



35<sup>th</sup> Annual  
Conference of the  
International  
Society for  
Environmental  
Epidemiology

September 17-21, 2023



**Kaohsiung, Taiwan**

Connecting the  
East and the West,  
One Health in  
One Planet

**Abstract  
E-Book**



**#ISEE2023**

[www.ISEEconference.org](http://www.ISEEconference.org)

# Environmental monitoring and risk assessments for gadolinium in topsoils from Alcalá de Henares (Spain)

Antonio Peña-Fernández<sup>1</sup>, Manuel Higuera<sup>2</sup>, Maria Carmen Lobo-Bedmar<sup>3</sup>

<sup>1</sup>Leicester School of Allied Health Sciences, De Montfort University, Leicester, LE1 9BH, UK.

<sup>2</sup>Scientific Computation & Technological Innovation Center (SCoTIC), Universidad de La Rioja, Logroño, Spain

<sup>3</sup>Departamento de Investigación Agroambiental. IMIDRA. Finca el Encín, Crta. Madrid-Barcelona Km, 38.2, 28800 Alcalá de Henares, Madrid, Spain.

**BACKGROUND AND AIM:**The global demand for gadolinium (Gd) is increasing rapidly due to its technological uses. To study its presence, distribution and potential risks in Alcalá de Henares's topsoils (Spain).

**METHOD:**Ninety-four topsoil samples were collected in July 2017 from: urban (66), industrial (24) and public gardens (4). Gd was analysed by ICP-MS after acid digestion with nitric acid (69%) and chlorhydric acid (37%). Noncarcinogenic risks were characterised following US EPA methodologies.

**RESULTS:**Gd was detected (LoD=0.0007 mg/kg) in all samples collected in the three areas monitored, which respectively were (median and interquartile limits; mg/kg): 2.902 (1.908, 3.366), 3.999 (3.469, 4.705), and 3.616 (3.490, 3.694). Significant ( $p$ -value=3.84E-06) higher mean concentrations of Gd were found in the industrial and garden topsoils, which would be logical due to its technological/industrial applications and its presence in fertilisers. Similarly, slightly higher mean concentrations were found in the urban (3.163, 2.823, 2.568, 2.220 mg/kg; NS) and industrial (4.365 vs. 3.505 mg/kg;  $p$ -value=0.0396) areas. Our results suggest minimal anthropic input of Gd in soils in Alcalá, as the levels were lower than the background values reported for Spanish soils [FOREGS, mean and reference range (in mg/kg); 2.694 (0.348-4.951) vs. 5.4 (0.9-24)], and slightly lower than the median reported for European topsoils (3.85 mg/kg). Thus, the median level of Gd was lower than that reported for urban topsoils from Beijing (4.46 mg/kg), suggesting some anthropic input in the topsoils monitored in the industrial area.

**CONCLUSIONS:**Noncarcinogenic risks quotients for inhalation of Gd in resuspended soils (8.35E-04, 1.15E-03) were lower than the threshold for urban and rural areas, respectively, representing a minor risk for human health. Moreover, understanding the fate processes Gd undergoes in the environment is critical to identify interventions/techniques for the decontamination of Gd, environmental presence of which will increase owing to its myriad of technological applications.

**Keywords:** Gadolinium, topsoils, presence, distribution, risks.