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**Abstract
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Environmental contamination and exposure to praseodymium in Leicestershire (UK)

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BACKGROUND AND AIM:The aim was to determine the environmental presence and distribution of praseodymium (Pr) across Leicestershire's topsoils (UK) and examine risk characterisation.

METHOD:A total of 850 samples were collected (2017-18); 26 composite samples were appropriately prepared after mixing topsoil samples collected per park/location (18 urban, 8 rural), which were further processed in duplicate. Pr was measured in triplicate in each of the 52 composite samples by ICP-MS. Both areas were further subdivided into the four ordinal directions to study the distribution of Pr. Noncarcinogenic risks were characterised following US EPA methodologies.

RESULTS:Levels of Pr were similar in both urban and rural areas, respectively (median and interquartile ranges, in mg/kg): 4.692 (4.250, 5.152) and 4.883 (3.469, 6.126). Significant differences were detected for the Pr monitored in the composite samples collected throughout Leicester city ($p=0.0207$) and rural areas ($p=0.021$), which revealed different concentration patterns NE>SW>SE>NW and SE>NE>SW>NW for each area, respectively, reflecting a wide distribution of Pr in Leicestershire soils. The median level of Pr in both areas were lower than the background values described for this element in European topsoils (FOREGS; 5.6 mg/kg), but were higher than the described in topsoils from the industrialised town of Maribor (Slovenia; 3.13 mg/kg). Noncarcinogenic risks quotients for ingestion ($1.10E-05$) and dermal contact ($3.90E-07$) due to Pr in urban topsoils were lower than the threshold.

CONCLUSIONS:Although the levels of Pr in Leicestershire topsoils would be lower than those described as background in Europe and in the Upper Continental Crust (9.1 mg/kg), further monitoring studies would be needed to have a better understanding of the potential sources (natural/anthropic) of Pr in Leicestershire, including agricultural practices, waste disposal, metal recycling, vehicular/industrial emissions and urbanisation, as a slight contamination by this metal was detected in Leicester when comparing with other industrialised towns in Europe.

Keywords: Exposures, Risk assessment, Praseodymium