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In vitro anti-hemolytic effect of 2,2'-((((λ2-azanediyl)bis(ethane-1,2-diyl))bis(azanylylidene))bis(ethan-yl-1-ylidene))diphenol ligand against ferrous sulfate induced damage in human red blood cells

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ABSTRACT

the Schiff base ligand 2,2'-((((λ^2-azanediyl)bis(ethane-1,2-diyl))bis(azanylylidene))bis(ethan-yl-1-ylidene))diphenol was selected for *in vitro* anti-hemolytic effect against hemolysis induced by ferrous sulfate. Our results indicate that the ligand exhibited an excellent anti-hemolytic effect with inhibition percentages of 86.07±0.73, 79.30±1.95 and 65.84±2.26% at 62.5, 31.25 and 15.62µg/mL respectively.

KEYWORDS: Schiff base, ligand, hemolysis, anti-hemolytic, red blood cells.

INTRODUCTION

Schiff bases are very important compounds in therapeutic chemistry [1]. Several studies demonstrate different pharmacological activities of these substances; include antibacterial, anticonvulsant, anti-inflammatory, anticancer, anti-hypertensive, anti-fungal, antipyretic, antimicrobial, anti-HIV, cytotoxic activity, hypnotic and herbicidal activities. [2]. A large number of Schiff bases have been reported to have bactericidal, fungicidal, antipyretic, antitumor, antitubercular, anticancer and sterease inhibitory activities [3]. In this paper the Schiff base ligand 2,2'-((((λ^2-azanediyl)bis(ethane-1,2-diyl))bis(azanylylidene))bis(ethan-yl-1-ylidene))diphenol was selected for the study of their physic-chemical proprieties using marvin sketch and for biological activity by their anti-hemolytic effect against ferrous sulfate induced human red blood cells damage. In addition, physico-chemical properties of the ligand such as net charge, isoelectric point pI ,microspecies distribution, molecular formula, molecular weight, and van der Waals volume were calculated using Marvin sketch software.

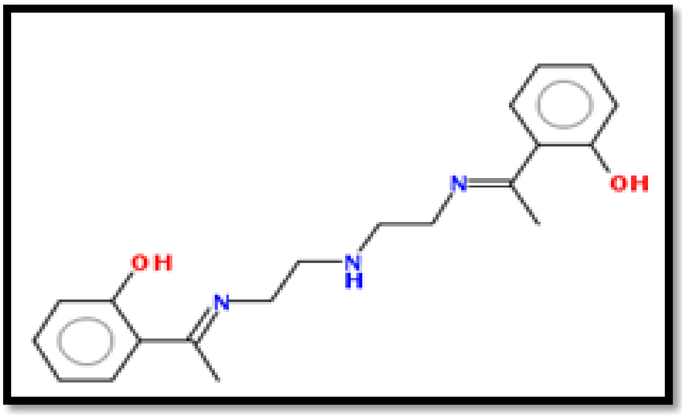

Figure1. Schiff base ligand

EXPERIMENTAL

In silico physico-chemical and biological properties evaluation

Marvin sketch software [4]was used to calculate physico-chemical properties of the ligand such as net charge, isoelectric point pI ,microspecies distribution, molecular formula, molecular weight, and van der Waals volume .

In vitro Anti-hemolytic activity

Erythrocytes were obtained from healthy individual in heparinized tube. The tube was centrifuged at 3,500 rpm for 15min. The supernatant was discarded. The resulting pellet was washed three times in NaCl (0.9%) solution. 0.3mL of erythrocyte suspension (2%) was added to 0.3 mL of $FeSO_4$ solution (5mM) and 0.3mL of the ligand at different concentrations or bovine serum albumin (BSA 0.1%). The mixture was incubated for 30 min at 37 °C and then centrifuged for 10 min at 2000 rpm. The absorbance of the supernatant was measured at 540 nm. [5]

Percentage of anti-hemolysis effect was calculated from following equation:

$$\text{Antihemolytic effect}(\%) = 100 * (\text{Ac} - \text{As})/\text{Ac}$$

Ac: Absorbance of control

As: Absorbance of sample

RESULTS AND DISCUSSIONS

Molecular properties

The computational method was used for evaluate the net charge, isoelectric point pI , microspecies distribution, molecular formula, molecular weight, and van der Waals volume of the ligand which are shown in the figures 2,3 and 4 respectively .

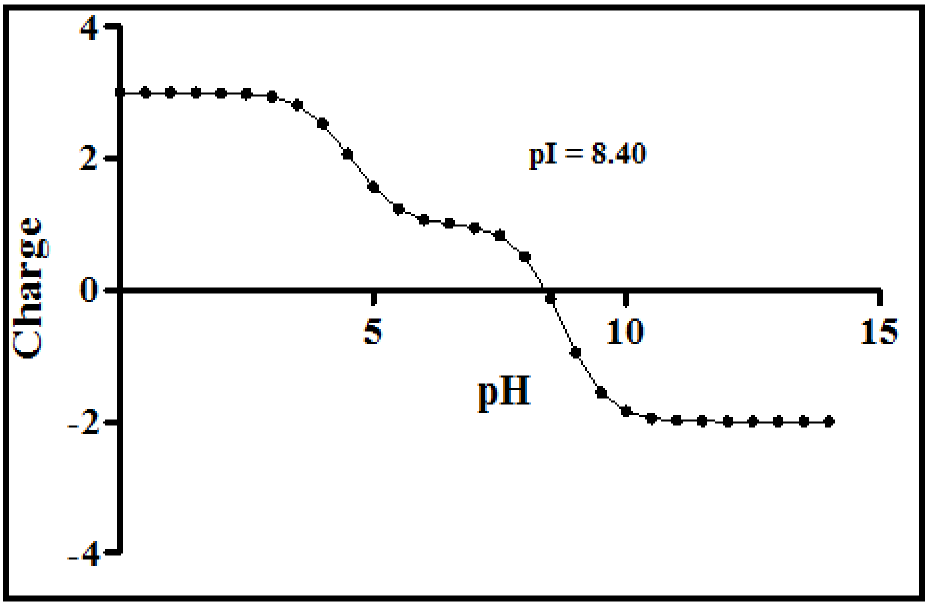

Figure 2. Net charge and isoelectric point of the ligand

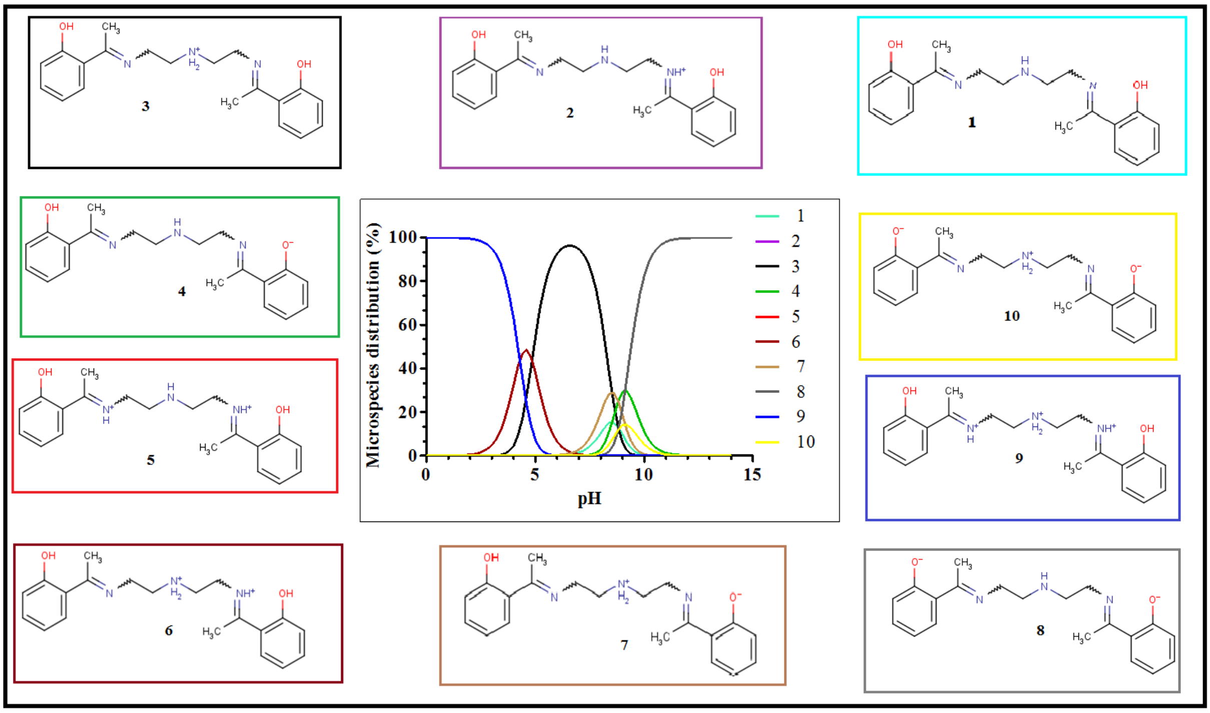

Figure 3. distribution species of the ligand

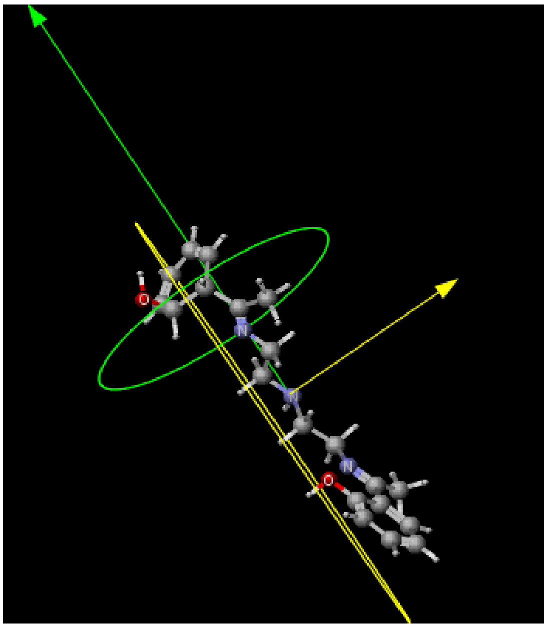

Figure 4. Geometrical structure, van der Waals volume and length perpendicular to areas of maximum and minimum potential of the ligand

Anti-hemolytic activity

Anti-hemolytic effect of the Schiff base ligand on ferrous ion induced hemolysis was represented in **Figure 5.** The results demonstrate that Ferrous sulfate affected the membrane of erythrocytes which caused lipid peroxidation and cells damage. For evaluate the protective effect the ligand, results indicate that the Schiff base ligand exhibited an excellent anti-hemolytic effect with inhibition percentages of 86.07±0.73, 79.30±1.95 and 65.84±2.26% at 62.5, 31.25 and 15.62µg/mL respectively and 100% of inhibition for BSA (0.1%) which served as positive control [6].

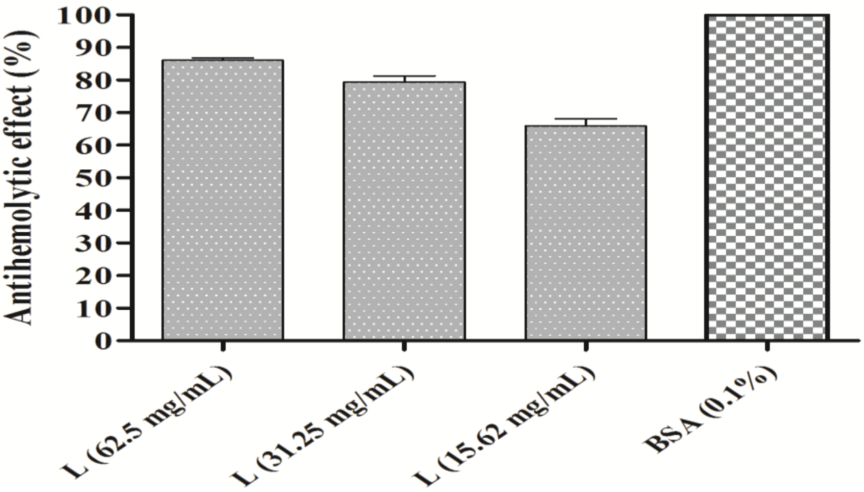

Figure5. Anti-hemolytic effect of the ligand.

CONCLUSION

The ligand 2,2'-((((λ^2-azanediyl)bis(ethane-1,2-diyl))bis(azanylylidene))bis(ethan-yl-1-ylidene))diphenol exhibited an excellent anti-hemolytic effect. Our theoretical and experimental results indicate the possibility of the ligand to can be a safe anti-hemolytic drug in the future.

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