

Sustainability in CGT

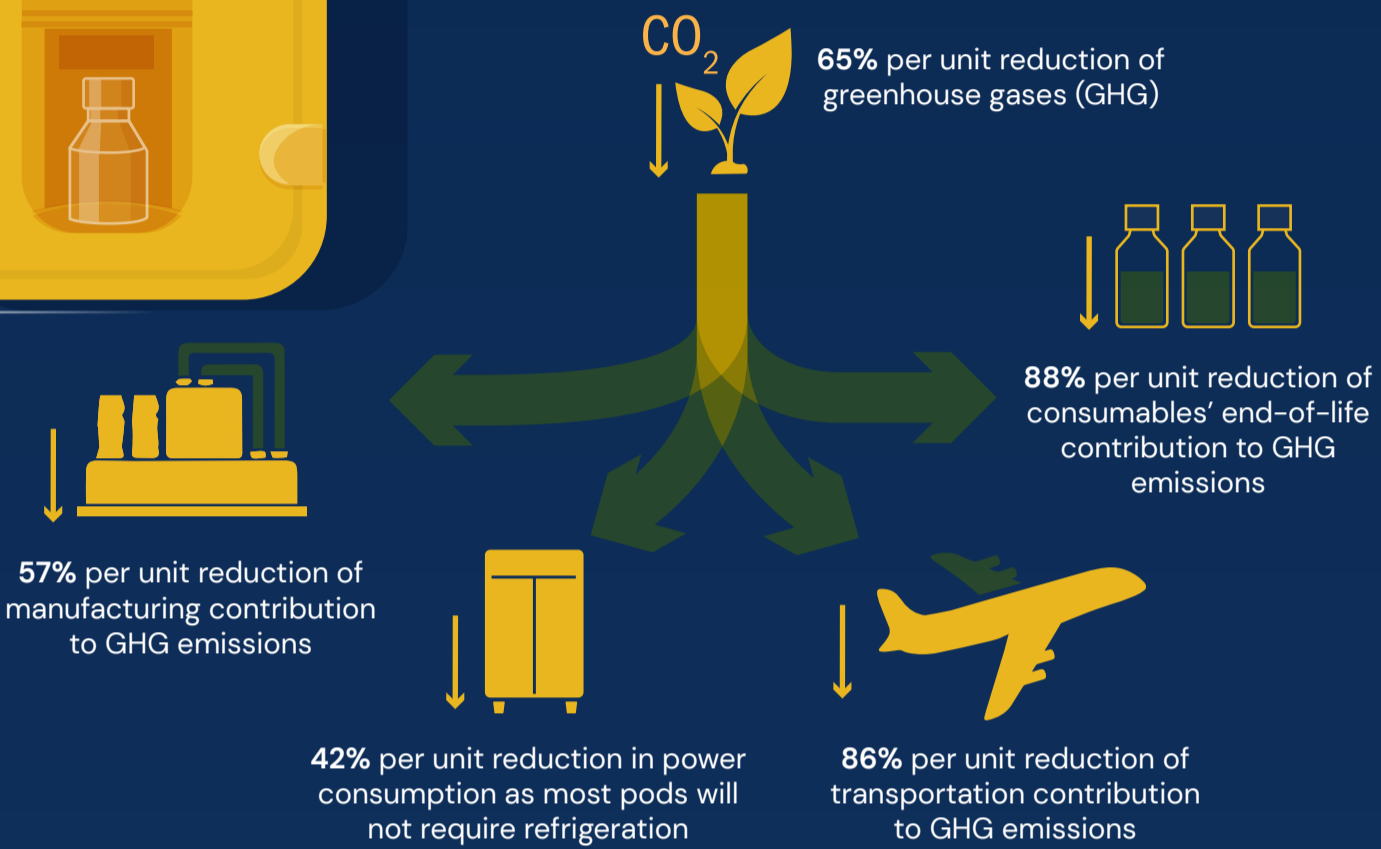
Can cell and gene therapy developers save the environment, while saving patients?

In recent years, there has been growing concern in the pharmaceutical industry about the sustainability of its practices. With other sectors making changes to improve sustainability, the pharmaceutical industry struggles with the balance between patient safety vs. environmental impact, particularly in relation to the abundance of single-use plastics and reductions in carbon emissions. What changes can developers make to their processes and workflow to streamline the pharmaceutical sector into a cleaner and greener future?

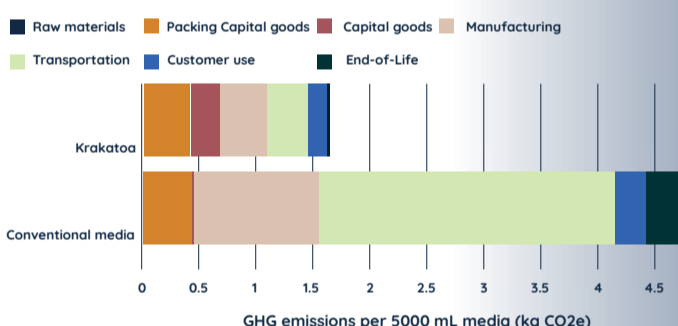
Manufacture sterile cell culture media in 500 mL volumes at point-of-use utilizing biodegradable and recyclable media pods for testing and iteration

Krakatoa

1. Reduces the carbon footprint of laboratories working with cell culture media by reducing single-use plastics and the need to ship and store media in temperature-controlled environments



Total conventional media GHG emissions VS total Krakatoa GHG emissions



2. Improve cell performance with custom formulated media delivered in powder format to ensure maximum potency mitigating the normal degradation that occurs after solubilization

Use media at peak performance and avoid degradation into toxic components

Factors that may affect component degradation:



Light exposure

Light exposure is directly correlated to faster degradation of vitamins, which then lead to increased cytotoxicity when present in cell culture medium



pH

Certain amino acids, such as L-glutamine⁵, are unstable at physiological pH in liquid medium and, consequently, break down into byproducts that are problematic in biomanufacturing applications



Temperature

Temperature fluctuations⁶ can cause cell culture media components to degrade at higher rates, especially vitamins such as pyridoxine⁷ which in turn can accelerate the degradation of amino acids in the media

Incorporate individually owned, high-quality custom media into any process



3. Reduces lead times for custom media, classical media, or buffers with a turnaround time of approximately 2-3 weeks. Further, it lowers the total shipping cost as media is shipped in lightweight, handheld pods instead of bottles or containers

4. Scalable from bench to bioreactors, allowing users to easily test, optimize, and reorder media in quantities that meet your projects demand, ultimately reducing waste



Cure People + Planet™

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3. Minerals: Jonas Lötscher, Adrià-Arnan Martí i Líndez et al. Magnesium sensing via LFA-1 regulates CD8+ T cell effector function. Cell. Volume 185, Issue 4, 2022, Pages 585–602.e29, ISSN 0092-8674

4. Amino acids: Geiger R, Rieckmann JC, Wolf T, Basso C, Feng Y, Fuhrer T, Kogadeeva M, Picotti P, Meissner F, Mann M, Zamboni N, Sallusto F, Lanzavecchia A. L-Arginine Modulates T Cell Metabolism and Enhances Survival and Anti-tumor Activity. Cell. 2016 Oct 20;167(3):829–842.e13. doi: 10.1016/j.cell.2016.09.031. Epub 2016 Oct 13. PMID: 27745970; PMCID: PMC5075284.

5. Ozturk, S.S. and Palsson, B.O. (1990), Chemical Decomposition of Glutamine in Cell Culture Media: Effect of Media Type, pH, and Serum Concentration. Biotechnol Progress, 6: 121–128. <https://doi.org/10.1002/bit.26942>.

6. Patrick Mayrhofer, David Reinhart, Andreas Castan, Renate Kunert. Monitoring of heat- and light exposure of cell culture media by RAMAN spectroscopy: Towards an analytical tool for cell culture media quality control. Biochemical Engineering Journal. 2021; Volume 166, ISSN 1369-703X. <https://doi.org/10.1016/j.bej.2020.107845>.

7. Schnellbaecher, A, Binder, D, Bellmaine, S, Zimmer, A. Vitamins in cell culture media: Stability and stabilization strategies. Biotechnology and Bioengineering. 2019; 116: 1537– 1555. <https://doi.org/10.1002/bit.26942>.



This infographic was created as part of the RegMedNet In Focus on sustainability in CGT, produced in association with Nucleus Biologics.

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