RÉPUBLIQUE FRANÇAISE
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Oniris
VetAgroBio Nantes
ÉCOLE NATIONALE

MAFEN MASTER **Academic Year 2026 - 2027**

Proposal of M1 tutored project

PROJECT TITLE AND SUMMARY:

Title: Shotgun Metagenomics vs. Culture-Dependent Approaches for Monitoring Foodborne Pathogens: The Case of *Campylobacter jejuni* in Poultry Supply Chains.

Summary and Student Directives:

Prepare a mini-literature review evaluating culture-independent shotgun metagenomics versus traditional culture-dependent whole genome sequencing (WGS) for food safety and epidemiological surveillance of *Campylobacter jejuni* in poultry processing.
Your review should synthesize recent advances, methodological trade-offs, and technical bottlenecks associated with directly sequencing complex food and environmental matrices without prior culture isolation. Specifically, you should:

1. **Compare Methodological Approaches**: Evaluate culture-dependent WGS against direct shotgun metagenomics (Illumina short-reads, Nanopore long-reads, and hybrid sequencing), critically assessing host/eukaryotic DNA interference and DNA extraction yield trade-offs in food matrices.
2. **Analyze Bioinformatic Workflows**: Review bioinformatic pipelines for taxonomic classification (e.g., Kraken2, MetaPhlAn), *de novo* assembly (e.g., MEGAHIT, SPAdes), and genomic profiling of antimicrobial resistance (AMR) and virulence genes (e.g., ResFinder, VFanalyzer, Bakta).
3. **Examine Strain Variability & Persistence**: Discuss genomic determinants enabling specific *Campylobacter* strains to survive abiotic processing stresses (e.g., scalding, chilling, oxygen exposure) and persist along slaughterhouse lines.
4. **Identify Knowledge Gaps & Perspectives**: Highlight unresolved challenges regarding sensitivity thresholds in low-level contaminations, strain-level resolution, and future integration into quantitative microbiological risk assessment

HOST UNIT: UMR 1014 INRAE/Oniris SECALIM
Oniris, Ecole Nationale Vétérinaire, Agroalimentaire et de l'Alimentation Nantes Atlantique - ONIRIS VETAGROBIO NANTES.

101 Rt de Gachet, 44307 Nantes CEDEX 3

CONTACT: Sofia STRUBBIA, sofia.strubbia@oniris-nantes.fr ; sofia.strubbia@inrae.fr

SANTÉ ET ALIMENTATION AU CŒUR DE LA VIE

Campus Vétérinaire
CS 40706 □ 44307 NANTES CEDEX 3
Tél. 02 40 68 77 77
(Direction Générale)

www.oniris-nantes.fr

Campus Sciences de l'Alimentation
CS 82225 □ 44322 NANTES CEDEX 3
Tél. 02 51 78 54 54