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# Assessing the exposure to uranium and thorium in healthy Spanish teenagers

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**BACKGROUND AND AIM:**To assess the exposure to uranium-238 (U) and thorium-232 (Th) in healthy teenagers living in Alcalá de Henares (Spain).

**METHOD:**Scalp hair was collected from 97 adolescents (13-16 years-old; 68 girls) from Alcalá. U and Th were monitored by ICP-MS after appropriate removal of exogenous contamination with Triton X-100/sonication. Data was processed using 'NADA' statistical package.

**RESULTS:**The limits of detection in hair were (in µg/g): U (0.0018) and Th (0.0011). Levels of censored data were 5.4% and 35.5%, respectively. Concentrations of U and Th were significantly higher ( $p$ -value=0.0017) and higher in female counterparts, respectively as follows (data provided as median and IQR, in µg/g): [0.0194 (0.0059, 0.0296) vs. 0.0055 (0.0030, 0.0135)] and [0.0015 (<0.0011, 0.0023) vs. 0.0014 (<0.0011, 0.0029)]. Levels of both radionuclides were slightly higher than those reported by our group in Alcalá's children (6-9-years-old; median for U was 0.011, meanwhile Th was detected only in 4.2% of children), which would be in line with scientific evidence suggesting that elemental content in hair increases with age. However, the concentrations of both radionuclides in teenagers' hair were much lower than those reported in exposed children aged 7-15 years-old (0.1495 µg/g) that live close to an industrial-scale gold mine in Soweto, South Africa, suggesting minimal environmental exposure. Moreover, Th showed statistical significance according to zones of residency ( $p$ -value=0.0028), being higher in teenagers' hair living in areas that support more industrial activities [0.00298 vs 0.0022 (which support high levels of traffic), 0.00171 and 0.00159 µg/g].

**CONCLUSIONS:**Teenagers living in Alcalá have minimal exposure to both radionuclides, not representing a risk for the population. Further studies should try to identify potential environmental/dietary sources of these radionuclides in the population living in Alcalá de Henares, especially Th, as this showed some increase with age in the population groups monitored.

**Keywords:** Radionuclides, uranium, human hair, monitoring, Spanish teenagers