# Biomonitoring chromium contamination in urban and rural topsoils from Leicestershire, England

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A monitoring study was performed to characterise the risks to chromium (Cr) in Leicestershire, England. 106 wild growing mushrooms were collected from Leicester city and Bradgate Park (a close rural park). Cr was monitored by ICP-MS in cleaned/dried/homogenised mushrooms appropriately mineralised [LoD=1.012 µg/g dry weight (dw)]. Cr was also monitored in 850 topsoils collected across Leicestershire processed as composite samples by ICP-MS after acid/microwave digestion (LoD=3.683 µg/g). Cr was detected in 92.2% of the topsoil samples, meanwhile was found in 47.1% of the mushroom samples [median and range, in µg/g dw; 0.863 (1.012-19.466)], showing significant distribution across the four ordinal directions in which Leicestershire was divided [SE (1.908) > NW (1.738) > NE (0.987) > SW (<LoD); Peto-Prentice test, $\chi 2(2)=12.4$, *p*-value=0.002]. These results might suggest some level of pollution by Cr in Leicestershire, as they were higher than the proposed reference interval for wild mushrooms that grow in unpolluted areas (0.5-5 µg/g dw). A similar distribution of Cr was found in the topsoils monitored, *i.e.* the highest concentration in those collected in the southeast and the lowest in the southwest quadrant (123.137 vs. 20.947 µg/g). Moreover, significantly higher levels were found in topsoils collected in the urban area (median and range, in µg/g; Peto-Prentice test, $\chi 2(1)=1.1$, *p*-value=$9x10^{-4}$): 82.542 (3.683-196.795) vs. 32.806 (3.683-265.069), which might be attributed to different anthropic sources such as vehicles. All bioconcentration factor values were lower than one, suggesting a low bioaccumulation of Cr in the wild mushrooms species collected in Leicestershire. Toxic risks derived from oral, inhalation and dermal exposure to Cr from topsoils in the urban four ordinal directions (NW=1.95E-01, NE=1.40E-01, SW=2.53E-01, SE=4.30E-02), were lower than the unit, suggesting a minimal risk for Leicester's population. However, speciation analysis would be needed to rule out carcinogenic risks to hexavalent Cr.

**Keywords:** chromium mushrooms, presence and distribution, human risks, Leicestershire.

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