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## Introduction

Nitrite is a common additive in cured meat formulation that provides microbiological safety, lipid oxidation management and typical organoleptic properties. However, nitrite is also associated with the formation of nitrosamines, some of them being genotoxic and associated with colon carcinogenesis [1]. Nitrite addition is thus pointed at and consumers are asking for safer products. To this end, the identification of mechanisms leading to nitroso-compounds formation is required in order to establish strategies to control those reactions during meat processing and digestion. The first aim of this study was to evaluate the anti-nitrosative capacity of phenolic compounds (PCs) selected among various phenolic classes representing plant diversity. Commercially-available plant extracts rich in the most anti-nitrosative PCs were then evaluated. Mechanisms occurring behind the anti-nitrosative capacity will also be discussed.

## Materials and methods

We designed an anti-nitrosative test using N-acetyltryptophan (AcTRP) as a marker in an o/w emulsion model at both pH 5 and pH 2.5 to simulate secondary amine nitrosation during product storage and beginning/end of gastric digestion. Concentrations in AcTRP, sodium nitrite, myoglobin, free iron, and lipids were as in ham. AcTRP nitrosation and PCs metabolisation were followed by UPLC-DAD-MS. Reaction mechanisms occurring between AcTRP, nitrite and PCs were determined in a simplified model containing neither lipids nor myoglobin.

## Results and discussion

In the absence of phenolic compounds, AcTRP nitrosation was found to be three-fold higher at pH 2.5 compared to pH 5 suggesting that the pH decrease occurring during gastric digestion can favor secondary amine nitrosation. Additionally, all the PCs tested except naringin were able to limit NO-AcTRP formation at pH 2.5 and 5. The anti-nitrosative effect of PCs decreased in the same following order for both pH: caffeic acid > epicatechin > chlorogenic acid ≈ rutin. Ascorbic acid showed the strongest effect at pH 5 but no effect at pH 2.5. Plant extracts from green tea leaves, rosemary, olive among others and dehydrated juices (acerola, carrot,…) proved to be anti-nitrosative at pH 5, suggesting that, even when involved in a complex matrix, PCs could limit NO-AcTRP formation. Last, UPLC-DAD-MS analyses highlighted the ability of PCs to react with nitrite undergoing C-nitration, C-nitrosation and oxidation. All these products indicate that PCs are able to scavenge part of the nitrite thus reducing residual nitrite available for N-nitrosation of AcTRP.

## Conclusion

This major finding suggests that some plant extracts could be used as additives to reduce nitrosamine formation during cured meat processing, storage and digestion.

[1] Bouvard et al. Carcinogenicity of consumption of red and processed meat. The Lancet Oncology, 2015.