Sensory-guided identification of N-(1-methyl-4-oxoimidazolidin-2-ylidene)-alpha-amino acids as contributors to the thick-sour and mouth-drying orosensation of stewed beef juice

Sensory-guided fractionation of stewed beef juice using ultrafiltration, gel permeation chromatography, PFPP-HPLC, and HILIC combined with analytical sensory techniques led to the identification of the dipeptides beta-alanyl-N-methyl-L-histidine and beta-alanyl-L-histidine, as well as the creatinine derivatives N-(1-methyl-4-oxoimidazolidin-2-ylidene)aminopropionic acid, N-(1-methyl-4-oxoimidazolidin-2-ylidene)aminocetic acid, and N-(1-methyl-4-oxoimidazolidin-2-ylidene)amino-4,5,6-trihydroxyhexanoic acid as taste modulators in stewed beef juice. Model experiments demonstrated for the first time that the latter three N-(1-methyl-4-oxoimidazolidin-2-ylidene)-alpha-amino acids are formed by Maillard-type reactions from creatinine and reducing hexoses. Quantitative analysis, followed by taste recombination and omission experiments, revealed that subthreshold concentrations of these taste modulators enhance the typical thick-sour and mouth-drying orosensation and the mouthfulness imparted by stewed beef juice, although none of these compounds exhibited any significant intrinsic taste when tasted individually in water.