Guided Missiles: Nanoparticles Enhancing Cisplatin's Cancer-Fighting Accuracy

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Background: Cancer remains a major global health challenge. Conventional treatments often have limited efficacy and severe side effects. Targeted nanomedicine offers hope by precisely delivering therapies to cancer cells while sparing healthy tissues. Recent efforts have focused on advancing cisplatin-based cancer therapies using nanotechnology. Cisplatin is potent but limited by toxicity. Specialized nanoconjugates aim to encapsulate cisplatin in controlled-release systems to reduce systemic toxicity and optimize tumor-specific delivery. Advances include laser-stimulated cisplatin nanoconjugates that enable controlled localized cisplatin release at tumor sites. Other approaches use ligand-decorated nanocarriers to target cancer cell receptors or combat therapy resistance. Exploring metallodrug nanodelivery also seeks to enhance effectiveness while mitigating toxicity. New nanotechnology methods that can precisely target cancer cells give hope for more effective and safer cancer therapies.

Aim and Objectives: We aim to explore the applications, benefits, challenges, and future prospects of nanomedicine in cancer diagnosis and therapy. The specific objectives include:

- Review recent advances in ligand-targeted cisplatin nanocarriers for improved tumor delivery
- Assess strategies to overcome cisplatin resistance using targeted nanodelivery

- Highlight promising results of ligand-nanocarrier systems in improving drug delivery and anticancer efficacy
- Summarize efforts to develop ligand-decorated nanocarriers to overcome cisplatin resistance and toxicity
- Discuss various ligands used to decorate nanocarriers and target overexpressed receptors on cancer cells

Conclusions:

Cisplatin-based nanomedicine holds a lot of promise, but it still faces some tough challenges. Future directions include understanding nano-biointeraction, developing stimuli-responsive or actively-targeted nanomedicines, optimizing combination therapy, and exploring novel combinations targeting tumor microenvironment and immunotherapy.