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Roles of Liposomes in the Treatment of Hematological Malignance: Advance and Future Direction

Mayur S.Chaudhari[1], Harshada A.Patil[1], Harshada H.Girase[1], Dr. Nitin G. Haswani[2], Megha S Jadhav[1]

1. *Department of Diploma Pharmacy, R C Patel Institute of Pharmaceutical Education and Research, Shirpur, Maharashtra, India, 425405*
2. *Principal, R C Patel Institute of Pharmacy, Shirpur, Maharashtra, India, 425405*

*Corresponding authors: Miss Megha S Jadhav, Asst. Professor, Department of Pharmaceutics (D. Pharmacy), R. C. Patel Institute of Pharmaceutical Education and Research, Shirpur India 425205

Email Id: serviceheb@gmail.com

ABSTRACT-

Haematological malignancies, including leukemias, lymphoma, and multiple myeloma, remain a significant clinical challenge due to their complex pathophysiology and resistance to conventional therapies. Liposomes a nanoscale lipid-based vesicle have emerged as promising drug delivery systems that enhance the therapeutic index of anticancer agents by improving bioavailability, reducing systemic toxicity, and enabling targeted delivery. Over the past two decades, liposomal formulations have gained considerable attention in the treatment of blood cancers, with several liposome-based chemotherapeutics, such as liposomal doxorubicin, achieving clinical approval. This review explores the current advancements in liposome technology, including PEGylation, active targeting strategies, and stimuli-responsive systems, and how these innovations have enhanced treatment outcomes in hematologic cancers. Furthermore, the paper discusses ongoing clinical trials, emerging preclinical data, and the challenges that limit broader clinical application, such as drug loading efficiency, stability, and immune clearance. Finally, we highlight future directions in the field, including multifunctional liposomes, personalized nanomedicine approaches, and the integration of liposomes with immunotherapy and gene editing technologies. Together, these developments signify a transformative shift in the therapeutic landscape of hematological malignancies, offering renewed hope for improved survival and quality of life.

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