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Hypervalent iron is formed in the digestive tract during digestion of meat. Hypervalent iron constitutes a potential risk for tissue damage but is at the same time reduced by specific amino acids. Cysteine is among the most reducing amino acids and may play a role in the protection of epithelial cells against free radical attack. Accordingly, the reduction of hypervalent iron by cysteine was studied under varying pH conditions. The reaction was studied in the pH-range 6-9 at 25 °C by UV/VIS spectroscopy from 450-700 nm using a diode array detector. Spectral data was analyzed using multivariate curve resolution (MCR) to identify intermediate and reaction products. At pH 6, 7 and 8, ferrylmyoglobin was reduced by cysteine forming traces of metmyoglobin but mainly sulfmyoglobin, a modified form of myoglobin caused by the presence of cysteine. At pH 9, two consecutive reactions were observed. Ferrylmyoglobin was reduced to metmyoglobin by cysteine, which further was reduced to oxymyoglobin. The different behaviour observed at pH 6, 7 and 8 compared to pH 9 may be explained by the pK$_a$ value of cysteine (pK$_a$=8.33). At pH 6 and 7, and partly pH 8, the protonated form of the cysteine thiols are dominating, causing formation of sulfmyoglobin. MCR proved to be a useful tool for analyzing the reduction of ferrylmyoglobin by cysteine by extracting information about the absorbing components making in possible to set up reactions schemes and differential equations for the kinetic interpretation of the data.