

# Using Fermentation to Produce Sustainable Alternatives to Antibiotics

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*Abstract:*

Antibiotics have been critical in treating bacterial infections, preventing disease spread, and ensuring longevity and quality of life. However, the rising antimicrobial resistance (AMR) poses a significant threat to both animal and

public health. AMR occurs when bacteria evolve mechanisms to withstand the effects of antimicrobial drugs, a phenomenon exacerbated by the overuse and misuse of antibiotics in both human and veterinary medicine. While major efforts are underway to develop novel alternatives to current antibiotic therapies in human medicine, very little is being done in veterinary contexts, despite policies to reduce antibiotic use.

Phytochemicals, such as polyphenols naturally occurring in foods, are promising candidates as alternatives to in-feed antibiotics due to their wide spectrum of antibacterial activities. However, they pose several disadvantages such as high toxicity and reduced digestibility. Fermentation can be an effective strategy to improve their bioavailability and bioactivity, whilst enhancing digestibility and reducing toxicity. Previous work from our group at Lusófona University has led to the development of a fermentation protocol that enhances the antibacterial activity of phenolic compounds in specific plant-based animal feeds. Here we propose to use our procedure to develop a novel fermented feed additive for prevention and treatment of common infections in cats and dogs. The proposed project adopts a multidisciplinary approach, encompassing the following specific goals:

- Development of a feed additive, suitable for cats and dogs;
- Evaluation of its potential against several bacterial strains related to common infections in cats and dogs, namely urinary, gastrointestinal and skin soft tissues infections;
- Validation of the additive's activities and resistance to digestion using in vitro assays;
- Testing the feed additive in pilot clinical cases.

The expected outcomes of this research include the development of a novel functional feed additive, intended to be submitted as a patent, the implementation of new strategies to improve animal health and the potential discovery of new antibiotic alternatives that could be used across a broader range of species.

Alignment with SDG's:

Our research project aligns with several Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being), SDG 12 (Responsible Consumption and Production), and SDG 15 (Life on Land).

This approach supports SDG 3 by promoting innovative, sustainable strategies to combat AMR, and enhancing animal and public health. Our work is also guided by the One Health framework, which emphasizes the interconnectedness of human, animal, and environmental health.

The project contributes to SDG 12 by encouraging responsible consumption and production practices. Overuse of antibiotics in veterinary medicine has exacerbated AMR, and our research offers a sustainable alternative to reduce antibiotic reliance in companion animals in a sustainable manner.

Finally, our project supports SDG 15 by potentially reducing the ecological footprint of veterinary practices. Lowering antibiotic use helps prevent the spread of resistant bacteria in the environment, promoting healthier ecosystems, preventing AMR in animal populations, and contributing to the conservation and sustainable use of ecosystems.

# FERMENTA

