Application of Griesbaum Co-ozonolysis in the Synthesis of Iron-Sensitive Conjugates of 1,2,4-Trioxolanes as Anticancer and Antiparasitic Agents

A Dual Strike Against Cancer and Malaria – How Chemists Are Designing the Next Generation of Drugs

The goal of our project is to develop new chemical compounds that can target both cancer cells and disease-causing parasites. Sounds like science fiction? It's an ambitious yet realistic path for the future of medicine.

What exactly are we going to study?

- We will design and synthesize new molecules based on **1,2,4-trioxolanes** (stable ozonides)-compounds that contain a unique peroxide bond, selectively activated by iron in cells.
- These molecules will be combined with natural drugs such as **salinomycin** and **artemisinin** (the latter awarded the Nobel Prize for its role in malaria treatment) to create hybrids with enhanced activity.
- In collaboration with national and international research institutions, we will test their activity against **cancer cells** and **malaria parasites**, assessing their **efficacy**, **selectivity**, and **mechanism of action**.

What do we aim to achieve?

- Discover compounds that can kill **treatment-resistant cancer cells** by triggering **ferroptosis**-a form of iron-dependent cell death.
- Identify new **antimalarial agents** effective against **drug-resistant parasite strains**, a growing problem especially in Africa.
- Develop **safer alternatives** to currently used toxic antiparasitic drugs.
- Create **chemical building blocks** that could serve as the foundation for future drug development.

Why is this important?

Cancer and malaria remain among the most dangerous diseases of the 21st century, and resistance to existing therapies is increasing. In 2023 alone, there were approximately **21.2 million new cancer cases** and **11.1 million cancer-related deaths**. Malaria affected around **263 million people**, with **597,000 deaths**.

Our project demonstrates how **medical chemistry**-with its precision and creativity-can deliver solutions beyond what biology and medicine alone can currently offer.