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Synthesis of new lipophilic phosphine oxide derivatives of natural amino acids and their membrane transport properties toward carboxylic acids

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Abstract

© 2015 Pleiades Publishing, Ltd. One-pot procedures were developed for the synthesis of lipophilic N-(dialkylphosphorylmethyl) derivatives of natural amino acids with high yields from dioctyl- or didecylphosphine oxide, formaldehyde, and amino acid in the presence of amino acid hydrochloride. The reactions with some amino acids were also effective under catalysis by crown ether. The structure of the isolated N-(dialkylphosphorylmethyl) and N,N-bis(dialkylphosphorylmethyl)amino acids was determined on the basis of ^1H , ^{13}C , and ^{31}P NMR and mass spectra; the structure of (S)-N-[(dicyclohexylphosphoryl)methyl]- α -alanine was proved by X-ray analysis, and intermolecular association of its molecules in crystal was characterized. Membrane transport properties of the new phosphorylated amino acids with respect to polyfunctional carboxylic acids were studied, and factors responsible for the efficiency and selectivity of membrane transport of acid substrates were estimated. Selective extraction of glutaric acid through a liquid membrane containing N,N-bis[(dioctylphosphoryl)methyl]- β -alanine was revealed.

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