



MOdel of DIgestion in Pigs and POultry

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INTRODUCTION

Digestive efficiency determines animal performance and nutrient excretion, and thus it has economical consequences. Increasing the digestive component of feed efficiency is a way towards a greater sustainability of animal production systems.

But the question is: what determines digestive efficiency? and how can it be improved?

OBJECTIVES

A simulation model MODIPIPO (MOdel of DIgestion in Pigs and POultry) based on existing digestion models has been developed in the Feed-a-Gene project. The conceptual model is now integrated into the *FeedUtiliGene* software. The aim is to introduce the functions of the tool.

USEFULNESS

- The digestive model is a tool to...
 - Look into the gastro-intestinal tract
 - Integrate knowledge and data
 - Test various conditions
- It serves better understanding of
 - Digestive mechanisms
 - Where to act (which digestive compartments)?
 - How to act (genetic selection, additives, diet composition...)?
 - Factors of variation
 - Animal
 - Feed
 - Interaction



The MODIPIPO tool

- offers the possibility to modulate various digestive parameters and assess the consequences on the nutrient digestibility
- represents the digestion of the main nutrients such as starch, protein, amino acids, lipids, fiber, calcium and phosphorus in the digestive tract.

The digestive mechanisms are the transit, hydrolysis, fermentation and absorption.

The user defines:

- the species
- feed composition
- feeding pattern (i.e., meals along the day)

... and MODIPIPO represents:

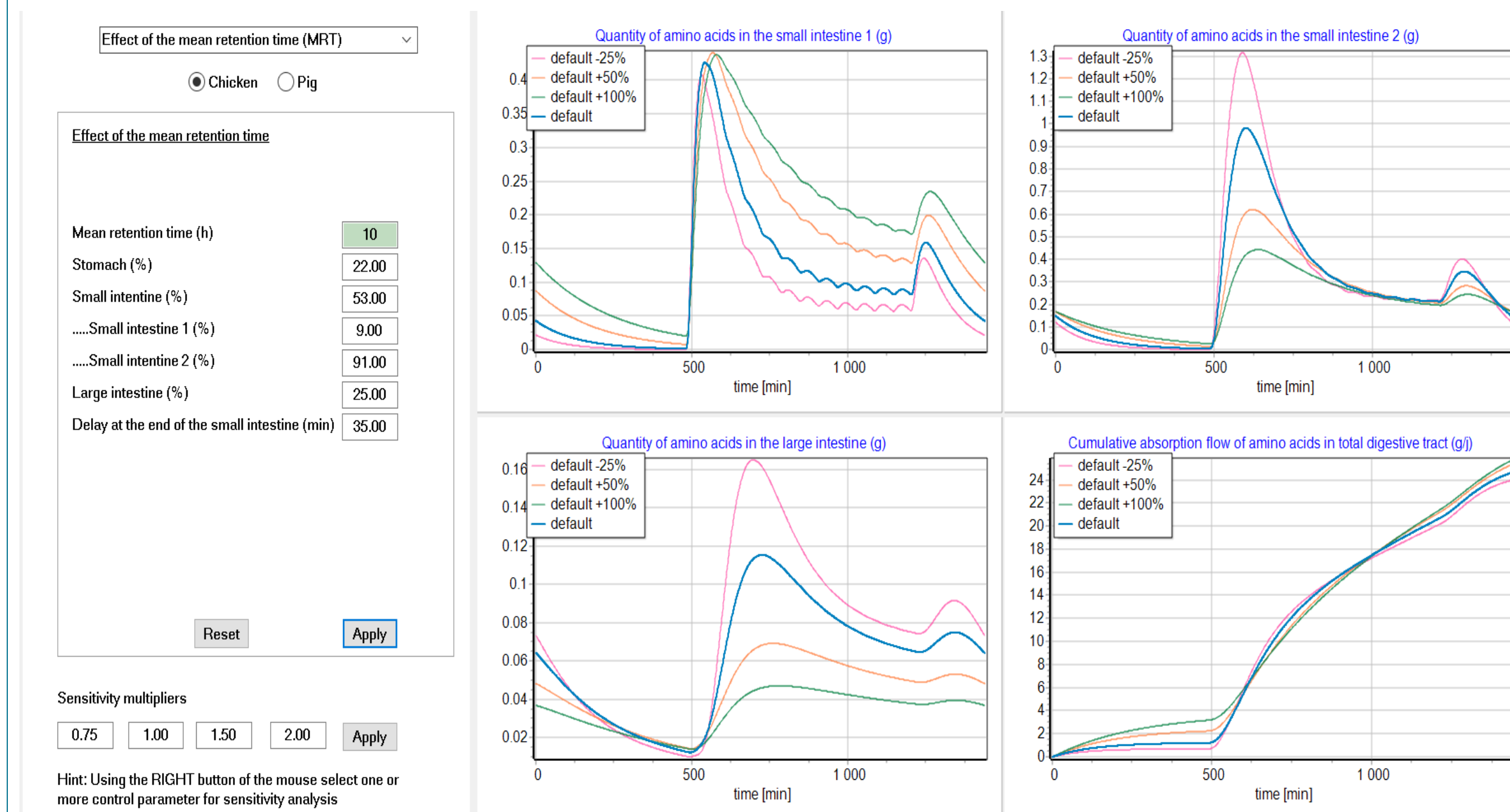
- the transit and digestion in time
- predicts the nutrient digestibility.

Despite a generic representation, the parameters are specific for each nutrient in each digestive segment. This allows the user to modulate the parameters of interest (i.e., each nutrient and each digestive segment) either alone or in combination to test various hypotheses.

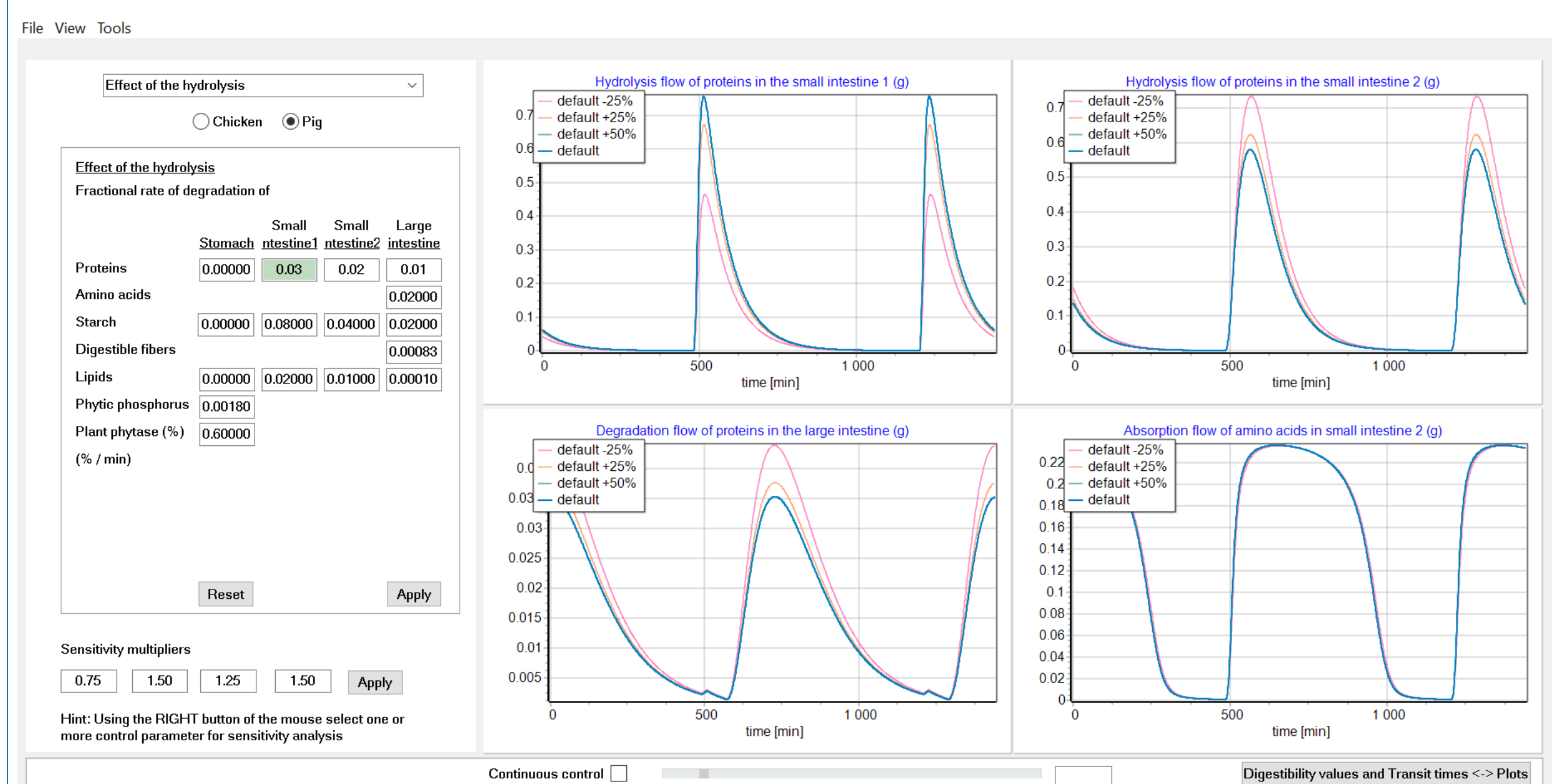
TYPE OF QUESTIONS TO ANSWER

The model helps to understand feed x animal interaction and to answer specific questions such as:

What are the consequences of a longer/shorter mean retention time?... In the total digestive tract?... In one specific segment?



What are the consequences of a greater hydrolysis rate or absorption rate?... For all nutrients?... In one specific segment?...



APPLICATION

The tool can be helpful to orientate research and development, for example by genetic selection or by the development of feed additives.

It can also be a useful tool for teaching digestive physiology, and the consequences of physiological parameters (e.g., mean retention time, hydrolysis efficiency) on the digestive efficiency in pigs and poultry.

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Feed-a-Gene

Feed-a-Gene is a European H2020 project involving 23 partners which aims to adapt feeds, animals and feeding techniques to improve the efficiency and sustainability of pig, poultry and rabbit production systems. It is coordinated by INRAE (France), started in March 2015 and will last 5 years. The project aims to reduce the environmental impact of monogastric livestock production by improving and diversifying animal diets and feed technologies and by integrating new selection criteria for these animals. The Feed-a-gene project further aims to develop new management systems for precision feeding and precision farming and to evaluate the overall sustainability of the different management solutions proposed in the project.



www.feed-a-gene.eu



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