

152P

Children's exposure to rare earth elements and cancer

N. Sadeg¹, F. Brousse¹, G. Malonga¹, H. Belhadj-Tahar²

¹ Analytical Toxicology, International Medical Institute of Toxicology and Pharmacology, Chambly, France² Research and Expertise, AFPreMED - Association Francaise de Promotion de la Recherche Medicale, Toulouse, France

Background

Rare earth elements (REE) are extensively used in the renewable energy technologies such as wind turbines, batteries, catalysts and electric cars. While there are many studies about cancer epidemiology of several heavy metal, much less is known about rare earth elements despite the fact that the lanthanides included in rare-earth metals have shown interactions with cellular metabolism and physiology due particularly to their catalytic properties (impact on phosphokinase) and their radii ionic similitude with calcium (impact on Calmodulin). Our team have recently developed ICP-MS technics for hair metallic trace element screening applied to epidemiology investigation on pediatric cancer. In this abstract, we describe the first investigation on hair REE concentration in pediatric cancer among children of the Sainte-Pazanne in northern France.

Methods

Subjects. 64 children aged 5 to 15 years were included in this investigation; 20 from Sainte-Pazanne (6 500 habitants) in the Loire-Atlantique department in western France and 44 healthy children from all other part of France. Among 20 children of Sainte-Pazanne 12 suffered from cancer. Briefly, 10-50 mg of hair was washed twice and hydrolyzed in nitric acid medium during 12h. The diluted hydrolysates and External standards were tested by ICP/MS Injection Agilent 7800. Rare Earth element dosed: Lanthane (La), Cerium (Ce), Praseodyme (Pr), Neodyme (Nd), Samarium (Sm), Europium (Eu), Gadolinium (Gd), Dysprosium (Dy), Holmium (Ho), Erbium Er), Thulium (Th) and Ytterbium (Yb).

Results

4 rare earth elements (Pr, Dy, Ho and Th) were found significantly in large proportion in Sainte-Pazanne children compared to the control population: 231% Pr, 257% Dy, 327% Ho and 400% Th respectively (n = 64, p <0.05). Within the population of the target area, the Praseodyme (Pr), and Holmium (Ho) levels were significantly high in 20% (4/20) of sick children: Pr (Patient: 0.033 ±0.01 µg/g versus healthy: 0.001 ± 0.001 µg/g) and Ho (Patient: 0.003 ±0.002 µg/g versus healthy: 0.001 ± 0.001 µg/g).

Conclusions

This result suggests that the prevalence of children cancer in lanthanide contaminated area might be much higher than elsewhere and rare earth elements could contribute to pathogenesis of pediatric cancer.

Legal entity responsible for the study

The authors.

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Disclosure

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