

Determination of the Formation Constant of the Inclusion Complex from a Naphthoquinone

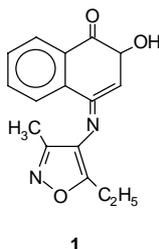
Gladys Granero, Marcela Longhi and María M. de Bertorello

Dpto de Farmacia, Facultad de Ciencias Químicas, U.N.C. Ciudad Universitaria, 5000-Córdoba, Argentina

E-mail: glagra@dco.fcq.unc.edu.ar

Abstract: Inclusion complexation of **1** with HP- β -CD or HP- β -CD:PVP K30 in aqueous solution was spectroscopically studied and the formation constant for a 1:1 complex was determined from these measurements.

Introduction



Previously we have demonstrated by means of phase solubility diagrams that hydroxypropyl- β -cyclodextrin (HP- β -CD) increases the aqueous solubility of 2-hydroxy-N-(3-methyl-5-ethyl-4-isoxazolyl)-1,4-naphthoquinone-4-imine (**1**) [1], a compound that has antibacterial and tripanosidal activity [2]. Also, we have demonstrated that the improvement in solubility of **1** can be further increased by adding 0.5% (w/v) of polyvinylpyrrolidone K30 (PVP K30) to the HP- β -CD solution.

In this work our aim is to determine the formation constants of the inclusion complex (K_c) between the HP- β -CD and the naphthoquinone.

Experimental

The K_c values were determined by the UV spectrophotometric method (Shimadzu UV 160 UV/visible spectrophotometer).

Results and Discussion

The UV-visible spectrum of **1** is affected in the presence of HP- β -CD or HP- β -CD:PVP K30. The absorption band around 280 nm shifted towards longer wavelengths (306 nm) with increasing concentration of HP- β -CD together with an increase in the intensity of the absorption band located between 400 and 550 nm. These spectral changes allowed us to obtain the K_c value using the Scott's equation: $(a-b)/d = 1/(K_c \epsilon_c) + b/\epsilon_c$, which assumes a complex stoichiometry of 1:1, where a is the total molar concentration of **1**, b is the total molar concentration of the complexing agent, ϵ_c is the difference of the molar absorptivities for free and complex **1** and d is the change in absorbance of **1** caused by addition of the complexing agent [3].

The K_c between **1** and HP- β -CD was also studied in buffer solutions (ionic strength of 0.5 M) and was observed that K_c increased with the increment of the pH (the pK_a value of **1** is 8.19). K_c between **1** and PVP K30 was significantly lower than K_c between **1** and HP- β -CD, but its value increased markedly in presence of 5% (w/v) HP- β -CD.

On the other hand, no bigger changes than those observed for the absorption spectra of zero order could be noticed in the derivative spectra.

References and Notes

1. Granero, G.; Longhi, M.; María M. de Bertorello *Influencia de la HP- β -CD y la PVP sobre la solubilidad acuosa de una naftoquinona*. 8^{vo} Congreso Argentino de Farmacia y Bioquímica Industrial. Bs As., Junio 1999.
2. Granero, G.; de Bertorello M.M.; Briñón, M. *J. Chem. Res.* **1999**, 110-111.
3. Letellier, S.; Maupas, B.; Gramond, J. P.; Guyon, F.; Gareil, P. *Analytica Chimica Acta* **1995**, 315, 357-363.