

Pharmaceutical Sciences Seminar Series

Thursday, August 25, 2022
12:00pm
NCRC B10-South Atrium

“A lipid nanoparticle templated anti-opioid vaccine”

Presented by:



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Abstract: The abusive use of opioid prescription drugs, often referred to as ‘the opioid crisis, has become a major global problem facing an exuberant number of deaths. To tackle this tremendous challenges, anti-opioid immunotherapy is considered as a promising therapy. The current generation of anti-opioid vaccines are based on random covalent conjugation of opioid haptens to a carrier protein in combination with an admixed adjuvant, and most likely do not fully embrace the potential of anti-opioid immunotherapy due to immunodominance of the carrier protein, sub-optimal priming of the immune system and translational challenges due to difficulties to reproduce and characterize hapten-protein conjugates. Focusing on fentanyl as a prominent opioid of concern, we present a more rational anti-opioid vaccine design based on a non-covalent assembly of opioid haptens, T-helper epitope and an immune-stimulant into a single lipid nanoparticle (LNP). The latter is engineered for optimal delivery to secondary lymphoid organs and to mediate multivalent hapten ligand exposure on a spherical nanoparticle template for optimal induction of hapten-specific antibody responses. We use peptide as a format for the T helper epitope antigen, and for this purpose we developed a generic strategy to load peptide antigens into LNP through electrostatic interaction with an ionizable lipid. As a molecular adjuvant we evaluated several TLR agonists and loaded these into LNP through either hydrophobic or electrostatic interaction. Furthermore we demonstrate how LNP design affects the amplitude and quality of the anti-opioid immune response and whether this confers protection in pre-clinical models of opioid overdosing.

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