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## PhD POSITION:

### TRANSFERS OF AND PROCESSES RELATED TO HUMAN AND VETERINARY PHARMACEUTICAL RESIDUES AND BIOCIDES FROM SLUDGE AND MANURE USED AS FERTILIZERS

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#### Project context

#### TELESPHORE Project – 2019/2022

The PhD thesis will be part of the TELESPHORE project, devoted to the evaluation of transfers of and processes (decay, infiltration, adsorption, etc.) related to pharmaceutical residues and biocides from both sludge from wastewater treatment plants and manure spread on fields as fertilizers. It is part of the global project RISMEAU (RISques liés aux résidus de Médicaments, biocides et antibiorésistance d'origine humaine et vétérinaire sur les ressources en EAU du bassin versant de l'Arve – Risks related to residues of drugs, biocides and antimicrobial resistance of human and veterinary origin on the water resources of the Arve catchment) carried out on the SIPIBEL observatory (<http://graie.org/Sipibel/projets.html>).

The project involves 3 scientific partners, 1 operational partner and the Rismeau coordinator:

- INSA Lyon, laboratory DEEP (<http://deep.insa-lyon.fr/>)
- INRA Narbonne, laboratory LBE (<http://deep.insa-lyon.fr/>)
- ISA Lyon (<https://isa-lyon.fr/>)
- SRB – Syndicat des Eaux des Rocailles et de Bellecombe (<http://www.s-rb.fr/>)
- GRAIE (<http://www.graie.org>), Rismeau project coordinator

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#### Research project

Sludge from wastewater treatment plants contains some nitrogen and phosphorus, which explains why it may be spread on fields as a fertiliser. However, sludge also contains residues of pharmaceuticals and biocides which may have negative impacts on soils, environment and water resources after infiltration. Similarly, manure spread on fields also contain residues of veterinary pharmaceuticals and other cleaning and detergents products.

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#### PhD content

Within the project, the PhD thesis aims to work mainly on some specific questions concerning pharmaceutical residues and other organic micropollutants:

- 1) Can we close a mass balance in field conditions between inputs, degradation, transfer, sorption and the part which may possibly be non-measurable with available analytical techniques?
- 2) Can we identify and quantify the various processes involved, including the possible distribution between the parent molecules (pharmaceuticals, biocides) and their transformation products?
- 3) Can we quantify the available fraction of the micropollutants and monitor its dynamics in soil over time?
- 4) Can we evaluate the mobility of the molecules and identify the processes involved in their transport (dissolved, co-transport with colloids or dissolved organic matter)? Can we establish some links between the mobility in soil and the distribution of organic pollutants in different size fractions in the amended wastes?

The research work will be carried out mainly on two *in situ* lysimeters, where sludge and manure (to be identified and selected at the beginning of project) will be spread according to real regional practices, and compared with a third lysimeter without fertilisers. Soil samples will also be analysed periodically and the applied organic wastes will be characterized.

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The PhD candidate will evolve in a multi-disciplinary environment integrating several scientific areas:

- Hydrology
- Contaminants, esp. pharmaceutical residues, biocides
- Experimental field work and sampling campaigns (incl. collaboration with other partners of RISMEAU working e.g. on ecotoxicology and analytical chemistry).
- Data analysis
- Process modelling (Matlab / Octave).

<b>Required diploma</b>	<p>Master of Science or equivalent degree (civil engineering, water sciences, soil sciences, etc.)</p> <p>For French candidates, a Master degree (diplôme d'ingénieur) in relevant areas is also accepted.</p>
<b>Expected skills</b>	<p>Interest and motivation for experimental field work, sampling campaigns.</p> <p>Interest in multi-disciplinary work</p> <p>Ability to work in collaboration and in a team</p> <p>Data processing and analysis</p> <p>Modelling experience is welcome</p>
<b>Duration</b>	3 years doctoral contract – Expected starting date: January 2020.
<b>Place/ Supervision</b>	<p>The PhD candidate will be based at INSA, Lyon, France, with frequent travels to the experimental site located in Scientrier (Haute-Savoie, 160 km from Lyon).</p> <p>She/he will be registered at the Lyon doctoral school MEGA (ED 162 - Mechanics, Energetics, Civil Engineering, Acoustics).</p> <p>The PhD student will be co-supervised by Prof. Jean-Luc Bertrand-Krajewski (INSA Lyon ), Dr. Dominique Patureau (INRA Narbonne) and Dr. Pierre Benoit (INRA Grignon).</p>
<b>Salary</b>	The PhD student will be employed by INSA Lyon. Net salary 1720 € per month.
<b>Language</b>	Working language can be French or English
<b>Contacts</b>	<p>Jean-Luc Bertrand-Krajewski (<a href="mailto:jean-luc.bertrand-krajewski@insa-lyon.fr">jean-luc.bertrand-krajewski@insa-lyon.fr</a>)</p> <p>Dominique Patureau (<a href="mailto:dominique.patureau@inra.fr">dominique.patureau@inra.fr</a>)</p> <p>Pierre Benoit (<a href="mailto:pierre.benoit@inra.fr">pierre.benoit@inra.fr</a>)</p>
<b>Recruitment process</b>	The PhD candidate must provide a CV and a motivation letter. After pre-selection based on received documents, interviews will be organised with the remaining candidates.

Deadline for applications: 30 September 2019