IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 3, October 2025
Impact Factor: 7.67

Investigation of Anti-Oral Cancer Drugs and Their Modulation by Vitamin C and Natural Supplements in Macrophage Cell Lines

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Abstract: *Carcinoma in the HNS region is the 6th most common cancer globally, with a high mortality rate. In India, cancer incidence could exceed 1.7 million by 2035, as enrollment is not mandatory. Combined therapies—chemotherapy, radiation, and surgery—are enhancing survival rates. Macrophages are crucial for immune surveillance, and vitamin C can boost the immune system and reduce DNA damage. Citrus fruits, abundant in vitamin C and other nutrients, contribute to cancer defense and may help mitigate side effects in treatments involving cisplatin, a common chemotherapy drug. This Research explores citrus fruits' nutritional and medicinal benefits, particularly their antibacterial and antioxidant properties and macrophage protectivity. Cisplatin has a mortality rate of 50% at conc. between 0.188 and 0.944 ± 0.1678 mg/mL after 24 hours of incubation. In studies with different citrus fruit extracts on macrophage cells J774A1, a concentration of 0.09375 ± 0.189 mg/mL of cisplatin resulted in 14.73% cell viability. When macrophages were treated with citric acid, ascorbic acid, and D-limonene, the results showed improved cell viability: ascorbic acid combined with cisplatin enhanced viability by 40%, citric acid improved it by 30-40%, and D-limonene significantly increased it by 80-90%. Vitamin C is noted for enhancing the efficacy of macrophage cells when combined with several anticancer drugs, including cisplatin. It has protective effects against cisplatin-induced cytotoxicity. Limonene, found in citrus fruits, may reduce inflammation by inhibiting pro-inflammatory mediators in macrophages. A concentration of 0.0058 mg/ml shows over 80% cell viability, while 0.125-0.015 mg/ml results in over 97% viability. In contrast, cisplatin without vitamin C causes 80-90% cell toxicity, but adding it maintains 80-90% viability, highlighting its protective effect. This study explored the effects of commonly used anti-oral cancer drugs, both alone and in combination with Vitamin C and its natural supplements, on a macrophage cell line. My findings suggest that the presence of Vitamin C and its natural derivatives can modulate the efficacy of these drugs, potentially influencing macrophage activity and immune response. The results indicate a complex interaction between chemotherapy agents and antioxidants, which may have significant implications for cancer treatment strategies. While Vitamin C has been widely recognized for its antioxidant and immune-boosting properties, its role in combination with anti-oral cancer drugs requires further investigation to determine optimal therapeutic approaches. Future studies should focus on detailed molecular mechanisms and in vivo models to validate these findings and assess their clinical relevance in oral cancer treatment.*

Keywords: Oral Squamous Cell Carcinoma (OSCC), Vitamin C, Cisplatin, Macrophage Cell Viability, Antioxidant Therapy

DOI: 10.48175/568