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Supplementary Figures:

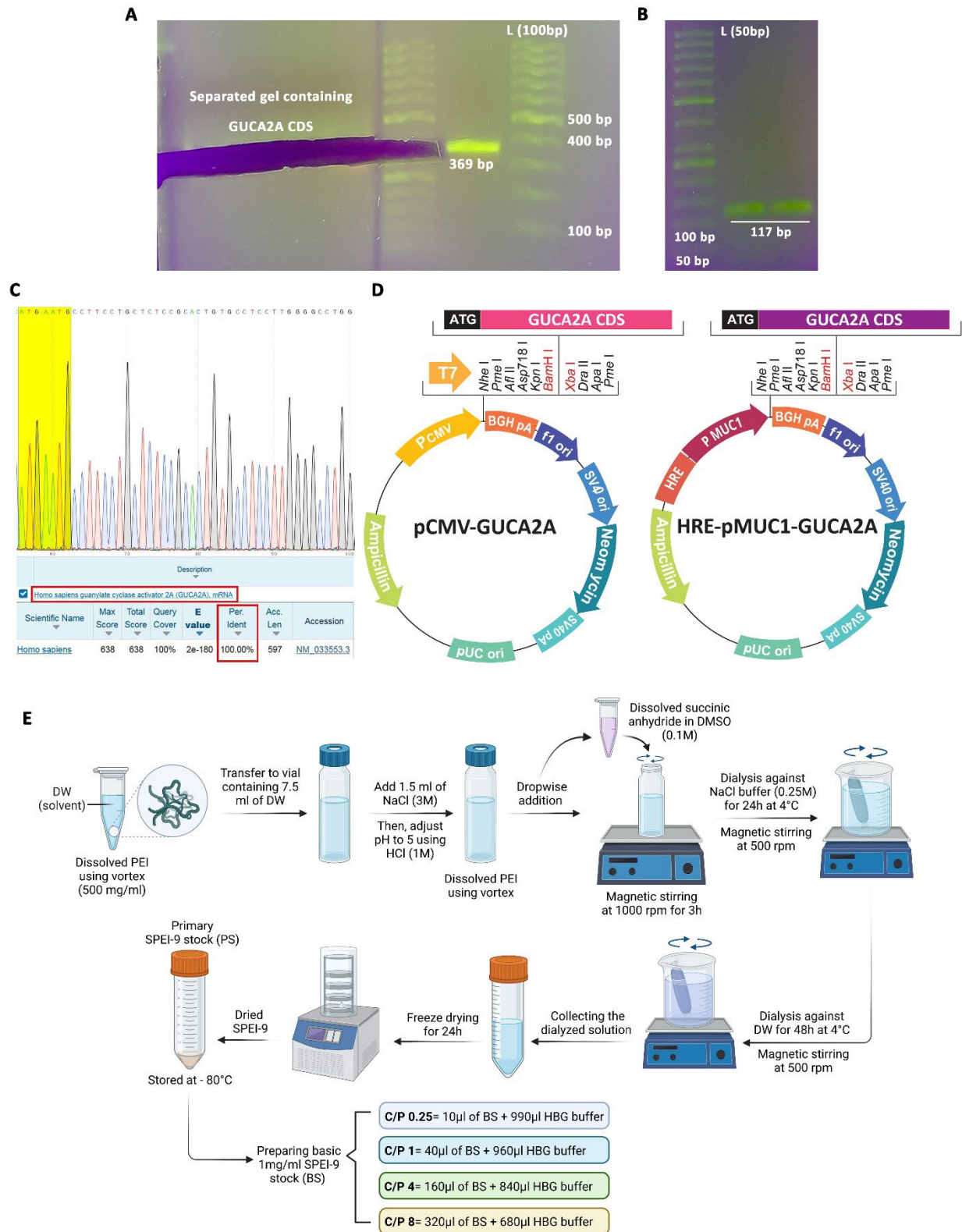


Figure S1. Construction of the guanylin-expressing nano-system. **A)** Amplification and gel extraction of GUCA2A coding sequence (CDS). **B)** Colony PCR validation of the constructed pCMV-GUCA2A and HRE-pMUC1-GUCA2A vectors. **C)** Final validation of the constructed vectors through Sanger sequencing. **D)** Schematic diagram of the constructed pCMV-GUCA2A and HRE-pMUC1-GUCA2A vectors. **E)** Schematic representation of the various steps involved in the synthesis of the SPEI-9 nanocarrier. This schematic is created with BioRender.

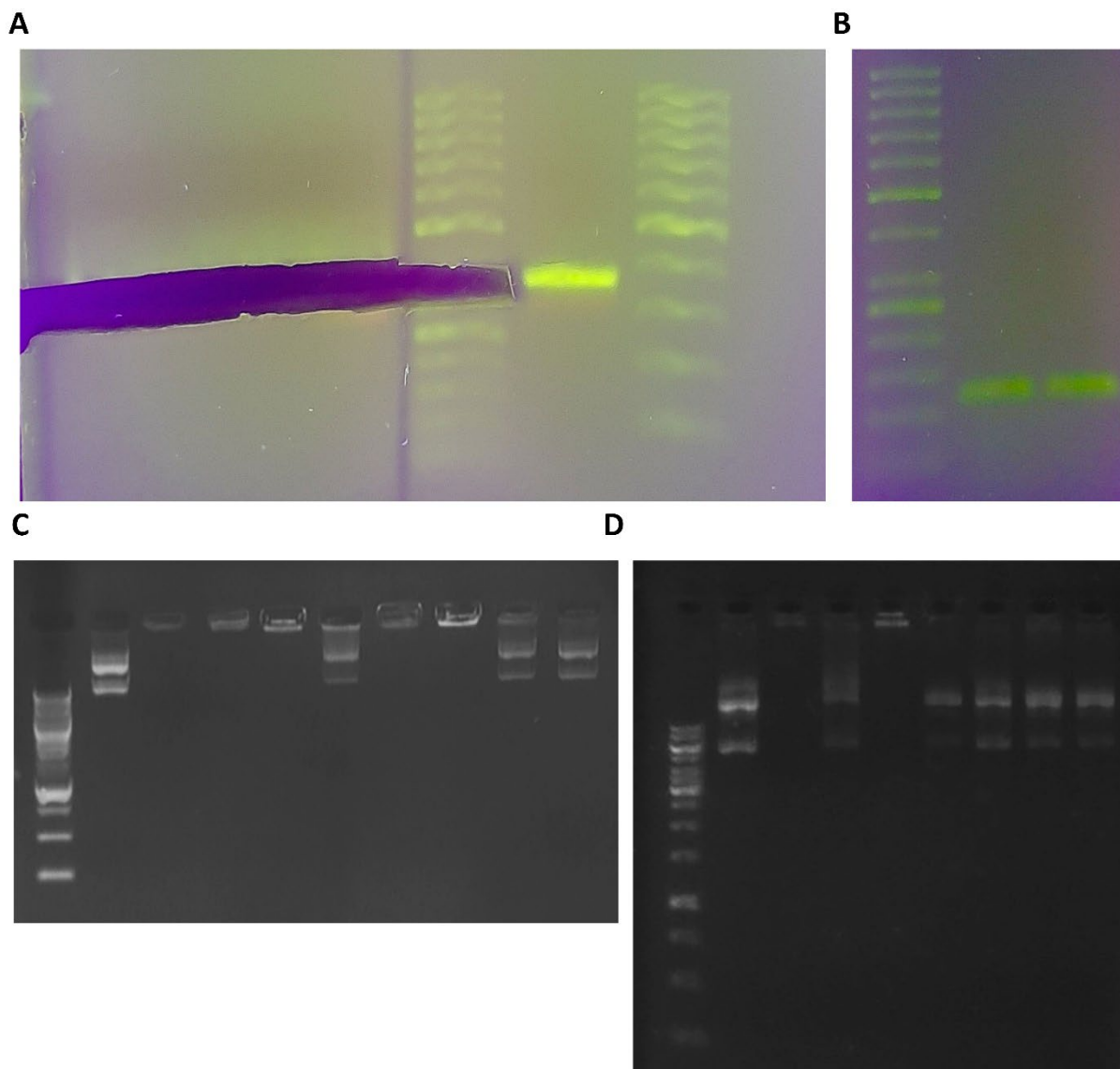


Figure S3. Raw images of gel electrophoresis for: **A)** Amplification and gel extraction of GUCA2A coding sequence (CDS). **B)** Colony PCR validation of the constructed pCMV-GUCA2A and HRE-pMUC1-GUCA2A vectors. **C)** Evaluation of the loading efficiency of synthesized SPEI-9 and PEI. **D)** Assessment of vector protection against degradation by DNase I loaded in SPEI-9.