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Emergence of Cell and Gene Therapy Community in Singapore

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“Singapore CGT stakeholders have demonstrated viability and resilience, yet the funding concerns still pose a significant challenge to the sustainability and growth of the sector” explains John Dangerfield, Senior Director, Celligenics, Singapore

Having previously pivoted towards medical devices more than 10 years ago, Singapore has recently seen a biotech resurgence in the form of cell therapy and cell science-related start-ups. This resurgence is undoubtedly inspired in large part by recent clinical successes using T-cell immunotherapy and associated technologies, particularly in the treatment of cancers and autoimmune diseases.

T-cell therapy often necessitates the use of gene therapy techniques to transform the patients' cells ex-vivo. Singapore now has a bona fide Cell and Gene Therapy (CGT) community with more than 25 biomolecule-based medical start-ups or SMEs, of which at least 18 are developing their own CGT products. However, the recent "biotech winter" funding challenges have cast uncertainty on the current vitality of this CGT community.

As a comparator, the UK's CGT scene is notable, with more than 100 companies registered as of 2024 and the rapid expansion of supporting organizations like the Cell and Gene Therapy Catapult and the Advanced Therapy Treatment Centres (ATTC) network. Singapore is developing a similar ecosystem, evidenced by the inauguration of the SingHealth Duke-NUS Cell Therapy Centre (SDCT) in 2021 and the Advanced Cell Therapy Research Institute Singapore (ACTRIS) in 2022. Both organizations aim to advance cell therapy research and commercialization by supporting clinical trials and providing advice, services, and resources for the local community.

Considering population size, Singapore’s performance is comparable to the UK in terms of entity numbers, but overall, the size and stage of the companies are lagging a little behind. Key decision-makers and fund controllers should step out of their comfort zones with next-level support and investments for this fledgling community to expand and thrive. Otherwise, there is

a risk of history repeating itself, with a pivot back to less innovative or quick-to-market projects where the global competition is already fierce and real product differentiation very difficult.

Singapore has a longstanding involvement in stem cell research, exemplified by the founding of the Stem Cell Society Singapore (SCSS) in 2008. SCSS initially focused on basic research into stem cells. As commercial prospects emerged in non-stem-cell-based cell therapies and cell-related medical technologies, SCSS established a Cell Therapy Focus Group (CTFG) which organizes regular events centred around the commercialization of cell therapies in Singapore.

SG Registered Entity	Disease Targets	Stage	Core biotechnologies
Albatroz Therapeutics	oncology	early pre-clinical	novel Abs
Austrianova Singapore	medical & microbiome	phase II	CT and bioencapsulation
Axcynsis Therapeutics	oncology	late pre-clinical	Ab-conjugates (AXC)
Biosyngen	oncology	phase I	T-cell CT (CART, TCRT & TIL)
Carcell Biopharma	C&GT and vaccines	pre-clinical	ex-vivo RBC and LNP C&GT
Carmine SG (EVX Ventures)	breast cancer, others	early pre-clinical	RBCEVs GT (REGENT)
Cell Genesis	anti-aging	pre-clinical	stem cells and RNA CT
Cell Research Corporation	regenerative medical	phase I	umbilical stem cells CT
Celligenics	wounds & inflammation	late pre-clinical	umbilical stem cell secretome
Cellvec	commercial C&GT	platform validation	lentiviral vectors C&GT
Cuprina	chronic wounds	clinical use	medical-grade maggots

Cytomed Therapeutics	oncology	phase I	CAR-?? T-cell CT (CTM-N2/-GDT)
Enleofen	fibrosis & inflammation	late pre-clinical	anti-IL-11 Abs
Gene Oasis	anti-aging	pre-clinical	stem cells
Hummingbird Biosciences	oncology	phase I	mAbs and ADCs
Immunoscape	solid tumours	early pre-clinical	T-cell CT (TCAPS)
Lambdagen Therapeutics	oncology	early pre-clinical	iPSC derived NK cells CT
Lerna Biopharma	hepatic & ophthalmic	late pre-clinical	siRNA
Lion TCR	hepatocellular carcinoma	phase II	HBV-specific T-cell CT
Medisix Therapeutics	oncology & autoimmune	phase I	T-cell CT (CART, TCRT)
Mirxes	oncology	clinical testing	miRNA (CADENCE)
Nuevocor	cardiomyopathy	pre-clinical	AAV-based GT (PrOSIA)
PairX Bio	oncology	platform validation	T-cell CT (tumour Ag pairs)
Panthera Labs	regenerative medical	pre-clinical	MSCs and exosomes
Tikva Allocell	solid tumours	late pre-clinical	T-cell CT, (allogenic CART)
Twain Therapeutics	oncology & autoimmune	early pre-clinical	cytokine targeted Abs

***Table**. Singapore's leading early-stage biologics and Cell and Gene therapy companies and their key focus.*
***Compilation by:** John Dangerfield*
***Note**: MNCs with local operations and govt organisations developing similar products are not included. Diagnostics, genetic testing, manufacturing, supply and other supporting companies are also not included.*

The Singapore CGT scene has been gathering momentum and should reach critical mass soon. Once that happens, it bodes well for the entire ecosystem. This is evidenced in part by eight T-cell immunotherapy companies emerging in recent years. Typically, technologies in this area work by modifying the patient's own extracted cells for reimplantation (autologous treatments), but there is a push towards developing a new wave of one-for-all (allogeneic) treatments for both solid tumours and blood-borne cancers; an approach which several of the Singapore companies have adopted. There is also a trend towards using products and factors secreted from cells as therapeutic agents, rather than the cells themselves, since this simplifies production, storage and regulatory pathways.

For instance, Singapore's homegrown venture Celligenics, an SG-registered tissue bank, has developed a potent, cell-free product sourced from a specific subset of umbilical cord stem cells. Based on technology originally developed at the National University of Singapore, the company was able to further develop and create a stable and scalable secretome product. Several rounds of pre-clinical data *in vivo*, including tests using a real human skin model, show remarkable accelerations in wound healing, with early evidence indicating that it can apply equally well to chronic wounds such as diabetic ulcers, a growing global medical challenge and unmet need. The technology also has strong applications in the veterinary, longevity, and cosmeceutical markets.

Similarly, Austrianova, a cutting-edge biotech headquartered in Singapore with a global footprint, focuses on micro-encapsulation of living cells, utilizing a novel and proprietary technology for the encapsulation of living mammalian (Cell-in-a-Box®) and bacterial (Bac-in-a-Box®) cells. Therapeutic biofactors are secreted from the microbeads. The company out-licensed their oncology cell therapy product and is currently focusing on providing R&D and CDMO services under a partnership model. Notably, Austrianova Thailand established a first-in-class, medical GMP-grade bioencapsulation service for Cell-in-a-Box®, which is offered alongside cell banking and other services to cell therapy partners. Austrianova has been strategically extending collaborations to develop novel, ingestible probiotic products using their Bac-in-a-Box® technology, with one at market-ready stage. There are also notable efforts towards developing first-in-class therapeutic antibodies such as cytokine-directed antibodies and antibody-(bio)drug conjugates for unmet needs such as cancer, arthritis and autoimmune diseases; all being indicative of the innovative efforts within the local biologics community.

Consequently, the timing is favourable for Singapore to explore, capitalise on, and firmly establish itself as a global centre of excellence for CGT research and development. The post-Covid "hangover" is easing, and the life sciences sector is now focusing on this area since it has many potential applications for health improvement. With zero capital gains, a government that is supportive of the life sciences sector, superb legal transparency, zero red tape, a first-class regional talent pool to mobilize, and a family-friendly environment, Singapore is a logical location of choice in APAC.

Navigating Through CGT Funding Complexities

Overall, the Singapore CGT community is at a pivotal point. The stakeholders have demonstrated viable, cutting-edge technologies and have exhibited strength and resilience over the last 12 to 18 months. They will continue to work tirelessly to earn the support they rightfully deserve. However, funding concerns still pose a significant challenge to the sustainability and growth of this sector.

The relative novelty of CGT products, combined with long and costly pathways through clinical trials, creates a high-risk environment that can deter traditional investors. Additionally, the lack of clarity around regulatory aspects further complicates funding efforts, making it difficult for investors to accurately assess the risk and potential return on investment. This issue is compounded by the fact that dedicated life science capital providers with the proper in-house expertise to analyse these types of ventures are scarce in Singapore. The unmet demand for capital creates a massive opportunity to get into promising companies at attractive terms. To capitalize on this, there needs to be a concerted effort to attract more specialized venture capital firms and strategic investors who understand the unique dynamics of the CGT sector.

Furthermore, government support plays a crucial role in bridging the funding gap. Initiatives such as grants, tax incentives, and public-private partnerships can provide much-needed financial backing to early-stage companies. In broad terms, the Singapore government continues to show commitment to supporting the life sciences sector, which bodes well for the future

of the CGT community.

The international success stories of local companies, such as those completing major business deals (e.g. Enleofen) or listings on international stock exchanges (e.g. Cytomed Therapeutics) can also help to build investor confidence. Showcasing these success stories can demonstrate the viability of Singapore's CGT sector and attract more funding from both local and international investors. Any other outcome would not only squander invested time and resources but could also result in a significant and regrettable loss on both local and international fronts. It's important that Singapore acknowledges and drives support for these entities to maintain its reputation as a leader in innovation and biotechnology on the global stage. By addressing funding concerns and fostering a supportive environment, Singapore can ensure the continued growth and success of its CGT community.

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