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THEME C- New Chemical Compounds: Synthesis, Methods and Industrial Processes

Topic C1 - Synthesis and reactivity in Metal based Compounds – Abstract 172

Synthesis, Characterization and Biological Activity of Novel Transition Metal Complexes Based on the Biologically Active Non-steroidal Carboxylates and Nitrogen Based Ligands.

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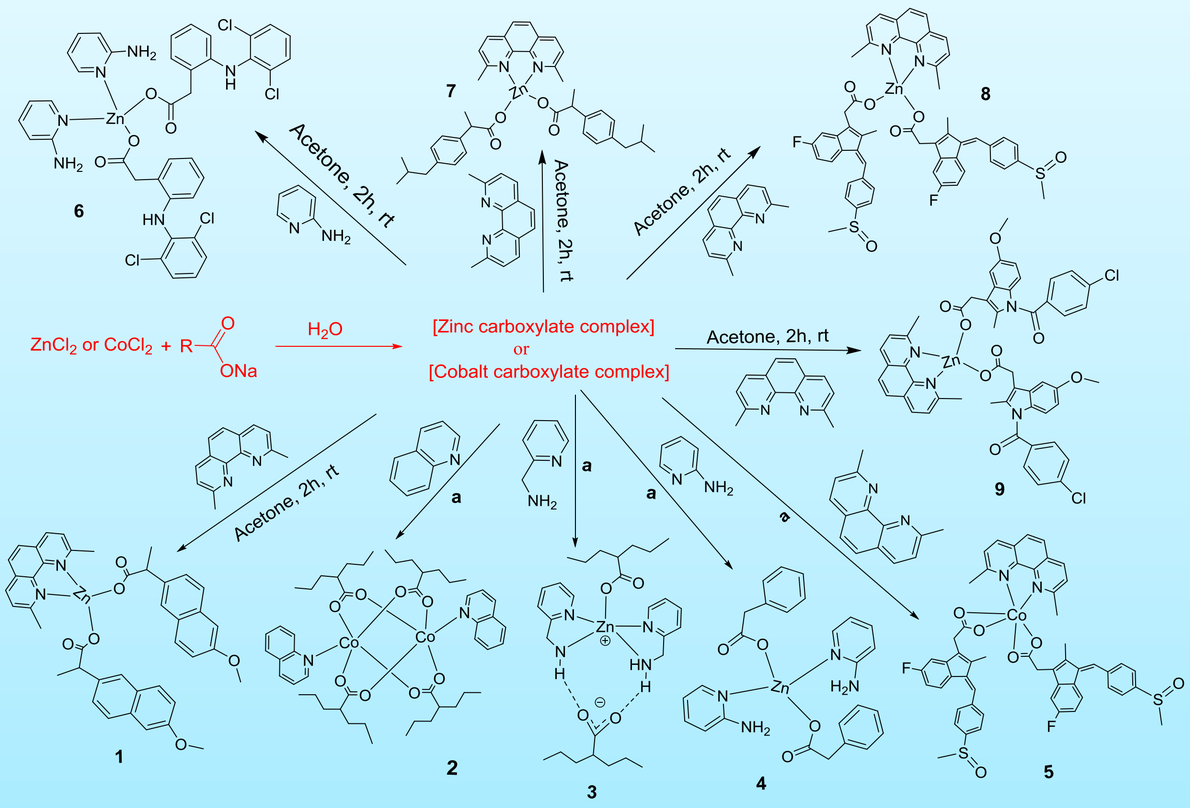
1. Introduction

Zinc is one of the most important trace elements in the body and it's considered essential for many processes in living organisms. Zinc ions exist primarily in the form of complexes with proteins and nucleic acids and participate in all aspects of intermediary metabolism, transmission and regulation of the expression of genetic information, storage, synthesis and action of peptide hormones and structural maintenance of chromatin, biomembranes and extracellular matrices. Zinc ions possess some anti-bacterial effects, good thermal and color stability with low cost and little toxicity. The growth of Escherichia coli is inhibited at high concentrations of zinc(II). However, low concentrations of zinc(II) have a promoting action on the growth of E-coli. Zinc also can inhibit the growth of Streptococcus faecalis, Klebsiellapneumoniae, Staphylococcus aureus and some soil bacteria. Many anti-bacterial drugs when chelated to the metal, show altered bioability and sometimes the chelated drug is more effective than the free ligand. This is due to the chelation of a bulky ligand to a metal cation which reduces the polarity of the ion and increases the lipophilicity of the metal complex, which can result in increased damage to bacterial cell walls and the transfer of zinc into the cell. In some cases, the interaction of metal ions (i.e. Zn(II)) with bioactive anti-bacterial or anti malarial organic compounds increases the biological activity of the ligands. The metal oxidation state, the type and number of donor atoms, as well as their relative positions within the ligand are major factors determining the relationship between the structure and activity. In other cases, the interaction of bioactive organic compounds with metals inhibits their activity.

Malaria is one of the most prevalent parasitic diseases in the world. It is caused by different species of *Plasmodium, Plasmodium vivax, Plasmodium falciparum, Plasmodium malariae* and *Plasmodium ovale* of which *P. flaciparum* is the most virulent human malaria parasite.

2. Experimental



3. Results and Discussion

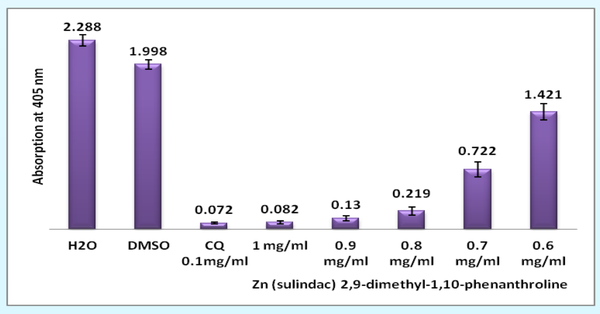


Fig. 1: Column diagram representing the Semi-Quantitative test results of potential anti-malarial drug **Zn(Sulindac)$_2$2,9-dimethyl-1,10-phenanthroline (8)** dissolved in DMSO, compared to Chloroquine as positive control. while water and DMSO used as negative controls, showing the absorption values of dissolved β-Hematin (alkaline hematin) at 405 nm using ELISA reader, absorption is inversely proportional to drugs efficiency, the lower the absorption is, the drug is considered to be more efficient.

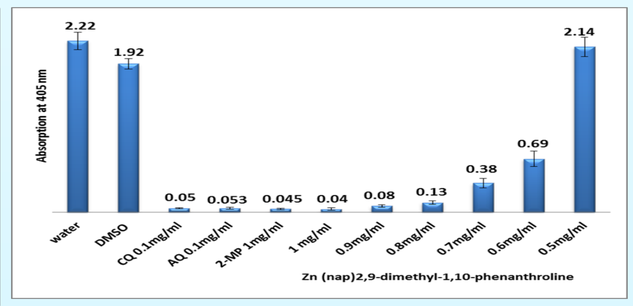
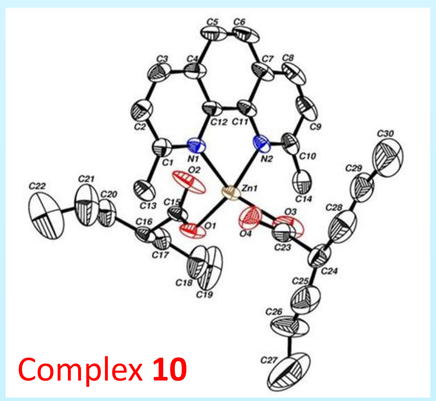
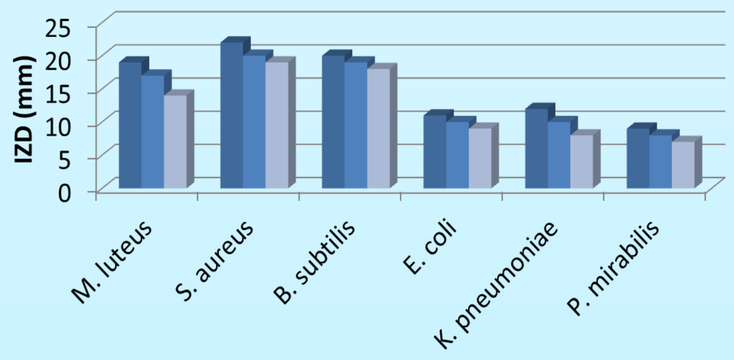


Fig. 2: Column diagram representing the Semi-Quantitative test results of potential anti-malarial drug **Zn(nap)-2,9-dimethyl-1,10-phenanthroline (1)** dissolved in DMSO, compared to Chloroquine, Amidoquine and 2-mercaptopyrimidine as positive controls. while water and DMSO used as negative controls, showing the absorption values of dissolved β-Hematin (alkaline hematin) at 405 nm using ELISA reader, absorption is inversely proportional to drugs efficiency, the lower the absorption is, the drug is considered to be more efficient.





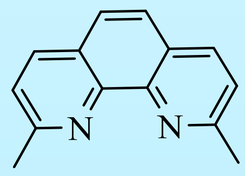
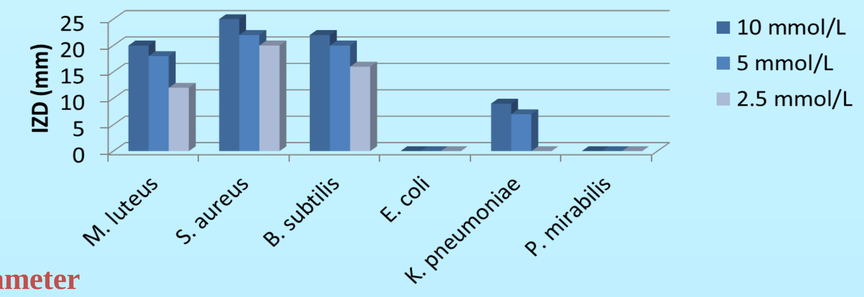


Fig3. Anti-bacterial activity of Complex **10** at different concentrations.



IZD = Inhibition Zone Diameter

Fig. 4. Anti-bacterial activity of 2,9-dmphen at different concentrations.

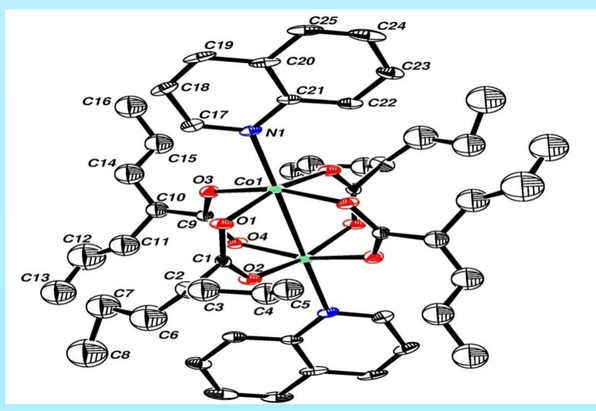


Fig. 5. Crystal structure of **2**

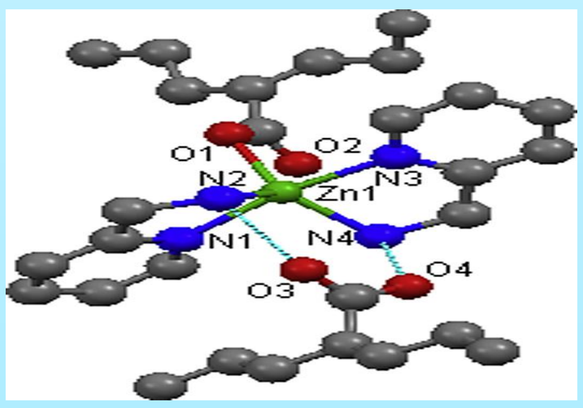


Fig. 6. Crystal structure of **3**

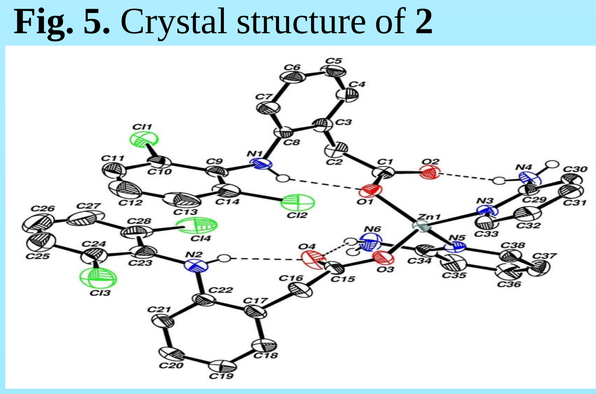


Fig. 7. Crystal structure of **6**

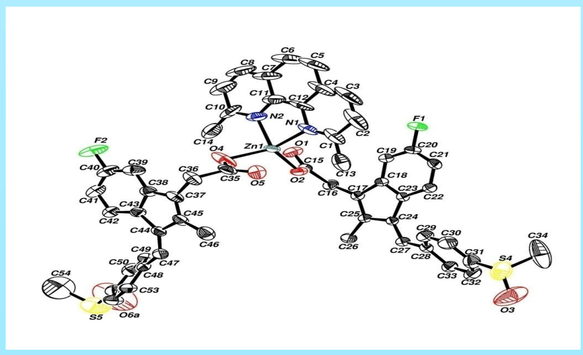


Fig. 8. Crystal structure of **8**

4. References

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5. Conclusion

A series of complexes of Zn and Co metal ions were synthesized and characterized using IR, UV-Vis, ^{1}HNMR, ^{13}C{^{1}H}NMR spectroscopic techniques in order to examine their binding coordination modes in addition to their biological activity. Most of the compounds showed anti-bacterial activity against different Gram-positive and Gram-negative bacteria. The complexes **1** and **8** have shown a very good inhibition activity on the formation of β-hematin.