

#

EHT

Judging Dept.

Pamela Kruger

Student

EHT

4

Patrick J. Parsons

Dept or Program Years in program

Mentor

Determination of lanthanide elements in the human placenta by ICP-MS

Author (s)

Pamela Kruger, Patrick J. Parsons

The rare earth elements (REEs) of the lanthanide series comprise the metals cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, promethium, samarium, terbium, thulium, and ytterbium. In recent years, there has been a growing interest in the measurement of REEs in human tissues and body fluids following their expanded use in many industrial and technological applications that may result in human exposure. In addition, more sensitive analytical techniques are now available for determining REEs in the low parts-per-billion concentration range. In this study, we measured 14 REEs in human placental tissues to evaluate possible maternal and fetal exposure to these metals. Sample dissolution is achieved using an open-vessel microwave digestion with HNO₃, followed by determination via inductively coupled plasma mass spectrometry (ICP-MS). Because low concentrations of REEs are expected in these tissues, we used an Elemental Scientific, Inc. (ESI) Apex High Sensitivity Inlet System and ACM Membrane Desolvation sample introduction system to acquire lower detection limits. Here we describe placenta sample preparation for trace element analysis, and an analytical method for determining REEs by ICP-MS. The method was validated using a certified reference material (CRM), internal quality control materials (IQCs), and spiked recovery experiments. Preliminary data show detectable levels of all 14 REEs measured in human placental tissue (n = 140) in the following order of decreasing concentration: Ce>La>Nd>Gd>Sm>Pr>Dy>Er>Yb>Eu>Tb>Ho>Tm>Lu. Future goals include studies that examine possible associations between the REE data and human subject variables such as age, nutritional status, and various health outcome parameters.