# Tributyrin supplementation as functional feed additive positively impacts the growth performance and gut microbiota in weaned piglets

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## Introduction

World population growth will increase the demand of food from animal origin. Antimicrobial resistance is still one of the global concerns for future development and sustainability, therefore valuable alternatives are urgently needed (Rossi et al., 2021). Functional feed additives contain bioactive compounds that can improve the animals' health status (Dell'Anno et al., 2021). Weaning is a critical phase of swine farming during which piglets could be exposed to enteric disorders due to their immaturity that are responsible for the major use of antibiotics (Smits et al., 2021). In this scenario, tributyrin contains three butyric acid moieties esterified to a glycerol backbone. It possesses antibacterial activity and promotes both gut health maintenance and nutrient absorption.

## Aim

The aim of the following study was to evaluate tributyrin supplementation as functional feed additive alternative to antibiotics on performance, health, serum metabolites and gut microbiota in post-weaning piglets.

## Materials and methods

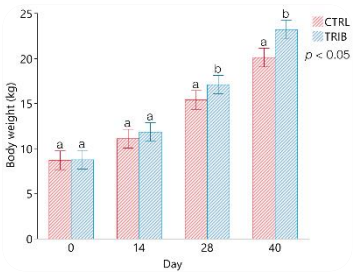
Ethical authorization: OPBA n°31/2019

120 piglets weaned at 28±2d were divided in two experimental groups fed for 40 days an isoenergetic and isoproteic diet differentiable only for the inclusion of 0.2% of tributyrin (CTRL and TRIB group).
Individual body weight and feed refuse were recorded at day 0, 14, 28 and 40.
Blood and faecal samples were collected for the evaluation of principal serum metabolites and faecal volatile fatty acids concentrations and faecal microbiota trough 16S rRNA gene amplification and sequencing.

Statistical analysis was performed using JMP Pro 15 software (SAS Inst. Inc.) and means were considered different for $p \leq 0.05$. Biostatistics analysis was performed using MicrobiomeAnalyst tool for calculating diversity indexes.

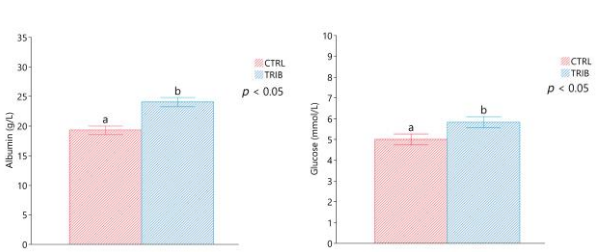
## Results

Body weight in the TRIB group was higher at 28 and 40 days ($p < 0.05$) compared to CTRL.




Least square means ± standard error of body weight at day 0, 14, 28 and 40 of trial divided by control (CTRL) and tributyrin group (TRIB).

Albumin and glucose serum concentrations were higher in TRIB compared to CTRL at 40 days ($p < 0.05$).



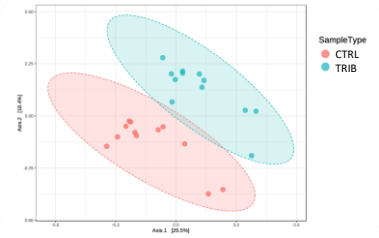

Least square means ± standard error of serum metabolic parameters divided by control (CTRL) and tributyrin group (TRIB).

CTRL showed lower concentration of faecal isobutyrate compared to TRIB at 40 days ($p < 0.05$) suggesting a modulation of dietary protein utilization.

| | Acetate | Propionate | Isobutyrate | Butyrate | Isovalerate | Valerate |
|---|---|---|---|---|---|---|
| **CTRL** | 58.63 ± 6.15 | 23.93 ± 4.45 | 1.74 ± 0.91[a] | 9.93 ± 2.41 | 2.25 ± 1.37 | 3.51 ± 1.09 |
| **TRIB** | 57.22 ± 3.35 | 22.72 ± 2.64 | 2.29 ± 0.82[b] | 10.84 ± 1.68 | 3.00 ± 1.24 | 3.93 ± 0.95 |
| **p-value** | 0.8852 | 0.2983 | 0.0269 | 0.4357 | 0.1410 | 0.5067 |

Least square means ± standard error faecal volatile fatty acids divided by control (CTRL) and tributyrin group (TRIB).

Gut microbiota of TRIB group showed a separate clustering for the beta diversity index and functional prediction showed higher potential for energy metabolism ($p < 0.05$).




Principal coordinates analysis (PCoA, Bray-Curtis distance) plot of the gut microbiota of control (CTRL) and tributyrin group (TRIB) ($R^2 = 0.19$).

## Conclusions

The supplementation of 0.2% tributyrin could improve animal performance by indirectly impacting on gut microbiota and enhancing the nutrients utilization by the host. In addition, gut microbiota of tributyrin supplemented piglets revealed higher potential for a more efficient energy and protein metabolism. In conclusion the use of tributyrin as functional feed additive could be considered interesting for enhancing animal performance, metabolism and gut health in weaned piglets thus contributing to reduce the occurrence of gastrointestinal disorders for reducing the use of antibiotic in swine farming.

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**References**: Rossi, et al., 2021. *Animals*, 2021, 11.8: 2415; Dell'Anno et al., 2023. *animal*, 17(5), 100791; Sotira et al., 2020. *Animals*, 10(4), 726; Smits, et al., 2021. *FAO Animal Production and Health Paper* No. 184.