

# Cisplatin-Induced Cellular Toxicity and its Mechanisms of Action

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**Abstract:** Cisplatin is a highly effective platinum-based chemotherapeutic agent widely used in the treatment of solid tumors, including cancers of the testis, ovary, bladder, lung, head and neck, and other malignancies. Its anticancer activity primarily results from the formation of platinum-DNA adducts that interfere with DNA replication and transcription and activate cellular DNA-damage responses. However, cisplatin also produces substantial toxicity in normal cells and tissues. Cellular toxicity involves a complex interaction among DNA damage, oxidative stress, mitochondrial dysfunction, endoplasmic reticulum stress, inflammatory signaling, cell-cycle arrest, apoptosis, necrosis, autophagy, senescence, and regulated forms of cell death. Cisplatin enters cells through passive diffusion and transporter-mediated mechanisms, including copper transporter 1 and organic cation transporter 2 in renal cells. Intracellular activation produces reactive platinum species that bind DNA and cellular proteins.

**Keywords:** Cisplatin, cellular toxicity, DNA damage, oxidative stress, apoptosis, mitochondrial dysfunction, ER stress, inflammation, ferroptosis, chemotherapy.