Adjuvant Design & Pattern Recognition Receptors — Hands-on

Connect innate immune sensing and pattern recognition receptors to practical adjuvant choices in vaccine and biologics design. This module explains PRR families, ligands and signalling, then walks through how adjuvant classes, combinations and formulations are selected for different platforms, routes and target populations.

Adjuvant Design & Pattern Recognition Receptors

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Session Index

Session 1

Fee: Rs 8800 Apply Now

Innate Sensing & PRR Landscape

Innate immune sensing and the role of pattern recognition receptors

sentinel cells and first line defence | **interface with adaptive immunity** | **danger sensing concepts**

Main PRR families and localisation

TLRs, NLRs, RLRs, CLRs (orientation) | **cell surface vs**

endosomal vs cytosolic | expression patterns in key cell types

Linking PRR engagement to cytokine patterns and response quality

Th1, Th2, Th17 and Tfh bias | type I interferon signatures | bridging to adjuvant choice

Session 2

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PAMPs, DAMPs & PRR Signalling Pathways

PAMP and DAMP ligand types for key PRRs

nucleic acid motifs (CpG, dsRNA, ssRNA) | lipids, lipoproteins and LPS | damage signals and alarmins

Canonical signalling pathways downstream of PRRs (conceptual)

MyD88 and TRIF adaptors (orientation) | NF kappa B and IRF axes | inflammasome activation overview

Cytokine, chemokine and costimulatory outputs as design readouts

IL 6, IL 12, TNF and others | chemokine driven cell recruitment | costimulation and licensing of APCs

Session 3

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Adjuvant Classes, Formulations & Mechanisms

Classical and modern adjuvant families (conceptual)

alum and mineral salts | emulsions and saponin based systems | TLR agonist adjuvants overview

Formulation concepts and delivery routes for adjuvanted

vaccines

particulate versus soluble formats | intramuscular, subcutaneous, mucosal | adjuvant antigen co localisation

Mechanistic themes: depot, PRR engagement and cell recruitment

antigen retention and release | local and systemic innate activation | germinal centre support

Session 4

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Adjuvant in Design: Matching PRR Signals to Vaccines

Aligning adjuvant choice with platform and indication (conceptual)

protein, peptide, VLP and mRNA platforms | infectious disease versus oncology | prime boost and heterologous strategies

Safety, reactogenicity and population specific considerations

age groups and comorbidities | baseline inflammation and risk factors | regulatory expectations at a high level

Mini design exercise: PRR and adjuvant strategy for a hypothetical vaccine

define target immune profile | select PRR pathways to engage | outline candidate adjuvant and formulation