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Lymphatic drug/siRNA delivery using Solid lipid nanoparticles (SLNs)

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Lymph nodes play a key role in cancer prognosis and metastasis. Indeed a number of cancers metastasize through the lymphatics, entering the systemic circulation resulting in the development of new tumours in other parts of human body [1]. However, it is very difficult to deliver appropriate therapies to the lymphatics using traditional administration routes (e.g. intravenous route) due to poor lymph node uptake and lymphatic absorption.

To address this issue, drug delivery systems can be employed: for example, colloidal systems (e.g. liposomes, lipid nanoparticles and polymeric nanoparticles) have the potential to deliver active substances to lymphatics via subcutaneous, intramuscular, or intraperitoneal injection[2]. However such systems need to be appropriately designed. For example, previous studies have shown that physicochemical characteristics including particle size, surface charge and hydrophobicity, determine the efficiency of lymphatic absorption and the distribution of colloidal systems within the lymphatics [3]. Given that the diameter of narrow aqueous channels in the interstitium is around 100 nm, a colloidal size larger than 100 nm will give low lymphatic absorption, whilst particles less than 10 nm go to the blood through blood capillaries. Thus, a particle size between 10 nm to 100 nm may be optimal to transfer across the channels from the injection site to the lymph node. Other attributes that will require consideration include the surface characteristics of the particles and their drug payload.

Thus the aim of this project is to design solid lipid nanoparticles (SLNs) to target cancer cells in the lymphatics and act as drug/gene delivery systems or image delivery systems to target the lymph node.

References

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