Opinion Article

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Design and Evaluation of Silver-Integrated N-Heterocyclic Carbene Complexes as Potential Anticancer Agents

Harrison Andrew*

Department of Analytical Chemistry, University of Wollongong, Wollongong, Australia

Corresponding author: Harrison Andrew, Department of Analytical Chemistry, University of Wollongong, Wollongong, Australia, E-mail: andrehari@uow.au

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Description

The hindrance of cell multiplication has arisen as an essential area of survey in the journey to encourage compelling malignant growth medicines. Cancer is still one of the leading causes of death worldwide, despite significant advancements in anticancer drug development over the past fifty years. The need for novel, highly effective and least toxic anticancer medications has been emphasized by the worldwide rise in cancer cases. Among the different methodologies being investigated, N-Heterocyclic Carbene (NHC) metal edifices have shown significant commitment because of their flexibility and likely restorative applications. Progress metal NHC edifices, specifically, stand out as expected possibility for disease treatment. The stability of these complexes and their capacity to form strong bonds with metals are well-known features that can enhance biological activity. In this field of study, silver(I) complexes in particular have emerged as a major focus. The one of a kind properties of silver(I) edifices, including their anticancer, antimicrobial and antiviral exercises (eminently against SARS-CoV-2), have settled on them a convincing decision for additional investigation in the improvement of new anticancer specialists.

Reactive oxygen species

One of the critical purposes behind the developing interest in Silver-NHC (Ag-NHC) buildings is their true capacity as anticancer specialists. Due to the complexes' controlled, slow release of silver ions, studies have shown that these complexes can be effective anticancer agents. This progressive delivery is pivotal as it guarantees supported cytotoxic impacts while limiting the gamble of harmfulness, which is a typical test in metal-based treatments. Ag-NHC complexes' controlled ion release makes them attractive for cancer treatment, where prolonged and targeted action is frequently required. Late exploration has zeroed in broadly on the amalgamation and assessment of the anticancer capability of Ag-NHC buildings. Different exploration bunches have announced that these buildings show critical anti-cancer movement against numerous disease cell lines. The level of action shifts, for certain buildings showing moderate impacts, while others exhibit brilliant viability. Multiple biological processes are involved in the multifaceted and fundamental Ag-NHC complex anticancer effects. The production of Reactive Oxygen Species (ROS) is one of the primary mechanisms by which Ag-NHC complexes inhibit cancer cell proliferation. ROS are molecules that react chemically and play a role in homeostasis and signaling in cells. However, ROS can cause significant damage to DNA, proteins and lipids, among other cellular components, when produced in excess.

Ag-NHC complexes

Oxidative stress is brought on by the redox imbalance in cancer cells that is disrupted by the ROS produced by Ag-NHC complexes. In turn, this oxidative stress stops DNA replication, which is necessary for cell growth. By impeding DNA replication, Ag-NHC edifices actually stop the development of malignant growth cells. One more significant part of the anticancer movement of Ag-NHC edifices is their capacity to straightforwardly cooperate with DNA. These complexes' cytotoxic effects are further enhanced by the silver ions' ability to bind to DNA *via* disulfide bonds. The addition of silver to these complexes improves their capacity to bind to DNA, increasing their overall efficacy as cancer treatments. Additionally, Ag-NHC complexes are a safer option for clinical development due to silver's relatively low toxicity in comparison to other metals utilized in anticancer therapies. In the current review, specialists expected to plan and orchestrate new silver-consolidated NHC buildings with possible applications as anticancer medications. Three stable NHC ligands were planned and their relating silver buildings were integrated. The level of viability shifted among the different cell lines, however by and large, the edifices showed guarantee as likely anticancer specialists. These complexes' capacity to stifle cell division and cause cytotoxicity in cancer cells suggests that further research could turn them into potent therapeutic agents.