Modified glycol chitosan nanocarriers carry hydrophobic materials into tumours

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Development of efficient delivery system for hydrophobic drugs remains a major concern in chemotherapy. The objective of the current study is to develop polymeric drug-delivery system for etoposide from amphiphilic derivatives of glycol chitosan, capable to improve the pharmacokinetics and to reduce the adverse effects of etoposide due to various organic solvents used in commercial formulations for solubilization of etoposide. As a promising carrier, amphiphilic derivatives of glycol chitosan were synthesized by chemical grafting of palmitic acid N-hydroxysuccinimide and quaternization to glycol chitosan backbone. To this end, a 7.9 kDa glycol chitosan was modified by palmitoylation and quaternisation into 13 kDa. Nano sized micelles prepared from this amphiphilic polymerhad the capability to encapsulate up to 3 mg/ml etoposide. The pharmacokinetic results indicated that GCPQ based etoposide formulation transformed the biodistribution pattern. AUC 0.5-24 hr showed statistically significant difference in ETP-GCPQ vs. commercial preparation in liver (25 vs 70, $p<0.001$), spleen (27 vs. 36, $P<0.05$), lungs (42 vs. 136, $p<0.001$), kidneys (25 vs. 30, $p<0.05$) and brain (19 vs. 9, $p<0.001$). Using the hydrophobic fluorescent dyeNile red, we showed that micelles efficiently delivered their payload to MCF7 and A2780 cancer cells in-vitro and to A431 xenografttumor *in-vivo*, suggesting these systems could deliver hydrophobic anti-cancer drugs such as etoposide to tumors. The pharmacokinetic results indicated that the GCPQ micelles transformed the biodistribution pattern and increased etoposide concentration in the brain significantly compared to free drug after intravenous administration. GCPQ based formulations not only reducedside effects associated with current available formulations but also increased their transport through the biological barriers, thus making it a good delivery system.

Speaker Biography

Akhtar Aman has completed his PhD from Peshawar University under Hec Scholarship. During his PhD studies, he also worked as Visiting Scientist at Center for Cancer Medicine, School of Pharmacy, University College London, UK. He is currently serving as Assistant Professor of Pharmaceutics at Shaheed Benazir Bhutto University, Sheringal, Pakistan. He has published more than 10 papers in reputed journals

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