



# Starch digestion kinetics; plan for an experimental pig trial

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## Background

Starch is the main source of energy in pig nutrition. Starches from different botanic origin vary in structural characteristics, which influences starch digestion kinetics.

Our recent *in vitro* studies showed that digestion kinetics of an isolated starch is mostly influenced by the **amylose content**, **type of crystalline structure** and **number of pores**.

We hypothesize that in addition, the **cereal matrix** and **processing conditions** will affect starch degradation kinetics.

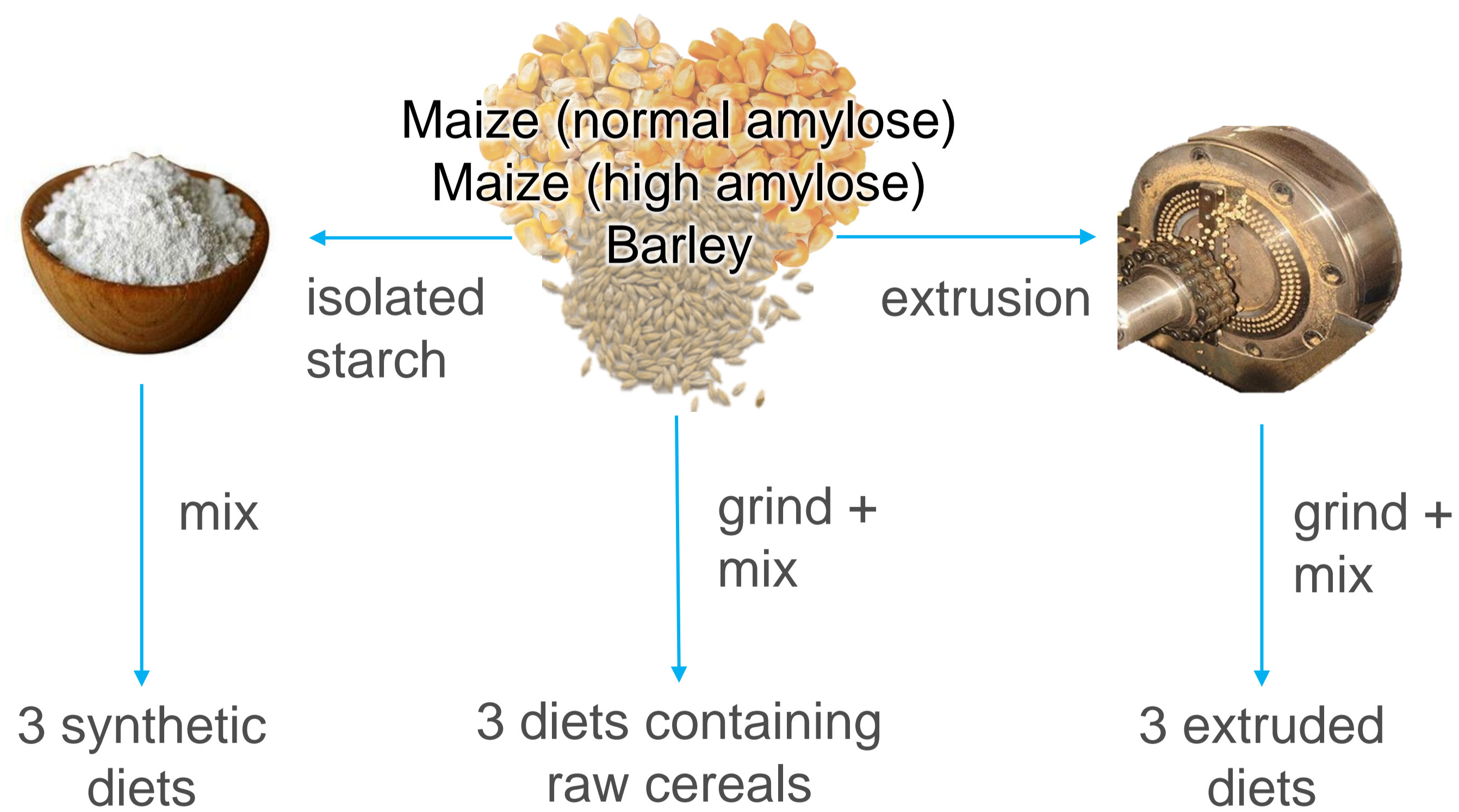
With an *in vivo* pig trial, the combined effect of all aspects is studied.

## Objectives

- Validation of *in vitro* work with isolated starch.
- Understanding effect of cereal matrix and extrusion processing on starch digestion kinetics.
- Study the relation between starch properties and passage rate of digesta.

## Experimental diets

This trial includes nine different experimental diets, which originate from three different raw materials.



All diets contain the same amount of starch, but in a different form.

## Outline animal trial

All diets are fed to ten pigs for two weeks, after which pigs are sacrificed and digesta is collected from:

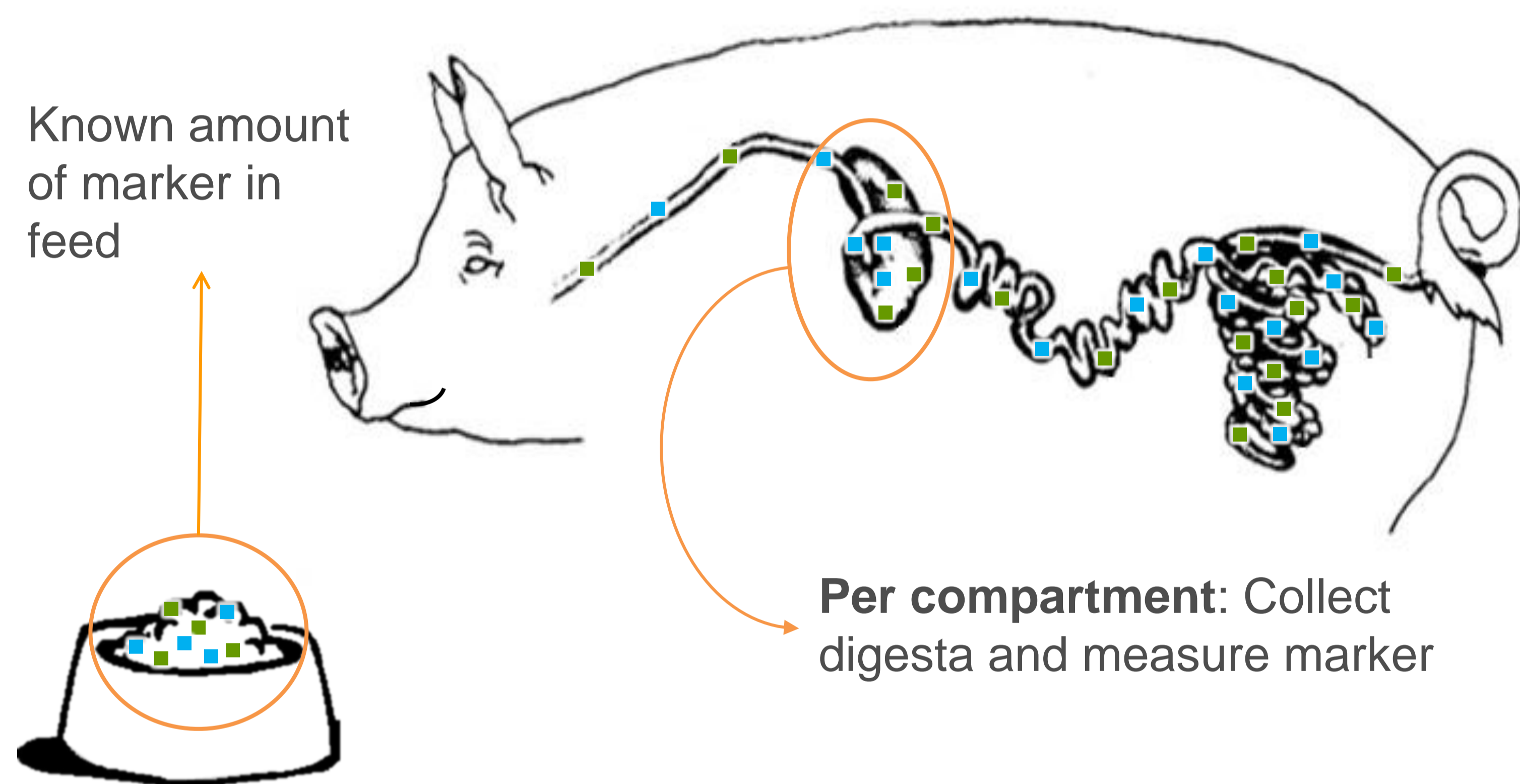
- Stomach
- Small intestine (4 parts)
- Caecum
- Large intestine (2 parts)
- Rectum

## Starch digestion kinetics

Starch and glucose oligomers will be measured in different compartments of the GIT tract. By dividing the small intestine in different parts, kinetics of starch disappearance can be measured.

## Passage rate of digesta using inert markers

To calculate the speed at which the different diets pass through the digestive tract, pigs are fed a **solid** as well as a **liquid** marker.



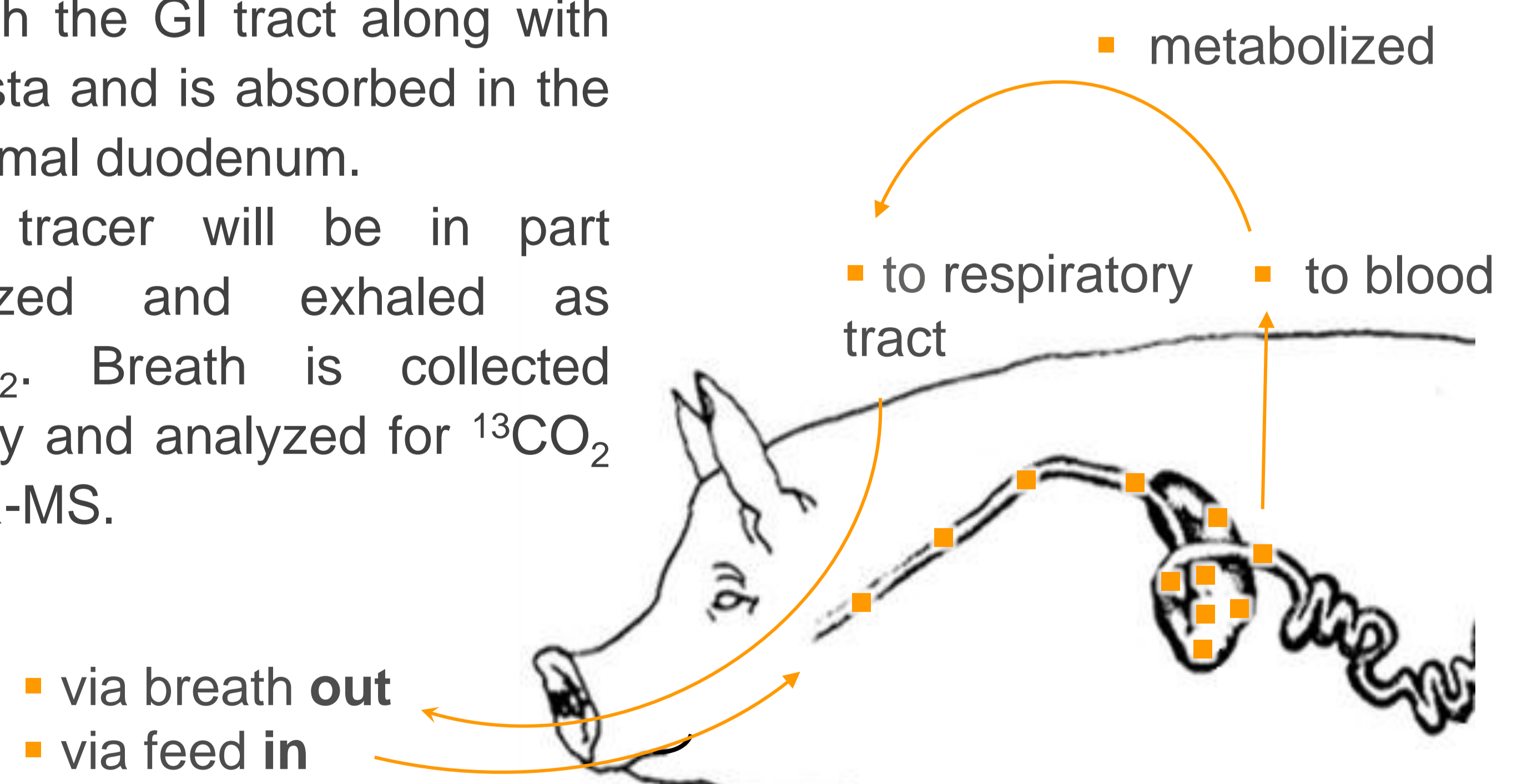
The quantity of marker recovered in each compartment, relative to quantity ingested via the feed in a certain time period, indicates the passage rate of feed through the GIT.

## Gastric emptying rate with breath test

Recovery kinetics of  $^{13}\text{C}$ -glycine (liquid) and  $^{13}\text{C}$ -octanoate (solid) in breath is used as indicator of time from ingestion to duodenum.

Principle:  $^{13}\text{C}$  tracer (■) moves through the GI tract along with digesta and is absorbed in the proximal duodenum.

The tracer will be in part oxidized and exhaled as  $^{13}\text{CO}_2$ . Breath is collected hourly and analyzed for  $^{13}\text{CO}_2$  by IR-MS.



## Acknowledgement

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