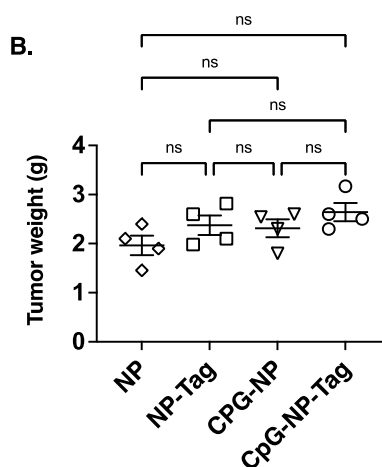
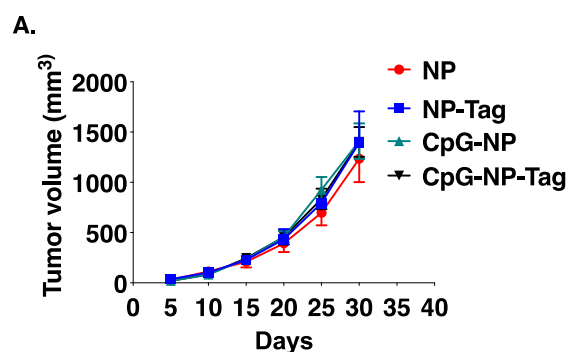
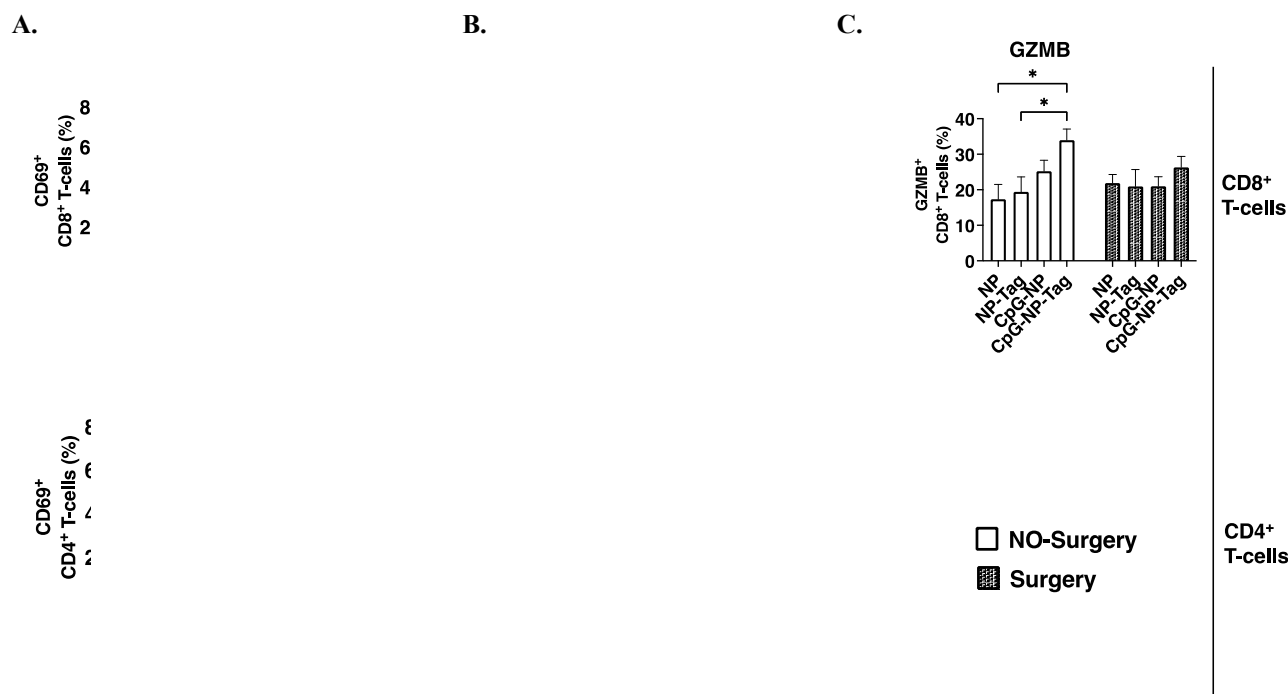


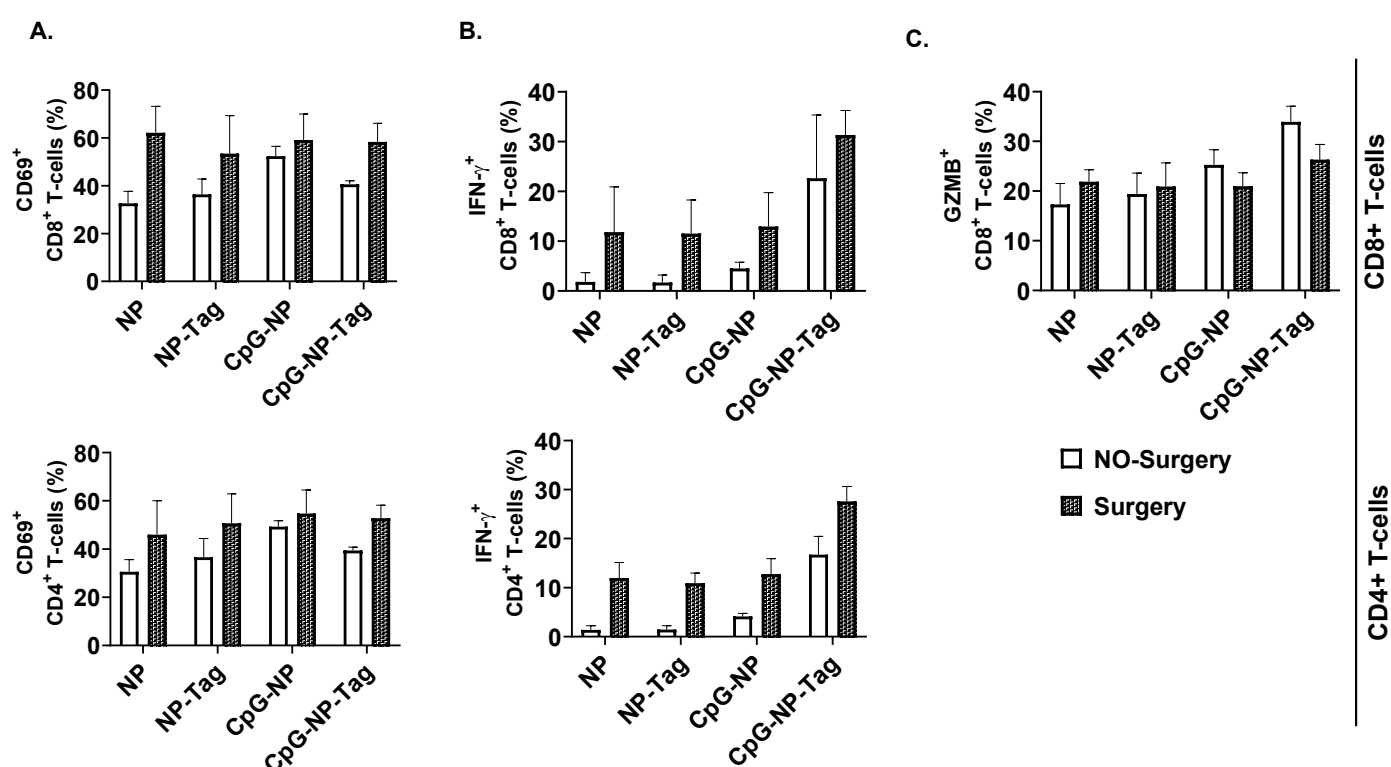
Supplementary Information:



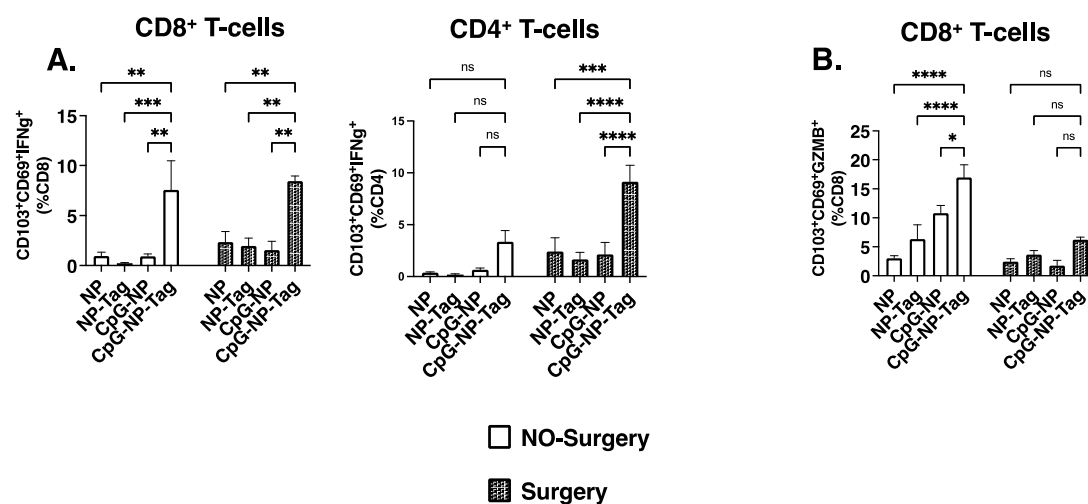
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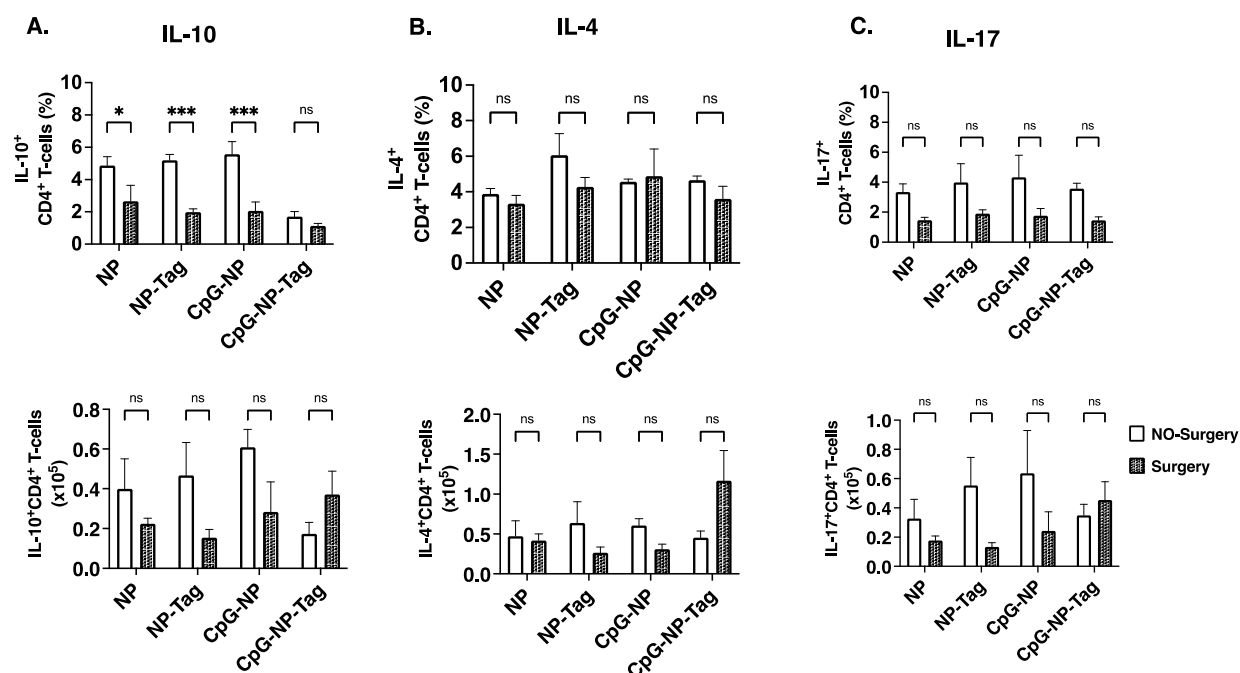
**Supplementary Figure S2. Intranasal CpG-NP-Tag increases the fractions of functional CD8<sup>+</sup> and CD4<sup>+</sup> T cells in the lungs of both CpG-NP-Tag immunized non-surgery and surgery mice. (A,B)** The fractions of CD69 expressing (A), and IFN- $\gamma$  producing (B) cells among CD8<sup>+</sup> (upper panels) and CD4<sup>+</sup> (lower panels) T cells in the lungs of immunized non-surgery and surgery mice. **(C)** The fractions of GZMB producing cells among CD8<sup>+</sup> T cells in the lungs of immunized non-surgery and surgery mice. (\* $p < 0.05$ ; \*\* $p < 0.005$ ; \*\*\* $p < 0.0005$ ).  $n = 4$ ; Two-way ANOVA followed by Sidak's multiple comparison test.



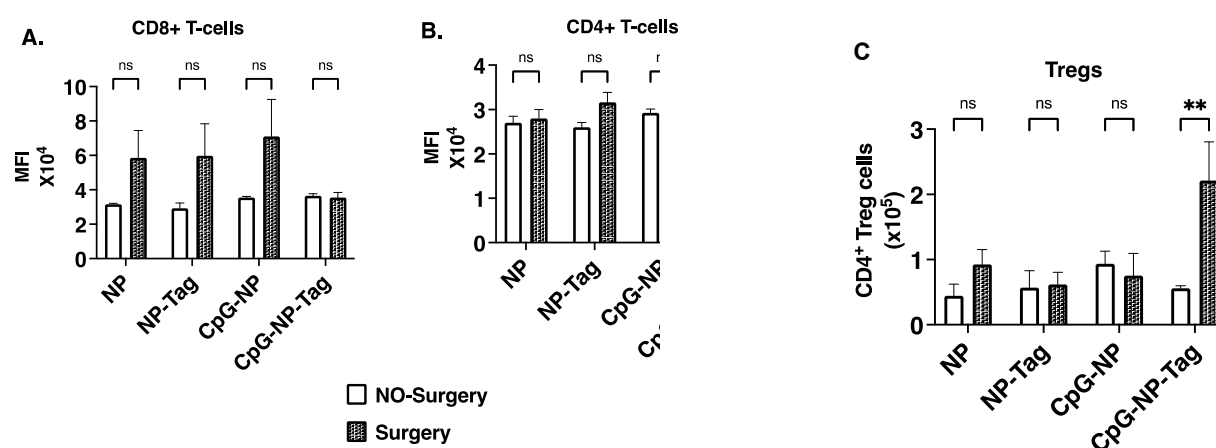
**Supplementary Figure S3. The proportions of functional CD4<sup>+</sup> and CD8<sup>+</sup> T cells in the lungs of both immunized non-surgery and surgery mice. (A, B) The fractions of CD69 expressing (A) and IFN- $\gamma$  producing (B) CD8<sup>+</sup> (upper panels) and CD4<sup>+</sup> (lower panels) T cells in the lungs of immunized non-surgery and surgery. (C) The fractions of GZMB producing cells among CD8<sup>+</sup> T cells in the lungs of immunized non-surgery and surgery mice. n = 4; Two-way ANOVA; Sidak's multiple comparison test.**



memory T cells.  
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5; \*\*p < 0.005;

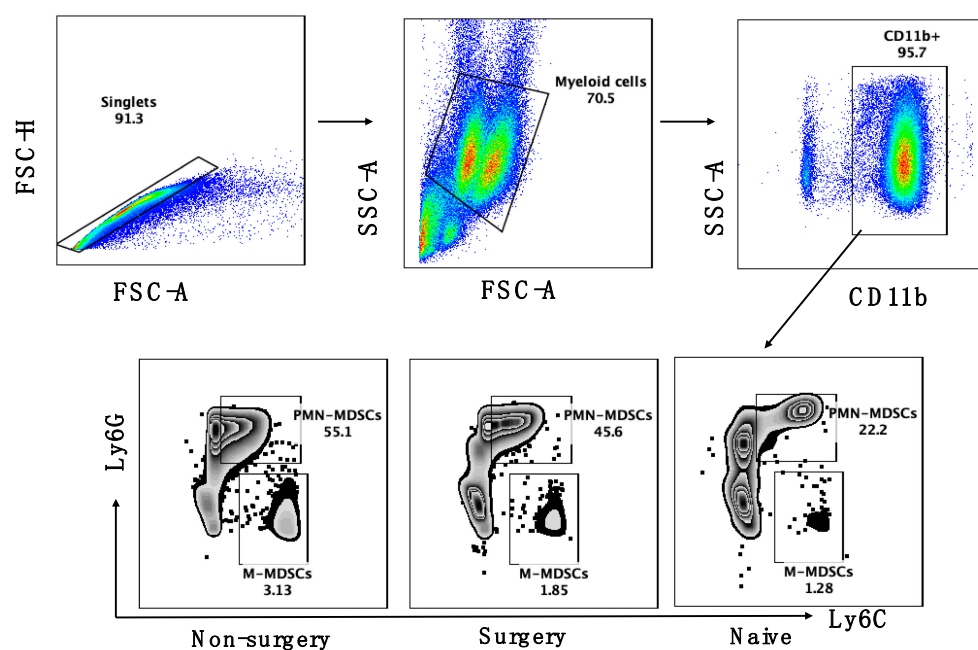


**Supplementary Figure S5.** The effect of intranasal nano-vaccine immunization on TH2 cytokines production by CD4<sup>+</sup> T cells. (A,B,C) The fraction (upper panels) and quantity (lower panels) of IL-10 (A), IL-4 (B) and IL-17 (C) producing cells among CD4<sup>+</sup> T cells in the lungs of immunized non-surgery and surgery mice. (ns, not significant \*p < 0.05; \*\*\*p < 0.0005;). n = 4; Two-way ANOVA followed by Sidak's multiple comparison test.

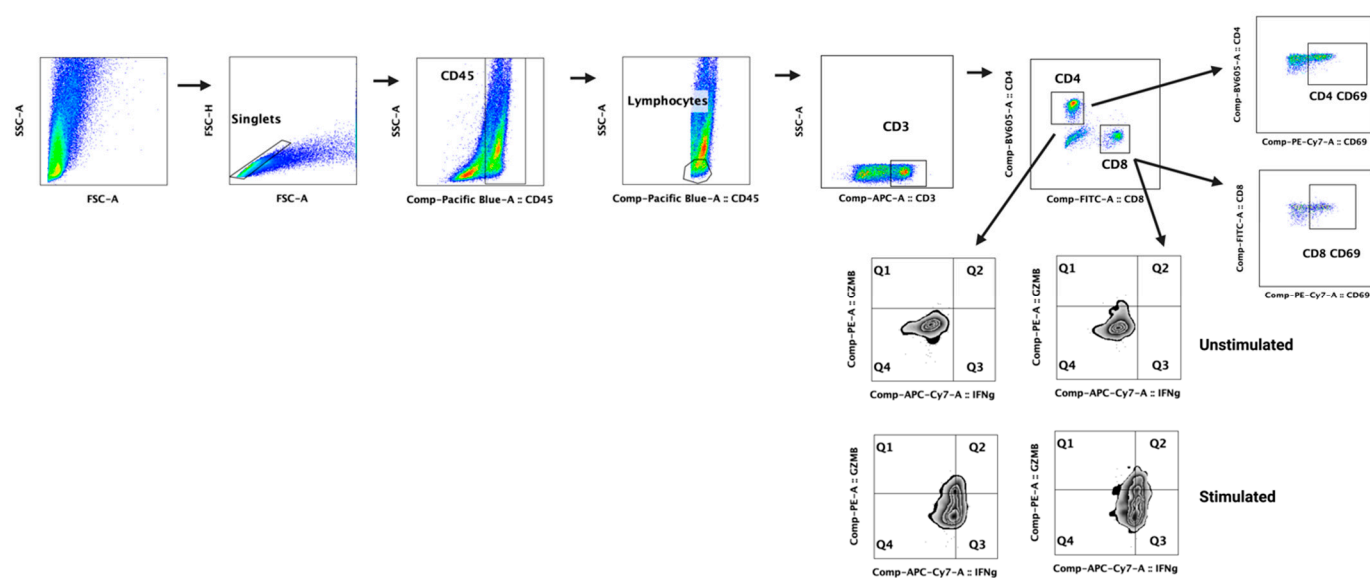


**Supplementary Figure S6. The effect of nano-vaccine immu**

**PD-1 on CD8<sup>+</sup> and CD4<sup>+</sup> T cells in the lungs of immunized non-surgery and surgery mice. (A and B)** The expression levels of PD-1 on CD8<sup>+</sup> (A) and CD4<sup>+</sup> (B) T cells. **(C)** The total number CD4<sup>+</sup> Tregs in the lungs of non-surgery and surgery immunized mice. (ns, not significant; \*\*p < 0.005) n = 4; Two-way ANOVA followed by Sidak's multiple comparison test.

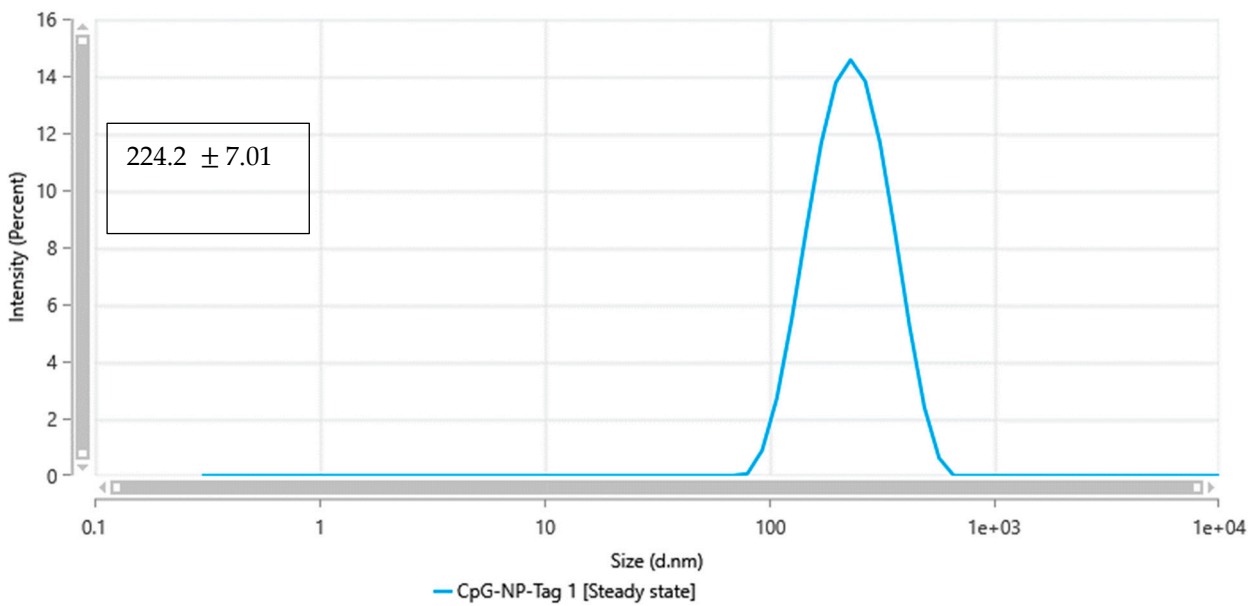


Supplementary Figure S7. Representative FACS blots of CD11b<sup>+</sup> MDSC-like cells (Ly6G<sup>+</sup>Ly6C<sup>+</sup> for PMN-MDSCs and Ly6G<sup>+</sup>Ly6C<sup>+</sup> for M-MDSCs).

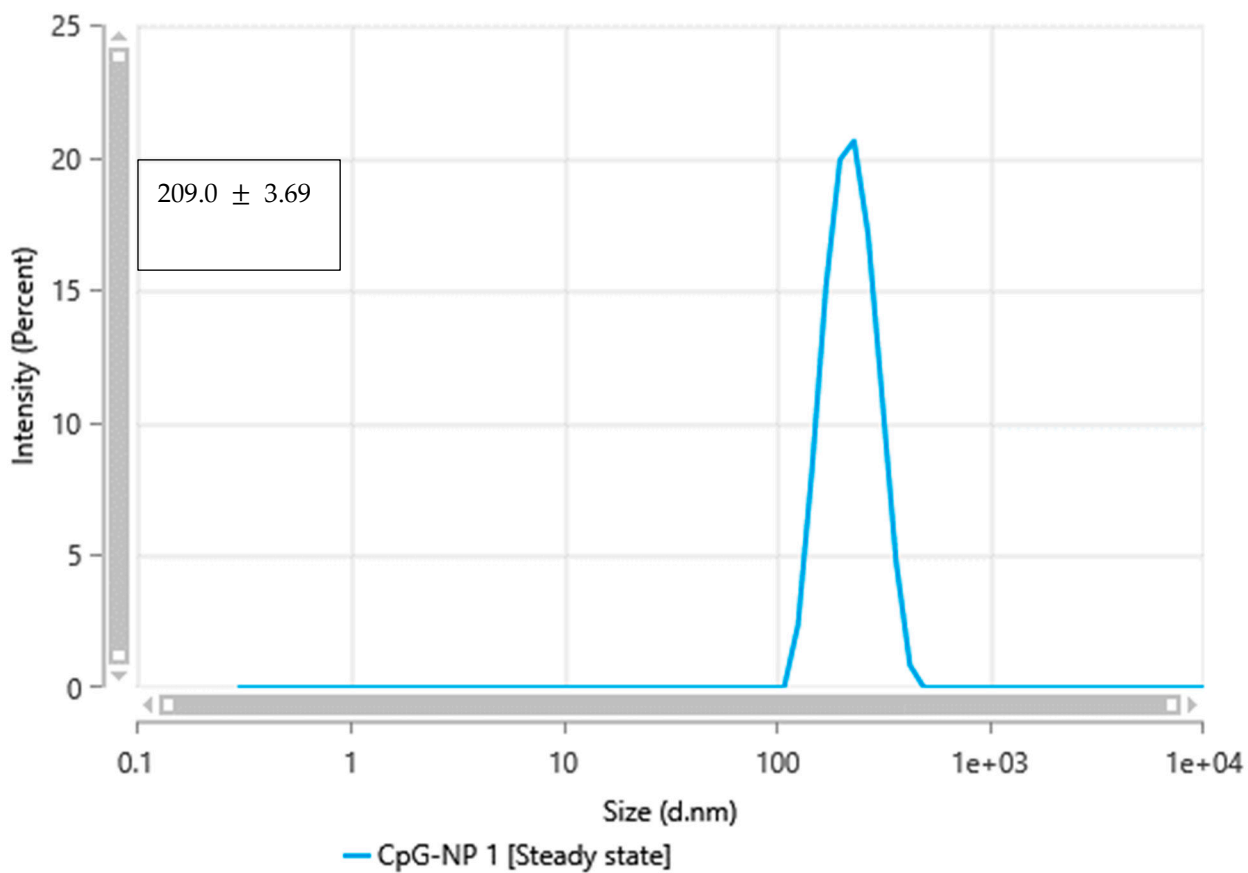


Supplementary Figure S8. Gating strategy to identify IFN- $\gamma$  and GZMB producing T cells in the lungs of immunized non-surgery and surgery mice that produce IFN- $\gamma$ .

A i

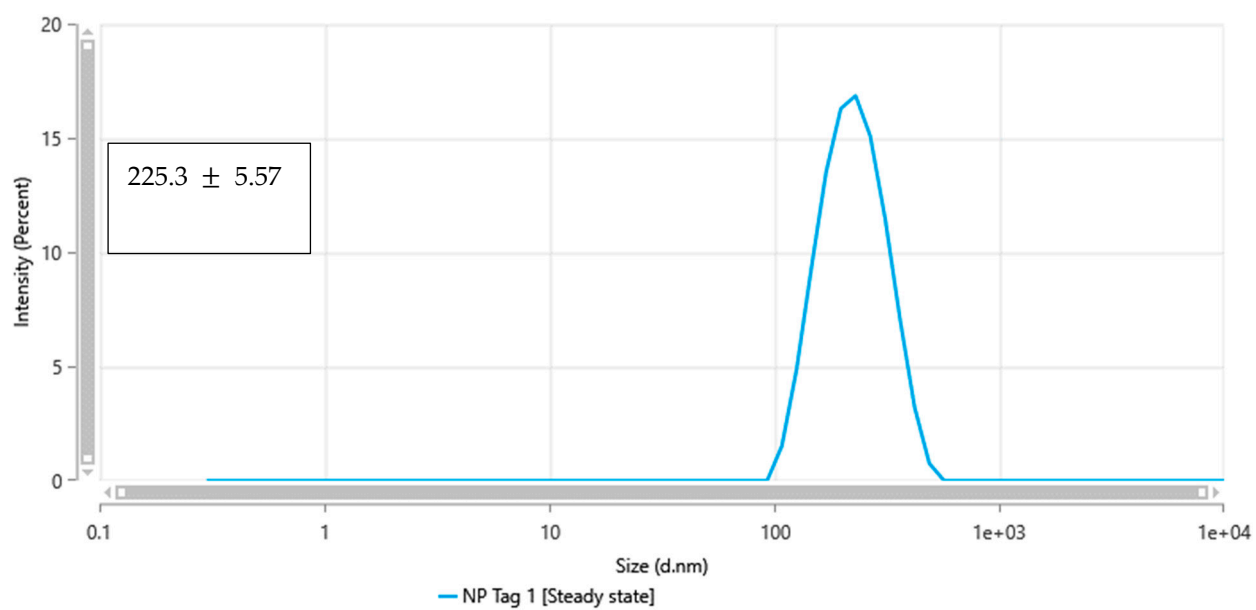


ii

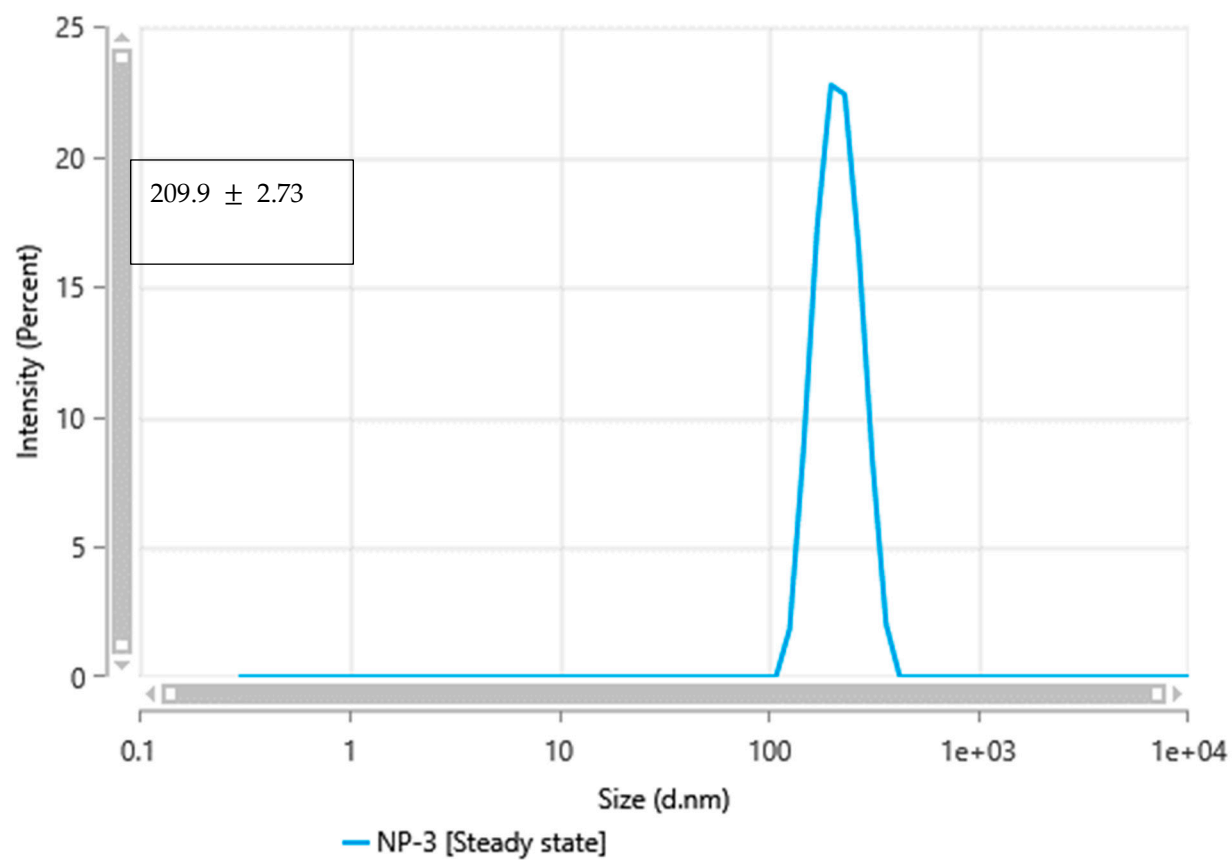




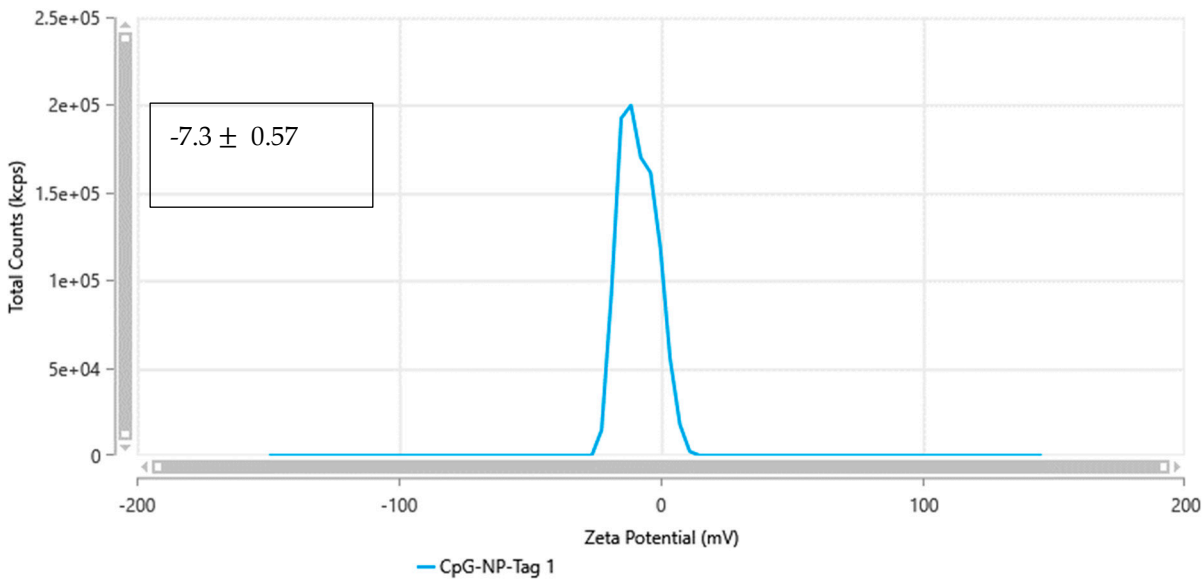
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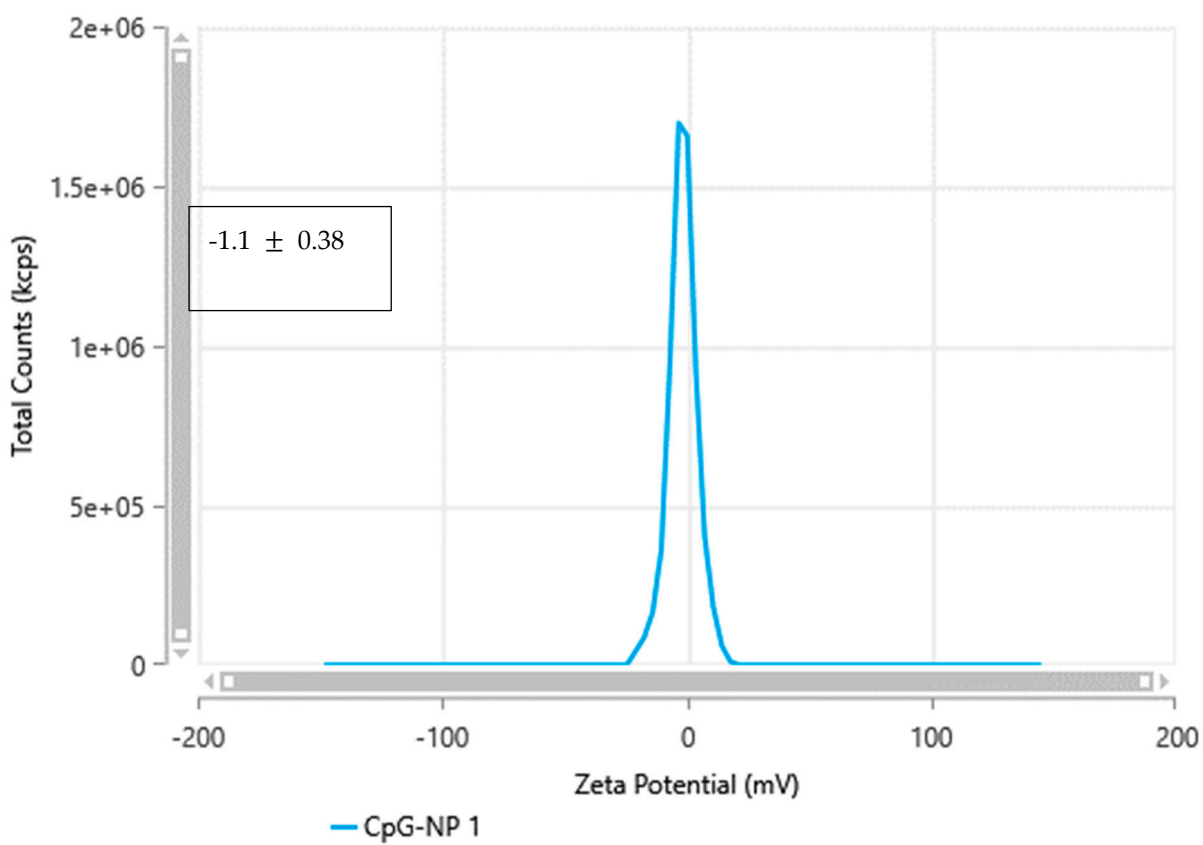
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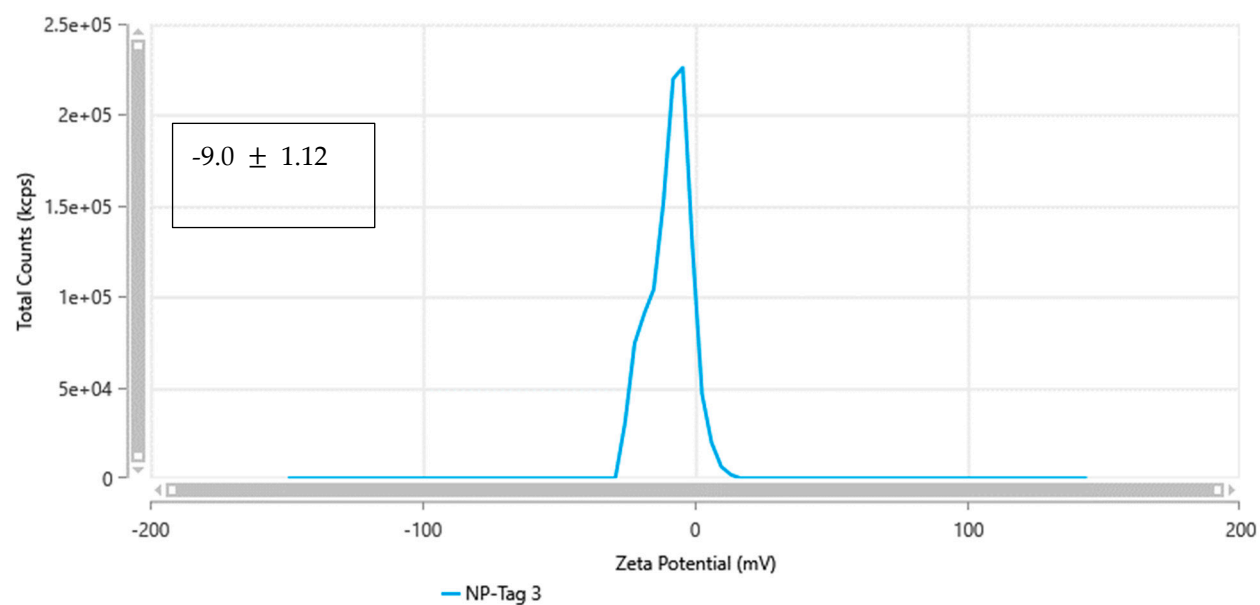
B i



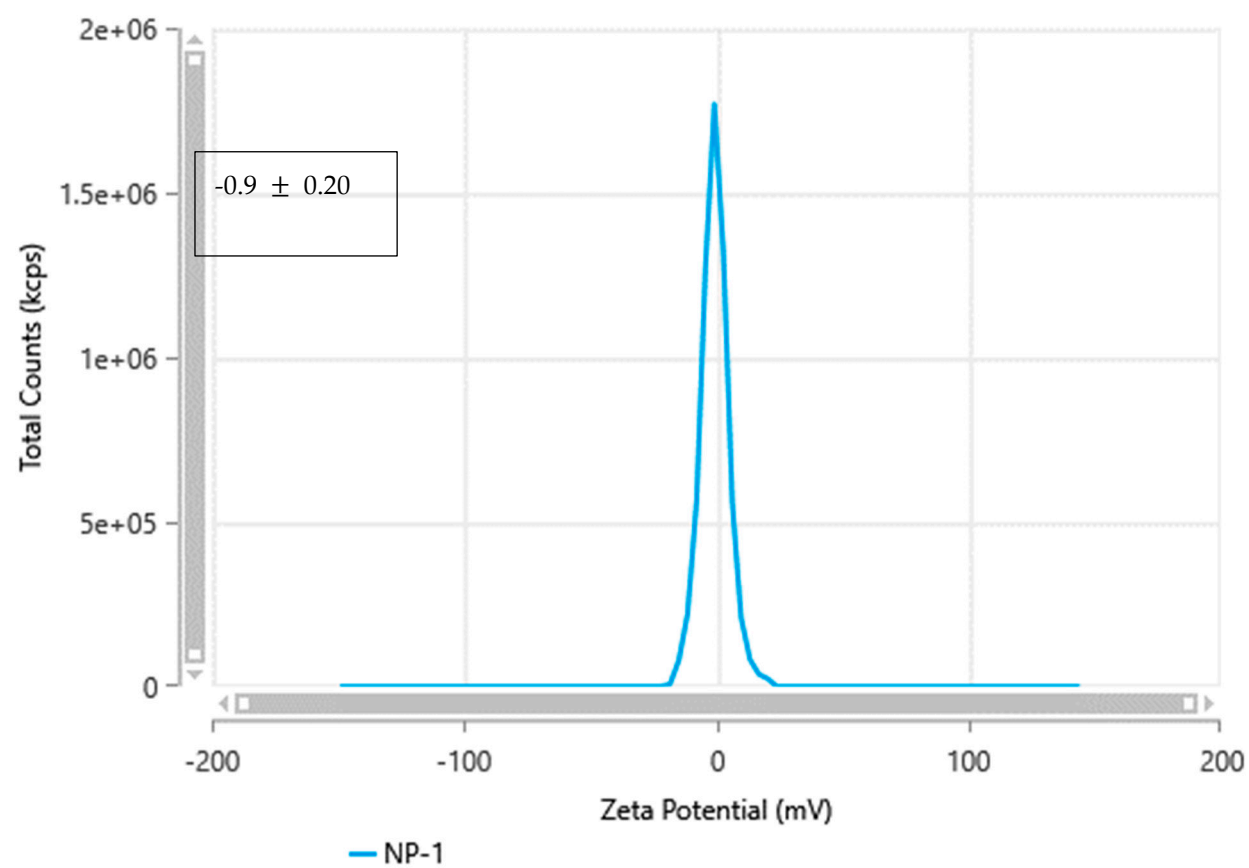
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iii



iv



**Supplementary Figure S9. Characterization of Nanoparticles.** (A) Particle size distribution of CpG-NP-Tag (i), CpG-NP (ii), NP-Tag (iii) and NP (iv) derived from dynamic light scattering measurements. (B) CpG-NP-Tag (i), CpG-NP (ii), NP-Tag (iii) and NP (iv) derived from dynamic light scattering measurements.