

[Home](#) > [Journal](#) > [Chemistry & Materials Science](#) | [Medicine & Healthcare](#) > [PP](#)[Indexing](#) [View Papers](#) [Aims & Scope](#) [Editorial Board](#) [Guideline](#) [Article Processing Charges](#)[PP](#) > [Vol.4 No.1, January 2013](#)

OPEN ACCESS

Ibuprofen-Maltodextrin Interaction: Study of Enantiomeric Recognition and Complex Characterization

PDF (Size: 3319KB) PP. 18-30 DOI: 10.4236/pp.2013.41003

Author(s)

Claudia Garnero, Carolina Aloisio, Marcela Longhi

ABSTRACT

The interaction between ibuprofen and maltodextrins with different dextrose equivalent was studied in solution and solid state in order to investigate the effect on the solubility of ibuprofen and to determine their usefulness in terms of chiral recognition. Apparent binding constants were calculated using nuclear magnetic resonance spectroscopy experiments and solubility studies. The results showed an increase in the apparent solubility of ibuprofen in the presence of maltodextrins that depended on their ionization state. The freeze-drying method was used to prepare solid complexes, while physical mixtures were obtained by simple blending. These solid systems were characterized in the solid state using differential scanning calorimetry, thermogravimetric analysis, Fourier Transform-Infrared spectroscopy, scanning electron microscopy and X-ray diffractometry. Detailed nuclear magnetic resonance studies provided evidence of the influence of the type and concentration of the maltodextrin host on the chiral recognition of racemic ibuprofen, indicating that these linear ligands act as chiral selectors.

KEYWORDS

Ibuprofen; Maltodextrin; Chiral Recognition; Complex Characterization; Nuclear Magnetic Resonance Spectroscopy; Solubility Studies

Cite this paper

C. Garnero, C. Aloisio and M. Longhi, "Ibuprofen-Maltodextrin Interaction: Study of Enantiomeric Recognition and Complex Characterization," *Pharmacology & Pharmacy*, Vol. 4 No. 1, 2013, pp. 18-30. doi: 10.4236/pp.2013.41003.

References

- [1] J. D. Higgins, T. P. Gilmore, S. A. Martellucci, R. D. Bruce and H. G. Brittain, "Ibuprofen," *Analytical Profiles of Drug Substances*, Vol. 27, Academic Press, London, 2001.
- [2] S. S. Adams, P. Bresloff and C. G. Manson, "Pharmacological Differences between the Optical Isomers of Ibuprofen: Evidence for Metabolic Inversion of the (-)-Isomer," *Journal of Pharmacy and Pharmacology*, Vol. 28, No. 3, 1976, pp. 256-257. doi:10.1111/j.2042-7158.1976.tb04144.x
- [3] C. J. Nunez Agüero, C. M. Escobar Llanos, D. Diaz, C. Jaime and R. Garduño Juárez, "Chiral Discrimination of Ibuprofen Isomers in γ -Cyclodextrin Inclusion Complexes: Experimental (NMR) and Theoretical (MD, MM/GBSA) Studies," *Tetrahedron*, Vol. 62, No. 17, 2006, pp. 4162-4172. doi: 10.1016/j.tet.2006.02.010?
- [4] P. Valderrama and R. J. Poppi, "Second Order Standard Addition Method and Fluorescence Spectroscopy in the Quantification of Ibuprofen Enantiomers in Biological Fluids," *Chemometrics and Intelligent Laboratory Systems*, Vol. 106, No. 2, 2011, pp. 160-165. doi:10.1016/j.chemolab.2010.05.012
- [5] K. Busch, I. Swamidoss, S. Fakayode and M. Busch, "Determination of the Enantiomeric Composition of Some Molecules of Pharmaceutical Interest by Chemometric Analysis of the UV Spectra of Cyclodextrin Guest-Host Complexes," *Analytica Chimica Acta*, Vol. 525, No. 1, 2004, pp. 53-62. doi:10.1016/j.aca.2004.07.066

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issues Guideline](#)

[PP Subscription](#)[Most popular papers in PP](#)[About PP News](#)[Frequently Asked Questions](#)[Recommend to Peers](#)[Recommend to Library](#)[Contact Us](#)

Downloads: 83,613

Visits: 195,301

[Sponsors >>](#)

- [6] K. Ozoemena, R. Stefan, J. van Staden and H. Aboul-Enein, " Utilization of Maltodextrin Based Enantioselective, Potentiometric Membrane Electrodes for the Enantioselective Assay of S-Perindopril," *Talanta*, Vol. 62, No. 4, 2004, pp. 681-685. doi:10.1016/j.talanta.2003.08.035
- [7] M. Shamsipur, L. Dastjerdi, S. Haghgoo, D. Armspach, D. Matt and H. Aboul-Enein, " Chiral Selectors for Enantioresolution and Quantitation of the Antidepressant Drug Fluoxetine in Pharmaceutical Formulations by ¹⁹F NMR Spectroscopic Method," *Analytica Chimica Acta*, Vol. 601, No. 1, 2007, pp. 130-138. doi:10.1016/j.aca.2007.08.017
- [8] J. Wang and L. Wang, " Structures and Properties of Commercial Maltodextrins from Corn, Potato, and Rice Starches," *Starch/Starke*, Vol. 52, 2000, pp. 296-304. doi:10.1002/1521-379X(20009)52:8/9<296::AID-STAR296>3.0.CO;2-A
- [9] L. Dokic-Baucal, P. Dokic and J. Jakovljevic, " Influence of Different Maltodextrins on Properties of O/W Emulsions," *Food Hydrocolloids*, Vol. 18, No. 2, 2004, pp. 233-239. doi:10.1016/S0268-005X(03)00068-7
- [10] H. Soini, M. Stefansson, M. Riekkola and M. Novotny, " Maltooligosaccharides as Chiral Selectors for the Separation of Pharmaceuticals by Capillary Electrophoresis," *Analytical Chemistry*, Vol. 66, 1994, pp. 3477-3484. doi:10.1021/ac00092a028
- [11] T. Higuchi and K. A. Connors, " Phase-Solubility Techniques," In: C. N. Reilly, Ed., *Advances in Analytical Chemistry and Instrumentation*, Wiley-Interscience, New York, Vol. 4, 1965, pp. 117-212.
- [12] H. Benesi and J. Hildebrand, " A Spectrophotometric Investigation of the Interaction of Iodine with Aromatic Hydrocarbons," *Journal of the American Chemical Society*, Vol. 71, No. 8, 1949, pp. 2703-2707. doi:10.1021/ja01176a030
- [13] R. L. Scott, " Some Comments on the Benesi-Hildebrand Equation," *Recueil des Travaux Chimiques*, Vol. 75, No. 7, 1956, pp. 787-789. doi:10.1002/recl.19560750711
- [14] K. H. Fromming and J. Szejtli, " Cyclodextrin Inclusion Complexes," *Cyclodextrins in Pharmacy*, Kluwer Academic Publishers, Dordrecht/Boston/London, 1994.
- [15] G. Granero, C. Garnero and M. Longhi, " The Effect of pH and Triethanolamine on Sulfoxazole Complexation with Hydroxypropyl- β -Cyclodextrin," *European Journal of Pharmaceutical Sciences*, Vol. 20, No. 3, 2003, pp. 285-293. doi:10.1016/S0928-0987(03)00202-1
- [16] G. Endresz, B. Chankvetadze, D. Bergenthal and G. Blaschke, " Comparative Capillary Electrophoretic and Nuclear Magnetic Resonance Studies of the Chiral Recognition of Racemic Metomidate with Cyclodextrin Hosts," *Journal of Chromatography A*, Vol. 732, No. 1, 1996, pp. 133-142. doi:10.1016/0021-9673(95)01244-3
- [17] K. Kano, H. Hasegawa and M. Miyamura, " Chiral Recognition of Dipeptide Methyl Esters by an Anionic β -Cyclodextrin," *Chirality*, Vol. 13, 2001, pp. 474-482. doi:10.1002/chir.1064
- [18] C. F. Dignam, L. A. Randall, R. D. Blacken, P. R. Cunningham, S. G. Lester, M. J. Brown, S. C. French, S. E. Anagyeyi and T. J. Wenzel, " Carboxymethylated Cyclodextrin Derivatives as Chiral NMR Discriminating Agents," *Tetrahedron: Asymmetry*, Vol. 17, No. 8, 2006, pp. 1199-1208. doi:10.1016/j.tetasy.2006.04.006
- [19] I. Oh, M. Y. Lee, Y. B. Lee, S. C. Shin and I. Park, " Spectroscopic Characterization of Ibuprofen/2-Hydroxypropyl- β -Cyclodextrin Inclusion Complex," *International Journal of Pharmaceutics*, Vol. 175, No. 2, 1998, pp. 215-223. doi:10.1016/S0378-5173(98)00286-5
- [20] A. Wangsakan, D. McClements, P. Chinachoti and C. Dickinson, " Two-Dimensional Rotating-Frame Overhauser Spectroscopy (ROESY) and ¹³C NMR Study of the Interactions between Maltodextrin and an Anionic Surfactant," *Carbohydrate Research*, Vol. 339, No. 6, 2004, pp. 1105-1111. doi:10.1016/j.carres.2004.01.019
- [21] M. V. Rekharsky and Y. Innoue, " Complexation and Chiral Recognition Thermodynamics of 6-Amino-6-deoxy-beta-cyclodextrin with Anionic, Cationic, and Neutral Chiral Guests: Counterbalance between van der Waals and Coulombic Interactions," *Journal of the American Chemical Society*, Vol. 124, 2002, pp. 813-826. doi:10.1021/ja010889z