

1. Abstract

The digestive tract of ruminants is characterized by a complex organization, and its development and activity are controlled by numerous neural, hormonal, and metabolic factors. In recent years, increasing attention has been devoted to the role of endogenous signaling peptides in the integration of digestive processes, feed intake, and the maintenance of energy homeostasis. To date, most studies concerning orexigenic (appetite-stimulating) and anorexigenic (appetite-suppressing) peptides have been conducted in monogastric animals, whereas the mechanisms of their action in ruminants remain poorly understood. The aim of the present doctoral dissertation was to determine the mRNA expression, immunolocalization, and concentration of selected signaling peptides with orexigenic (ghrelin, phoenixin-14) and anorexigenic (nesfatin-1, leptin) activity, as well as their receptors (GHSR, GPR173, LEPR), in consecutive segments of the gastrointestinal tract of calves and adult cattle (*Bos taurus taurus*). The research material was obtained from twelve healthy male Polish Holstein-Friesian cattle, divided into calves ($n = 6$) and adult individuals ($n = 6$). Samples from nine consecutive segments of the gastrointestinal tract were collected for the assessment of mRNA expression using RT-qPCR, for the evaluation of protein distribution by immunohistochemistry (IHC), and for the determination of concentrations using the ELISA assay. Statistical analyses were performed using linear models and Tukey's post hoc tests, including interactions between age and gastrointestinal segment. The study revealed the presence of transcripts of all analyzed genes in all examined segments of the gastrointestinal tract (from the rumen to the rectum) in both calves and adult individuals. Immunohistochemical analyses confirmed the presence of all investigated peptides and receptors in the wall of the gastrointestinal tract in both age groups, from the rumen to the colon, except for GHSR, which presence was not detected in the rumen. The levels of immunoreactivity differed between age groups and organs. The obtained results provide comprehensive data on the distribution of key appetite-regulating peptides within the bovine gastrointestinal tract. They indicate that ghrelin, nesfatin-1, and phoenixin-14 may exert complex paracrine and neuroendocrine functions within the digestive system, participating in the gut-brain axis communication. Differences in expression and immunolocalization between calves and adults confirm the occurrence of significant developmental changes in metabolic regulation during the postnatal period.

Keywords: ghrelin, GHSR, GPR173, nesfatin-1, phoenixin-14