

The development of Multifunctional Hybrid-Nanoparticles for improved pancreatic cancer therapy

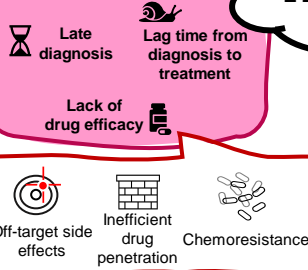
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The problem

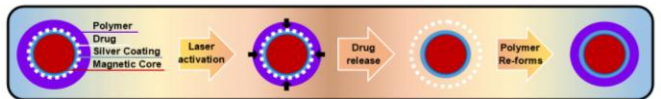
Pancreatic cancer is the most aggressive of all common cancers. Over the past few decades unfortunately the survival rate has seen no substantial increase in the UK. Survival remains at only around 7%. [1]

Poor Prognosis



Introducing... The nano-ninja

The concept

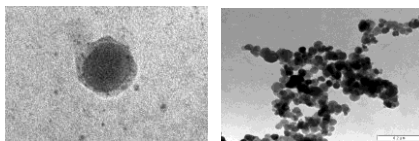


The development: Characterisation

Zeta potential measurement

Particle	Zeta potential value (mV)
Fe_3O_4	0.84
Fe_3O_4 -PEI	21.83
Fe_3O_4 -PEI-Ag seeds	-12.4
Fe_3O_4 -PEI-Ag-PEI	4.78
Final AgHNPs	-1.64

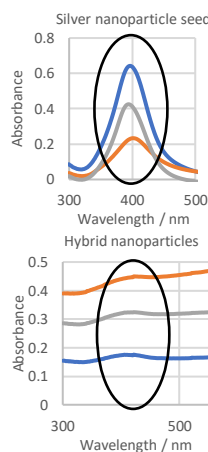
Transmission electron microscopy images



Fe_3O_4 -PEI-Ag seeds

Final AgHNPs

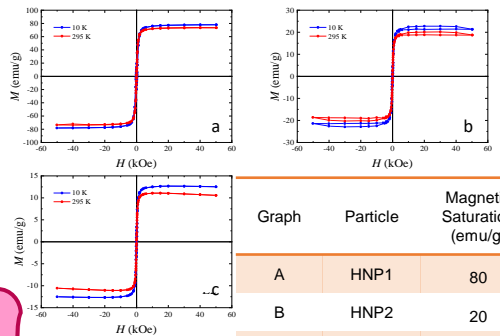
UV-Vis spectroscopy spectra



Successful HNP synthesis
Spherical particles
Size approx. 50 nm
Silver on surface

Optimisation: Tailoring composition

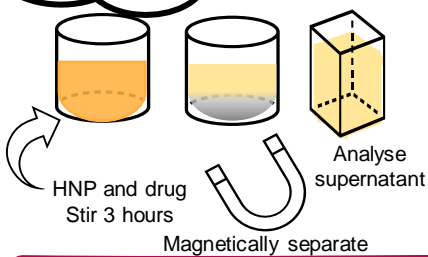
Hybrid nanoparticle sample	Fe:Ag Ratio
1 Ag coating (HNP1)	9.87
5 Ag coatings (HNP2)	2.64
10 Ag coatings (HNP3)	2.72



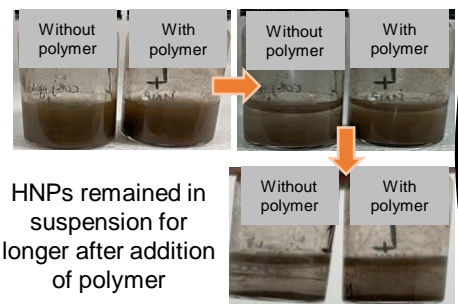
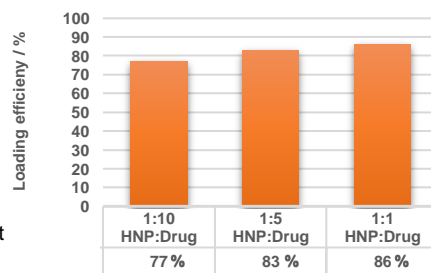
Graph	Particle	Magnetic Saturation (emu/g)
A	HNP1	80
B	HNP2	20
C	HNP3	12

Superparamagnetic.
Increased silver coating = decreased magnetism

Drug loading



Drug attachment



HNPs remained in suspension for longer after addition of polymer

Anti-cancer drug has been immobilised onto the HNP surface with high loading efficiency (with and without polymer). Addition of polymer gave negligible drug loss.

Next steps



- Further drug loading and release studies at various physiological conditions
- Laser irradiation studies → Heating capability of HNPs
- In vitro testing → Bacterial culture studies → Antibacterial behaviour of HNPs



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