The University of North Dakota has developed a method to enhance adjuvant performance by adding full length or truncated YscF needle protein of Yersinia pestis to an adjuvant mixture. The YscF component targets both TLR2 and TLR4, resulting in induction of Th1, Th2, and Th17 responses. Adding YscF to an adjuvant may therefore provide a broader immune response than alum or other adjuvants that are being developed.

**Applications**
- Co-administer with vaccine
- Immune system boost, e.g. for livestock entering high stress situations that increase infection risk

**Advantages**
- Targets toll-like receptors TLR2 and TLR4, boosting immunity for gram-positive and –negative bacteria, mycoplasma, and yeast
- Induces Th1, Th2, and Th17, targeting bacteria and viruses both inside and outside (e.g. staph infection) of cells

**Technology**

The full length YscF protein, or N-terminally truncated fragments of YscF/trYscF have been shown to induce pro-inflammatory cytokines in human THP-1 cells, mouse RAW 264.7 cells, ex vivo mouse bone-marrow and peritoneal derived macrophages, and in vivo in mice. Hexa-Histidine tagged YscF/trYscF are produced as recombinant proteins in E. coli.

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