222}Rn as uranium daughter radionuclide and of uranium fission products generated after neutron irradiation. The uranium concentrations found via ^{222}Ra were between 0.09 and 1.13 ppm, whereas those found through fission products were between 0.11 and 1.30 ppm. The difference in uranium concentrations determined by track radiography via ^{222}Rn and from fission products upon neutron irradiation was larger in female than in male smokers. These uranium concentrations differed significantly ($P < 0.05$) between smokers and nonsmokers. Smokers and nonsmokers had no significant difference in age ($p > 0.005$).

i This is a preview of subscription content, [log in via an institution](#)  to check access.

Access this article

Log in via an institution

Buy article PDF 39,95 €

Price includes VAT (Iraq)

Instant access to the full article PDF.

Rent this article via [DeepDyve](#) 

[Institutional subscriptions](#) →

REFERENCES

1 NASA, Life Sciences Data Archive. CR-39 Plastic Nuclear Track Detector (PNTD). Hardware Information, Hardware Type, Measurement Devices, Radiation. <https://lsda.jsc.nasa.gov/Hardware/hardw/939>.

2 Guo, S.L., Chen, B.L., and Durrani, S.A., *Handbook of Radioactivity Analysis*, L'Annunziata, M.F., Ed., Amsterdam: Elsevier, 2012.

[Google Scholar](#)

3 Rana, M.A. and Qureshi, I.E., *Nucl. Instr. Meth. B*, 2002, vol. 198, nos. 3–4, p. 129. [https://doi.org/10.1016/S0168-583X\(02\)01526-4](https://doi.org/10.1016/S0168-583X(02)01526-4)

[Article](#) [CAS](#) [Google Scholar](#)

4 Rana, M.A., Guedes, S., and Iqbal, M., *Radiat. Meas. A*, 2018, vol. 910, p. 121.

<https://doi.org/10.1016/j.nima.2018.08.07>

[Article](#) [CAS](#) [Google Scholar](#)

5 Thabayneh, K.M. and Shoeib, M.Y., *J. Assoc. Arab Univ. Basic Appl. Sci.*, 2018, vol. 20, no. 1, p. 55. <https://doi.org/10.1016/j.jaubas.2014.11.00>

[Article](#) [Google Scholar](#)

6 Eisenbud, M. and Gesell, T., *Environmental Radioactivity*, New York: Academic, 1997, 4th ed.

[Google Scholar](#)

7 Source and Effects of Ionizing Radiation: UNSCEAR Report to the General Assembly, with Scientific Annexes, New York: UN, 2000.

8 Kadhim, H.A., Al-Alawy, I.T., and Mkhaimer, A.F., *Radiochim. Acta*, 2023.

<https://doi.org/10.1515/ract-2022-0060>

[Article](#) [Google Scholar](#)

9 CDC, Centers for Disease Control and Prevention. National Report on Human Exposure to Environmental Chemicals: National Exposure Report Transitions to an Online Interface, March, 24, 2022. <https://www.cdc.gov/exposurereport>

10 Rostker, B., Environmental Exposure Report. Depleted Uranium in The Gulf (II). Office of the Seduced Assistant to the Secretary of Defense for Gulf War Illnesses, OSAGWI, Department of Defense, December 2000.

11 Depleted Uranium Sources, Exposure and Health Effects, Geneva: World Health Organization, 2001.

12 Lal, N., Sharma, P.K., Nagpaul, K.K., Behera, D., and Malik, S.K., *Int. J. Clin. Pharmacol. Ther. Toxicol.*, 1987, vol. 25, no. 1, p. 36

[CAS](#) [PubMed](#) [Google Scholar](#)

13 Radiological Conditions in Selected Area of Southern Iraq with Residues of Depleted Uranium: Report by an Int. Group of Experts, Vienna: IAEA, 2010.

14 Şahin, M. and Özbay, D.S., *J. Radioanal. Nucl. Chem.*, 2021, vol. 329, pp. 45–50.
<https://doi.org/10.1007/s10967-021-07684-1>

[Article](#) [CAS](#) [Google Scholar](#)

15 Showard, A.F. and Aswood, M.S., *Iraq Pol. J. Med. Phys. Eng.*, 2020, vol. 26, no. 3, p. 143.
<https://doi.org/10.2478/pjmpe-2020-0016>

[Article](#) [Google Scholar](#)

16 Amin, S.A., Haleem, A.M., and Mahmood, O.H., *Int. J. Phys. Res.*, 2020, vol. 8, no. 2, p. 60.

[Article](#) [Google Scholar](#)

17 Koul, P.A., Hajni, M.R., Sheikh, M.A., Khan, U.H., Shah, A., Khan, Y., Ahangar, A.G., and Tasleem, A.G., *Asian Pac. J. Cancer Prev.*, 2011, vol. 12, p. 519.

[PubMed](#) [Google Scholar](#)

18 Khater, A.G., Abed El-Aziz, N.S., Alsewaidan, H., and Chaouachi, K., *J. Environ. Radioact.*, 2008, vol. 99, no. 12, p. 1808. <https://doi.org/10.1016/j.jenvrad.2008.07.005>

[Article](#) [CAS](#) [PubMed](#) [Google Scholar](#)

19 Liu, F., Bao, J., Chen, J., and Song, W., *J. Radioanal. Nucl. Chem.*, 2021, vol. 330, p. 821.

<https://doi.org/10.1007/s10967-021-07984-6>

[Article](#) [CAS](#) [Google Scholar](#)

20 Koul, P.A., *Asian Pac. J. Cancer Prev.*, 2011, vol. 12, no. 8, p. 2145.

[PubMed](#) [Google Scholar](#)

21 Zaga, V., Lygidakis, C., Chaouachi, K., and Gattavecchia, E., *J. Oncol.*, 2011, vol. 2011, ID 860103. <https://doi.org/10.1155/2011/860103>

[Article](#) [CAS](#) [PubMed](#) [PubMed Central](#) [Google Scholar](#)

22 Mould, R.F., *Br. J. Radiol.*, 2014, vol. 74, p. 677.

<https://doi.org/10.1259/bjr.74.884.740677>

[Article](#) [Google Scholar](#)

23 Iraqi Cancer Board, Results of Iraqi Cancer Registry, Baghdad: Cancer Registry Center, Ministry of Health, 2005.

24 Prabhavathi, P.A., Fatima, S.K., Roa, M.S., and Reddy, P.P., *Mutat. Res.*, 2000, vol. 466, no. 1, p. 37. [https://doi.org/10.1016/S1383-5718\(99\)00236-3](https://doi.org/10.1016/S1383-5718(99)00236-3)

[Article](#) [CAS](#) [PubMed](#) [Google Scholar](#)

25 Daway, H.G., Al-Alawy, I.T., and Hassan, S.F., *AIP Conf. Proc.*, 2019, vol. 2144, 030006.

<https://doi.org/10.1063/1.5123076>

26 Hassan, S.F., Al-Alawy, I.T., and Daway, H.G., *Indian J. Public Health Res. Dev.*, 2018, vol. 9, no. 12, p. 1282.

[Article](#) [Google Scholar](#)

27 L'Annunziata, M.F., *Radioactivity, Introduction and History*, Elsevier, 2007.

[Google Scholar](#)

28 Younes, W. and Loveland, W.D., *An Introduction to Nuclear Fission*, Springer, 2021.

[Book](#) [Google Scholar](#)

29 Lowenthal, G. and Airey, P., *Practical Applications of Radioactivity and Nuclear Radiations*, Cambridge Univ. Press, 2001.

[Book](#) [Google Scholar](#)

30 Somogyi, P., Hafez, A.F., Hunyadi, I., and Toth-Szilagyi, M., *Int. J. Radiat. Appl. Instrum. D*, 1986, vol. 12, nos. 1–6, p. 701. [https://doi.org/10.1016/1359-0189\(86\)90683-7](https://doi.org/10.1016/1359-0189(86)90683-7)

[Article](#) [CAS](#) [Google Scholar](#)

31 Hall, E.J., *Radiobiology for the Radiologist*, Philadelphia: Lippincott Williams and Wilkins, 2000.

[Google Scholar](#)

32 Podgorsak, E.P., *Basic Radiation Physics. Radiation Oncology Physics: a Handbook for Teachers and Students*, Vienna: IAEA, 2005.

[Google Scholar](#)

33 Wong, S.S., *Introductory Nuclear Physics*, New York: Wiley, 2008.

[Google Scholar](#)

34 Khan, H.A. and Qureshi, A.A. *Nucl. Geophys.*, 1994, vol. 8, no. 1, p. 1

[CAS](#) [Google Scholar](#)

35 Koul, S.L. and Chaddetron, L.T., *Radiat. Eff.*, 2010, vol. 10, p. 19.

<https://doi.org/10.1080/01422447908226498>

[Article](#) [Google Scholar](#)

36 ICRP, International Commission on Radiological Protection, Statement on Radon, Ref. 00/902/09, 2009.

37 Fox, S.I., *Human Physiology*, New York: McGraw-Hill, 2003.

[Google Scholar](#)

38 Berence, M.R. and Veny, M., *Physiology*, US: Sanders Company, 1987.

[Google Scholar](#)

39 Obaed, H.K. and Aswood, M.Sh., *IOP Conf. Ser.: Mater. Sci. Eng.*, 2020, vol. 928, ID 072043. <https://doi.org/10.1088/1757-899X/928/7/072043>

[Article](#) [CAS](#) [Google Scholar](#)

40 Amin, S.A., Haleem, A.M., and Mahmood, O.H., *Int. J. Phys. Res.*, 2020, vol. 8, no. 2, p. 60.

[Article](#) [Google Scholar](#)

ACKNOWLEDGMENTS

The authors are grateful to the technical staff of the nuclear laboratory for postgraduate studies in the physics department and the environment laboratory in the biology department at the College of Science, Mustansiriyah University, for providing administrative facilities and scientific discussions in the implementation of this study. Great thanks to Mustansiriyah University, College of Science, Baghdad, Iraq, for the assistance rendered during the sampling and for scientific assistance to conduct this research work. And last but not least, we, the authors, can extend our sincere thanks and gratitude to the people who donated blood samples, whose consent was the basis of this scientific work, and whose impact on health is reflected.

Funding

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author information

Authors and Affiliations

Department of Physics, College of Science, Mustansiriyah University, Baghdad, Iraq
I. T. Al-Alawy & H. A. Kadhim

General Directorate of Education for the Holy Karbala, Iraqi Ministry of Education,
Karbala, Iraq
A. A. Hasan

Department of Physics, College of Education for Pure Sciences Ibn Al-Haitham,
Baghdad University, Baghdad, Iraq
A. F. Mkhaiber

Corresponding authors

Correspondence to [I. T. Al-Alawy](#), [H. A. Kadhim](#), [A. A. Hasan](#) or [A. F. Mkhaiber](#).

Ethics declarations

The authors declare that they have no conflicts of interest.

Rights and permissions

[Reprints and permissions](#)

About this article

Cite this article

Al-Alawy, I.T., Kadhim, H.A., Hasan, A.A. *et al.* Determination of Uranium Concentration in Blood Samples of Cigarette and Hookah Smokers by Means of Track Radiography Detecting Daughter and Fission Products. *Radiochemistry* 65, 371–377 (2023).

<https://doi.org/10.1134/S106636222303013X>

Received

06 January 2023

Revised

08 April 2023

Accepted

13 April 2023

Published

07 August 2023

Issue Date

June 2023

DOI

<https://doi.org/10.1134/S106636222303013X>

Keywords:

[uranium concentration](#)

[blood](#)

[cigarette smokers](#)

[hookah smokers](#)

[irradiation](#)

[CR-39 detector](#)