Powering the Future of Cell Therapy:
Building Scalable Cell Therapy Manufacturing Across the UK

Chimeric antigen receptor (CAR) T-cell therapy is one of the most transformative breakthroughs in modern medicine. The concept of reprogramming a patient's own immune cells to recognise and destroy cancer cells was first demonstrated in the 1990s, when researchers successfully engineered T-cells to express synthetic receptors capable of targeting tumour antigens.

A New Era in Cancer Treatment

After years of refinement, the FDA approved tisagenlecleucel (Kymriah) in August 2017 for the treatment of children and young adults with R/R acute lymphoblastic leukaemia (ALL). Since then, these therapies have transformed outcomes for patients with blood cancers once considered untreatable, achieving remission where traditional chemotherapy or stem cell transplants had failed.

As of now, there are six FDA-approved CAR T-cell therapies and ten CAR T-cell therapies commercially available globally, with approved indications that include B-cell ALL, large B-cell lymphoma (LBCL), follicular lymphoma, mantle cell lymphoma, chronic lymphocytic leukaemia (CLL) and multiple myeloma. However, the potential use of cell therapies such as CAR T-cell therapy stretches far beyond oncology, with the potential to offer curative solutions where conventional treatments often fail.

The success of CAR T-cell therapies has inspired broader exploration into cell therapies for autoimmune and infectious diseases, with over a thousand active trials worldwide.[1] This rapid expansion has placed unprecedented pressure on global manufacturing networks to deliver therapies at scale without compromising safety or efficacy.

Despite its promise, CAR T-cell therapy remains expensive and difficult to manufacture, with limited effectiveness against solid tumours. In addition, the path from research to the delivery of these therapies to the patients that need them most remains complex. Developing robust, flexible manufacturing capabilities in the UK is therefore critical to ensuring the nation remains at the forefront of this growing field.

Affordability and Access

The cost of CAR T-cell therapies has always been a major barrier to patient access. The initial treatment prices for Kymriah and axicabtagene ciloleucel (Yescarta) were roughly $475,000 and $373,000, respectively,[2] costs driven by the complexity of cellular manufacturing in specialised GMP facilities and the intensive hospital care required post-infusion to manage risks to patients such as cytokine release syndrome.

Globally, access remains uneven. CAR T-cell therapies have been approved in Brazil, China, Australia, Singapore, the UK and several European countries. Yet vast parts of the world, including much of Africa, Asia and South America, still lack access entirely, highlighting the urgent need to make these treatments more scalable and affordable worldwide, particularly given their curative potential.

This has prompted a global movement towards developing local, in-country CAR T-cell therapies, not just to improve access, but to lower costs by building domestic manufacturing capacity. Countries including China, Brazil and India are investing heavily in their own cell therapy development programmes, seeking to localise production for affordability, reduce reliance on imported therapies and expand patient eligibility.

This decentralised approach marks an important shift in the global CAR T-cell therapy landscape from a few large commercial manufacturers to a more diverse network of regional and academic developers. For the UK, this represents both a challenge and an opportunity to establish itself as a leader in cost-efficient, high-quality CAR T-cell manufacturing and to ensure equitable access for patients at home.

As such, strengthening our own domestic biomanufacturing capacity offers a pathway to reduce per-patient costs and make it easier for the NHS to deliver these treatments equitably and consistently. For a nation already known for its clinical and academic strength, improving access to these cell therapies must now become a national manufacturing priority.

Turning Discovery to Delivery

The UK's academic excellence, clinical infrastructure and regulatory environment have helped establish it as a key player in cell therapy development. As such, the UK is poised to play a leading role in the development of the next generation of cell therapies, with forecasts that the UK immunotherapy drug market is expected to grow at a compound annual growth rate of 11.2% between 2025 and 2030.[3] However, the UK faces a growing gap between innovation and capacity.

Investment in research alone is not enough to secure the UK's position as a global leader in cell therapy development. Institutions such as the ABPI have emphasised that whilst the UK has made progress in getting cell therapies to patients, more must be done to get ready to provide future cell therapies to broader patient populations.[4] This shift will demand not just more funding, but more manufacturing power, process innovation and skilled workers.

Bridging this gap will also require closer alignment between researchers, the NHS and industry to ensure that discoveries made in the lab are designed with manufacturability, scalability and clinical deployment in mind. The UK's research hubs provide a strong foundation for this integration, but a more connected national network is needed to move therapies efficiently from discovery to delivery.

Bridging the Manufacturing Gap
CAR T-cell therapies have achieved remarkable success in treating blood cancers, yet scaling their use to wider patient populations demands a transformation in how these therapies are made. High production costs, scalability limitations and long vein-to-vein delivery times continue to restrict access. Compounding these challenges, the UK faces a shortage of skilled biomanufacturing workers, which the industry warns could become one of the most significant barriers to growth in the coming years.[5]

To meet rising global and domestic demand, cell therapy manufacturing must evolve to become faster, more automated and more cost-efficient. This requires more than infrastructure investment alone; it calls for a coordinated ecosystem that connects researchers, clinicians and manufacturers from the earliest stages of development through to commercial production.

Momentum in this direction is already building with the recent £11.5 million investment in UK biomanufacturing,[6] alongside the continued expansion of MHRA-licensed GMP facilities,[7] reflecting growing national recognition of the need for stronger and more resilient advanced therapy manufacturing capacity.

Whilst existing facilities in southern and central England have established valuable expertise, they alone cannot support the volume of demand that the next decade will bring. Regional expansion is therefore essential, not only to improve capacity but to ensure equitable patient access across the country.

Creating a Northern Powerhouse for Biomanufacturing
The North of England, and Liverpool in particular, is uniquely positioned to become a biomanufacturing powerhouse for CAR T-cell therapies and future cell therapies. The region combines a rich industrial heritage, a skilled life sciences workforce and a strategic geographic location that connects the UK with international supply chains. In particular, Liverpool's long-standing excellence in vaccine and gene therapy production offers an adaptable foundation for scaling cell therapy production.

By leveraging this infrastructure, the UK can bridge the current biomanufacturing capacity gap, expanding existing partnerships between innovation clusters to translational centres in the North. Such regional investment would not only drive growth and job creation but also shorten supply chains, reduce costs and enhance the sustainability of therapy delivery.

The Importance of a Skilled Workforce
Building a sustainable cell therapy industry will require developing a highly skilled and adaptable workforce. Some UK institutions have already begun tackling this challenge through specialist training programmes, apprenticeships and partnerships that integrate manufacturing experience into research.

Expanding these efforts nationwide could transform regional capacity and ensure a steady pipeline of trained professionals ready to support GMP manufacturing. Importantly, the UK must also focus on retaining talent by providing long-term career opportunities in regional hubs so that expertise does not remain concentrated in the Southeast.

The Next Phase of CAR T-cell Therapies
As the field evolves, the next phase of CAR T-cell therapy development will focus on streamlining efficiencies between research, biomanufacturing and clinical use. Addressing affordability and access is essential to ensure these life-changing treatments reach all patients who could benefit.

The future of CAR T-cell therapy lies beyond cancer. Early clinical trials applying CD19-targeted CAR T-cell therapy to autoimmune diseases such as systemic lupus erythematosus and antisynthetase syndrome have shown promising results, hinting at a much broader therapeutic horizon. With this, the UK now stands at a strategic crossroad where we can emerge as a world leader in developing the next generation of cell therapies.

Conclusion
CAR T-cell therapies stand at a pivotal moment, clinically validated yet not universally accessible. The UK now has a strategic opportunity to lead the world in cell therapy biomanufacturing by investing in infrastructure, workforce development and regional capacity. Turning this potential into reality will require coordinated investment and long-term planning, but with the right approach, the UK can ensure these advanced therapies are made, scaled up and delivered here for the benefit of patients nationwide.

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