

## 2021年度 博士前期課程学位論文要旨

学位論文題名 (注: 学位論文題名が英語の場合は和訳をつけること)

Determination of anthropogenic Gadolinium in sewage water treatment plant  
下水処理施設における人為的ガドリニウムに関する研究

学位の種類: 修士 (放射線学)

東京都立大学大学院

人間健康科学研究科 博士前期課程 人間健康科学専攻 放射線科学域

学修番号 20897720

氏名: Wijesiri Mudiyansele Indunil Sandamali

(指導教員名: 井上 一雅)

注: 1 ページあたり 1,000 字程度 (英語の場合 300 ワード程度) で、本様式 1~2 ページ (A4 版) 程度とする。

The advancement of healthcare system is directly impact on the discharge of anthropogenic gadolinium ( $Gd_{Anth}$ ) into the natural environment. The main source of  $Gd_{Anth}$  is Gd based contrast agents used in magnetic resonance imaging (MRI). The number of contrast enhanced studies were increased since its initial use in 1990s and it is expected to be increased in the future too.  $Gd_{Anth}$  is added to natural water sources mainly due to the inefficiency of typical wastewater treatment plants (WWTPs). In this study, Gd anomaly of inflow and outflow sewage water samples were collected in 12 different locations in Osaka prefecture, Japan. The rare earth elements (REEs) from collected waste water samples were measured using inductive couple plasma mass spectrometry (ICP-MS).

Both inflow and outflow of sewage water samples showed positive Gd anomalies ( $Gd/Gd^*$ ). The average concentrations of  $Gd_{Anth}$  in inflow and outflow sewage water samples were calculated as 23.32 ppt and 46.48 ppt, respectively. The average  $Gd/Gd^*$  of inflow sewage water and outflow sewage were 13.76 and 30.41, respectively. After the wastewater treatment process, an average concentration of  $Gd_{Anth}$  and average Gd anomaly in the outflow sewage waters have been increased with compared to inflow sewage water samples approximately by 1.9 folds and 2.2 folds, respectively. The  $Gd_{Anth}$  concentrations were increased in every outflow sewage water sample except for the samples collected in Hirana and Konahana areas. The results suggest that the high-water solubility and elevated stability of Gd based contrast agents could be the reasons for the high concentrations of  $Gd_{Anth}$  and Gd anomalies in the waste water

samples. Based on the results, we could predict that the annual output of  $Gd_{Anth}$  concentration in Osaka river waters should be higher. Although, the impact of  $Gd_{Anth}$  on aquatic ecosystems are not fully understood. Therefore, the regular monitoring of the  $Gd_{Anth}$  is essential to observe the adverse effects on living beings altogether.