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Using artificial intelligence to improve food safety: ANSES and the CNAM create Metabiot, a dedicated research unit

ANSES and the *Conservatoire National des Arts et Métiers* (CNAM) have created Metabiot, a contracted research unit dedicated to the processing of massive data on the safety of foods of animal origin. This new jointly supervised entity will conduct research into diseases that can be transmitted between animals and humans, and will focus in particular on bacteria that pose risks to human health, throughout the production chain, on farms and in the food processing industry.

The creation of the "Metabiot: Use of massive data to improve food safety" contracted unit (USC) was made official on 28 February 2022 at the Paris International Agricultural Show, when the agreement to that end was signed by Olivier Faron, General Administrator of the CNAM, and Roger Genet, Director General of ANSES. The USC, which will run for a renewable three-year period, had been included in a framework agreement signed by ANSES and the CNAM in 2021.

The aim of Metabiot is to study the role of microbiota (communities of micro-organisms), in conjunction with the metabolome (the complete set of metabolites produced), in the foodborne transmission of bacteria posing risks to humans. The studies undertaken will rely on the development of tools for the acquisition and analysis of massive data. The unit's research will encourage measures to reduce the use of medicinal products and biocides in animal and food production sectors. It will also provide input for discussions on how to improve animal feed and make better use of massive data in the food processing industry.

Studying zoonoses from farm to fork

The joint research team will study interactions between bacteria that pose risks to human health and their hosts, all throughout the food production chain. The objective is twofold:

- optimise animal feed in order to limit levels of bacteria transmissible to humans in their digestive system;
- better understand the interactions that occur between the microbiota contained in products such as meat and that found on surfaces in agri-industrial environments, in order to determine what role they play in the circulation of pathogenic bacteria.

Complementary skills relating to the food industry

The Metabiot USC will bring together the Hygiene and Quality of Poultry and Pig Products (HQPAP) Unit of the ANSES Ploufragan-Plouzané-Niort Laboratory, led by Marianne Chemaly, director of research projects, and the Agri-food Chair of the CNAM, placed under the responsibility of Philippe Fravalo, professor and CNAM chairholder. Both entities are based in Ploufragan, in the Côtes-d'Armor *département*. Therefore, Metabiot will be supported by the Bretagne region, the Côtes-d'Armor *département* and the Saint-Brieuc urban community, to facilitate the hosting of doctoral and post-doctoral students.

The HQPAP Unit will provide its expertise on foodborne zoonotic bacteria in the poultry, pig and cattle sectors. Its research aims to gain insight into bacterial circulation, identify sources of contamination, and understand how zoonotic bacteria interact with their hosts, to improve the methods used to combat infections.

The CNAM's Agri-food Chair, supported by its biology team, has expertise in the acquisition and analysis of massive data in the food processing industry, in particular for the poultry and pig sectors but also for crop production. Based on an analysis of vast amounts of data, the use of artificial intelligence will help make connections and identify indicators associated with the transmission of these zoonotic bacteria in various production sectors; these may include the genomes of all of the bacteria present, or the metabolites of bacteria or animals.

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The French Agency for Food, Environmental and Occupational Health & Safety (ANSES) provides public decision-makers with the scientific benchmarks needed to protect humans and the environment against health risks. It studies, assesses and monitors all the chemical, microbiological and physical risks to which humans, animals and plants are exposed, thereby helping the public authorities take the necessary measures, including in the event of a health crisis. A national agency working in the public interest, ANSES comes under the responsibility of the French Ministries of Health, the Environment, Agriculture, Labour and Consumer Affairs.

The *Conservatoire National des Arts et Métiers* is a higher education and research institution where the worlds of academia and professional activity come together. Its three main missions are life-long vocational training, technological research and innovation, and the dissemination of scientific and technical culture. With a strong regional presence, the CNAM offers over 500 training courses in the fields of exact, technical and tertiary sciences. Every year, it welcomes more than 55,000 students and issues over 13,000 diplomas and certificates. The CNAM conducts multi- and cross-disciplinary research related to major societal challenges. Within its 22 laboratories and 16 national teaching teams, it hosts 430 researchers and teacher-researchers and around 350 PhD students. The *Arts et Métiers* museum, part of the CNAM, has a remarkable collection of nearly 80,000 objects and 15,000 drawings, providing precious evidence of the development of scientific knowledge and technical progress; almost 2500 of its objects are on public display.