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# The future of cell and gene therapies in the UK: Skills, training and development

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# About

## About this programme

The future of cell and gene therapies in the UK is a policy programme designed to identify practical and actionable steps to address the current skills shortages seen in Cell and Gene Therapy (CGT) and wider life sciences sector. The findings and recommendations are aimed at key leaders from government, industry and academia.

The programme included a series of three roundtables conducted throughout 2022/23, chaired by Dr Anji Miller Lead for Gene Therapy Innovation Hubs & Senior Business Manager at LifeArc.

The roundtables were attended by cell and gene therapy leaders and experts throughout the UK, including academics, researchers, and professionals from the public and private sectors.

This report covers the key insights, opinions and recommendations that emerged from each discussion. It is not an exhaustive account of issues relating to cell and gene therapies and the wider life sciences sector, but rather a summary of key issues raised by a group of experts and stakeholders.

Sponsorship for this programme has been provided by LifeArc, the University of Birmingham and Birmingham Health Partners.

## About Public Policy Projects

PPP is an organisation offering practical analysis and development across health and life sciences.

PPP is independent and cross-party, bringing together public and private sector leaders, investors, policy makers, academics and commentators with a common interest in the future of public policy.

Through roundtables, conferences and research, PPP brings together national and regional governments, the NHS, integrated care system leaders, and private, public, and third sector organisations. The resulting policy papers, insights, and publications provide practical analysis and recommendations to drive transformational change in health and life sciences.

# About

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## About LifeArc

LifeArc is a self-funded medical research charity. We specialise in advancing early scientific discoveries so they can be developed into the next generation of diagnostics, treatments and cures. We do this by offering a unique combination of funding (philanthropic and venture capital), advice (notably in technology transfer and business development), and science (including two laboratories with specialisms in drug discovery and diagnostic development respectively).

LifeArc has over 25 years' experience in offering a holistic package of support to universities, academics, charities, investors, public sector research establishments (PSREs) and other research performing organisations (RPOs) who want to bridge the gap between lab and patient. To date, our work has resulted in five licensed medicines including cancer drug Keytruda. We are committed to spending £1.3 billion by 2030 in areas of unmet need where we believe we can have the greatest impact on patients.

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# Foreword



## Anji Miller MSc PhD RTTP CLP

**LifeArc and skills Lead, Innovation Hubs for Gene Therapies  
Chair, Roundtable Discussions on Cell and Gene Therapy Skills Shortages**

The UK's cell and gene therapies (CGT) sector is growing quickly and holds great promise for patients. Despite this, there is well-documented evidence of skills shortages in the sector which challenges its future potential. Over the past year we convened key leaders in the CGT sector for three roundtable discussions, the aims of each of these discussions was to develop actionable and practical steps to address skills shortages in CGT and indeed across STEM roles more broadly. As Chair of these roundtables, and LifeArc's lead on academic-led gene therapy innovation, I am delighted to present this summary of the key insights and recommendations we gathered.

The roundtables convened a diverse group of experts from across the CGT community, representing academia, industry, regulatory bodies, and healthcare providers. The cross-sector nature of the attendees was instrumental in highlighting the multifaceted challenges faced by the sector. By harnessing the collective knowledge and experience of these participants, we identified the critical hurdles to ensuring the future success of CGT in the UK.

It is important to acknowledge the many existing reports that have detailed the skills shortages within our sector. These reports have laid a strong foundation by highlighting the urgency of addressing this issue and the potential impact on our ability to remain at the forefront of innovation. Our findings build upon these earlier works and assume a level of familiarity with the prevailing challenges and opportunities. Our intention is to further the dialogue and complement existing work.

The primary goal of this report is to drive cross sector collaboration and inspire the necessary political support for the UK to fully leverage the potential of the CGT sector. With the right measures in place, this burgeoning field can significantly contribute to both the health and wealth of our nation. By fostering innovation, attracting investment, and nurturing the development of vital skills, we can position the UK as a global leader in this transformative area of medicine.

To achieve these objectives, the report outlines a series of actionable recommendations that emerged from the roundtable discussions. These recommendations encompass a range of critical areas, including education and training, research infrastructure, funding mechanisms, and collaboration between academia, industry, and government. It is my hope that policymakers, funding bodies, and other key stakeholders will embrace these recommendations, recognising the importance of sustained and strategic investment in building a skilled workforce and supporting the growth of the sector.

I would like to express my sincere gratitude to all the participants and contributors who dedicated their time and expertise to these roundtables. Their passion, insights, and commitment to driving progress in the CGT field are commendable. Additionally, I would like to thank the teams at LifeArc, Birmingham Health Partners, PPP and everyone else involved in the production of this report for their hard work to capture and distil the insights of these discussions.

I invite you to read this report with a sense of optimism and possibility. Together, we can seize the opportunity presented by the CGT sector and lay the foundation for an agile workforce that nurtures innovation, advances patient care, and drives economic growth. Together, we can make life science life-changing.

# Executive Summary

The cell and gene therapy (CGT) industry is undergoing rapid growth and is expected to play a key role in facilitating the government's strategy for the UK to become a Science and Tech superpower by 2030. However, to facilitate its continued growth, a significant expansion of the workforce is required. Factors currently contributing to the vulnerability and inhibiting the growth of the CGT workforce include an under-skilled pipeline of sectoral workers, broader workforce shortages in STEM positions, and unpredictable government support for the industry.

A holistic and collaborative approach between government, industry and local institutions will be key to building awareness and accessibility around career opportunities in the CGT industry to overcome workforce shortages.

## THE EARLY WORKFORCE PIPELINE

There are opportunities to increase exposure to CGT for students at all levels and ages. Currently, however, few initiatives in schools exist which are dedicated to generating enthusiasm and awareness of the CGT sector, and educational professionals may not be aware of the opportunities available for students. Engagement from CGT industry leaders is required to raise awareness of career opportunities and dispel misconceptions around STEM career pathways more generally.

At university level, the UK has maintained solid student engagement with STEM fields, but it remains a challenge to promote CGT specifically - as it is a highly specialised and still relatively novel bioscience lacking awareness amongst students. Alongside providing more careers days and internships/placements, the CGT industry must reach the entire STEM student base in universities with information about career opportunities and breakthroughs to inspire students.

A lack of core practical skills also exists amongst graduates due to the pandemic forcing courses online and declining numbers of industrial placements. This has created bottlenecks in the CGT industry, slowing growth and innovation. Additionally, spending time training new hires is unaffordable and unsustainable for many SMEs – who make up the core of the CGT and wider bioscience industry. Government, industry, and academic stakeholders should collaborate to drive and increase in placements, internships, and wider training courses to improve the skillsets of CGT trainees.

## TRAINING PROGRAMMES AND PRIVATE ACADEMIES

To help plug the skills gap, government investment in current training and development programmes, such as the Advanced Therapies Apprenticeship Community (ATAC) and the Advanced Therapies Skills Training Network (ATSTN), is required to raise awareness and enhance the accessibility of the CGT industry. The industry should also look to other sectors, particularly those in decline like oil and gas, for workers with core competencies who can be upskilled.



Private training academies are run by large industry organisations to skill their employees with the highly particularised capabilities required to work in CGT but can have unintended consequences for the future sustainability of the CGT skills pipeline. They potentially threaten quality and training standards, and duplicate, therefore waste, training resources which could otherwise be used to collectively strengthen the CGT skills base. These academies could result in a sector with a range of different skillsets lacking common practices. Larger companies should be incentivised to share knowledge from academies, and the government should collaborate with industry to establish more effective oversight.

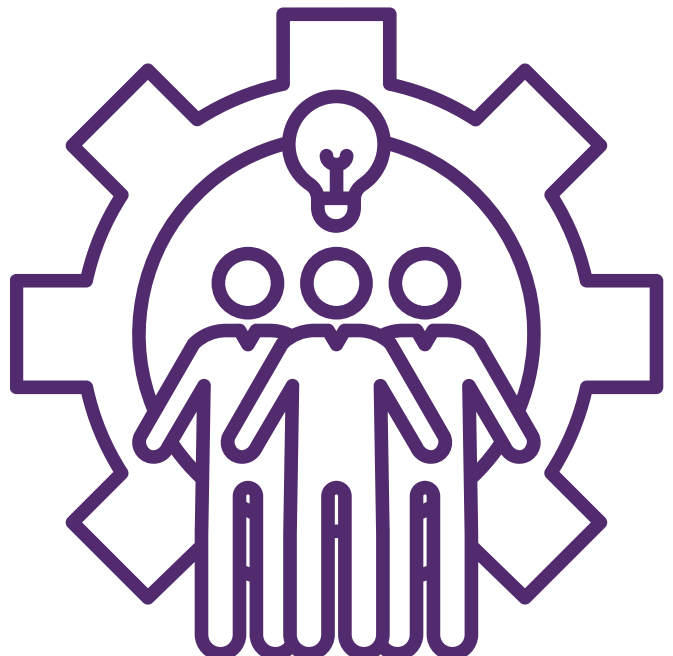
## NHS CAPACITY AND GEOGRAPHICAL CONSIDERATIONS

Even with approvals of advanced therapies and CGTs, roundtable participants acknowledged that the NHS's capacity for drug delivery is an important factor inhibiting their deployment and movement from novel one-off test cases to becoming part of routine care. Demand on the system means NHS staff have little time to dedicate to new research or learn new methods to deliver treatments like CGTs, and it is unlikely that staff will take on further training until workplace conditions stabilise.

The CGT industry is also relatively geographically well-distributed throughout the UK. This will help in providing access to CGTs, reducing health inequality, and allowing for the capturing of skills from across regions, benefitting the levelling up agenda. However, the CGT industry should be careful not to spread itself too thin, and key stakeholders should aim to build relationships with local decision makers to access a wider range of funding programmes to further support to pre-existing structures.

## CONCLUSION: CROSS SECTOR COLLABORATION IS KEY TO MAINTAINING GROWTH OF CGT

Collaboration will be key to harnessing the CGT sector's potential. Forming new sector relationships between academia, the private sector and government, alongside sustained investment are essential to address the skills gap and ensure the long-term success of the industry. All CGT sub-sectors must work together to highlight the transformational benefits of the industry if a sustainable skills pipeline is to be built in the UK.



# Recommendations

## FOR GOVERNMENT

1] Education is at the core of the UK's skills shortage, from school through to university and workplace training. Given the estimated skills demand and shortage outlined in this report, alongside the forecasted growth of the sector, there is a clear role for government to create a UK wide strategy and plan to expand, develop and train an industry-ready CGT workforce to support the potential of the sector. This could be led by the Minister of State for Skills, Apprenticeships and Higher Education in close collaboration with the Minister responsible for genomics, genetics and regenerative medicine.

2] A critical factor within this will be how to equip candidates with relevant industrial skills via industrial placements and internships. The government should work with academia and industry to create a national strategy for industrial placements and internships, and to support the adoption of VR simulations of CGT environments to increase graduate awareness of the sector. This strategy would help to select and match talented, motivated students to industry placements and strengthen engagement between industry and academia through enhanced business value in taking on trainees.

3] In addition to working closely with universities, the government should look to develop national primary school curriculum to include key STEM learning initiatives, broadening scope for involvement in specialist fields such as CGT in increasing the number of practical opportunities available.

4] Government should be encouraged to allocate more ringfenced funding to expand the ATAC and the ATSTN on a long-term basis to provide long-term stability and predictability of workforce numbers.

## FOR THE LIFE SCIENCES INDUSTRY WORKING WITH ALL STAKEHOLDERS:

5] The life sciences sector collectively needs to do a better job of improving the visibility and career pathways of roles in STEM, including CGT research, development and manufacturing to prospective students and graduates. Inspiration for this could be taken from better exposed sectors such as the tech industry, where companies actively work to highlight career pathways and even process visa applications for overseas applicants.

6] There is an opportunity for industry, government bodies, and relevant charities and academic bodies to work together to develop clear, transparent and standardised roles and career pathways, qualifications, and training programmes to address the future CGT talent pipeline required to meet the needs of the sector. All stakeholders should work together with government to develop a centralised and easy to find repository/'shopfront' of job, training and education opportunities in the CGT industry. This could be a stand-alone platform or be embedded within one of the pre-existing government-funded CGT organisations.



# Recommendations

7] To meet the current and real demand for skilled CGT workers, all stakeholders, government, industry and academic leaders alike, should explore opportunities to work together to create targeted training programmes to attract, recruit and reskill talented workforce from allied sectors with relevant expertise. Industries that could potentially provide a source of relevant professionals with transferable skills include biomanufacturing, computational biology and data analytics.

## **FOR THE CGT SECTOR TO TAKE ACTION ON LOCALLY:**

8] The CGT industry should look at opportunities for funding and support from existing skills programmes such as the Local Skills Improvement Plan and the Strategic Development Fund. This requires stakeholders building closer relationships with local decision-makers and educating them on the benefits of the CGT sector.

9] Given the geographic clustering of CGT skills and economic development, there is an opportunity for the CGT ecosystem to work with, educate and engage regional and local government and academic leaders such as local authorities, council members, university personnel and local skills officials on the benefits of participating in building a sustainable regional CGT skills pipeline.

10] Nationally, there is a mismatch between the skills needed to fill STEM roles and the labour available at a local level. As such the CGT sector must work closely with local authorities and educational institutions to both identify the roles required in specific area and develop more locally responsive recruitment and training opportunities for potential STEM students.

## **FOR THE CGT SECTOR TO TAKE ACTION ON FOR THE FUTURE:**

11] The skills shortage in the CGT sector is systematic of the wider well-known problem of a general shortage of STEM workers in the UK. Looking into the future and the need to build the skills pipeline in the long-term, the promise of cell and gene therapies should be incorporated into all STEM education and awareness outreach programmes, national strategies, taskforces, STEM teacher training and educational materials.

# Introduction

In March 2021, the government outlined a clear ambition for the UK to become a Science and Tech Superpower by 2030, placing life sciences as a central pillar of future economic growth and health outcome improvement. As one of the fastest growing industries within life sciences, cell and gene therapy (CGT) is expected to play a central role in facilitating this strategy. The CGT sector recorded over 200 per cent growth between 2018 and 2020 alone, and it is hoped the UK's momentum in this field will provide it with a competitive advantage in research, development, manufacturing and clinical adoption of CGTs.<sup>1</sup>

Facilitating this continued growth will require a significant expansion of the CGT workforce. Even the most conservative skills demand forecasts estimate that the number of jobs in CGT will need to grow by 117 per cent from 2021-2026, to more than 15,000 in total.<sup>2</sup>

Roles in CGT are typically highly complex and qualified and are as such difficult to recruit for, the sector is particularly vulnerable to broader skills gaps and workforce shortages in life sciences and STEM positions. Further adding to this exponential growth is the fact that the sector itself is adding new roles that did not exist before, potentially allowing for significant redeployment and reskilling from other sectors.

There are, unfortunately, several structural barriers adding to this vulnerability and inhibiting the growth of CGT and will require significant cross sector collaboration to address. These barriers include, but are not limited to, an under-skilled pipeline of sectoral workers, a general lack of awareness of the industry, and an unstable political environment leading to unpredictable government support for the CGT industry. Clearly, CGT is not immune to headwinds facing the Life Sciences sector more broadly, a majority of respondents to a recent PPP survey of key industry stakeholders indicated that they anticipate the skills shortage to grow in the next five years.<sup>3</sup> Further, skills gaps in STEM roles and CGT specifically do not manifest equally across the UK, and any initiatives designed to bring down these disparities will have to take a localised approach.<sup>4</sup>

There are also fundamental issues around salaries for specialists working in CGT and life scientists more broadly, with lucrative contracts available in the private sector meaning that pharma are able to attract candidates that are desperately needed in academia. This issue is not exclusive to the UK, with research showing that across Europe, scientists make 30 per cent more in industry than in academia.<sup>5</sup> While the market dynamics will inevitably mean industry packages are more lucrative than those offered by academia, it is imperative that the sector collaborate to find ways for academic institutions to retain a strong foundation of basic CGT research in the UK. Ensuring a more sustainable academic skills pipeline will benefit the entire sector, ensuring it is able to capture the exponential growth of the sector.

In recent years, the government has published a raft of reviews and reports in an effort to highlight the skills gaps, as well as establishing a special visa for highly skilled foreign workers to boost the sector workforce in the short term.<sup>6</sup> However, as was found by the House of Lords Science and Tech Committee last year, these efforts do not go far enough to address the scale of the UK's skills gap. Indeed, the Committee stressed that if the UK is to harness its potential to become a science and tech superpower, urgent action is needed to address the skills gap in STEM fields.<sup>7</sup>



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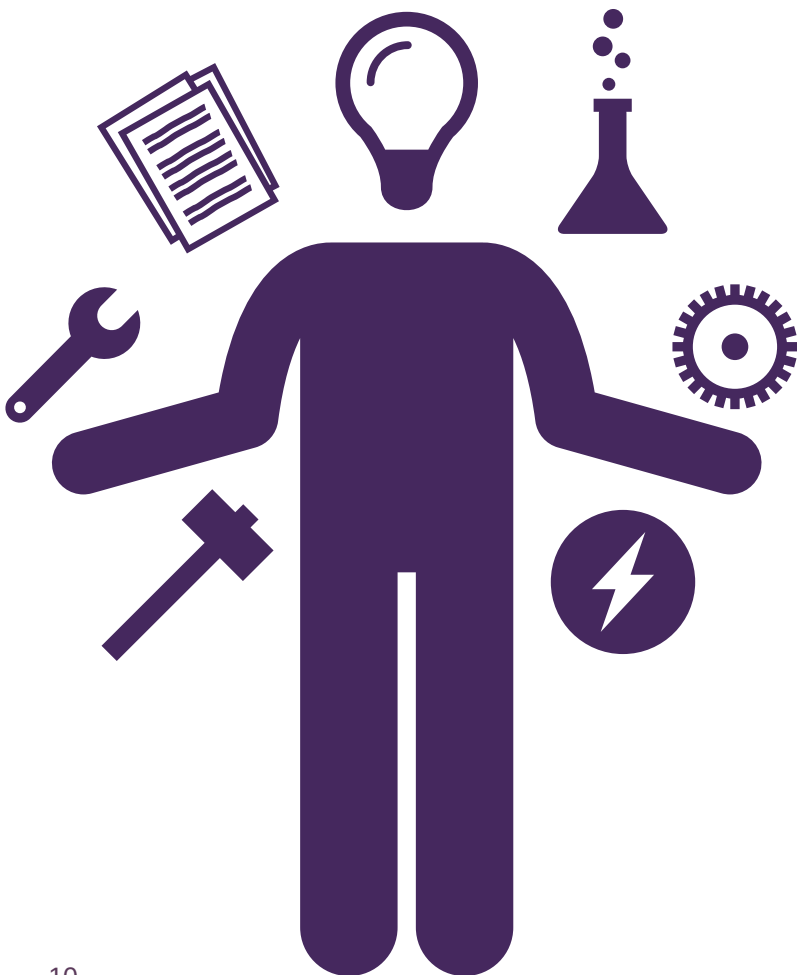
**The number of jobs in CGT  
will need to grow by 117  
per cent from 2021-2026**

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Ensuring an adequately large and skilled workforce for the science and technology sectors not only benefits the economy but also the patients, populations, and health systems that rely on breakthroughs and innovations in medicines, therapies and medical technologies.

At the heart of the skills shortage is an education and policy environment that is currently unable to facilitate a sustainable talent pipeline that matches the rapid growth of the CGT sector. As such, this report provides a series of practical, actionable recommendations for government, industry and key local institutions to enhance the visibility and accessibility of career opportunities within the CGT sector, life sciences and STEM roles more broadly.

**At the heart of the skills shortage is an education and policy environment that is currently unable to facilitate a sustainable talent pipeline that matches the rapid growth of the CGT sector.**



# Building awareness and accessibility

As a highly specialised bioscience, CGT is not a sector that benefits from widespread awareness beyond those studying advanced medical degrees. Fixing the current skills gap in CGT requires technician-level workers and non-specific staff as much as highly educated specialists. In PPP's own survey of key industry stakeholders, 92 per cent of respondents indicated that regulatory and compliance knowledge is one of the greatest needs of the sector.<sup>8</sup> Beyond this, commercial organisations working in CGT, who are so vital for the sector's continued growth, need people with business acumen in order to succeed.

The breadth and scale of the shortage facing the sector requires holistic and collaborative approaches from all key players involved in STEM education. This will enhance awareness of the sector's career pathways and ensure that its recruitment net is cast as wide as possible.



**92 per cent of respondents to PPP's stakeholder survey indicated that regulatory and compliance knowledge is one of the greatest needs of the sector**

## CAPTURING THE IMAGINATION OF THE NEXT GENERATION

There is ample opportunity to increase exposure to CGT for students at all levels and ages. Children have the ability to engage with complex topics and ideas, but there are far too few initiatives within primary schools designed to generate enthusiasm and awareness for the sector.

Furthermore, developing a comprehensive understanding of these topics among young people requires time, expertise, and resources that are often beyond the standard lesson and school curriculum. Teachers and education professionals may not be aware of the many opportunities available in CGT, and they do not have access to the resources needed to conduct enriched classroom activities that draw children into science in meaningful ways.

To ensure that children are given the opportunity to explore these important areas, it is essential to provide more comprehensive resources for schools and encourage them to use experts, such as actual scientists, to provide a realistic and contextual understanding of the STEM industry.

This will require more proactive engagement from biotech and industry leaders with schools, who should be conducting more regular visits to classrooms to engage students of all ages.

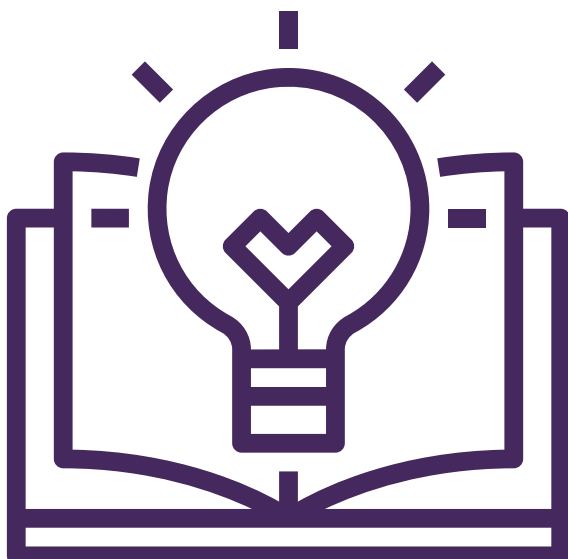
Birmingham based software company, FourPlus, has been using its immersive virtual reality (VR) technology to provide vital life science training to workforce entrants and aspiring STEM students. The company's co-founder and roundtable participant, Professor Ivan Wall, recounted how VR headsets were used to provide a chance to see how labs operated through immersive technology. VR technology creates an immersive experience that can supplement a candidate's learning by providing an interactive environment that enhances their understanding and retention of complex topics. Harnessing innovation to deliver hands-on experience is vital to sustaining motivation and interest in STEM subjects amongst CGT workforce entrants.



Other key organisations working to drive STEM engagement among young people include STEM Learning, which works with schools and professionals on a voluntary basis to provide better STEM learning opportunities for school children of all ages. Opportunities such as this bring science directly to school children and provide proactive and engaging opportunities for them to interact with science.

These practical interventions can also help dispel certain misconceptions about STEM career paths. Several participants remarked on the fact that a substantial proportion of the general public believes that studying biology or a similar subject will inevitably lead to a career as a medical doctor. In the same conversation, it was noted that too many children and adults think pharmacists are in labs producing medicines. These misconceptions show a clear breakdown in communication between the biotech industry as a whole and the public. It is only through proactive collaboration between industry and education that it can be addressed.

These interventions provide compelling examples of how enthusiasm can be generated among children for life science careers and STEM more broadly and highlight a potentially missed opportunity to create a stronger skills pipeline. The government should more actively look to embrace the models provided by STEM Learning and integrate them with the national school curriculum.



## BUILDING MOMENTUM IN HIGHER EDUCATION

Medium-term solutions to address the skills shortage should be rooted in higher education. In recent years, the UK has maintained solid student engagement with STEM fields, with the ABPI revealing that in 2019/20, 45 per cent of student enrolments in higher education were in STEM subjects.<sup>9</sup> However, the same report still highlights bioscience and CGT as priority areas to improve student engagement.

CGT is a niche specialist field and students who enter university studying a STEM subject will likely need guidance as to how they can specialise. From the earliest days of university, the CGT industry and supportive academics must ensure efforts are made to reach the entire STEM student base with information on CGT and potential career opportunities. Time and resources must be invested by the industry to enable students to attend career days, offer more internships and/or placements, and communicate directly with all STEM departments.



**In 2019/20, 45 per cent of student enrolments in higher education were in STEM subjects"**

More broadly, universities and CGT companies must strive to more effectively communicate the transformational potential of CGT breakthroughs, inspiring a new cohort of skilled individuals to enter the sector. Real-world examples can help to drive such engagement. Most recently, the remarkable story of Teddi Shaw, a 19-month-old from Northumberland cured of a deadly genetic condition with the help of a new gene therapy, has made headlines in UK newspapers.<sup>10</sup> Stories such as this serve to crystallise the potential benefits of working in the CGT industry in a more tangible way and will likely become more commonplace as the CGT sector matures.

Broader public awareness of CGT will benefit the entire life science sector, but the government must take ultimate responsibility for ensuring that adequate resources are available for schools and students alike to help guide students towards careers in the sector. Industry and academia can supplement these efforts through educating guidance counsellors or more frequent “career days” on university campuses. Ultimately, students must have a clearer idea of how they can enter the CGT sector in the first instance.

The CGT industry cannot limit itself to only a certain subset of students at universities. The needs of the industry are great, meaning the proverbial net must be cast wide to ensure all roles are filled. Non-CGT focused STEM students can still make for quality candidates. Students studying chemical engineering, for example, can transfer their skills to areas in CGT manufacturing. Furthermore, should AI and machine learning technologies continue to rollout across the industry as some predict, then the need for data analysts and computer engineers could become significant.<sup>11</sup>

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# Revamping the practical skillset of the new workforce

To manifest a vibrant and resilient skills pipeline for CGT, the practical skillset of its workforce must be strengthened. Roundtable delegates consistently highlighted a lack of core practical skills among students at all levels – even masters-level students and recent graduates. Widespread unfamiliarity with basic lab practices such as cell culturing creates bottlenecks in the CGT industry and can slow growth and innovation, as employers must spend time training new hires from the ground up – time which may not be affordable for many SMEs, which form the core of the CGT industry.<sup>12</sup>

To get a sense of the scale of the problem, one roundtable participant, a professor, noted that around seven of their students are participating in a placement option. However, they noted that this number would need to be scaled by a factor of perhaps 100 if the UK wanted to create a truly robust skills pipeline.<sup>13</sup> Given that emerging biopharma companies account for 65 per cent of the molecules in the R&D pipeline, the lack of sufficiently skilled graduates presents an existential threat to the future of the industry.<sup>14</sup>

This was recently exacerbated by the Covid-19 pandemic, with courses moving online for multiple years leading to less lab time for students while opportunities for industrial placements have since been in steady decline. Universities find it challenging to locate placements and industry can struggle to see the business value. There needs to be collaborative effort between government, academia and industry to create a pro-active national strategy for industrial placements, internships and wider training courses. These can include virtual reality training in simulations of CGT facilities that can be accessed widely by many students, increasing graduate awareness and entry to the sector.

Crucially, this national strategy should also include greater support and expansion for key apprenticeship schemes. Like in other sectors, apprenticeships offer a meaningful way through which trainees can gain invaluable practical experience and this is particularly for the CGT sector. Medical research charity LifeArc offer extensive apprenticeship programmes for CGT roles, as part of their innovation hubs. The hubs themselves support the development of new CGT treatments, enabling academic led clinical trials for novel therapies and, as such, offer invaluable opportunities for CGT trainees to get hands on sector experience.

The CGT Catapult provides a pre-existing framework upon which a national training infrastructure could be built. Using Catapult's existing infrastructure as a backbone, together with the government's convening power, financial commitments to skills in the industry, and academia's training capabilities, a national placement programme could be put together, which would alleviate the skills gap seen in the CGT industry.

Funding for such a programme could come in part from the recent government commitment to spend £370 million on a new Science and Technology Framework, which explicitly calls for "building on the UK's already enviable talent and skills base".<sup>15</sup>



However, in the absence of further additional funding and in the context of challenging UK economic circumstances, the CGT industry will have to step up in the form of either in-kind contributions, finance, or both. A fee-based consortium of industry players could provide the remaining funding for such a national programme.

To generate a cohesive and effective national strategy, academia and industry will also have to collaborate more closely. Industry should more effectively communicate to universities which skills are most crucial in new starters and academia should actively develop these skillsets through coursework. More broadly, universities should be more responsive to industry needs, working to adapt classes and degree programmes more quickly to the rapidly advancing and changing field of CGT. As part of a broader push to enhance the visibility of career pathways in life sciences, universities should actively seek out skilled and experienced individuals in the CGT sector to deliver lectures, thereby providing an applied perspective for students.

## POST-GRADUATION: APPRENTICESHIPS, UPSKILLING, AND RE-TRAINING

Other potential pools of candidates for the CGT industry come in the form of the millions of people who either never went to university, have already graduated from university but work in a different industry, or those who are currently employed in the CGT industry but require upskilling.

Seeking to broaden the appeal of CGT, the CGT Catapult has established the Advanced Therapies Apprenticeship Community (ATAC), the first apprenticeship programme for the CGT industry in the UK. ATAC has so far had a significant impact, with 47 per cent of companies surveyed by the CGT Catapult in 2021 actively participating in the programme. The government has invested £2 million in ATAC, and an additional £4.7 million was granted to create the Advanced Therapies Skills Training Network (ATSTN), which builds on the success of ATAC.

Both programmes are widely regarded as successful, but more investment is needed to train and upskill more workers.

From PPP's own survey, there was near-universal agreement (92 per cent of respondents) that the single most important thing that can be done to help fill the skills gap is to invest more in training and development programmes.<sup>16</sup> Further investment and expansion of ATAC and ATSN would go some way to fill the current skills gap.

Existing training opportunities must also become more accessible to both people in work, and people who do not live in close proximity to a national training centre. Flexibility will be required from both employers and training networks to allow staff the necessary time to take on additional training, this could include the provision of temporary relocation assistance and assurances of liveable wages for staff who undertake further training.

Currently, opportunities in the CGT industry are spread among disparate websites and information portals, making information largely inaccessible unless one already knows where to look. A government-sponsored centralised platform could be used to host all job and training-related information for the UK's CGT ecosystem. This would include programmes available through the ATSTN, but also industrial placement opportunities, job openings, internships, scholarships/awards, upskilling and training programmes etc. A centralised repository hosting information about CGT jobs and skills could be an immensely helpful resource for anyone curious about the industry. Such a resource would also greatly benefit SMEs who may have a difficult time advertising openings with their limited resources.



**The CGT sector should look beyond its horizons into other sectors to plug skills gaps**



The CGT sector should look beyond its horizons into other sectors to plug skills gaps, and there is ample talent with applicable skillsets to be found in allied sectors, particularly those which are in decline. For example, if the UK is to meet its net zero obligations, then oil and gas production will see a decline over the coming years and decades. This will present increasing opportunities to re-skill chemical engineers who are already accustomed to operating in highly regulated environments. The same also applies to specialists working in the UK's small molecule sector. Here, government could provide training bursaries so adult workers can take the time to learn new skills without the risk of losing income.

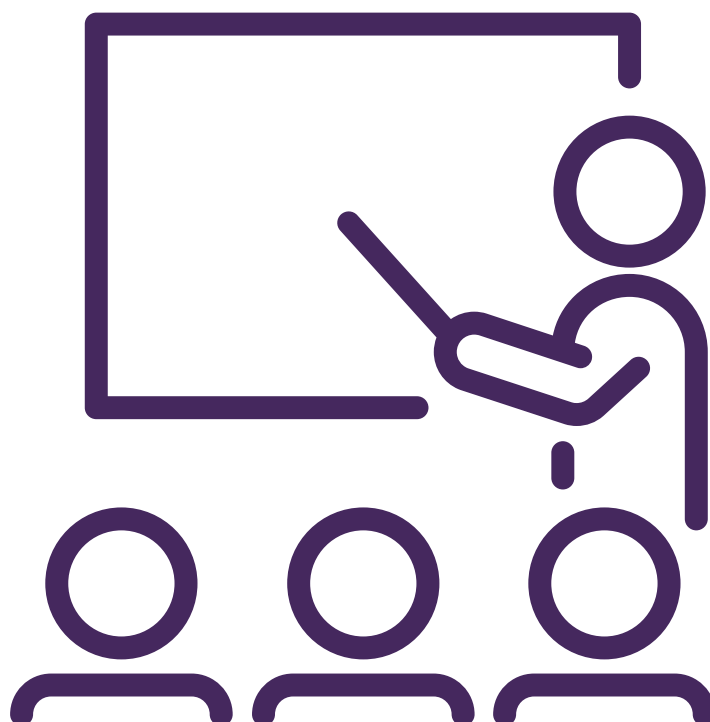
Career change is never easy, but highly discounted training for people with key core competencies and the prospect of joining a young industry that is set to grow rapidly in the coming years are good incentives to attract talent. A focused effort on behalf of all stakeholders should be made to identify a handful of target industries, and then an awareness and information campaign must be executed so that skilled workers from these target industries can be re-trained for the CGT industry.

## THE PREVALENCE OF INDUSTRY TRAINING ACADEMIES

The development of industry training academies poses certain questions for the future sustainability of the CGT skills pipeline. In the context of a skill shortage impacting the entire life sciences and wider STEM sector, companies with the resources to do so understandably want to be proactive and ensure a sustainable skills pipeline. However, privately run training academies can have unintended consequences for the wider sector.

Individual companies of course retain the right to train their own employees, especially when the industry involves highly particularised skills and proprietary technologies, such as with CGT. Nonetheless, it appears as though some companies are using training to gain a competitive advantage over other companies in a way that is undermining the overall long-term health of the sector. What was once a tool created out of necessity to address the drastic workforce shortage is now being deployed as a protectionist mechanism which could threaten quality standards and further deplete an already minimal workforce pool for SMEs and startups.

Training academies are resource intensive, meaning they can only be developed by more well-off companies in the sector. A significant risk is that companies with academies duplicate the sector's training efforts, thereby wasting precious resources that could otherwise be used to collectively strengthen the CGT skills base, such as through the national placement programme as recommended by this report, or through ATAC and the ATSTN.



Roundtable participants highlighted that without proper oversight, siloed training academies offered by the private sector can fragment training standards. Splintered standardisation risks creating a CGT sector full of workers with wildly different skillsets, and few common definitions, practices, and competencies. This inconsistency could also threaten product quality, which is dangerous for patients and clinicians alike.

However, while in their current form these academies can pose a risk for the long term health of the sector, they could present new opportunities for industry collaboration. If larger CGT companies can be incentivised to share knowledge from academies this might strengthen the longevity of the wider sector.

The government should use its convening power to collaborate with large pharmaceutical companies as well as SMEs within the sector with the aim of establishing more effective oversight of private training academies. This could include new forms of accreditation for such courses that guarantee a certain level of baseline competency, but the case must be made to all involved that more consistent practices will ensure a more robust skills pipeline that will ultimately benefit the entire sector. However, any form of accreditation must acknowledge the growing nature of the CGT sector and the wide range of products that are worked on, meaning the standard must be flexible and frequently iterated upon.

**For CGTs to move from novel, one-off test cases to a part of routine NHS care for patients that need them, NHS staff will have to be continually trained on the latest in CGT treatment.**

## THE NHS AND THE 'TICKING TIME BOMB' OF CGTS

It is not a secret that the NHS is currently stretched to its maximum capacity. Demand on the system and the persistently high care backlog are key factors obstructing the research and delivery of clinical trials. Pressures of day-to-day care delivery mean that NHS staff have little time to conduct new research or learn new methods that may be required to deliver novel treatments such as CGTs. Roundtable participants highlighted that nurses find it especially difficult to access the necessary training that will give them the skills needed to carry out CGT procedures.

For CGTs to move from novel, one-off test cases to a part of routine NHS care for patients that need them, NHS staff will have to be continually trained on the latest in CGT treatment. This of course means that staff must be properly incentivised to take on additional training. As the recent wave of nursing strikes has shown, NHS nurses feel undervalued and overworked, so it is unlikely nurses would choose to take on further training en masse until workplace conditions stabilise.



The NHS Workforce plan specifically highlights the need for developing the CGT workforce as well as ensuring that the service's capacity for scientific innovation is maintained and enhanced.<sup>17</sup> A lack of workforce capacity to implement new procedures will make the UK a less attractive trial location for drug companies. Any future in which the UK is a 'life science superpower' will be reliant on a satisfied, fulfilled and engaged workforce who are active participants in the clinical trial process. These challenging macro conditions facing the UK's health and care system raise the risk for businesses investing in CGTs. The political and economic instability in the UK is manifesting in the life sciences through markers such as the sharp decline of clinical trials in the UK, falling R&D investments, and an overburdened, understaffed life science sector.<sup>18, 19</sup>

Staff shortages mean that providers are currently ill-equipped to harness the number of advanced therapies and CGTs that will be made available over the coming decade. In the UK alone, there were 178 ongoing clinical trials for advanced therapy medicinal products (ATMPs) in 2022, of which CGTs are a key subset.<sup>20</sup> The UK is heading towards a situation where advanced medicines used to treat deadly diseases will be available for patients, but the health system may not be able to handle their deployment. This is bad for patients and a further drag on the commercial and research environment for the UK's CGT sector.

The need for closer collaboration with industry partners is highlighted in the recent NHS Workforce plan, specifically with regard to embracing scientific innovations within the NHS.<sup>21</sup> For the NHS to capitalise on the benefits of CGT, a comprehensive plan for the rollout new therapies must be developed, covering not just R&D and commerciality, but also manufacturing and, crucially, the NHS' capacity for drug delivery. The highly successful Covid-19 vaccine rollout has demonstrated how government and central NHS can rapidly develop and execute an ambitious medicines plan across the nation. If this endeavour can be applied to the CGT rollout plan, then the UK will be in a far stronger position to realise its 'life science superpower' ambition.

**For the NHS to capitalise on the benefits of CGT, a comprehensive plan for the rollout new therapies must be developed.**



# Geographical considerations

The life sciences industry in the UK is mostly concentrated in the "golden triangle" of Oxford, Cambridge, and London, where there are many research universities and financial resources. However, the CGT industry is relatively well-distributed throughout the country, with clusters in Stevenage, Birmingham, the West Midlands, Darlington, and Scotland. This geographic diversity is thanks to organizations such as ATSTN and the CGT Catapult, which host training sites across the country.

The geographic diversity of the CGT industry will remain a critical balancing act going forward. On one hand, CGT has the potential to be a leader in the government's 'levelling up' agenda; CGT jobs are very well paid and CGT itself is a nascent industry showing massive growth potential. CGT clusters that have developed so far have already had significant impacts on local economies.<sup>22</sup> Further, access to CGTs and other innovative medicines will reduce the UK's stark geographic health inequalities.

But on the other hand, such a young industry already experiencing extreme staffing and workforce pressures can ill-afford to stretch itself too thin. Clustering is an excellent way to de-risk otherwise risky ventures, and the current clustering of resource in the CGT industry should continue to be supported. However, industry and government alike should also remain cautious of unsustainable proliferation at this stage.

To further support these pre-existing structures, key CGT stakeholders should aim to utilise a wider range of existing programs for funding and assistance, such as the Local Skills Improvement Plan and the Strategic Development Fund (SDF). These local funds should not be discounted as too small and not worthwhile: for the 2022/23 financial year, the government allocated £92m for the SDF alone.

Accessing these funds alongside broader programmes such as the Levelling Up Fund and the UK Shared Prosperity Fund will require building closer relationships with local decision makers.

The Northeast Local Enterprise Partnership (LEP) and the West Midlands Combined Authority (WMCA) are two examples of regional organizations that have identified CGT as a key area of growth and have allocated resources for CGT organizations to tap into for training and upskilling workers.

The concentration of research centres in clusters, such as with the golden triangle, poses a certain degree of risk for this rapidly expanding industry. Within STEM industries broadly, many companies are leaning towards decentralised treatment hubs, which can allow the capture of skills from other regions and other allied industries – perhaps where people with transferable skills have retired early, and other sectors are currently better placed to capture broader skills. As stated prior, it is not just PhD students who can perform STEM roles and, as such, the expansion of the CGT could have positive consequences for the levelling up agenda. However, capturing this talent and levelling up regions will require a certain degree of agility that may not always be offered by the clustered approach of UK life sciences geography.

That being said, the current level of clustering presents significant upside for the sector if sustained efforts are made to build relationships with local stakeholders. CGT industry members should not expect local leaders to see the benefits of supporting CGT as self-evident and should instead work together to ensure that local political, business, and community leaders understand the benefits of this growing, but highly technical sector.

It's up to the CGT ecosystem to work with and educate local leaders about the resources needed to build a sustainable skills pipeline, because a sustainable skills pipeline is only possible if every region of the UK is engaged and pulling in the same direction.

# Conclusions: Collaboration is key to harnessing sector potential

While still in its infancy when compared with other scientific sectors, the emergence of the CGT industry poses transformational benefits for patients and the economy. However, the unique opportunity presented by the sector's rapid growth risks going missed unless government and key local institutions can establish new collaborative partnerships to plug an ominous skills gap and provide desperately needed visibility and accessibility of the sector.

New sector relationships can help promote resource pooling between academia, the private sector, and government, which is essential to address the skills gap and promote the growth of the CGT industry. This could involve expanding the training infrastructure of the ATSTN and other training initiatives, which can be achieved through joint contributions from all stakeholders involved.

Injecting the private sector with a greater sense of collaboration is central to addressing the skills gap, but CGT companies must be provided with clear platforms through which to engage with the broader sector, and with the right incentives to prompt a shift in organisational behaviour towards training. Left to its own devices, the market is likely to respond to skills shortages in siloed means, such as with privately run training academies.

Despite some positive developments such as the Cell and Gene Therapy Catapult and associated programs like the ATSTN and ATAC, there has been a mixed record in terms of policies and political support for science in the UK over the past few years. While these initiatives have provided a solid foundation for the CGT sector, a lack of long-term, predictable funding for such programmes risks undermining their positive long-term impact.

Sustained investment and government initiatives are necessary to ensure the long-term success of the CGT industry and, crucially, any government policies in this area should be built to withstand any changes in Prime Minister or ruling political party. Good government policies include incentives for learning and businesses, as well as initiatives to attract skilled workers from overseas. To this latter point, many bioscience roles are included on the government's "shortage occupation list", and the post-study



graduate visa offers another relatively easy path for new graduates to stay and work.<sup>23</sup> Nevertheless, PPP roundtable delegates passionately argued for the government to remove all unnecessary barriers for CGT workers to immigrate to the UK, as the critical workforce shortage means skilled workers are needed immediately.

The CGT sector has a great deal of momentum behind it, but the government should not expect inertia to carry CGTs forward. Many of the recommendations in this report highlight structural changes needed within the organisational behaviour of the CGT sector and indeed life sciences more broadly.

However, the principle aim of this report is to put forward a series of practical, actionable cross-cutting solutions that will help bridge the CGT skills gap in the short to medium term. All CGT sub-sectors must work together to highlight the transformational benefits of the industry if a sustainable skills pipeline is to be built in the UK.

The current workforce shortage is an immediate impediment on the industry's ability to grow and prosper both now and into the future. Our hope is that the recommendations in this report will provide a constructive roadmap for greater cross-sector collaboration. Ultimately, greater joint working between the government, industry, and academia will be the only way to finally solve the skills gap.



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## WHAT NEXT?

We hope this report supports more focussed discussions about the future of CGT and will provide a platform for those engaging with policymakers to continue to build UK CGT and ensure it reaches its potential.

We encourage you to share the report and recommendations with your contacts in this sector. You can download a digital version of this report for free from our website, [publicpolicyprojects.com](http://publicpolicyprojects.com)

For information on the full range of PPP events across health and life sciences, sign up to the PPP newsletter from our website and join our LinkedIn and Twitter community.

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