

Ghrelin-induced contractions and growth hormone secretagogue receptor expression in the chicken gastrointestinal tract

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Background and aim. Ghrelin is the endogenous ligand of the growth hormone secretagogue receptor (GHS-R), and stimulates food intake and gastrointestinal (GI) motility in mammals. In chickens, on the other hand, ghrelin inhibits food intake. This discrepancy prompted us to investigate whether ghrelin affects gastrointestinal motility in the chicken. Methods. The contractile effect of chicken ghrelin was measured isometrically in muscle strips from different regions of the GI tract suspended in an organ bath. The effect of chicken ghrelin was compared with that of rat and human ghrelin. In addition, mRNA expression of ghrelin and GHS-R was examined by quantitative RT-PCR. Results. Among the ghrelin peptides tested (rat, human and chicken ghrelin), only chicken ghrelin caused contraction of muscle strips from the GI tract. No effect was seen in des-octanoylated chicken ghrelin, suggesting that octanoylation at Ser³ residue was essential for its activity. The contractile response to chicken ghrelin in the crop was not affected by tetrodotoxin (TTX), but that in the proventriculus was decreased by TTX and atropine to the same extent. D-Lys³-GHRP-6 (a GHS-R antagonist) caused a transient contraction and inhibited the chicken ghrelin-induced contraction without affecting the 50 mM high-K⁺-induced contraction. The amplitude of the chicken ghrelin-induced contraction was different among GI regions: highest in the crop and colon (70% of high-K⁺-induced contraction), moderate in the esophagus and proventriculus (30%), and weak in the small intestine (10-20%) and the ranking order of amplitude of contraction was consistent with GHS-R mRNA expression in each region (colon > crop = esophagus > proventriculus > duodenum = jejunum > ileum). GHS-R mRNA expression in the muscle preparations of crop and proventriculus without mucosa was 2 – 4 times higher than that in whole segments of crop and proventriculus, indicating that the GHS-R is mainly expressed in smooth muscle layers including enteric nerves. In contrast to GHS-R expression, ghrelin mRNA was mainly expressed in the mucosa of proventriculus and duodenum. Conclusion. These results indicate that ghrelin stimulates GI contractility and preferentially affects the motor activity of esophagus, crop and colon through myogenic and/or neurogenic mechanisms. These actions are mediated through the GHS-R, which is highly sensitive

to chicken ghrelin.