

FUNCTIONAL AND MORPHOLOGICAL ADAPTATIONS OF THE DIGESTIVE SYSTEM INDUCED BY DOMESTICATION IN CATS

Sara Berardi¹, Agnese Da Re¹, Stefano Pesaro², Paola Beraldo³, Andrea Piccinini¹, Silvia Scarpona¹, Subeide Mari¹ and Giacomo Rossi¹

¹School of Biosciences and Veterinary Medicine, University of Camerino

²Theron Research Group

³Department of food Science, Division of Veterinary Pathology, University of Udine

Several studies have showed the macroscopic difference in the gastrointestinal tract between the European wildcat (*Felis silvestris silvestris*) and the domestic cat (*Felis silvestris catus*). Digestive system in the wildcat is shorter than in domestic species and this feature is considered distinctive in the taxonomic classification of subjects (Schauenberg et al. 1977). This study is a part of a large investigation regarding the microscopic anatomy of the gastrointestinal tract of European wildcat, associated to the study of intestinal microbiome. Its main purpose was to enhance knowledge about this species, to get a comparison with domestic cat, and to evaluate if and how domestication has influenced the functional and morphological development of this apparatus, also changing the gut's microflora.

To this aim we collected, weighted and measured the gastrointestinal tract of twenty European wildcats. Afterwards, intestinal sections were sampled, treated and observed at the microscope in order to evaluate histological characteristics as the villi height and width, crypts depth and wall thickness. Moreover, we wanted to study the intestinal production of an apolipoprotein that is believed directly related to the development of hepatic steatosis, decreasing the amount of lipids deposited in the liver. For this purpose, liver specimens were collected and treated to study histologically the degree of vacuolar degeneration of hepatocytes. Data were analyzed and compared with those of the domestic cats coming from our database. In attempt to evaluate the microbiome, feces and rectal ampulla were collected and sent to the Texas A&M University for pyrosequencing analysis (data not shown).

Results demonstrated significant differences in intestinal structure between *F. catus* and *F. s. silvestris*. Villi coming from domestic cats were significantly shorter ($p < 0.0001$) and wider ($p < 0.0142$) than in wildcats that showed crypts deeper ($p < 0.0009$).

Domestication has led to significant changes in adaptation regarding both behavior and diet. Several studies showed the correlation between diet changes (protein, carbohydrates, and fiber concentration) and morphological adaptation in the gut of different species (Altmann, 1972; Hampson, 1983; Goodlad et al., 1988; Pluske et al., 1996; Sritiawthai et al., 2013).

Moreover, data from liver study showed that domestic cat has higher levels of apolipoprotein compared to the wild cat and that the percentage of lipids in the liver was lower in *F. catus* than in *F. s. silvestris*. Despite these results, the liver of domestic cat revealed a rate of steatosis higher than in wild cat. Indeed, this pathology proved to be almost absent in wild cats and can be explained by the different nature of the two species diet and microbiome composition.

This study revealed that transition from a strictly-carnivorous diet (typical of the wild cat) to an omnivorous type, has modified the nutritional intake considerably and influenced the evolution of the digestive apparatus in domestic cat.