

# ADVANCED MATERIALS

## Supporting Information

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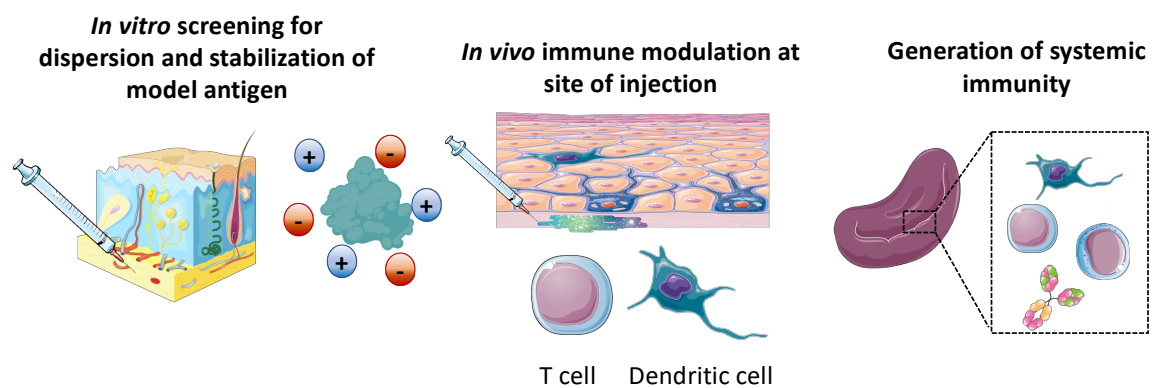
### Ionic-Liquid-Based Safe Adjuvants

*Anvay Ukidve, Katharina Cu, Morgan Goetz, Pavimol  
Angsantikul, Alexander Curreri, Eden E. L. Tanner, Joerg  
Lahann, and Samir Mitragotri\**

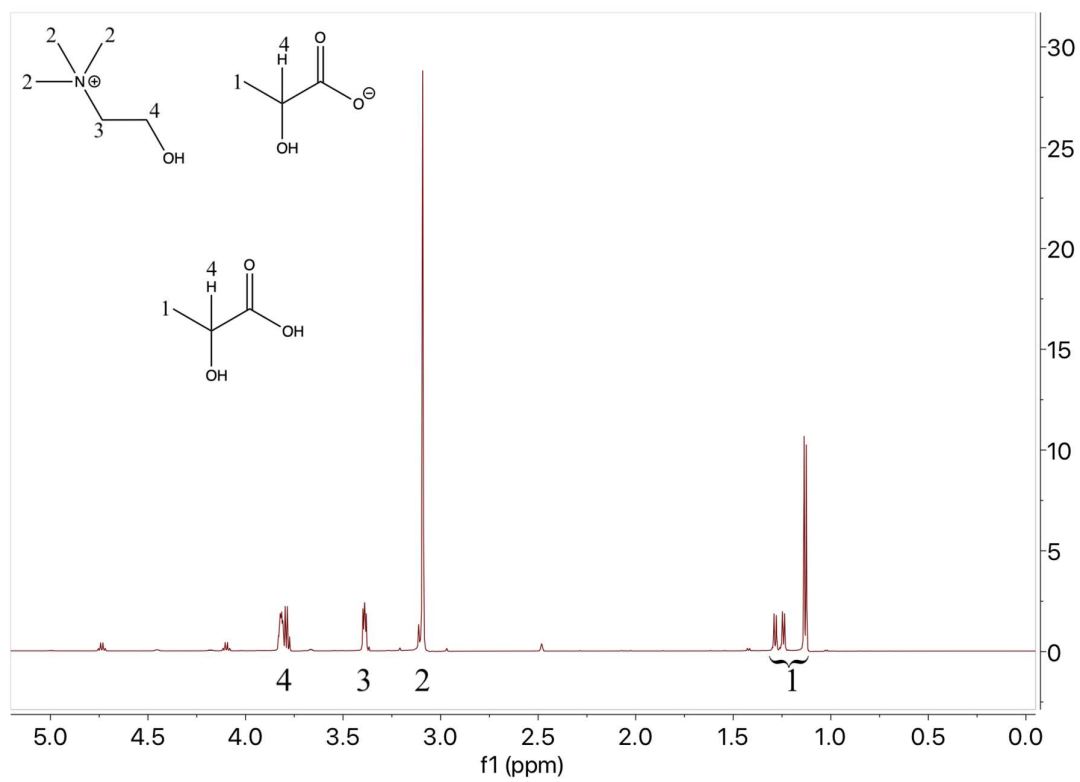
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## Ionic-Liquid-Based Safe Adjuvants

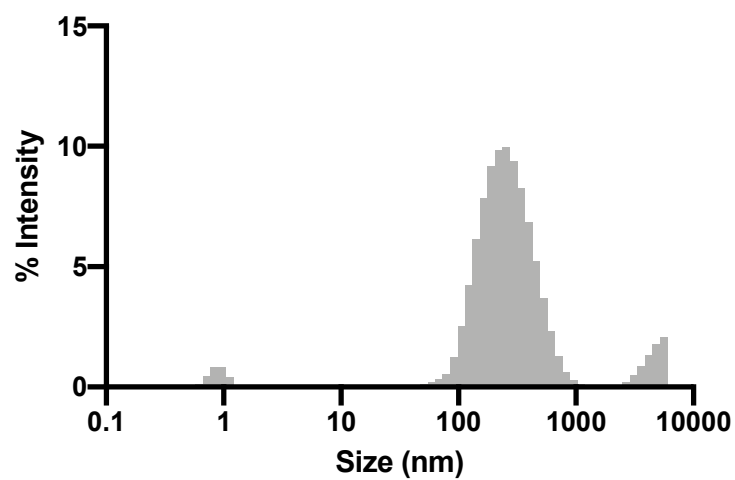
Anvay Ukidve, Katharina Cu, Morgan Goetz, Pavimol Angsantikul, Alexander Curreri, Eden E.L. Tanner, Joerg Lahann, Samir Mitragotri\*



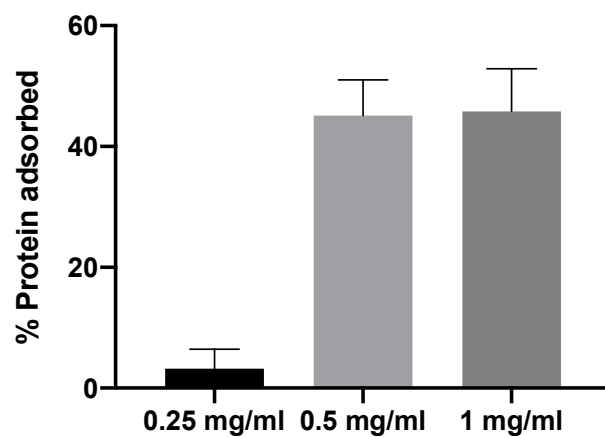
Supplementary Figure 1. Schematic of developmental plan for ChoLa as an adjuvant



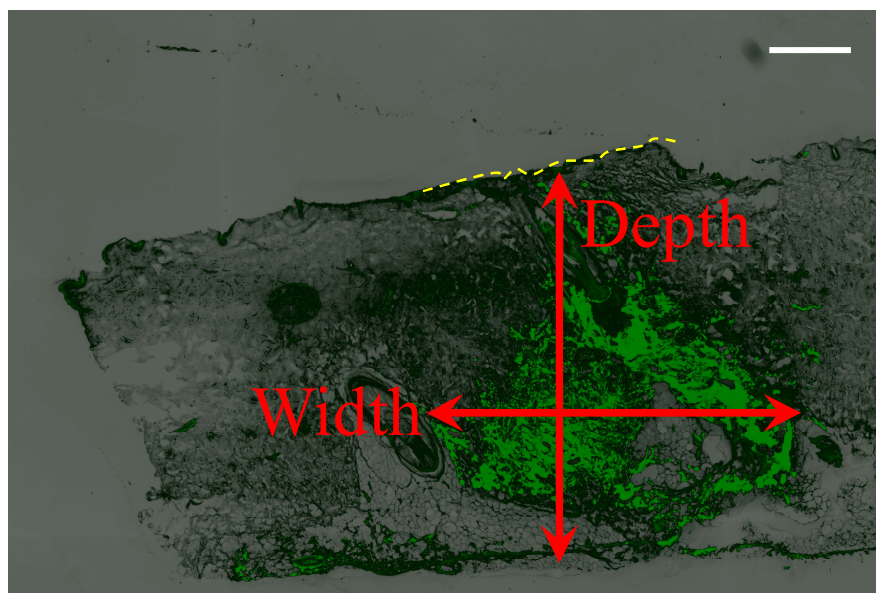
Supplementary Figure 2.  $^1\text{H}$  NMR spectrum of choline lactate (1:2)



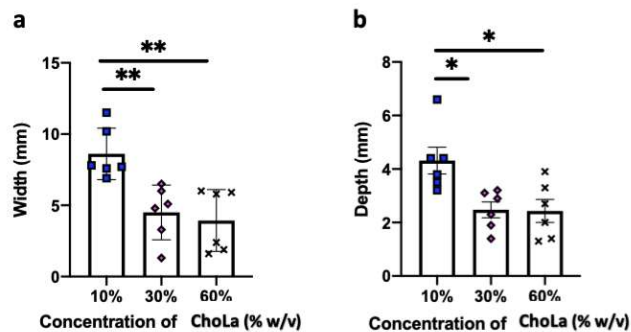
Supplementary Figure 3. Globule size distribution of 10% ChoLa in saline



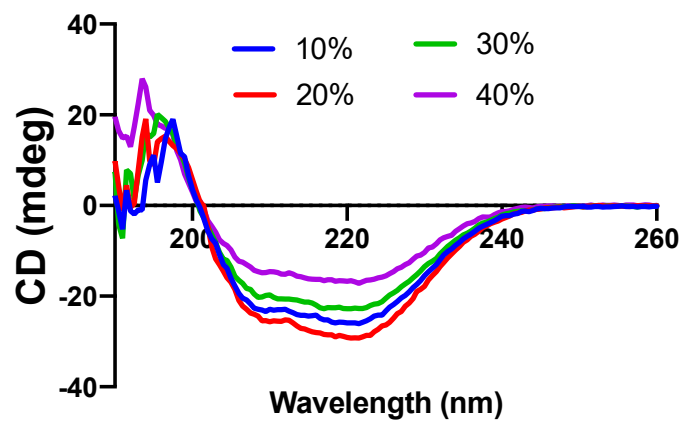
**Supplementary Figure 4. Percentage protein adsorption as a function of protein added to the adjuvant formulation**



**Supplementary Figure 5. Illustration of depth and width of dispersed antigen from fluorescent images were used to identify the region of interest (ROI). A MATLAB code was used to determine the area of dispersion within that ROI.**

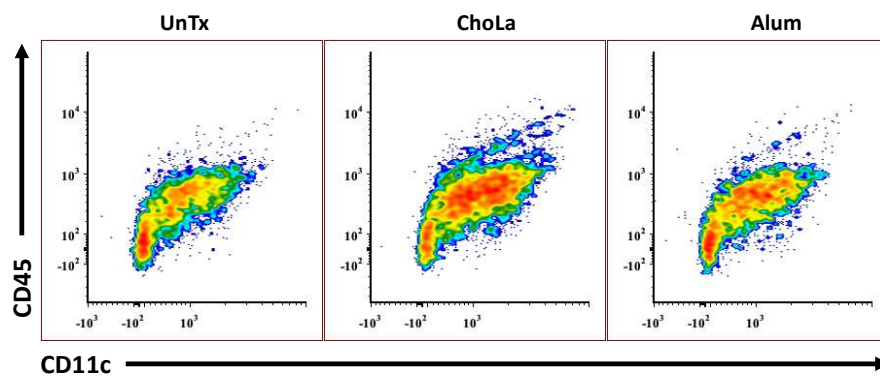


**Supplementary Figure 6. Effect of increasing ChoLa concentration in adjuvant formulation on dispersion. a.** Width of spread in mm. **b.** Depth of spread in mm. (n= 6 for all groups). \*: p<0.05, \*\*: p<0.01. Significantly different. (One-way ANOVA followed by Tukey's HSD test)

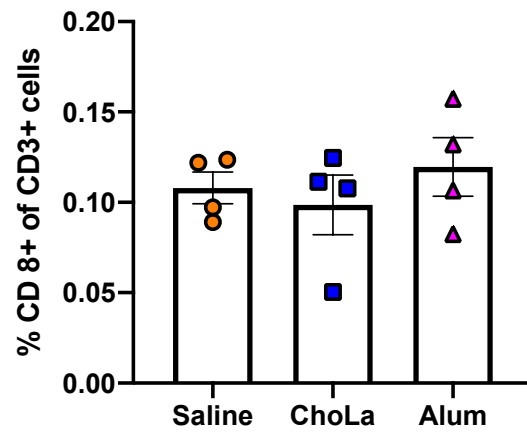


Supplementary Figure 7. Effect of increasing ChoLa concentration on OVA stability

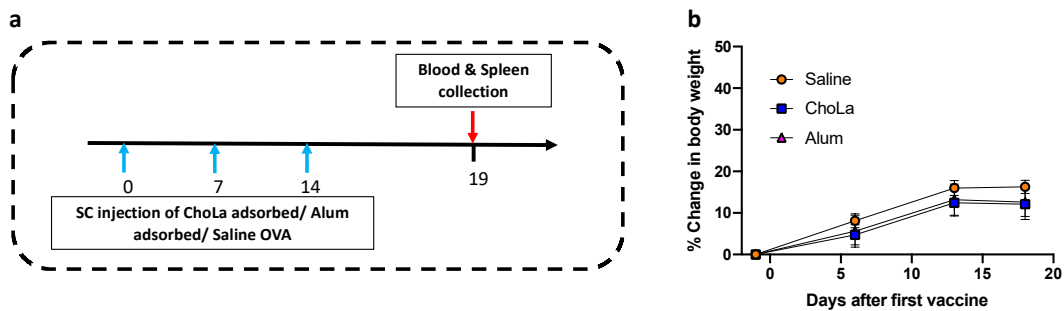




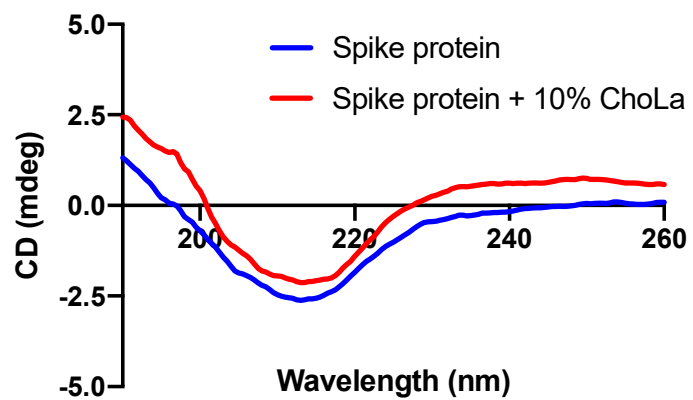
**Supplementary Figure 8. Representative flow cytometry graphs for infiltrating CD45<sup>+</sup>CD11c<sup>+</sup> cells at the injection site**



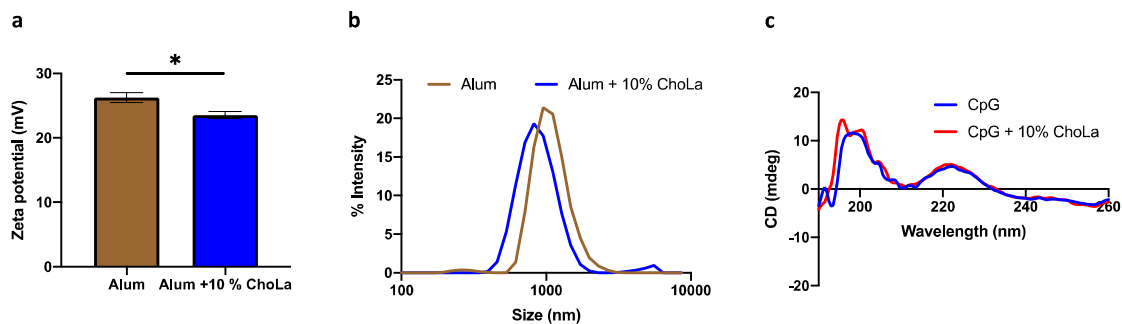
**Supplementary Figure 9. Quantitative analysis of infiltrated CD8+ cells from CD45+ cells at the site of injection 24h after adjuvant administration**



**Supplementary Figure 10. Schedule and toxicity assessment of ChoLa vaccination. a.** Schedule for vaccination and organ harvesting. **b.** Percent change in body weight for different treatment groups. Different treatment groups show no effect on weight change (n=8 for all groups) (Two-way ANOVA followed by Tukey's HSD).



Supplementary Figure 11. Stability of SARS-Cov-2 spike protein in ChoLa



**Supplementary Figure 12. Versatility of ChoLa with other adjuvants. a.** Zeta potential reduction of Alum + 10% ChoLa demonstrates ChoLa adsorption. Significantly different ( $n=3$  for all groups) (Unpaired t-test)\*:  $P<0.05$ . **b.** Particle size distribution of Alum and Alum + 10% ChoLa demonstrating formulation stability. **c.** CD spectra of CpG admixed with ChoLa demonstrating conserved CpG motifs