

**Republic of Sudan**

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**Preparation and Characterization of Novel Cobalt (III)  
Complex and Biologically Efficiency Studies**

A Thesis Submitted in Fulfillment of The Requirement of The  
Degree of M.Sc in Applied Chemistry

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## **ABSTRACT:**

The aim of research is synthesis anovel ligand (FPH) and Co(III) complex and Character of Co(III) complex and ligand by using UV,IR and XRF to conform the Chemical structure and studies physical properties, Explanation how ligand target DNA and linked with this by any type of mode to therapeutic like antitumor by planar of ligand to averting disadvantage (resistance) which frontages cisplatin.

Anovel intercalator ligand (FPh) = [2furaldehyde [4,5,F] (1,10) phenanthroline)] have been synthesized and characterized by physico-chemical and spectroscopic method (UV-Vis) , reacted with Cobalt(III)Complex to preparation therapy metal complex .

Anovel Cobalt(III)Complex [Co(phen)<sub>2</sub>(FPH)]ClO<sub>4</sub>.H<sub>2</sub>O have been synthesized and characterized by physico-chemical and spectroscopic method (IR,UV-Vis and XEF).The central Co(III) atom is six coordinate with four N atoms of two 1,10-phenanthroline (1,10-phen) molecules and two terminal N atoms from (FPH) ligand giving shows not perfect octahedral structure with a (Co-N)<sub>6</sub>.metal center into design of intercalating compounds gives rise to a greater range of geometric diversity and structural flexibility , The molecular structure of the complex is consolidated by face-to-face  $\pi$ - $\pi$  stacking between the aromatic rings of phen ligand. Applied biological efficaciousness of Co(III)complex against two types of bacteria Gram positive bacteria *Staphylococcus aureus* and gram negative bacteria *Escherichia Coli* and (MIC/MBC) ,the results explained that complex have higher antibacterial efficaciousness in *E.coli* (21mm).

The recommendations for this study ware towards to widening in biological studies like cytotoxicity in assay, DNABinding and Using more modern analytical techniques such as ,docking studies, fluorescence, thermal gravimetric analysis NMR and CHN to conform the chemical structure, and XRD singal crystal to spelled geometry shape of complexes.

## **المستخلص:**

تهدف هذه الدراسة الي تصنيع ليجند إقحامي ومعقد الكوبلت الثلاثي جديد مع توضيح خصائص الليجند والمعقد بواسطة (IR,UV-Vis and XEF) للتأكد من التركيب الكيميائي ,ودراسة الخصائص الفيزيائية وتوضيح طريقة ارتباط الليجند مع الحمض النووي لعلاج الكانسر وذلك تفاديا للعيوب التي واجهت مركب cisplatin وذلك بسبب إستواء الليجند.

تم تحضير ليجند إقحامي [2furaldehyde [4,5,F] (1,10) phenanthroline] (FPh) جديد مع تفسير خصائصه بواسطة الأشعة فوق البنفسجية ومن ثم تم توليفة مع معقد الكوبلت الثلاثي لتصنيع معقد علاجي .

تم تحضير معقد الكوبلت الثلاثي جديد مع توضيح خصائصه بواسطة الطرق الفيزيوكيميائية (IR,UV-Vis and XEF) ، معدن الكوبلت المركزي يتربط بستة روابط تناسقية مع ذرات النتروجين الموجودة في الليجند لينتج معقد كوبلت الثلاثي المشوة , وجود المعدن في تصميم المعقد الإقحامي يودي الى ضخامة الشكل الهندسي ومرونته .

تم تطبيق الفعاليه الإحيائية للمعقد ضد نوعين من البكتيريا *Staphylococcus aureus* and *Escherichia Coli* وأشارت النتائج الي ان المعقد لة فعالية عاليه في *E.coli* (21mm).

أوصي لمتابعة التجارب الإحيائية مثل DNAbinding, cytotoxicity in assay , وأستخدام تقنيات أخرى لتأكد من التركيب الكيميائي مثل TGA, NMR, و CHN معرفه الشكل الهندسي للمعقد.

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Anew ligand FPH and Co(III)complexes were synthesized and characterized by UV, IR, XRF and physical properties studies. The results of Biological activity indicates that complexes have ability to inhibit the bacteria growth at given conditions and showing high antimicrobial activity against *E.coli* and *S. aureus*.

The MIC values indicate that the ligands (FPH) have high activity against the bacteria.

## **5-2 RECOMMENDATION:**

- I recommend the researcher to widening in biological studies like cytotoxicity in assay, DNAbinding.
- Using more modern analytical techniques such as ,docking studies, fluorescence, thermal gravimetric analysis NMR and CHN to conform the chemical structure, and XRD singal crystal to spelled geometry shape of complexes.