Influence of acute exposure to high altitude on basal and postprandial plasma levels of gastroenteropancreatic peptides.

Acute mountain sickness (AMS) is characterized by headache often accompanied by gastrointestinal complaints that vary from anorexia through nausea to vomiting. The aim of this study was to investigate the influence of high altitude on plasma levels of gastroenteropancreatic (GEP) peptides and their association to AMS symptoms. Plasma levels of 6 GEP peptides were measured by radioimmunoassay in 11 subjects at 490 m (Munich, Germany) and, after rapid passive ascent to 3454 m (Jungfraujoch, Switzerland), over the course of three days. In a second study (n = 5), the same peptides and ghrelin were measured in subjects who consumed standardized liquid meals at these two elevations. AMS symptoms and oxygen saturation were monitored. In the first study, both fasting (morning 8 a.m.) and stimulated (evening 8 p.m.) plasma levels of pancreatic polypeptide (PP) and cholecystokinin (CCK) were significantly lower at high altitude as compared to baseline, whereas gastrin and motilin concentrations were significantly increased. Fasting plasma neurotensin was significantly enhanced whereas stimulated levels were reduced. Both fasting and stimulated plasma motilin levels correlated with gastrointestinal symptom severity ($r = 0.294$, $p = 0.05$, and $r = 0.41$, $p = 0.006$, respectively). Mean $O_2$-saturation dropped from 96% to 88% at high altitude. In the
second study, meal-stimulated integrated (= area under curve) plasma CCK, PP, and neurotensin values were significantly suppressed at high altitude, whereas integrated levels of gastrin were increased and integrated VIP and ghrelin levels were unchanged. In summary, our data show that acute exposure to a hypobaric hypoxic environment causes significant changes in fasting and stimulated plasma levels of GEP peptides over consecutive days and after a standardized meal. The changes of peptide levels were not uniform. Based on the inhibition of PP and neurotensin release a reduction of the cholinergic tone can be postulated.