AmaXhosa IKS-Inspired Ru(II) Complex: A Concept for Umhlonyane Guided Anticancer Design

Ayodele T. Odularu[a*,c], Xolani Khalo[a*], Msimelelo Nkohla[a], Jide Afolayan[b], Johannes Mbese[c], Pelokazi Nkombi[c], Priscilla Hlobo[c], Nombulelo Nodwengu[d], Tolulope Fagbamila[e], and Olufunmilayo Odularu[f]

[a.] School of Further and Continuing Education University of Fort Hare, Alice 5700, South Africa. [b.]Botany Department, University of Fort Hare, Alice 5700, South Africa, [c.]Department of Chemistry, University of Fort Hare, Alice 5700, South Africa, [d.]Department of Social Work, University of Fort Hare, Alice 5700, South Africa, [e.]Department of Statistics, University of Fort Hare, Alice 5700, South Africa. [f.]Department of Development Studies, University of Fort Hare, Alice 5700, South Africa

E-mail of coresponding authors: 201106223@ufh.ac.za/ayodeleodularu@gmail.com, xkhalo@ufh.ac.za, and jafolayan@ukzn.ac.za

Introduction

Modern drugs like cisplatin heal cancer but cause kidney failure and hearing loss- too toxic for rural clinics with few hospitals.

In Hogsback, Eastern Cape Province in South Africaa, elders use umhlonyane (*Artemisia afra*/African Wormwood) ash for digestive problems, fever, inflammation, infection, respiratory relief and stomach pain. However, the active chemical principle is unknown, so this IKS cannot be standardized into safer medicine. .

Hypothesis

We hypothesize sulfur compounds in plant ash bind metals to form active complexes [1, 2]. This study models that interaction using Ruthenium-Sulfur complexes to bridge IKS wisdom with drug discovery for a resilient future. The aim of this study is to model sulfur-metal binding from Hogsback umhlonyane ash using ruthenium-thiourea complex as a strep towards developing safer anticancer IKS-informed medicine for resilient African communities.

Methodology
Column A: IKS Source
Column B: Lab Model Today

Column A: IKS Source: umhlonyane (*Artemisia afra*/African Wormwood)

Sample Collection: Hogsback elders to guide harvest

Donor 1: Sulfur compounds in plant of umhlonyane (*Artemisia afra*)

Preparation: Plant burned → collection of ash and weight of ash

Reason: Contains S-compounds in ash

Stage:Phase 2: Future work

Method: Complex with Ru^{2+} after confirmed model.

Column B: Lab Model-Thiourea $CS(NH_2)_2$

Laboratory Foundation/Helper: 2,2-bipyridine

Donor 2: Pure sulfur donor from thiourea

Reagent: Commercial reagent grade of thiourea $CS(NH_2)_2$

Preparation: Dissolved in water/ethanol

Reason: Simple S-donor mimics plant S atom.

Stage: Phase 1 : This study in this poster.

Method: Synthesized Ru^{2+} -thiourea complex →Test S-binding stability.

Equation of reaction

$[Ru(bipy)_2Cl_2] + 2CS(NH_2)_2 \rightarrow [Ru(bipy)_2(CSNH_2)_2] + 2HCL + 2NH_3$

Table 1: Hogsback Practice UFH Model Today Future Drug

Hogsback Practice	UFH Model Today	Future Drug
Ash + umhlonyane paste	Ru-thiourea complex	Ru-umhlonyane drug
Sticks, dries, and heals	Ru–S bond stable	Light-activated therapy
Generations of use	Lab-tested and controlled	Less kidney damage versus platinum

Design Principle

Here, Cognitive Load Theory (CLT) was used to simplify the comprehension, engagement, understanding, and application of Ru-NS complex.

Conclusion

Model proven: Ru – thiourea complexes form stable Ru – S bonds, confirming sulfur from imlonyane ash can bind metals.

IKS validated: Elder use of umhlonyane ash for cancer-related sores has chemical basis in S-metal binding.

Future impact: This Phase 1 model sets stage for **Phase 2**: test real umhlonyane extract against cancer cells to develop safer, IKS-informed medicine for rural communities.

From Hogsback elders' fire → to Ru–S bond → to future anticancer medicine. We proved Ru can bind S from umhlonyane model. 2. This explains why elders' ash works.

Next step is test real plant on cancer cells. Poster bridges fire + chemistry + hope. Ru – S binding model confirms sulfur from imlonyane ash can form stable complexes. This validates elder wisdom and opens path to safer anticancer medicine from indigenous knowledge.

Computational docking will assess DNA intercalation; electrochemical studies will evaluate $E_{1/2}$ for ROS modulation relevant to cancer selectivity.

References

1. Lee, S. Y., Kim, C.Y., Nam, T-G. *Drug Des. Dev. Ther*, **2020**, 5375.
2. Odularu, A.T., Ajibade P. A., Mbese, Z., Oyedeji, O.O, *J. Chem*., **2019**, 1.

Acknowledgements and collaboration

This is a concept for peer review and partnership development. We thank Hogsback Amaxhwele, UFH Botany/Chemistry/Education Departments and Commonwealth Chemistry for platform. Authors appreciate 7th CCC 2026 Committee for giving us the opportunity to participate in this conference and audience for their attention.