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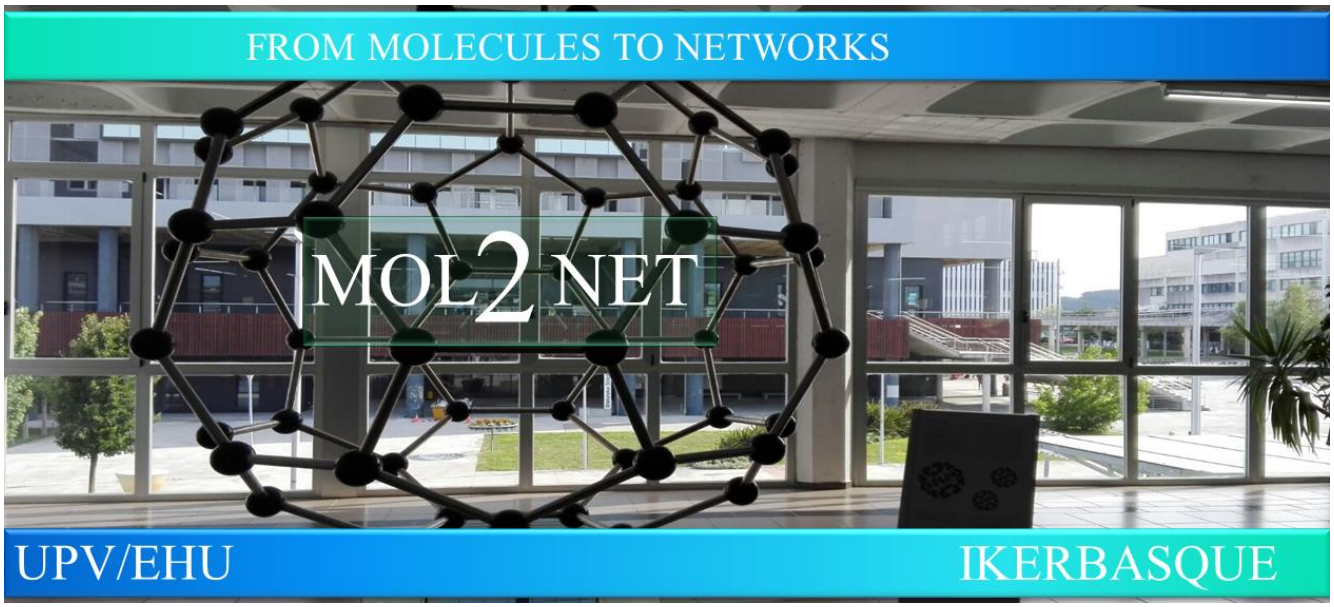


# Nanotechnology Applied to Anticancer Drug Delivery Systems

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**Abstract.**

In the last four decades, nanotechnology has gained a lot of importance with no sign of slowing down. Nanoparticles have made it possible to significantly extend the shelf lives of food product, improve intracellular delivery of hydrophobic drugs and so on. The improvement that nanotechnology has reached in the field of anticancer agents and new drug delivery systems will be seen.

In the last four decades, nanotechnology has gained a lot of importance with no sign of slowing down. The application of inventions or products from nanotechnology has revolutionized all aspects of everyday life ranging from medical applications to its impact on the food industry. Nanoparticles have made it possible to significantly extend the shelf lives of food product, improve intracellular delivery of hydrophobic drugs and so on. In this context, the improvement that nanotechnology has reached in the field of anticancer agents and new drug delivery systems will be seen.

To begin with, Mochamad Zakki Fahmi *et al.* [1] studied chalcone loaded carbon dots (CDs) nanomaterials for enhancement of anticancer and bioimaging potencies. CDs have great optical ability and outstanding biocompatibility. In this work, the authors reported a new design of chalcone-loaded carbon dots (Chalcone-APBA-CDs) to serve chalcone transport onto cancer cells and enhance the CDs bioimaging and antitumor activity. To do so, the boronic acid was directly introduced to carbon dots via pyrolysis process to drive CDs specifically to the cancer cell, and chalcone was mediated on CDs by ultrasonication to perform facile release of the drug delivery model. After synthesizing the particles were tested by different analysis, and, flow cytometry and confocal fluorescent imaging proved CDs' cellular uptake and imaging performance. *In vitro* analyses further proved that the Chalcone-APBA-CDs exhibited a higher toxicity value than bare CDs and efficiently inhibited the proliferation of the HeLa cells depending on their dose-response. Finally, the performance of Chalcone-APBA-CDs on cancer healing capability was examined *in vivo* with fibrosarcoma cancer-bearing mice, which showed a remarkable ability to reduce the tumour volume compared with saline (control). This result strongly suggested that the Chalcone-APBA-CDs appear promising simultaneously as cancer cell imaging and drug delivery.

Additionally, Salma T. Rafik *et al.* [2] reviewed organic nanodelivery systems as a new platform in the management of breast cancer. Effective diagnostic and treatment strategies in breast cancer are indeed urgently required for improving cure rates among patients. In fact, current therapeutic modalities have many limitations and side effects. Fortunately, nanomedicine is evolving as a promising approach for cancer management. In fact, various types of organic and inorganic nanomaterials have been investigated for their role in breast cancer diagnosis and treatment. The authors made an overview on breast cancer characteristics and pathogenesis and challenges of the current treatment strategies, the therapeutic potential of biocompatible organic-based nanoparticles such as liposomes and polymeric micelles that have been tested in breast cancer models. Given the increasing role of combination therapy in cancer treatment, they stated that it is likely nanodelivery systems will play an increasingly important role in the armamentarium for breast cancer treatment.

Lastly, Danni Yan *et al.* [3] studied nanoparticulate anticancer drug delivery systems based on ferroptosis. Ferroptosis is a new type of cell death discovered in recent years that distinguishes from apoptosis and necrosis, mainly caused by the imbalance between the production and degradation of lipid reactive oxygen species in cells. Ferroptosis is involved in the occurrence and development of a variety of diseases such as nervous system diseases, cardiovascular diseases and cancer. That is why inhibiting or inducing the occurrence of ferroptosis could intervene in related diseases. As nanotechnology has been widely used in the development of nanodrug delivery systems, the authors reviewed outlines current the advance on the intersection of ferroptosis and biomedical nanotechnology.

In conclusion, the utilization of nanotechnology has experienced significant growth in the realm of healthcare, particularly in the field of cancer treatments. This can be attributed to the numerous

benefits that nanoparticles offer, which contribute to the advancement of therapies. As a result, nanotechnology has not only influenced the global quality of life, but also the global economy. However, it is imperative to carefully examine the potential consequences of prolonged exposure to nanoparticles as a result of the increased usage of nanotechnology.

## References

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