# A thermodynamic and spectroscopic study of the complexes of the undecapeptide substance P, of its N-terminal fragment and of model pentapeptides containing two prolyl residues with copper ions.

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Streszczenie

Eight pentapeptides have been synthesised which either are models of the N-terminal pentapeptide fragment of Substance P(Arg-Pro-Lys-Pro-Gln-Gln-Phe-Phe-Gly-Leu-Met-$NH_2$) or assist in understanding its co-ordinating ability; Gly-Pro-Gly-Pro-Gly, Gly-Pro-Gly-Pro-Glu, Gly-Pro-Gly-Pro-Gln, Gly-Pro-Lys-Pro-Gly, Arg-Pro-Gly-Pro-Gly, Arg-Pro-Lys-Pro-Gln (Substance $P_{1–5}$), Gly-Pro-Pro-Gly-Gly and Glu-Pro-Pro-Gly-Gly. A potentiometric and spectroscopic study of the complexes formed with $H^+$ and $Cu^{2+}$ and a potentiometric study of the complexes with substance P have been made. The results demonstrate the profound effect which the prolyl residue can have, when incorporated in a peptide chain, on the formation of copper(II)-peptide complexes. It acts as a break-point to co-ordination and encourages the formation of folded peptide chains, through β turns, resulting in large, but very stable, chelate rings. The co-ordination behaviour of Substance P is almost identical to that of the N-terminal fragment, Substance $P_{1–5}$, with chelation through the N-terminal amino N and the Îµ-amino N of the Lys residue to form a large chelate ring of high stability, the peptide being forced into a bent conformation by the prolyl residue. With Substance P and its analogues, bonding between $Cu^{11}$ and deprotonated peptide nitrogens is absent below pH 10 but with the pentapeptides containing the Pro-Pro unit co-ordination to the peptide N of a Gly residue takes place surprisingly easily (starting at pH 7) to form a large chelate ring.

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