There is a lack of information regarding the combination of both antioxidants on the supplementation in sows. The results of the present study seem to indicate some light additive effects on piglet development at birth that are diminished during lactation.

Conclusion and Implications
Vitamin E seems to produce the best results. The combination of the two antioxidants may not be necessary..

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O131 Gut integrity and anti-microbial properties of an essential oil blend are valuable traits to modulate growth performance in piglets

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Keywords: Essential oil; Growth performance; Gut integrity and anti-microbial properties

Introduction
Different combinations of essential oils are used in an effort to reduce antibiotics in the swine and poultry industry. The aim of this study was to investigate the efficacy of an essential oil blend of cinnamaldehyde and thymol (EO) on the growth performance of pigs.

Material and Methods
We fed total 72 (6 replicates with 6 pigs/treatment) day 28 weaned piglets (average body weight; BW 7.92 ± 1.36 kg) for 35 days with 2 phase feeding (phase 1, day 1–14 and phase 2, day 14–35) with Control diet (C) and supplemented with EO at 100 g/ton. We monitored piglets daily for their weight and feces for signs of diarrhoea. For in vitro assays, we used pig intestinal epithelium cell line; IPEC-J2. Confluent IPEC-J2 cells were treated with 100 ng/ml of EO for 16 h. followed by LPS stimulation and Subsequently, cells were either analyzed for TEER (trans epithelial electric resistance) values or lysed to performed RNA analysis. For bacterial growth inhibition assay, different pathogenic bacteria were grown in the presence of EO and the inhibition in the growth were recorded based on the optical density values.

Results and Discussion
We observed increased average daily weight gain (ADG; $P < 0.05$) and reduction in the diarrhoea score ($P < 0.05$) in EO fed group in comparison with control group. To study the mode of action of EO a variety of in vitro assays were performed. Firstly, in vitro growth inhibition assay confirmed anti-microbial capacity of EO (>90% inhibition) against different pathogenic bacteria causing diarrhoea in the piglets like *Escherichia coli*, *Clostridium perfringens* and *Salmonella spp*. Next, we evaluated the effect of EO on the expression of tight junction protein, key players in maintaining the gut barrier integrity which is otherwise compromised during diarrhoea. We observed upregulation of occludin ($P < 0.001$), Claudine-4 ($P < 0.05$) and Zonula occludin 1,2,3 ($P < 0.01$) in IPEC-J2 cells treated with EO in an in vivo surrogate assay (Table 1). In vitro TEER values of EO treated IPEC-J2 cells displayed a trend of improved resistance hinting at the better gut integrity in presence of EO.

Table 1
Relative expression of *OCLN, CLDN-4, ZO-1,2,3* for Control and EO+LPS treated IPCE-J2 cells. Data expressed as the mean copy number ± standard deviation with *P*-value.

Genes	Control	EO	*P*-Value
Occludin	66390 ± 2476	81382 ± 2648	0.0002
Claudine-4	459463 ± 8291	546942 ± 7465	0.03
ZO-1	49506 ± 2930	58307 ± 3895	0.002
ZO-2	22585 ± 1161	29735 ± 1014	0.003
ZO-3	6145 ± 1429	7593 ± 351	0.012

Conclusion and Implications
Taken together, the observed performance increase of the blend of cinnamaldehyde and thymol is supported by several traits like antimicrobial activity, the development of superior gut barrier integrity and the stronger innate immunity.

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O132 Food industry leftovers slightly affect gut microbiota and blood metabolites in pigs

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Keywords: Sustainability; Food leftover; Food security; Gut health; Alternative feed ingredients

Introduction
Worldwide, the amount of wasted food is around 1.3 billion tons per year (McGuire et al., 2015). At the same time, by 2050 the sustenance demand is expected to increase significantly. The recovery of food loss as animal feed addresses both waste reduction and zero-hungry challenges. Food industry leftovers, also called former foodstuff products (FFPs) can be divided into two main categories: sugary confectionary FFPs (FFPs-C) and salty FFPs from bakery production (FFPs-B). The present study intends to increase the knowledge about the impact of both FFPs-C and FFPs-B included in growing pig's diet on the large intestinal microbial community composition and biodiversity, together with their metabolic status.

Material and Methods
Thirty-six post-weaning female piglets (Large White × Landrace) with a body weight (BW) of 8.52 ± 1.73 kg were randomly assigned to a standard diet (CTR), or diets in which traditional ingredients were partially replaced by the 30% inclusion (w/w) FFPs-C or FFPs-B diets for 42 days. Growth performance and feeding behaviour were measured.
The fecal samples were collected from the rectal ampulla after 42 days of the three experimental diets feeding and the variable regions V3 and V4 of the 16S rRNA were sequenced as described in Girard et al. (2021).
Blood serum samples (100 μL) were collected at day 0 and 42 and analyzed by UHPLC/MS-MS in ionization mode to quantify serum metabolites.
All data analyses for microbiota evaluation were performed in R (v 4.0.5) as described in Girard et al. (2021). Data about serum metabolites were analyzed through the software MetaboAnalyst (version 5.0).

Results and Discussion
The three diets did not evidence any effect ($P > 0.05$) on live animals in terms of growth performance. No differences ($P > 0.05$) were found in ADG, ADFI, and FCR. The three diets met NRC conditions, were isoenergetic and isonitrogenous. The FFPs-B diet had a lower content of NDF compared to CTR and FFPs-C. As expected, the content of simple sugar was higher in the FFPs-C diet compared to CTR and FFPs-B.
Diets did not affect the gut microbial community at the family level. No significant differences ($P > 0.05$) in the analyzed alpha diversity indexes have been observed between groups. No differences were observed in both Unweighted (PERMANOVA, $P = 0.16$) and Weighted beta diversity between groups (PERMANOVA, $P = 0.23$). Different bacteria as potential biomarkers between the three groups have been identified. A total of 104 metabolites have been quantified. Among those metabolites, several were influenced by the age of the animals. However, only two were significantly affected by the interaction between the diet and the time (Table 1). Specifically, the sugary FFP-C diets strongly increased ($P < 0.001$) both the serum concentration of the theobromine and caffeine compared to the CTR and salty FFP-B diets. Theobromine and caffeine are compounds contained in chocolate products. Theobromine has been found to affect body weight gain as well as lipid and glucose metabolism (Camps-Bossacoma et al., 2021). Similarly, it has been suggested that caffeine enhances lipolysis, fat oxidation, and reduces lipogenesis (Harpaz et al., 2017). No significant correlations between blood metabolites and bacterial taxa have been found.

Table 1
Selected serum metabolites quantified in pigs fed the three experimental diets. Values are expressed as arbitrary units of measurements.

	CTR[1]		FFP-B[2]		FFP-C[3]		SEM	*P*-value		
Metabolites	T0	T1	T0	T1	T0	T1		Diet	Time	D × T[4]
Theobromine	59419[a]	15406[a]	31890[a]	1417364[a]	40483[a]	3133733[b]	388320	<0.001	0.01	<0.001
Caffeine	4692[a]	2658[a]	5367[a]	88451[a]	6072[a]	341337[b]	33398	<0.001	0.07	<0.001

[a.] Means within in a row with different superscripts differ significantly ($P < 0.05$).
[1] Standard diet.
[2] Salty bakery former foodstuff products (FFPs) diet.
[3] Sugary confectionary FFPs diet.
[4] Interaction between diet and time (D × T).