INTRODUCTION

Campylobacter jejuni: Leading cause of foodborne diarrheal disease worldwide.
Main reservoir: poultry

Efficacy of Formulated Carvacrol on Campylobacter jejuni: In Vitro and Electron Microscopy Approaches

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OBJECTIVES

- Creation of a formulation helping the carvacrol to reach the caeca (Campylobacter location).
- This product contains a liquid formulated core based on carvacrol, and a specific solid carrier.
- Determination of the efficacy and the mode of action of the liquid formulated carvacrol compared to the pure carvacrol.

EXPERIMENTAL APPROACH

- EFFICACY OF THE PRODUCTS:
  Use of the broth microdilution method in 96-well plates to determine the minimum inhibitory concentration (MIC) and the half maximal inhibitory concentration (IC50) of gentamicin and carvacrol alone or formulated on a reference strain of Campylobacter jejuni (ATCC 33291)
  Test of 12 concentrations of the 3 products simultaneously.

- STATISTICAL ANALYSIS:
  Values compared with a Kruskal-Wallis test and pairwise differences further analysed using a Mann-Whitney-Wilcoxon test.

- MECHANISM OF ACTION ON MEMBRANE PERMEABILITY:
  Treatment of Campylobacter jejuni cells with lethal doses of these 2 products during 3 hours and preparation of the samples for both Scanning (SEM) and Transmission (TEM) Electron Microscopy.
  Comparison with untreated C. jejuni cells.

RESULTS

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<th>Products</th>
<th>MIC (mg/mL)</th>
<th>IC50 (mg/mL)</th>
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<tr>
<td>Gentamicine</td>
<td>0.0008 ± 0.0004</td>
<td>0.0003 ± 0.0001</td>
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<tr>
<td>Carvacrol alone</td>
<td>0.0281 ± 0</td>
<td>0.0167 ± 0.006</td>
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<tr>
<td>Formulated carvacrol</td>
<td>0.0223 ± 0</td>
<td>0.0131 ± 0.0017</td>
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- Untreated cells: normal, with both spiraled and not spiraled shapes. Cells were smooth and without blebs.
- Treated cells: Similar results for liquid formulated carvacrol and pure carvacrol.
- In SEM: wrinkles, clefts and blisters.
- In TEM: membrane blebs caused by separation of the plasma membrane from outer membrane.
- Membrane permeabilization.

CONCLUSION & PERSPECTIVES

- The liquid formulation does not change the efficacy of carvacrol against Campylobacter jejuni in vitro.
- Both pure carvacrol and formulated carvacrol induced a membrane permeability disruption.

PERSPECTIVES
Confirm in vivo the efficacy of the liquid formulation linked on a solid carrier with two points:
- the ability of the product to reach the caeca
- the capacity of the product to kill Campylobacter jejuni cells in the caecal environment