

Improving the Function and Stability of Cytokines and Growth Factors for Regenerative and Immune Cell Therapies.

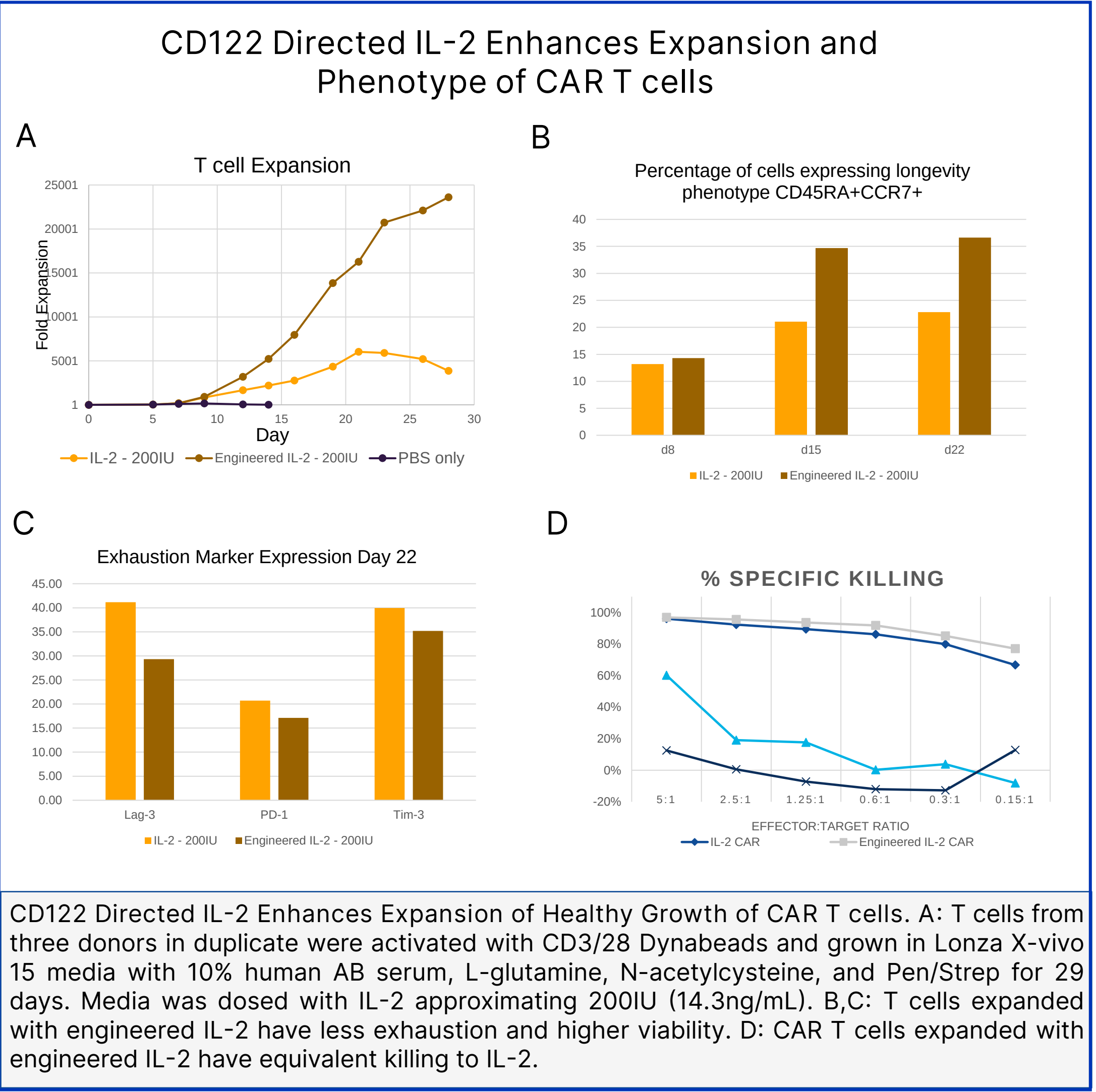
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Introduction

Recombinant cytokines and growth factors are vital components in immune and stem cell therapies, requiring stable and reliable reagents to maintain consistent culture conditions and optimize developmental processes for cost-effective and efficacious therapies. While progress has been made in manufacturing and cell process enhancement, there has been limited consideration given to leveraging improved recombinant proteins to tackle operational and process development costs in cell therapies. Envisioning a future with mass-produced cell therapies, enhancing affordability, efficiency, and accessibility is vital. Our research highlights the importance of protein engineering to optimize recombinant proteins, improving operational efficiency and cell therapy manufacturing cost-effectiveness amidst advancements in process development and bioreactor enhancements for large-scale production.

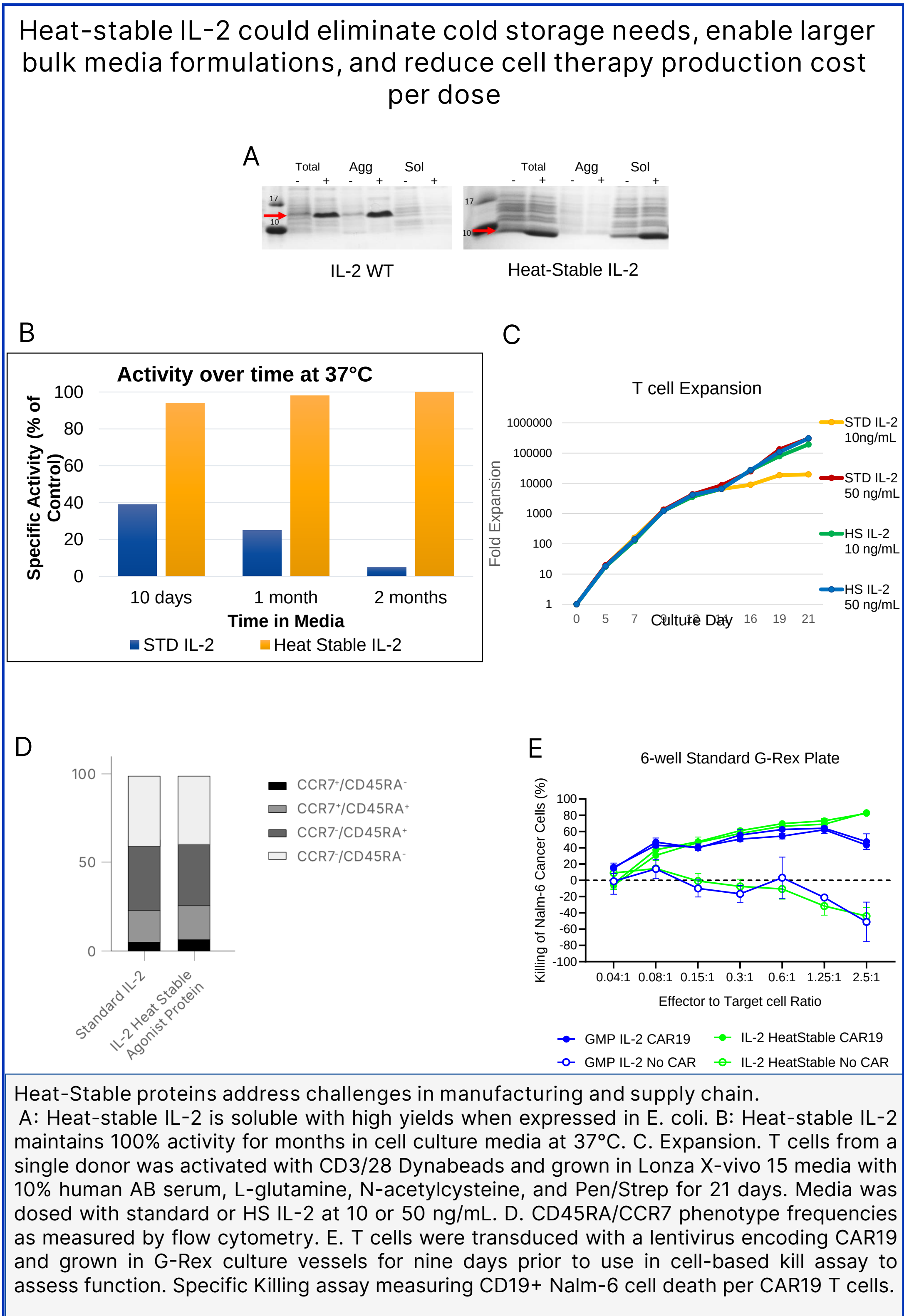
Immune Cell Therapy Cytokines

CD122 Directed IL-2



CD122 Directed IL-2 Enhances Expansion of Healthy Growth of CAR T cells. A: T cells from three donors in duplicate were activated with CD3/28 Dynabeads and grown in Lonza X-vivo 15 media with 10% human AB serum, L-glutamine, N-acetylcysteine, and Pen/Strep for 29 days. Media was dosed with IL-2 approximating 200IU (14.3ng/mL). B,C: T cells expanded with engineered IL-2 have less exhaustion and higher viability. D: CAR T cells expanded with engineered IL-2 have equivalent killing to IL-2.

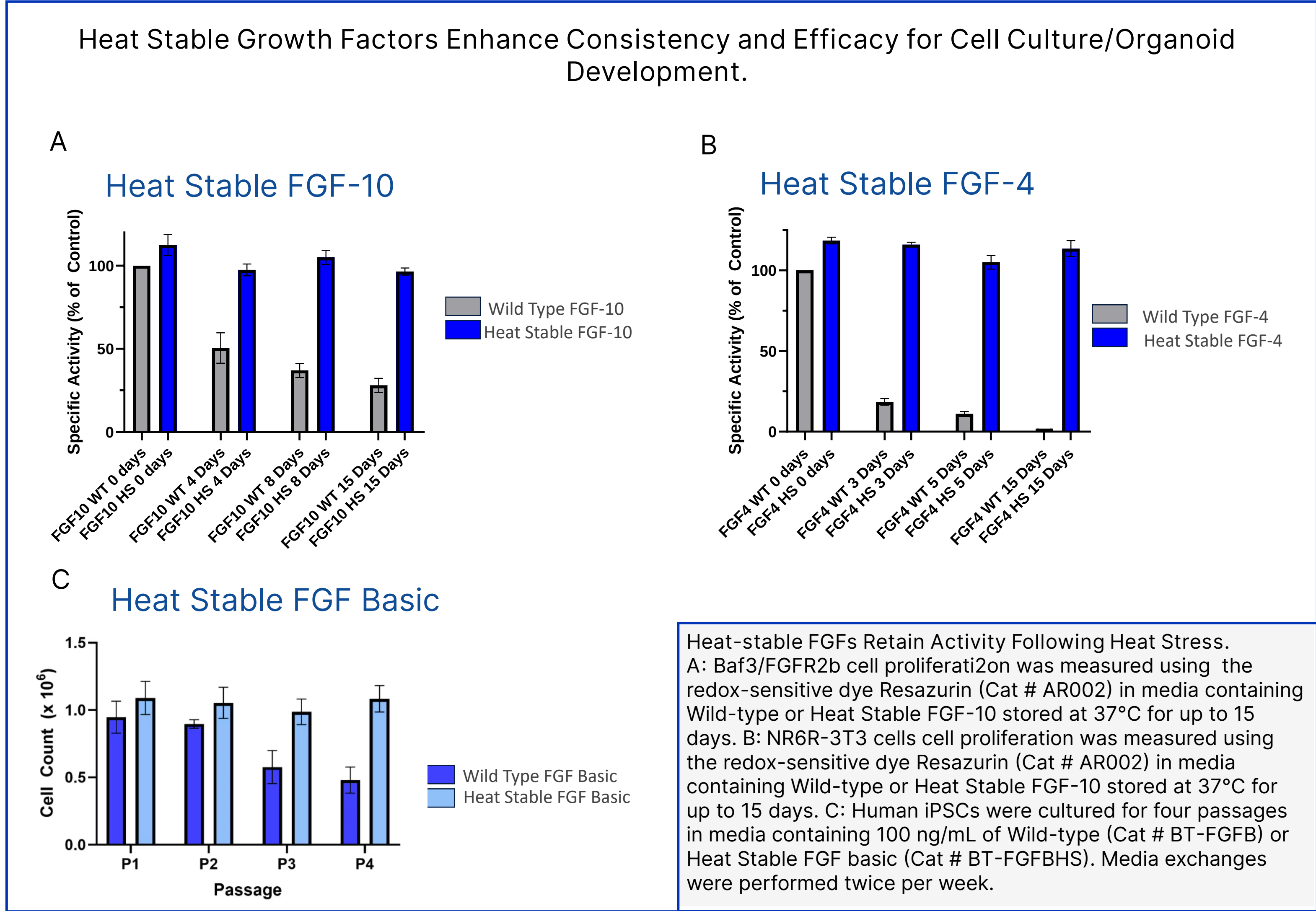
Heat Stable IL-2 Agonist



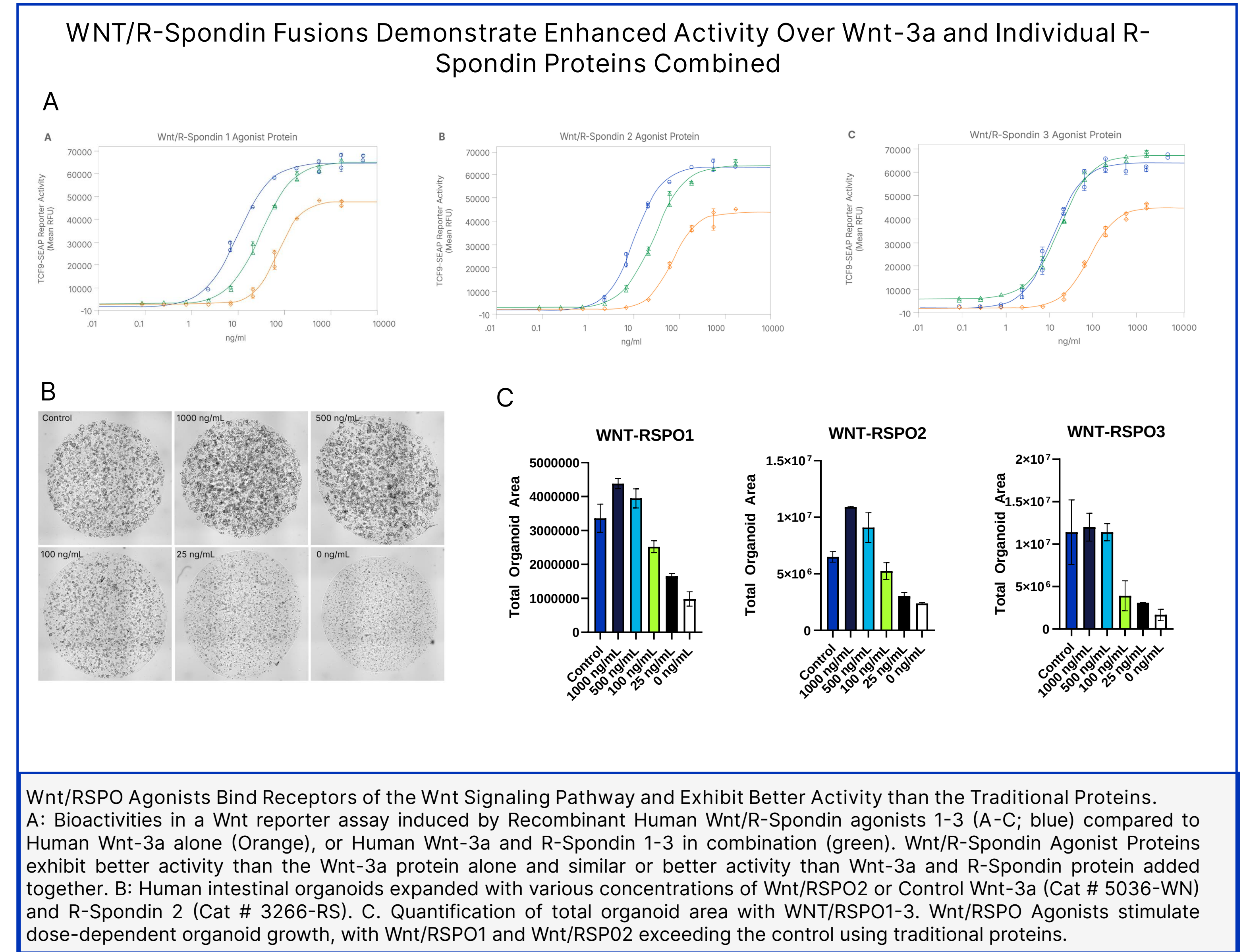
Heat-Stable proteins address challenges in manufacturing and supply chain. A: Heat-stable IL-2 is soluble with high yields when expressed in E. coli. B: Heat-stable IL-2 maintains 100% activity for months in cell culture media at 37°C. C. Expansion. T cells from a single donor was activated with CD3/28 Dynabeads and grown in Lonza X-vivo 15 media with 10% human AB serum, L-glutamine, N-acetylcysteine, and Pen/Strep for 21 days. Media was dosed with standard or HS IL-2 at 10 or 50 ng/mL. D. CD45RA/CCR7 phenotype frequencies as measured by flow cytometry. E. T cells were transduced with a lentivirus encoding CAR19 and grown in G-Rex culture vessels for nine days prior to use in cell-based kill assay to assess function. Specific Killing assay measuring CD19+ Nalm-6 cell death per CAR19 T cells.

Regenerative Medicine Growth Factors

Heat Stable FGFs



Wnt/R-Spondin Agonist Fusion Proteins



Wnt/RSPO Agonists Bind Receptors of the Wnt Signaling Pathway and Exhibit Better Activity than the Traditional Proteins. A: Bioactivities in a Wnt reporter assay induced by Recombinant Human Wnt/R-Spondin agonists 1-3 (A-C; blue) compared to Human Wnt-3a alone (Orange), or Human Wnt-3a and R-Spondin 1-3 in combination (green). Wnt/R-Spondin Agonist Proteins exhibit better activity than the Wnt-3a protein alone and similar or better activity than Wnt-3a and R-Spondin protein added together. B: Human intestinal organoids expanded with various concentrations of Wnt/RSPO2 or Control Wnt-3a (Cat # 5036-WN) and R-Spondin 2 (Cat # 3266-RS). C. Quantification of total organoid area with WNT/RSPO1-3. Wnt/RSPO Agonists stimulate dose-dependent organoid growth, with Wnt/RSPO1 and Wnt/RSP02 exceeding the control using traditional proteins.

Conclusions

In envisioning a future with mass-produced cell therapies, enhancing affordability, efficiency, and accessibility is vital. Our research highlights the importance of protein engineering to optimize recombinant proteins, improving operational efficiency and cell therapy manufacturing cost-effectiveness amidst advancements in process development and bioreactor enhancements for large-scale production. Collaboration is key to drive meaningful progress, and we welcome partnerships to co-develop solutions for your specific therapeutic challenges. Please contact us you are interested.

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