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A One of antimicrobial resistance in metropolitan Lyon

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► To cite this version:

Claire Harpet, Collineau Lucie, Colomb-Cotinat Mélanie, Amat Jean-Philippe, Elodie BreLOT, et al.. A One of antimicrobial resistance in metropolitan Lyon. Journée annuelle du réseau Shape-Med@Lyon, May 2024, Villeurbanne, France. pp.Poster. anses-04587106

HAL Id: anses-04587106

<https://anses.hal.science/anses-04587106v1>

Submitted on 24 May 2024

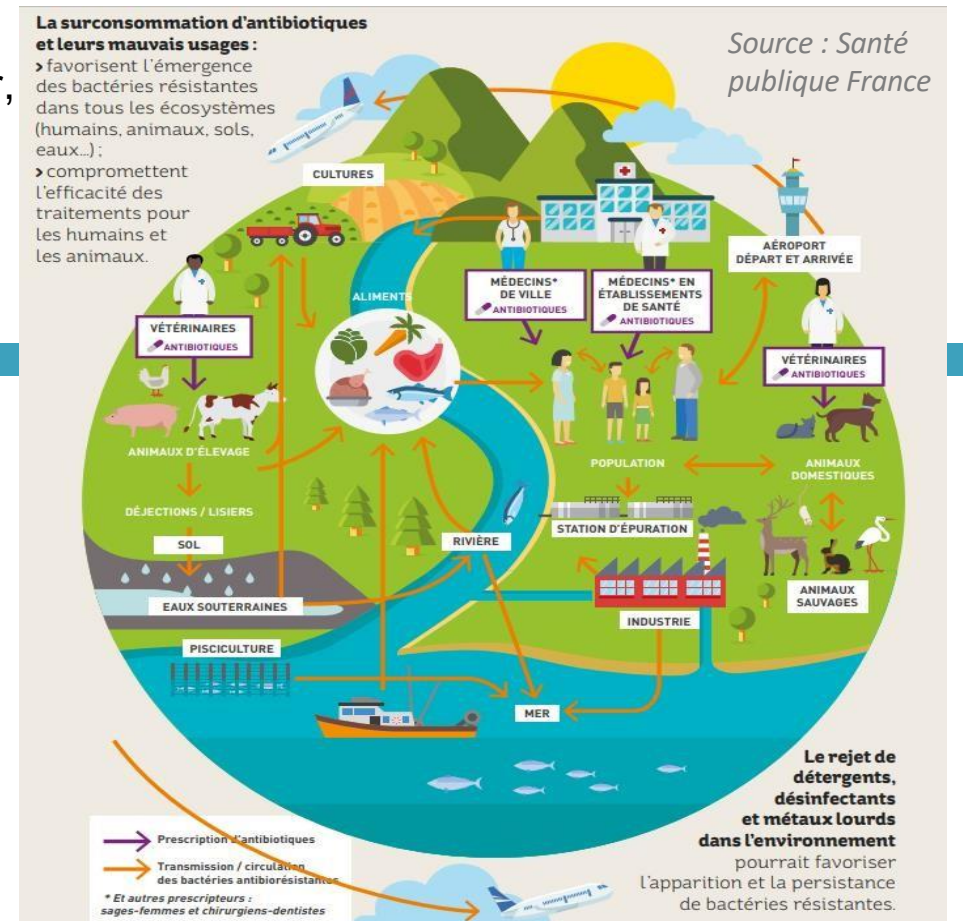
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CONTEXT

Preventing antimicrobial resistance (AMR) is a complex issue at the human-animal-environment interface. Surveillance of AMR relies on a rich yet complex and highly fragmented system. Cross-sectoral data collection and analyses have been limited so far, but there is a strong willingness to better collaborate between sectors.

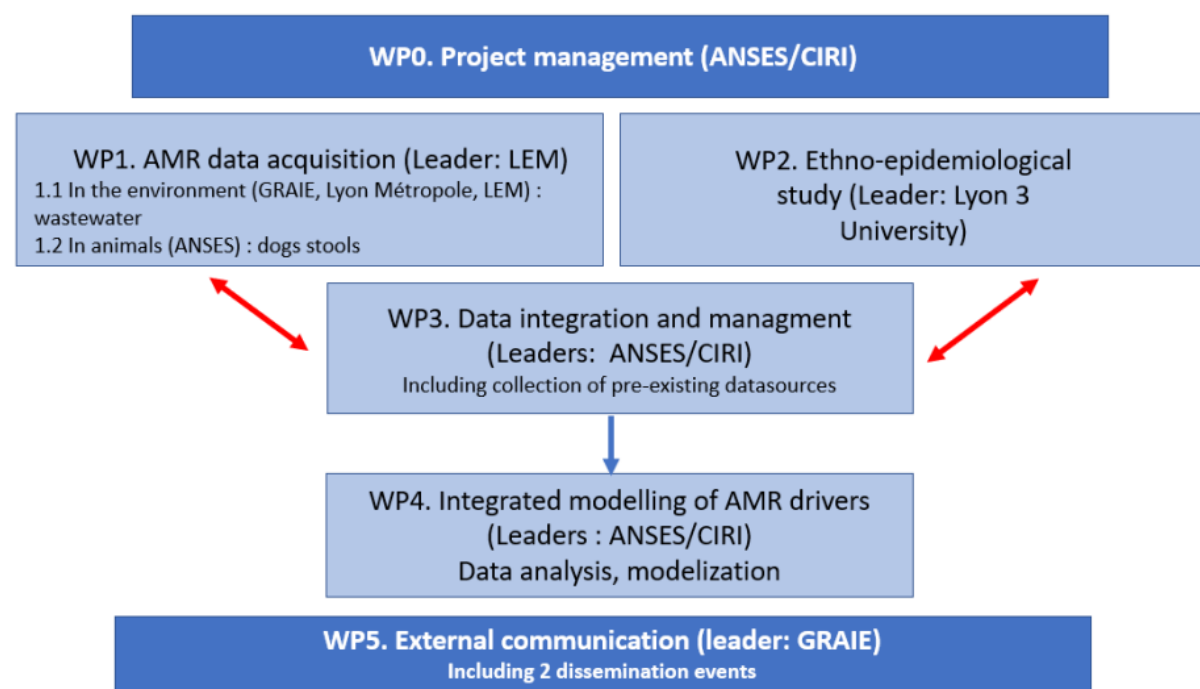
The national meta-network PROMISE brings together 22 professional networks and 42 university research units from the human, animal and environmental sectors, with a joint interest in combating AMR. Several partners of PROMISE are located in Lyon.



OBJECTIVES

- To map and characterise the diversity of AMR in various geographical areas of metropolitan Lyon, in the human (hospitals and the community), animal (dog) and environmental (wastewater) compartments
- To explain the observed geographical diversity of AMR in relation to different drivers directly and indirectly related to healthcare, including antibiotic use, living conditions (e.g. family structure, presence of pets, travels abroad) and other socio-economic factors (population density, access to healthcare, level of income, etc.)
- To evaluate to which extent urban and hospital wastewater plays a role in disseminating AMR from human/animal origin into the environment

METHODOLOGY



AMR data collection from already available databases :

- from HCL hospitals: % of *E. coli* resistant to 3rd generation cephalosporins and/or carbapenems
- from the community (partnership with national mission PRIMO) : % of *E. coli* resistant to 3rd generation cephalosporins
- from the community (SNDS national reimbursement data): antibiotic consumption data

Socio-demographic data will be obtained from various sources, e.g. the regional health observatory, the regional health, medico-social and social observatory portal and the metropolitan Lyon open data platform

An ethno-epidemiological study will be performed : questionnaire to approx. 300 patients on influence of family structure, pets in the household, travels abroad, access to health care, etc. Furthermore, a qualitative study with face-to-face interviews will be conducted with 30 voluntary patients for in-depth study of AMR drivers.

Statistical modeling will explore the main drivers for AMR, and quantify the link with antibiotic consumption and socio-demographic factors, taking into account the heterogeneity of data sources

AMR data acquisition :

- In wastewater : sampling upstream/downstream of 5 urban wastewater treatment plants and in effluents from 4 HCL hospitals, searching for : 16S rRNA encoding gene, integrase encoding gene int11 and the AMR genes aacA4, aadA1, and blaCTX-M (partnership with AMR-Env)
- In animals : dog stools from 14 geographical areas of metropolitan Lyon : % of *E. coli* resistant to 3rd generation cephalosporins and carbapenems

EXPECTED DELIVERABLES

- A **geographical map** of AMR indicators in the 3 sectors in metropolitan Lyon, including a **visualization of AMR "hotspots"**
- A comprehensive **evaluation of the main drivers**, including anthropological drivers, influencing AMR at a local level
- A **set of epidemiological modelling methods** adapted to the study of AMR drivers using heterogeneous data and their consensual and trans-disciplinary interpretation
- **External communication** of the results via newsletters, social media, etc. directed to a wide audience

INNOVATIVE ASPECTS and IMPACT

- Building a One Health research consortium on AMR in Lyon, as a **kick-start for a sustainable local AMR Observatory**
- **Close collaboration with Lyon Métropole and the civil society** : fostering direct impact on the target local population
- Joint analysis of pre-existing or newly collected data with a **high resolution on a limited urban area**
- Opportunity to **pilot-test the indicators proposed by AMR-Env** for AMR surveillance in surface water prior use at national level
- An **innovative mixed approach** combining qualitative (anthropological) and quantitative methods, feeding each other