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The effect of plant extracts, *L. salicaria* and *S. pratensis* on the interaction between copper(II) complexes and biomolecules

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Lythrum salicaria ***Salvia pratensis***

Introduction

Copper complexes have demonstrated remarkable and selective biological activity, attracting attention as promising anticancer metallodrugs. Their potential arises from their complex mechanisms of action, where they interact with various cellular components and influence critical processes related to cell survival and proliferation.[1]

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Ferrocene derivatives are valued for their reversible redox properties, high stability, and lipophilicity, which facilitate interactions with biomolecules such as DNA and proteins. When incorporated into Schiff base ligands, ferrocenyl groups can synergistically enhance both the anticancer and antimicrobial activity of copper complexes, forming multifunctional scaffolds with strong therapeutic promise.[2]

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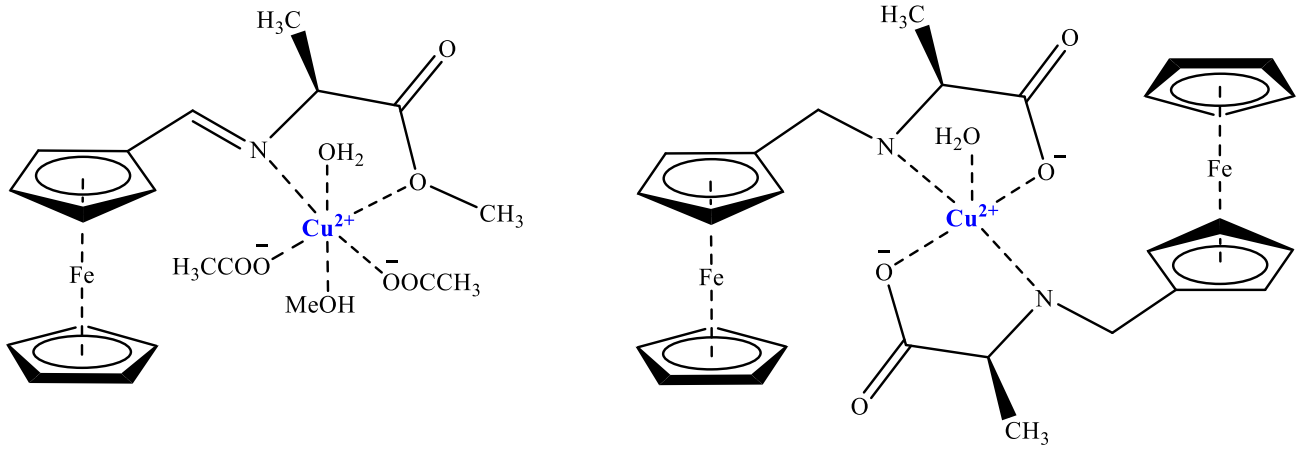
Combining copper complexes with active ligands and **natural compounds** offers a unique strategy to exploit potential synergistic effects, where the pharmacological potential of phytochemicals complements the redox and coordination chemistry of the metal complexes.[3]

1. L. A. Alfonso-Herrera, J. A. Aragón-Muriel, et al., ChemMedChem 2022, 17 (18)
2. S. Peter, E. Morifi, et al., Pharmaceutics 2025, 17 (6), 722
3. N. Srećković, J. Katanić Stanković, S. Matić, N. Mihailović, P. Imbimbo, DM Monti, V. Mihailović, Ind. Crops Prod.. 2020, 155, 112781.

Introduction

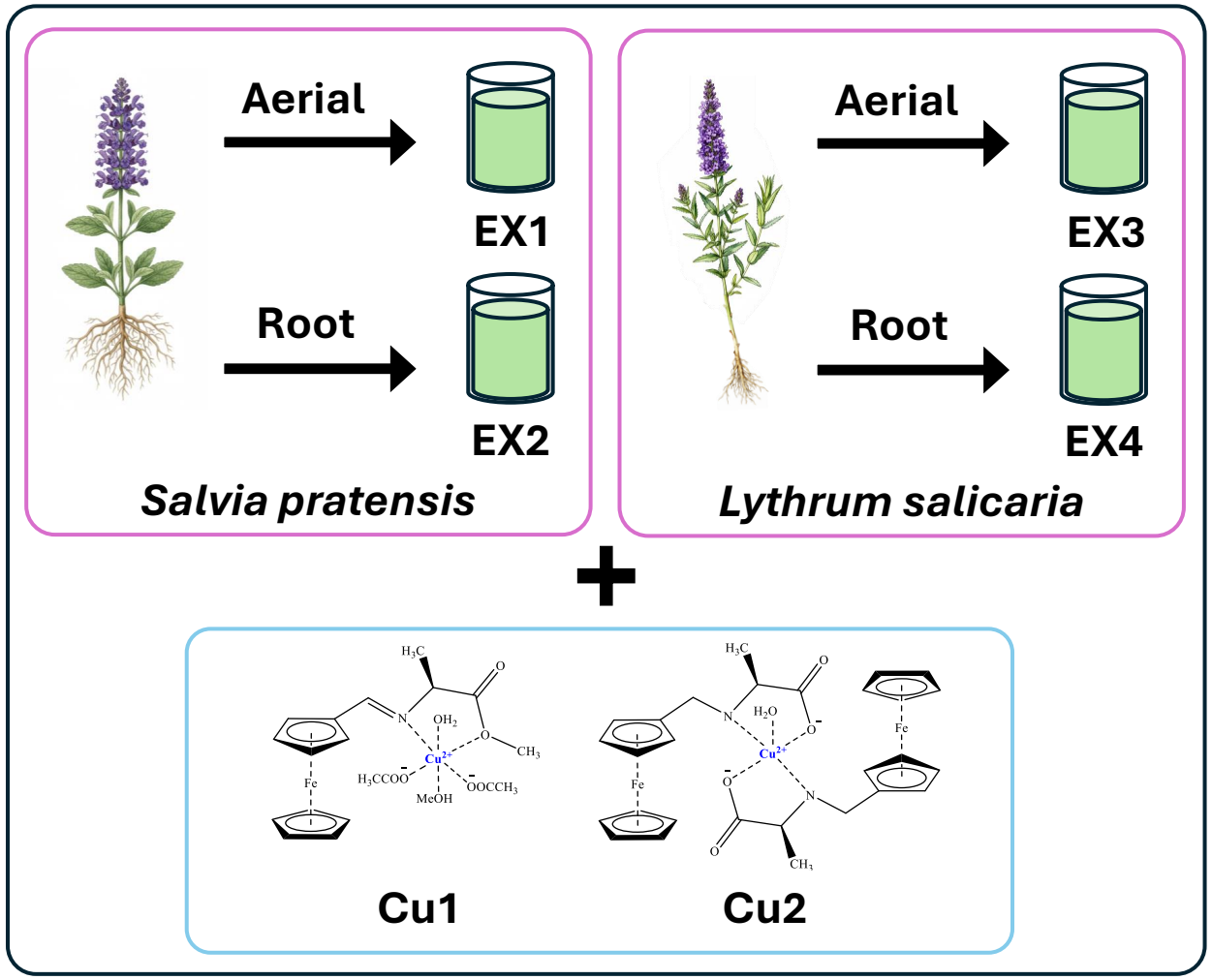
Copper(II) complexes



Cu1 **Cu2**

Characterization: UV-Vis, IR, and mass spectroscopies, while single crystals of the **Cu2** complex were also obtained.

Introduction



→ DNA interactions

→ Protein (HSA) interactions

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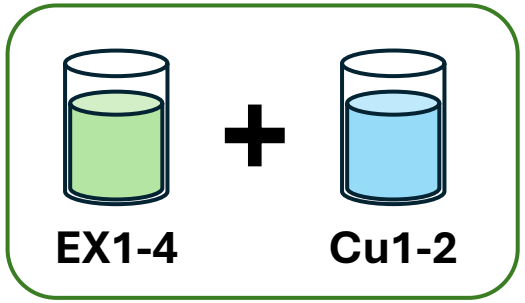
DNA interactions



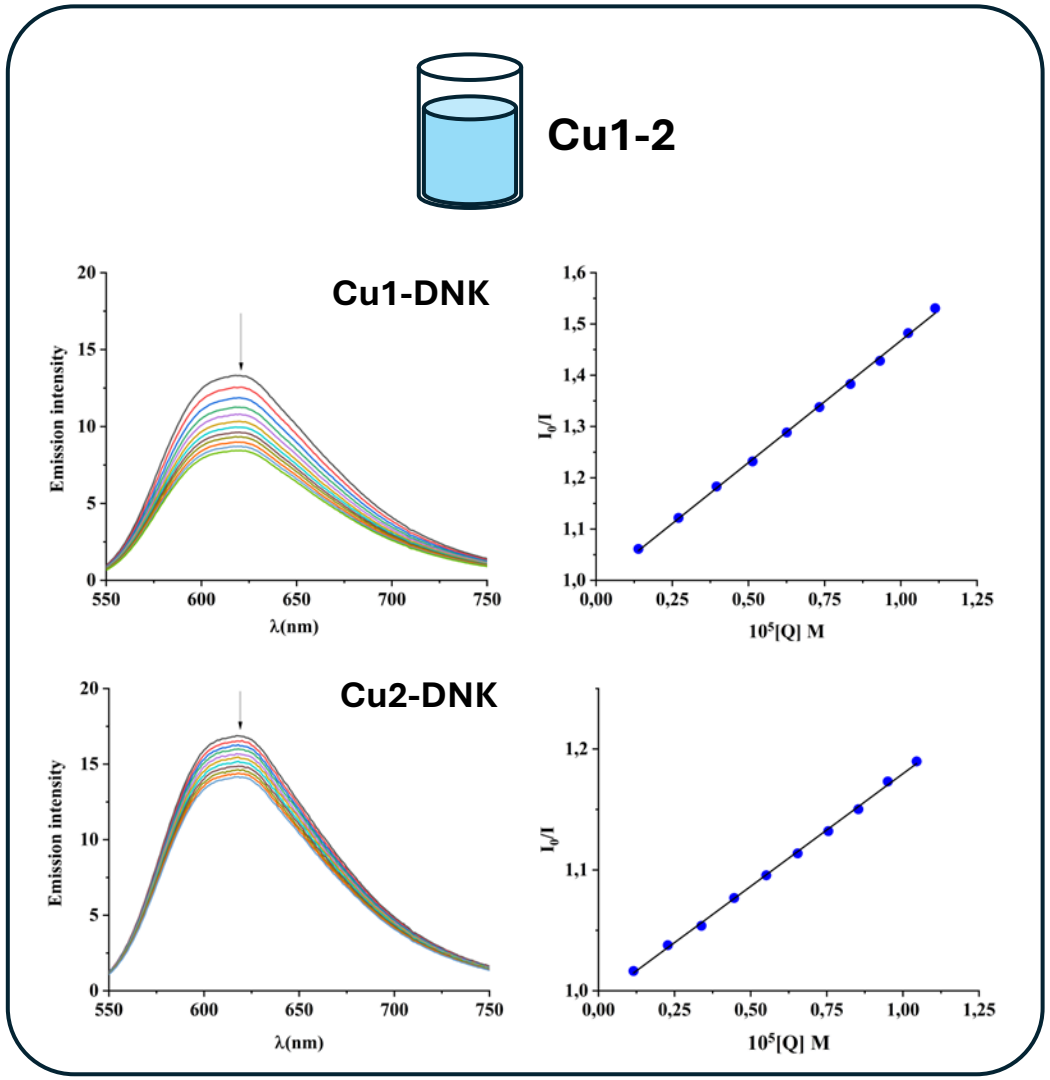
EX1-4 (0,5mg/l)
Cu1-2 (0,1mM)

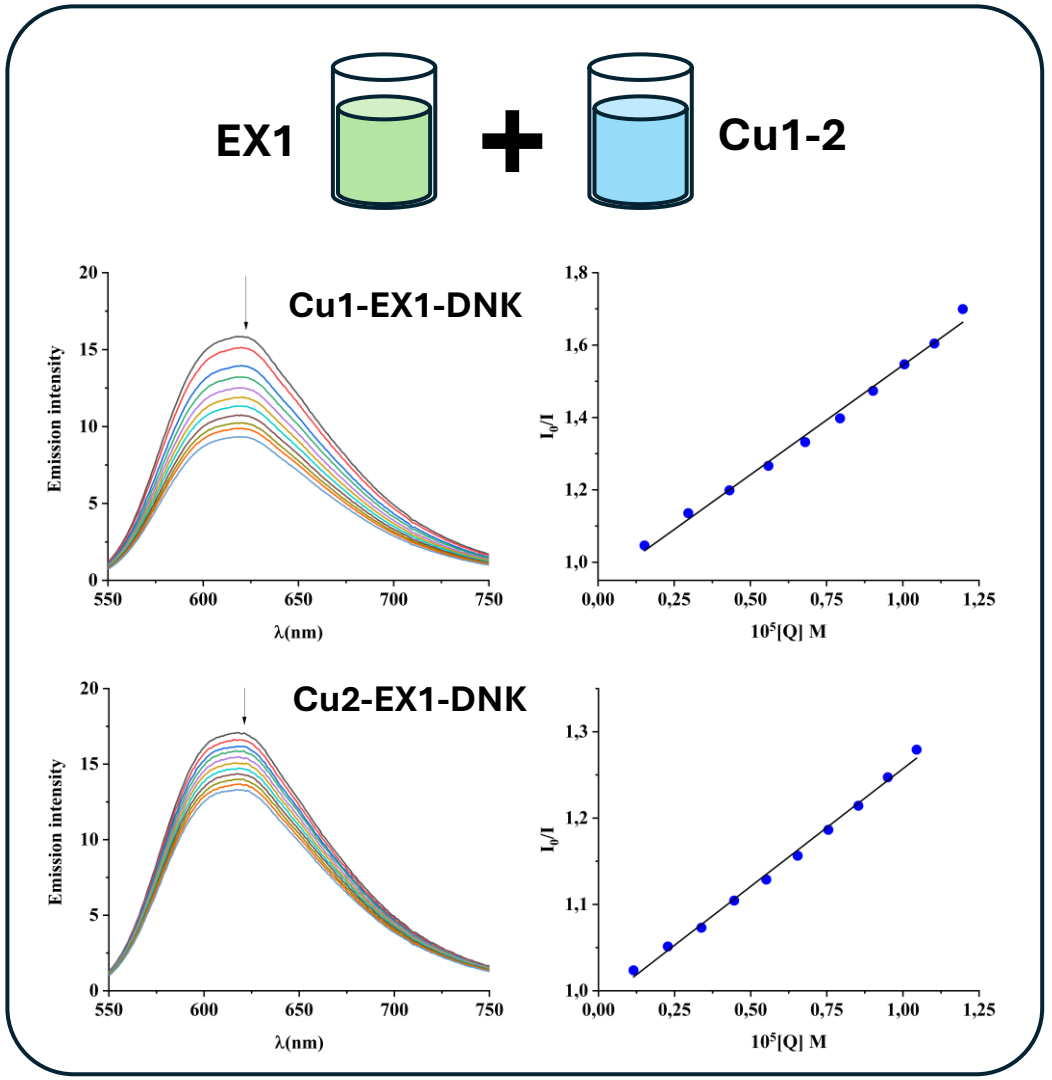
DNA/EB
ratio 1:1, 1.25 μM

increasing the concentration of the copper complexes and extracts (up to a molar ratio of 1.25)

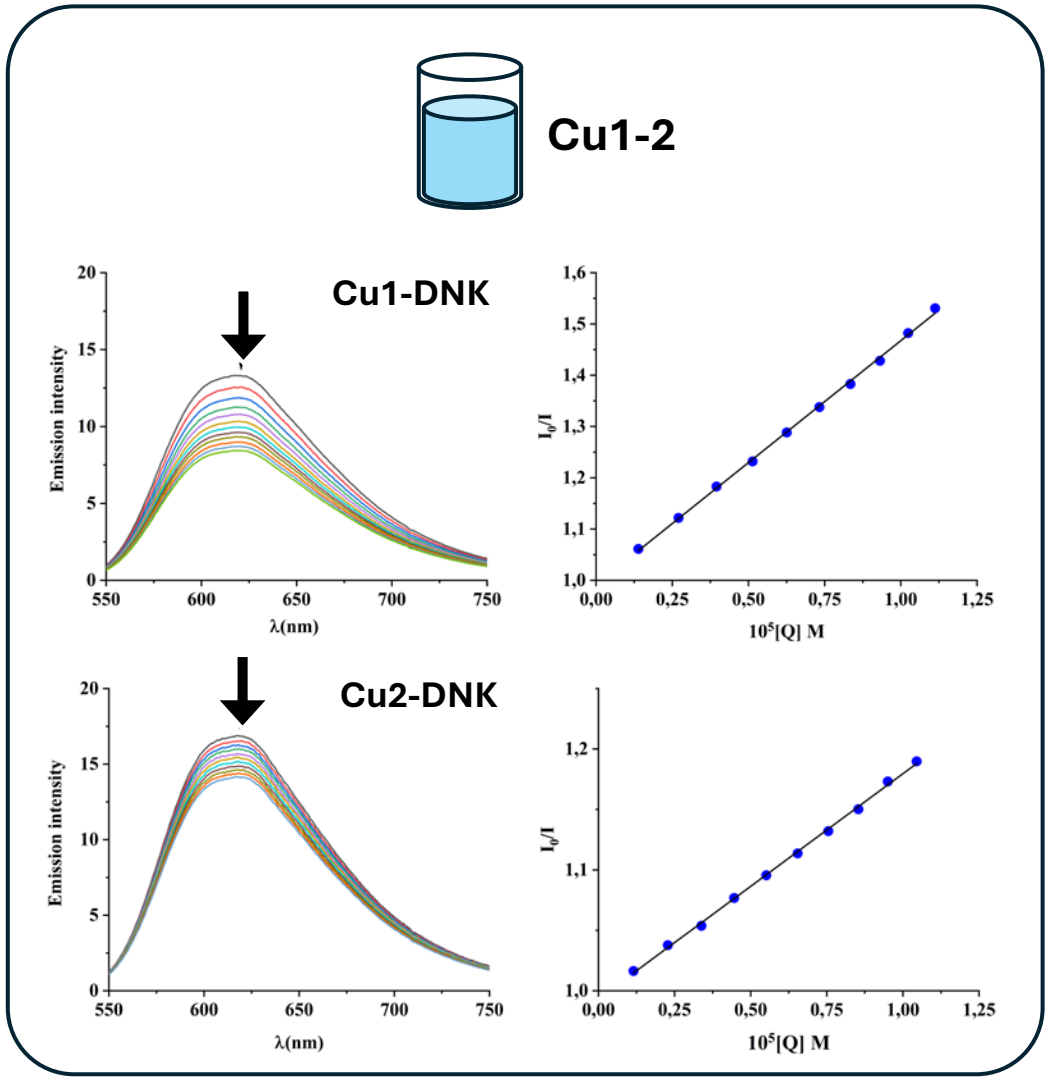
fluorescence spectroscopy

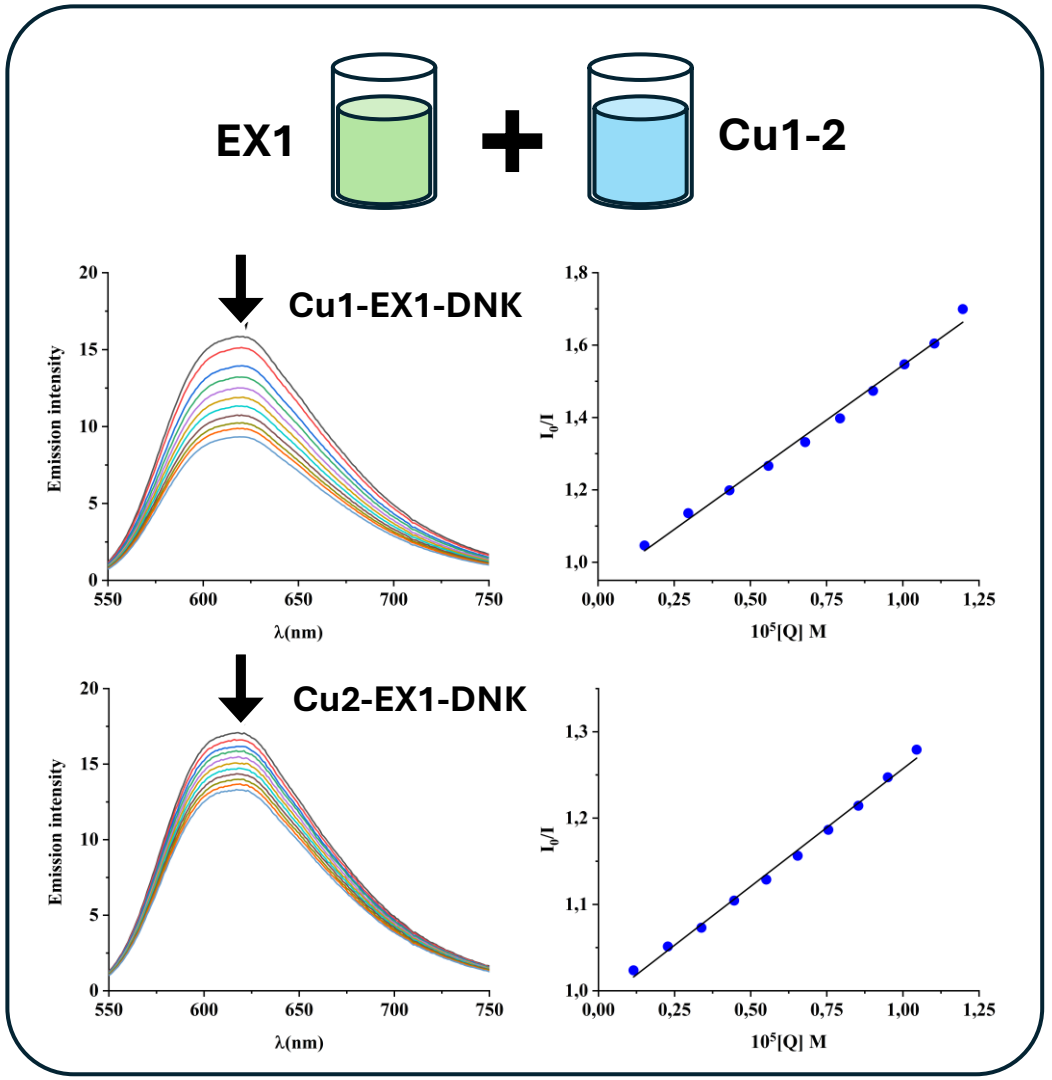
DNA interactions





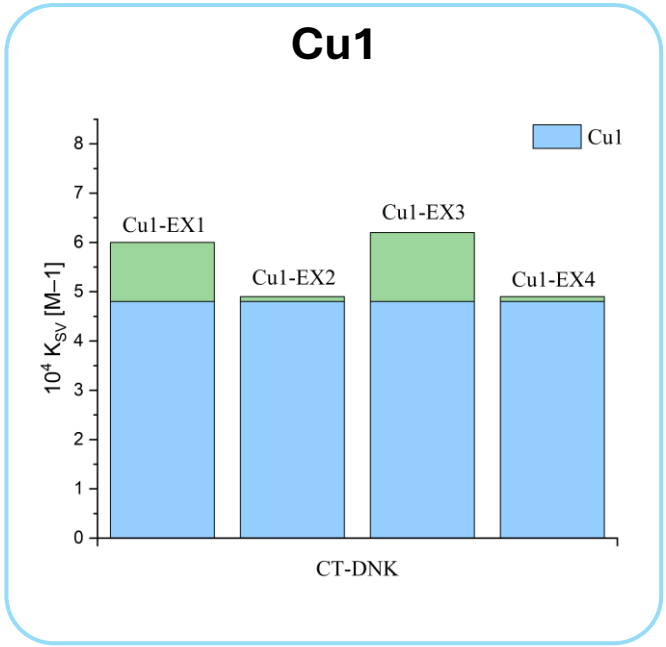
DNA interactions

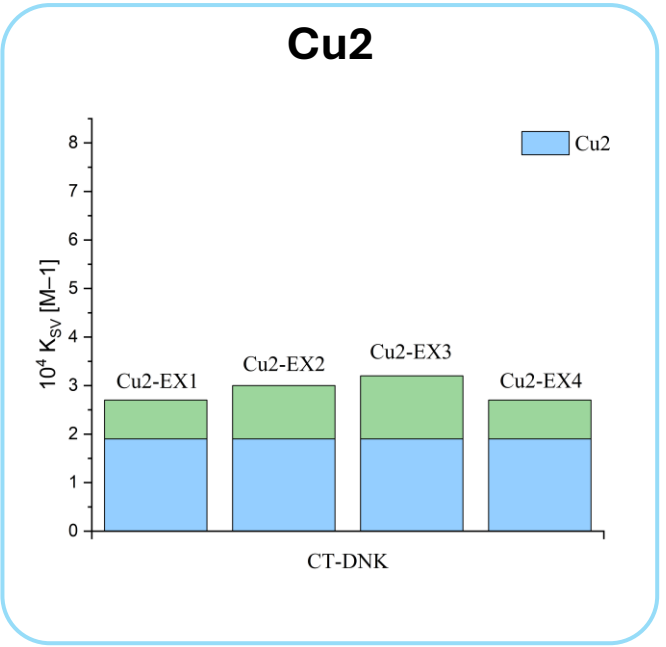




DNA interactions

DNK	Cu1	Cu2
	$10^4 K_{sv}$ [M^{-1}]	$10^4 K_{sv}$ [M^{-1}]
	4.8±0.1	1.9±0.1
EX1	6.0±0.1	2.7±0.1
EX2	4.9±0.1	3.0±0.1
EX3	6.2±0.1	3.2±0.1
EX4	4.9±0.1	2.7±0.1





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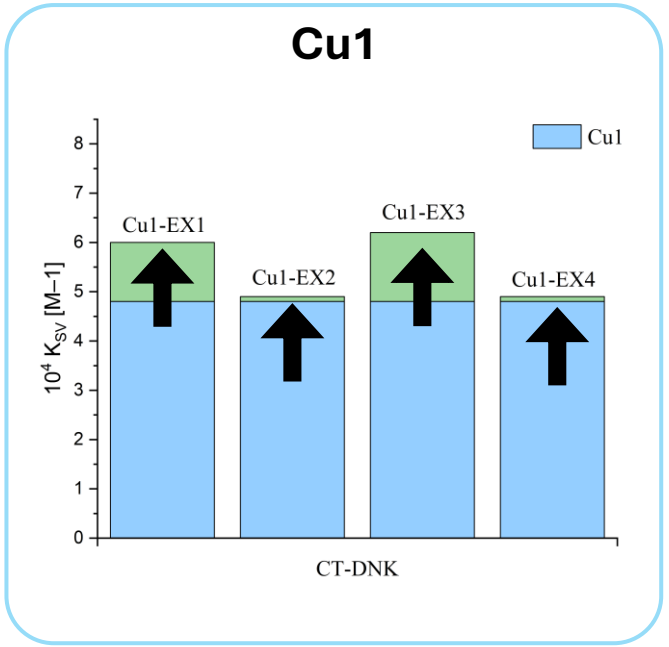
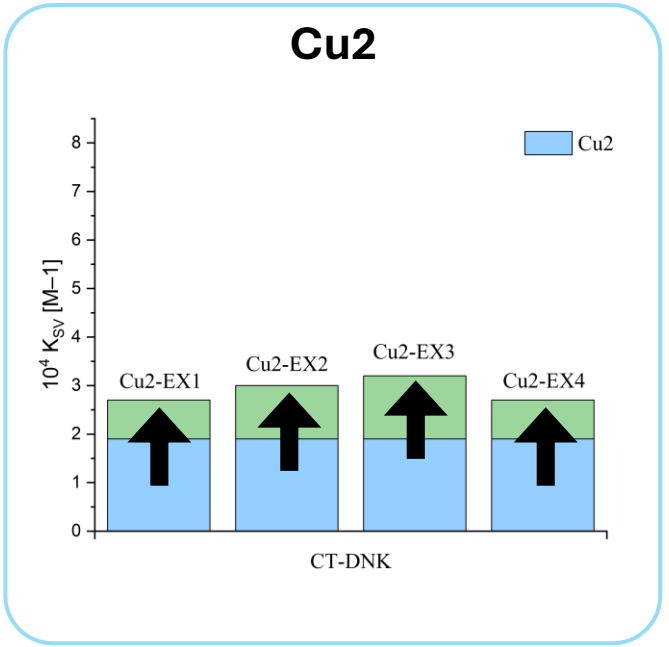
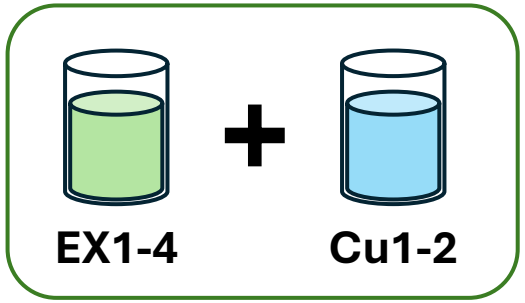
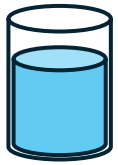


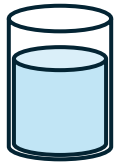


Protein (HSA) interactions





EX1-4 (0,5mg/l)
Cu1-2 (0,1mM)

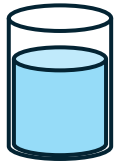


HSA (2 μM)

increasing the concentration of the copper complexes (up to a molar ratio of 1.25)

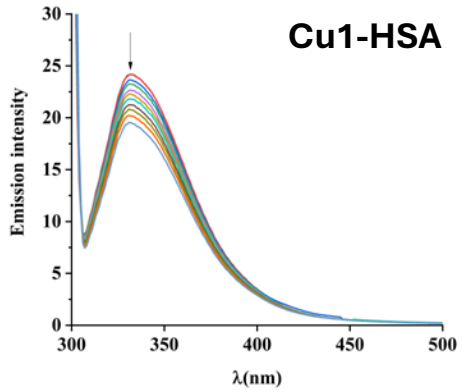
fluorescence spectroscopy

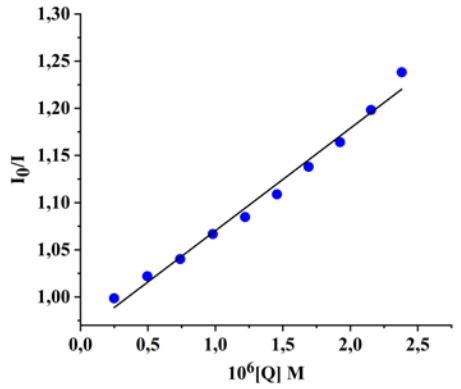
Protein (HSA) interactions



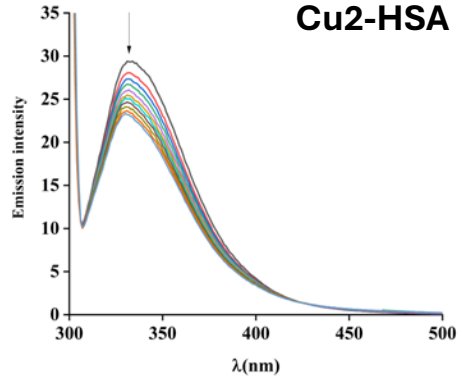
Cu1-2

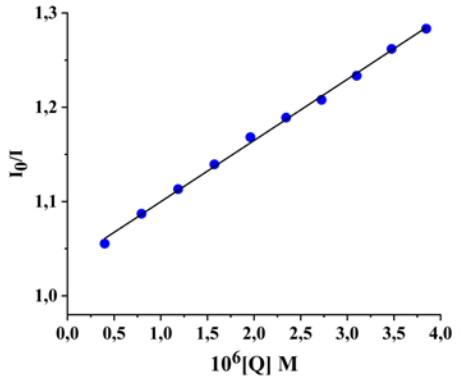
Cu1-HSA



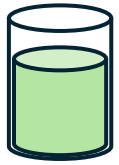


Cu2-HSA





EX1



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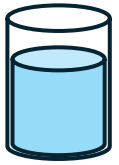
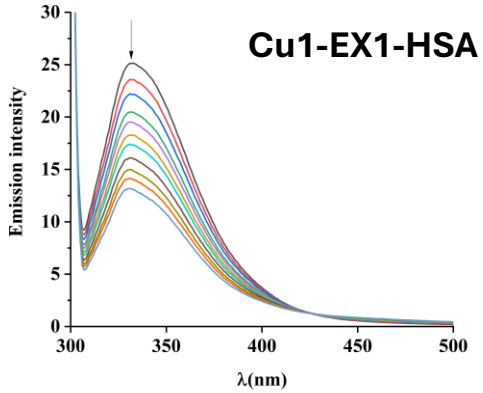
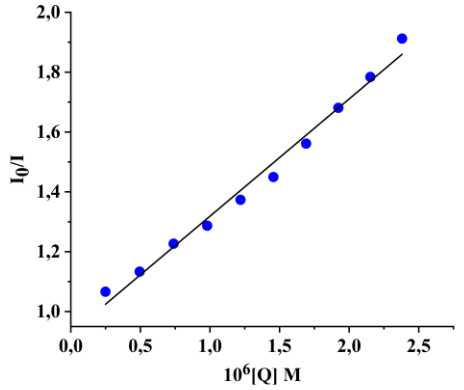


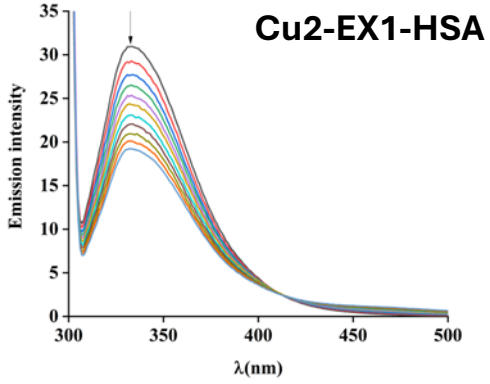
Cu1-2

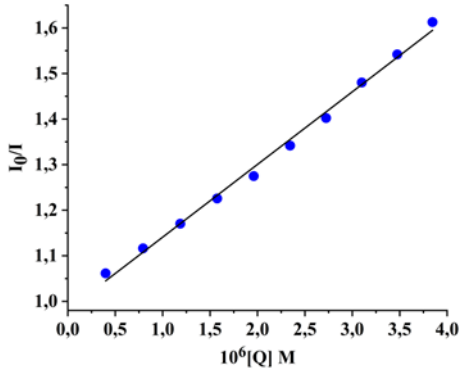
Cu1-EX1-HSA





Cu2-EX1-HSA





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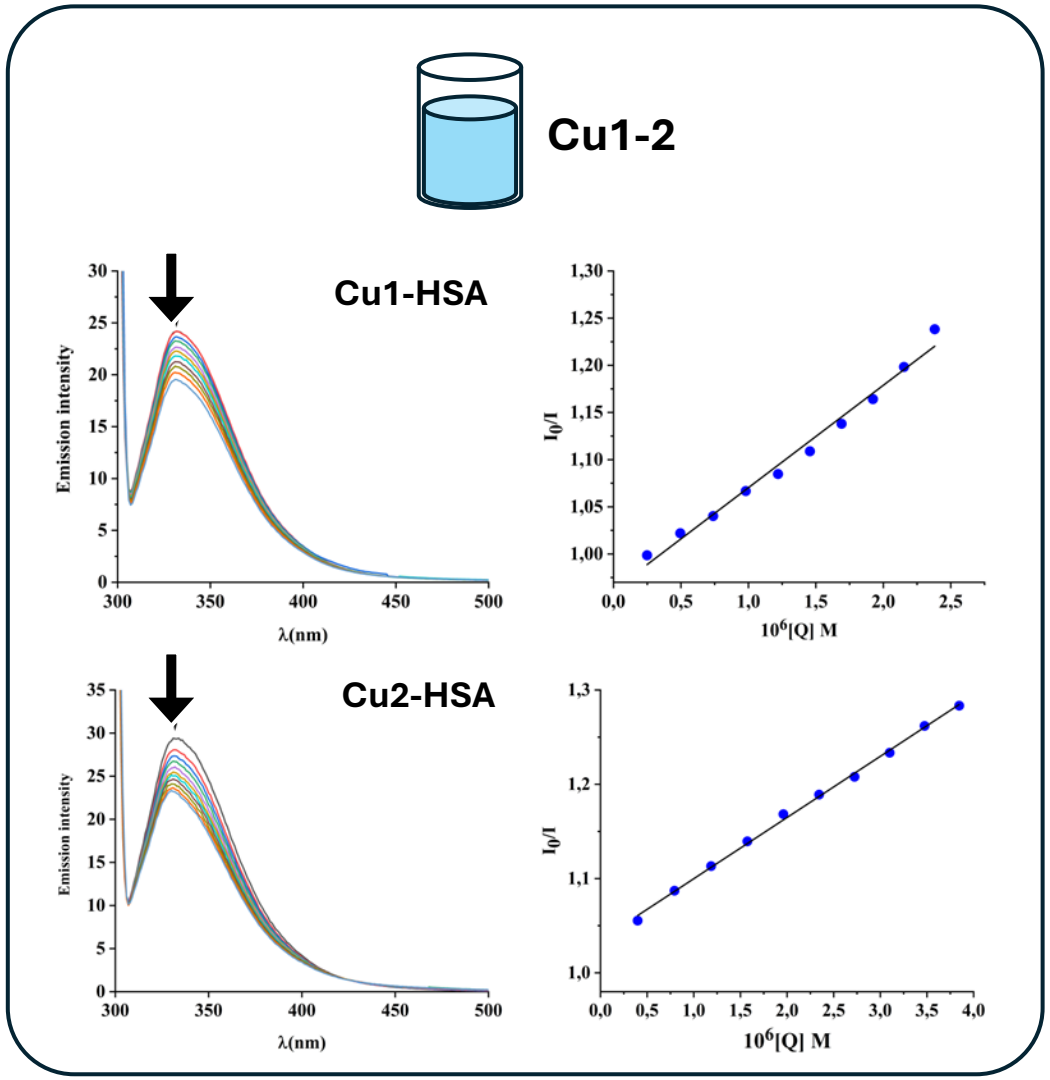

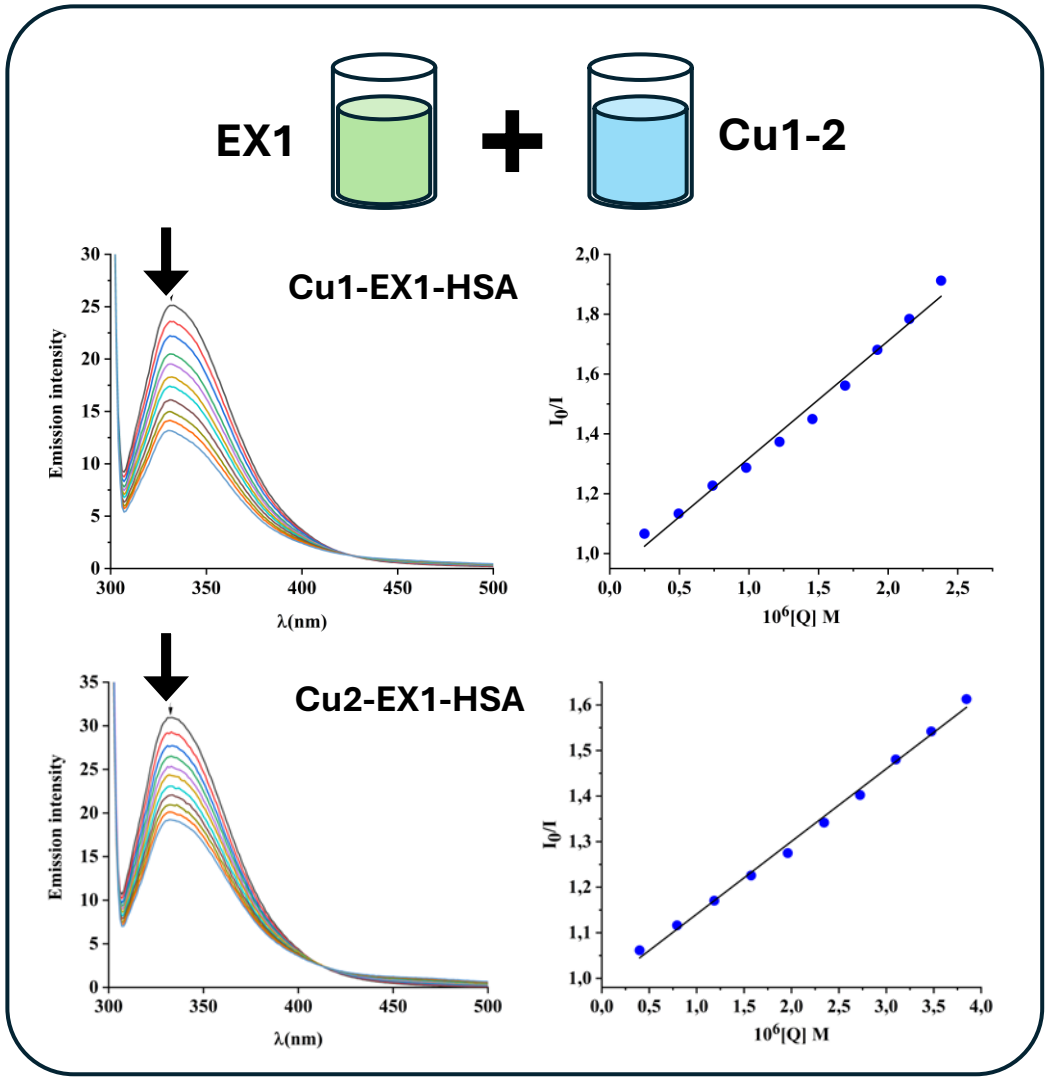

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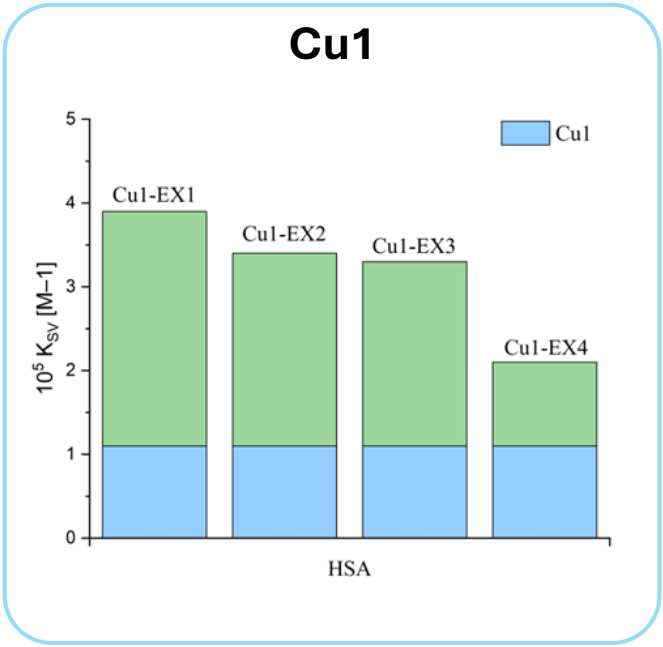

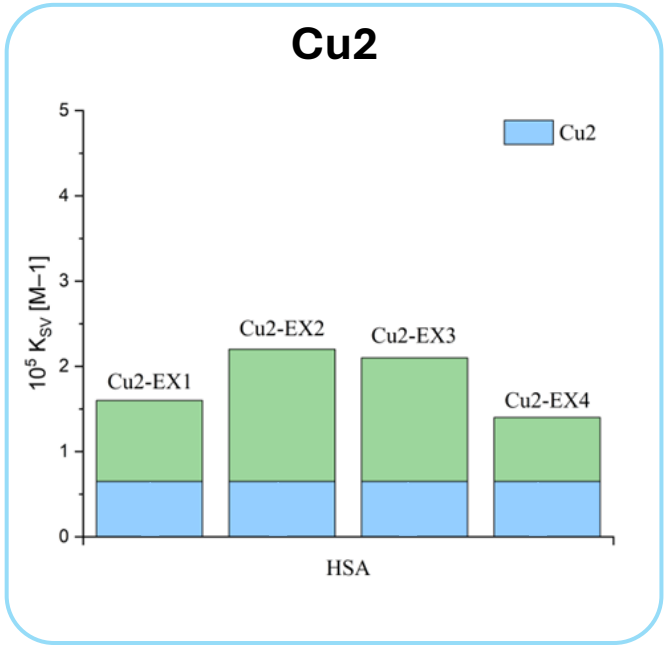

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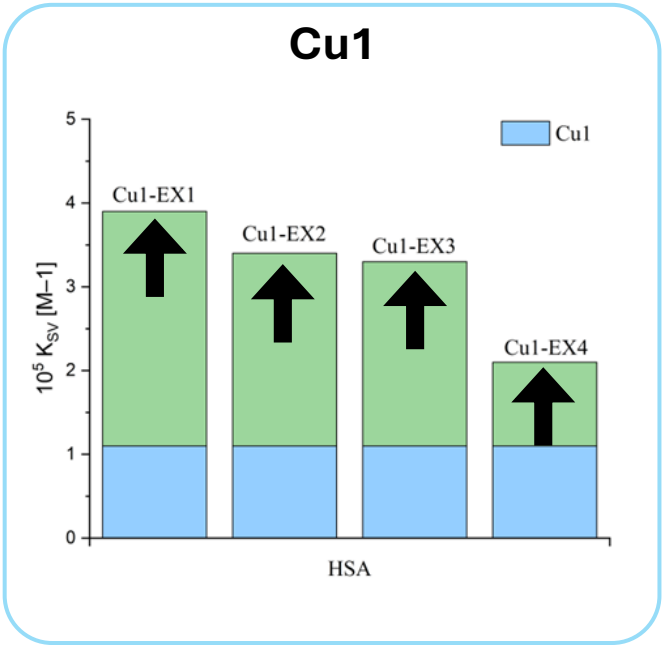

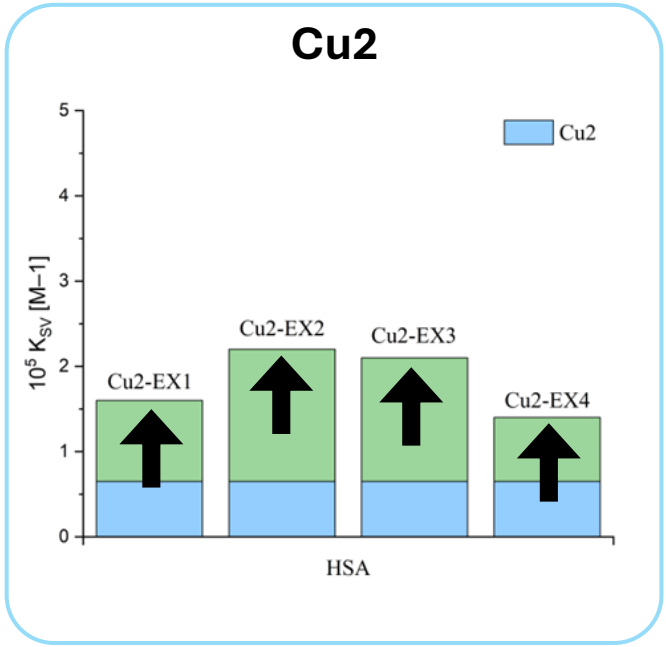

Discussion and Future Research

Structure matters

Cu1, the Schiff base, consistently binds stronger than **Cu2** because its geometry allows better access to DNA and protein binding pockets.

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Building on these promising results, several research directions are worth pursuing: the synthesis of similar ligands and complexation with other metal ions, as well as the investigation of antimicrobial and antitumor activities.

Thank you for your attention.





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Special thanks to all my colleagues and mentors for their guidance, collaboration, and encouragement during this work.