

Reducing contrast agents residuals in hospital wastewater: the GREENWATER study protocol

Abstract

The potential ecotoxicological effects of iodinated (ICAs) and gadolinium-based contrast agents (GBCAs) have recently come under scrutiny, considering the current nonselective wastewater treatment. However, their rapid excretion after intravenous administration could allow their potential recovery by targeting hospital sewage. The GREENWATER study aims to appraise the effective quantities of ICAs and GBCAs retrievable from patients' urine collected after computed tomography (CT) and magnetic resonance imaging (MRI) exams, selecting ICA/GBCA per-patient urinary excretion and patients' acceptance rate as study endpoints. Within a prospective, observational, single-centre, one-year framework, we will enrol outpatients aged ≥ 18 years, scheduled to perform contrast-enhanced CT or MRI, willing to collect post-examination urine in dedicated canisters by prolonging their hospital stay to one hour after injection. Collected urine will be processed and partially stored in the institutional biobank. Patient-based analysis will be performed for the first 100 CT and 100 MRI patients, then all analyses will be conducted on the pooled urinary sample. Quantification of urinary iodine and gadolinium will be performed with spectroscopy after oxidative digestion. The evaluation of the acceptance rate will assess the "environmental awareness" of patients and will aid to model how procedures to reduce ICA/GBCA ecotoxicological effects could be adapted in different settings.

Keywords (MESH terms)

Contrast media; Gadolinium; Iodine; Outpatients; Urinalysis

Key points

- Ecotoxicity of iodinated and gadolinium-based contrast agents represents a growing concern
- Current wastewater treatment is unable to retrieve and recycle contrast agents
- Prolonging hospital stay may allow contrast agents retrieval from patients' urine
- The GREENWATER study will assess the effectively retrievable contrast agents' quantities
- The enrolment acceptance rate will allow to evaluate patients' "green sensitivity"

Abbreviations

CA: Contrast agent; CT: Computed tomography; GBCA: gadolinium-based contrast agent; ICA: iodinated contrast agent; MRI: Magnetic resonance imaging.