Discrepancies in microbiota composition along the pig gastro-intestinal tract between in vivo observations and an *in vitro* batch fermentation model

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In vitro fermentation models are increasingly used to assess prebiotic potential of novel indigestible carbohydrates (CHO). An experiment was performed to assess the validity of such approaches by comparing the influence of fermentation of inulin (INU) and cellulose (CEL) on microbiota composition *in vivo* and *in vitro*. Three INU and CEL based semi-purified diets (5% INU, 5% CEL and 2.5% of both) were fed to 3 groups of 4 pigs (≈ 25 kg). After 3 weeks, the pigs were slaughtered and digesta was sampled from the jejunum, ileum, caecum and 3 parts of the colon to measure pH, SCFA and microbiota population. One week before slaughter, an *in vitro* gas fermentation test was performed on INU and CEL with fresh faeces of the experimental pigs as bacterial inoculum. The gas production kinetics were modelled and fermentation broth samples were taken after 5, 8, 12, 24 and 72h of fermentation for further microbiota characterisation. Total bacterial DNA was extracted from the samples and qPCR was performed to quantify total bacteria, *Lactobacilli*, *Bifidobacteria*, *Bacteroides*, *Clostridium* Cl. I and *E. coli*. Total bacteria quantification showed similarities between both systems. *In vivo*, total bacteria increased along the gut until the second part of the colon (from 10.5^6 to 10^{10} cfu mg^{-1}) and then decreased to 10^9 cfu mg^{-1}, while *in vitro*, it increased until 12 to 24h of fermentation (+0.5 10^9 cfu ml^{-1}) and then decreased to the initial level. This evolution was correlated to the fermentation kinetic of each CHO. In both models, INU increased *Bifidobacteria* and *E. coli* populations compared to CEL ($P<0.05$). However, *in vivo* this was observed only in the first parts of the gut while *in vitro*, the effect lasted during the whole fermentation. *Bacteroides* genus was not influenced by the CHO source in the 2 systems. Finally, evolution of *Lactobacilli* and *Clostridium* Cl. I populations in both systems were not consistent. This can be ascribed to specific bacterial properties as e.g. adhesive properties or sensitivity to the sulphur reducing agent used in the *in vitro* model. Further developments of the *in vitro* method are required to properly assess prebiotic potential of indigestible CHO.

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