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Interaction between olanzapine and human serum albumin and effect of metal ions, caffeine and flavonoids on the binding: A spectroscopic study

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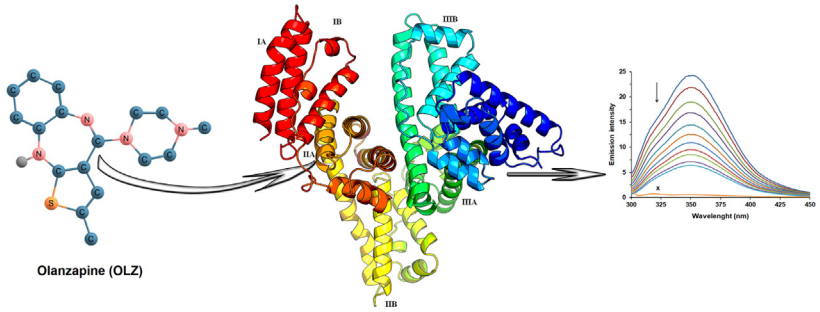
HIGHLIGHTS

- Spectroscopic methods were used to study the interaction between HSA and olanzapine.
- HSA form a stable complex with olanzapine through a mixed quenching mechanism.
- The influence of caffeine and three different flavonoids on the interaction of HSA with olanzapine was investigated.
- The influence of metal ions on the interaction of HSA with olanzapine was investigated.
- Competitive and non-competitive interference were observed.

GRAPHICAL ABSTRACT



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ABSTRACT

In this study, the binding of olanzapine (OLZ) to human serum albumin (HSA) and the influence of metal ions (Ca^{2+}, Mg^{2+}, Cu^{2+}, Zn^{2+}, Fe^{3+}), caffeine (CAF) and flavonoids (diosmin (DIO), catechin (CAT), quercetin (QUE)), on their affinity, was investigated by fluorescence spectroscopy and UV–vis absorption spectroscopy. Fluorescence experiments suggest that OLZ quench the fluorescence of HSA through the mixed quenching mechanism and non-radiation energy transferring as a result of the HSA–OLZ complex formation. OLZ spontaneously bind in the site I on HSA, and according to thermodynamic parameters, the reaction was spontaneous and mainly driven by hydrogen bonds and van der Waals interactions. The presence of M^{n+} ions, CAF, DIO and CAT decreased binding affinity between OLZ and HSA which indicates that they could compete against OLZ in the site I. Contrary, in the presence of QUE the binding affinity of the HSA-OLZ system enhanced, which may be explained by conformational changes in HSA (non-competitive interference).

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1. Introduction

The most abundant carrier protein present in the circulatory system is serum albumin (HSA). The determined crystallographic structure revealed that serum albumin consists of three homologous domains (I, II, III), each domain contains two subdomains (A, B) [1].

Most of the drugs bind to Sudlow sites I and II, located in subdomains IIA and IIIA, respectively [2,3]. The drug-serum albumin interaction plays a dominant role in the metabolism of drugs, its distribution, free concentration and efficacy [4,5].

Except for drugs, numerous exogenous and endogenous compounds bind to serum albumin as well, like food components -

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