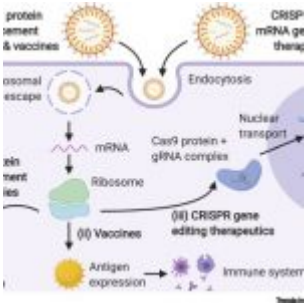
Using lipid nanoparticles for cancer treatment



As tumours age, they begin to harden on the outside of their cell surface forming a hardened barrier, making it difficult for targeted drugs to penetrate the cell surface and enter into cells for cancer treatment purposes. In a recent paper, Zhang, et al, have developed small particles, nanoparticles, that can break down the barriers around tumours, reaching cancerous cells, providing a potentially improved and effective treatment for cancers. The nanoparticles carry a gene editing system (CRISPR-Cas9) that alters tumour DNA, inhibiting or blocking growth and activating the immune system for targeted attack of the tumour. (Figure 1 for summary) In this paper they looked at this system in ovarian and liver cancers in mouse models.

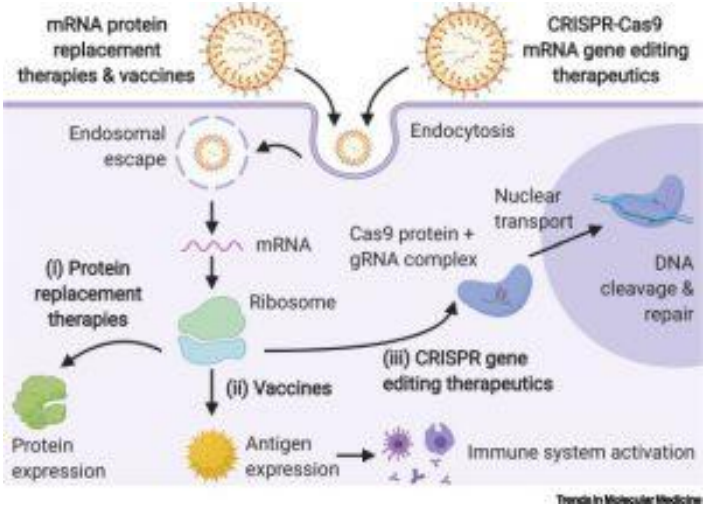


Figure 1: Graphical abstract (Swingle, et al., 2021).

As the power of CRISPR-Cas9 technology has grown over recent years, delivering this system into solid tumours for DNA editing is still a difficult task (READ MORE). Lipid nanoparticles (LNPs) are *small spheres of fatty molecules which can carry molecular cargo into the human body*, may offer an attractive option for delivering this system into cancer cells.

In this present study, the researchers made an addition of siRNA to block focal adhesion kinase (FAK), a gene crucial for protection of many tumour types. CRISPR-Cas9 machinery was encapsulated inside of the nanoparticles, targeting the gene *PD-L1*. This gene inhibits/blocks the immune response towards tumours. By targeting this gene, it may alleviate this blockage and allow the immune system to successfully attack these tumours.

In their own words:

"*Overall, we provide evidence that modulating the stiffness of tumour tissue can enhance gene editing in tumours, which offers a new strategy for synergistic LNPs and other nanoparticle systems to treat cancer using gene editing*"

Following the positive results of this study, more work is needed to investigate the efficacy and safety of these nanoparticles.

Journal article: Zhang, D, et al., 2022. Enhancing CRISPR/Cas gene editing through modulating cellular mechanical properties for cancer therapy. *Nature Nanotechnology*.

Summary by Stefan Botha