Protein-based biodegradable nanoparticle with stealth properties and reduced toxicity suitable for diagnostic imaging, drug delivery and theranostic treatment approaches.

- Nanoparticle platform technology
- High payload carrier for targeted diagnostic imaging agent and drug delivery
- Protein-based and biodegradable
- Stealth properties allowing improved blood circulation time

THE CHALLENGE

Nanoparticle-based carrier platforms have emerged as a suitable strategy for overcoming limitations associated with conventional molecular imaging agents and drug formulations. The main obstacle associated with the nanoparticles is that they are strongly taken up by the Mononuclear Phagocytic System (MPS), leading to accumulation in the macrophages of MPS organs and fast clearance from circulation. Moreover, non-degradable nanoparticles can lead to long-term toxicity.

Current generation nanoparticles are engineered to have low fouling characteristics and are able to escape MPS, by coating them with or making the particles out of polymers that have stealth properties. Poly ethylene glycol (PEG) is the gold standard polymer for this purpose. However, there are increasing concerns regarding the biocompatibility of PEG. Several recent studies show that injection of PEG into systemic circulation is associated with significant toxicity.

The most notable drawback of the unnatural PEG polymer is its lack of biodegradability and increasing concerns regarding PEG-related cellular vacuole formation.

There is a clear need for nanoparticles based on more natural materials that have good stealth or low fouling properties and are biodegradable.

THE TECHNOLOGY

Proline-Alanine-Serine-Lysine (PAS) polypeptides has proposed as a biological alternative to PEG with similar stealth and biocompatibility properties alongside with biodegradability1. PAS polypeptides with 200 to 600 residues can lead to a plasma half-life extension of certain drugs by a factor 10 to 100.

To generate stealth nanoparticle with biodegradable properties, Monash researcher have built on PAS polypeptide to develop a polypeptide based nanoparticle (PASKE nanoparticles) (Fig. 1). PASKE nanoparticles display low phagocytic association and biodegradability. We have tested in vivo bio-distribution and demonstrated targeted imaging utility (thrombosis disease model) of PASKE nanoparticles in small animal models.

PASKE nanoparticle platform could be tailored to allow high payload delivery of imaging agents or drugs to targeted site.

THE OPPORTUNITY

We seek a partner for commercialization and further development of this nanoparticle platform for diagnostic imaging and drug delivery applications.

Reference:

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