Cereal extrusion affects caecal SCFA concentration in piglets and poultry

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INTRODUCTION

Short chain fatty acids (**SCFA**) result from fermentation of dietary carbohydrates in the hindgut of animals, and have been described to affect pH and microflora composition.

Cereal extrusion changes carbohydrate structure and may affect fermentation and SCFA production.

OBJECTIVE

To study the effect of extrusion of rice and barley on the caecal concentrations of SCFA in piglets and chickens.

MATERIALS AND METHODS

Animals

- 32 piglets
  - 6.9±0.83 kg BW; 26 d of age
  - on trial for 27-28 d
  - Individual piglet as experimental unit
- 160 broiler chickens
  - 1 d of age
  - on trial for 24-25 d
  - Pools of 5 animals as experimental unit

Experimental treatments

- Four experimental feeds with 55% of one of the following cereals:
  - Rice-raw
  - Rice-extruded
  - Barley-raw
  - Barley-extruded

Sampling and analysis

- At the end of trial, caecal digesta was sampled and preserved in a solution with 5 % (w/w) H_3PO_4, 1% mercuric chloride and 50 mM 4-methyl valerate at 4ºC until analysis.
- SCFA and lactic acid were analyzed by gas liquid chromatography (Richardson *et al.*, 1989) using 4-methylvaleric acid as internal standard.

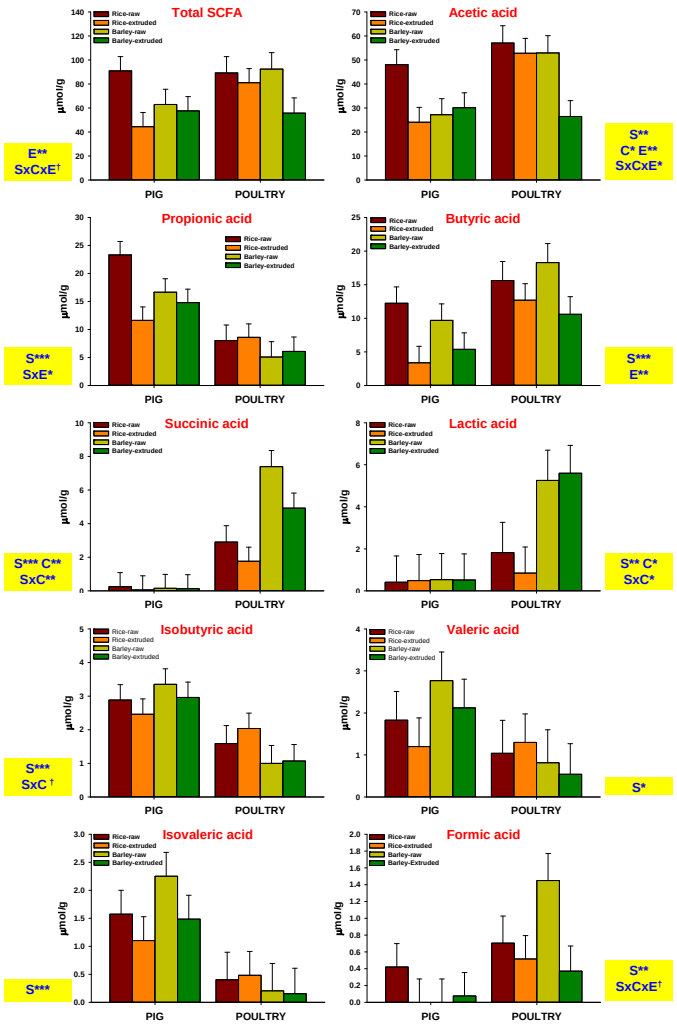
Statistical analysis

- Factorial design (2×2×2), with CEREAL (rice or barley), EXTRUSION (with or without), and SPECIES (pig or chicken) as main factors.
- Data were analyzed by ANOVA considering the main factors CEREAL (**C**), EXTRUSION (**E**) and SPECIES (**S**) and all their interactions.

RESULTS

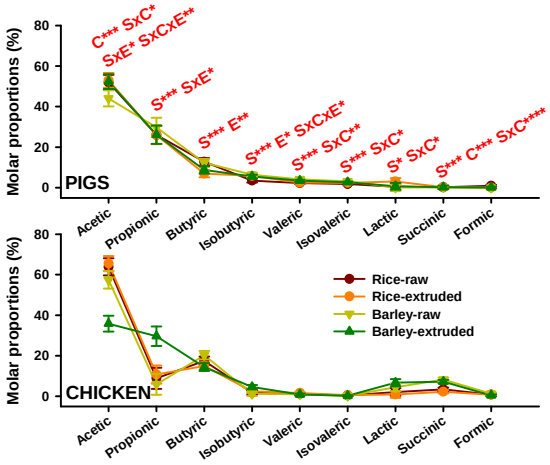
- Formic, butyric, lactic and succinic acid concentrations were higher in chickens, whereas propionic, isobutyric, isovaleric and valeric acids were higher in piglets (P<0.05).
- In piglets, cereal source had no effect but extrusion reduced the concentrations of propionic and butyric acids (P<0.05) and tended to reduce total VFA (P=0.06).
- In chickens, rice resulted in higher concentrations of acetic, propionic, isobutyric, isovaleric, and valeric acids than barley, but lower concentrations of lactic and succinic acids (P<0.05). Extrusion reduced (P<0.05) the concentrations of acetic, butyric and total VFA.

Figure 1. Caecal SCFA concentration (µmol/g) in piglets and chicken fed diets containing 55% rice or barley, with or without extrusion



*†P<0.1,*P<0.05,**P<0.01,***P<0.001. Main effects: species (S), cereal (C) and extrusion (E)*

Figure 2. Molar proportions (%) of caecal SCFA in piglets and chicken fed diets containing 55% of rice or barley, with or without extrusion



*†P<0.1,*P<0.05,**P<0.01,***P<0.001. Main effects: species (S), cereal (C) and extrusion (E)*

CONCLUSION

Caecal SCFA concentration depends on the animal species, the nature of cereal fed to them (only in chickens) and whether the cereal has been extruded or not