



Cell and Gene Therapy UK Skills Demand Report

November 2023



Contents

1 Executive summary	3
1.1 Methodology	4
2 Skills demand	5
2.1 Anticipated source of skills	7
3 Challenges and opportunities identified by industry	9
3.1 Recruitment and retention challenges	9
3.2 Skills challenges	10
3.3 Work ready graduate challenges	10
3.4 Skills solutions and opportunities identified by industry	12
4 Conclusion	14

1 Executive Summary

The Cell and Gene Therapy UK Skills Demand Report identifies the current levels of employment in the advanced therapies and bioprocessing industries across a range of roles from R&D to manufacturing to clinical trials. The report also captures the anticipated levels of employment for the next five years, allowing for the identification of particular areas of need.

This is the fourth biennial Skills Demand Report from the Cell and Gene Therapy Catapult (CGT Catapult). It shows that the UK cell and gene therapy industry has doubled over the past four years, with there being 6,232 roles in 2023, an increase of over 3,199 roles since 2019. The 2023 findings support a prediction made in the 2019 report that there would be 6,420 roles in the industry by 2024.

Compared to the 2021 report, the size of the core advanced therapies industry has grown, even though the headline total shows a slight decrease. This is due to a few factors, the most important being the way the workforce had to pivot onto a vaccine footing, due to the exceptional circumstances of the SARS-CoV-2 pandemic, as well as a resulting difference in the organisations that responded to the 2021 survey across the associated supply chain. Approximately 25% of the growth reported in 2021 was due to the exceptional response by the UK advanced therapy industry in meeting pandemic-vaccine manufacturing demands. This means that, when comparing 2021 core cell and gene therapy manufacturing against 2023 headcount, there has been approximately 10-15% growth.¹

While the size of the workforce has approximately doubled from 2019 to 2023, this rate of growth is predicted to slow, but companies are still forecasting overall employment to grow by 63% over the next five years. The UK is not alone in seeing a

trend of less-rapid growth. In the US, in 2023 the Alliance of Regenerative Medicine (ARM) reported that some companies in the cell and gene therapy space have been reducing their workforce as well as adjusting their outlook for 2023 and beyond.

Against the challenging economic backdrop of recent years, the anticipation of continued growth in the UK highlights the relative strength of the UK industry.

With this expected growth, there is a need to continue to prioritise and deliver an end-to-end skills provision in the UK to ensure that growth is not restricted by the size of the skilled workforce. By acting now, to provide comprehensive access to training, upskilling and outreach to communities outside of the sector, there is an opportunity to ensure that there are sufficient levels of skilled talent in the UK to enable further industry growth.

This is of upmost importance to the success of the advanced therapies sector in the UK and to ensure that the UK benefits from access to life-changing advanced therapies, as well as from the economic benefits that come with having a thriving industry.

CGT Catapult would like to express its thanks and gratitude to all the organisations who took part in this survey.

UK sector key figures from 2017 to 2028

2017 survey employee headcount in 2017	2017 survey forecasted 2022 employee headcount	2019 survey employee headcount in 2019	2019 survey forecasted 2024 employee headcount	2021 survey for employee headcount in 2021	2021 survey forecasted 2026 employee headcount	2023 survey for employee headcount in 2023	2023 survey forecasted 2028 employee headcount
No data available	No data available	3,033 (CGT manufacturing only)	6,420 (CGT manufacturing only)	6,956 (included all vaccine manufacturing)	15,114 (included all vaccine manufacturing)	6,232 (CGT manufacturing only)	10,161 (CGT manufacturing only)
2017 survey headcount for bioprocessing* roles in 2017	2017 survey forecasted 2022 headcount for bioprocessing* roles	2019 survey headcount for bioprocessing* roles in 2019	2019 survey forecasted 2024 headcount for bioprocessing* roles	2021 survey headcount for bioprocessing* roles in 2021	2021 survey forecasted 2026 headcount for bioprocessing* roles	2023 survey headcount for bioprocessing* roles in 2023	2023 survey forecasted 2028 headcount for bioprocessing* roles
~500 (CGT manufacturing only)	~1,000 (CGT manufacturing only)	1,720 (CGT manufacturing only)	2,175 (CGT manufacturing only)	3,985 (included all vaccine manufacturing)	10,022 (included all vaccine manufacturing)	3,544 (CGT manufacturing only)	5,456 (CGT manufacturing only)

* Includes manufacturing, supply chain and logistics, process development and total quality

¹ Removing pandemic-vaccine manufacturing from the 2021 figures

1.1 Methodology

The survey which this report is based on received responses from 58 organisations in the UK; 41 of which participated in the previous survey in 2021. The responses represent 90% of the industry's biomanufacturing capacity. This strong representation of the current capacity means that the findings provide a meaningful picture of the anticipated skills challenges and opportunities over the next five years.

As with the Skills Demand Reports in 2017 and 2019, the 2023 report focuses on cell and gene therapy development and manufacturing.

The 2021 survey took place during the Covid-19 pandemic when vaccines were prioritised and the survey therefore focused on cell and gene therapy manufacturing as well as including information from several organisations about their vaccine manufacturing workforces, which were closely aligned with advanced therapy skillsets, and highlighted the benefit of having an agile workforce for national health resilience.

Case study: CGT Catapult

CGT Catapult is working with industry to help address the skills gap and ensure that talent is available to meet the needs of this industry, now and in the years to come. To achieve this, CGT Catapult coordinates a number of skills programmes, tools and content.



- The Advanced Therapies Apprenticeship Community (ATAC), the first apprenticeship programme designed specifically to train and upskill individuals in developing, manufacturing and delivering advanced therapies
- The Advanced Therapy Skills Training Network (ATSTN), which provides a range of training opportunities, including in-person, online, virtual, and augmented reality technology. This is delivered through the National training Centres: National Horizons Centre, University of Birmingham and RoslinCT
- An Online Training Platform (OTP), which provides a range of industry approved and recommended skills courses
- State-of-the-art Skills and Training Laboratories (STL) in Stevenage that host a range of skills and training offerings
- Career Converter tool, which aims to help people from outside the advanced therapies industry understand the roles, opportunities and development routes available in the sector

CGT Catapult is committed to collaborating with industry, regulators, educators, the healthcare service and Government to ensure there is a pipeline of skilled talent to drive industry growth.



2 Skills Demand

The survey responses show that cell and gene therapy organisations have grown by 3,199 additional roles since 2019. This is in line with the headcount projections for 2024 that were made in the 2019 report.

Compared to the 2021 report, the size of the core cell and gene therapy industry has continued to grow, albeit more modestly than previous years, at 10-15%. This is due to a few factors, the most significant being how the 2021 report included a rapid increase in headcount as part of the SARS-CoV-2 pandemic response at several companies, due to the flexible skillsets for both vaccines and advanced therapies, which equated to over a thousand people. These organisations have now refocused

on advanced therapies and no data regarding direct vaccine manufacturing has been included in the 2023 report. Secondly, there are some differences in the organisations that replied to the 2021 and 2023 surveys, meaning it is not a direct like-for-like comparison. This difference accounts for around 850 people.

Looking to the future, a total of 74% of the 2023 survey respondents anticipate further growth in their workforces, equating to an additional 3,929 roles anticipated to exist by 2028. Around half of these additional roles, 1,912 roles, are expected to be within bioprocessing. This would represent a 54% increase for the number of roles within bioprocessing from 2023 to 2028.

Breakdown of sector figures for different job roles 2019 to 2028

Year of Survey	2019 Report (42 companies)		2021 Report (63 companies)		2023 Report (58 companies)			
	2019 survey reported headcount	2024 anticipated growth	2021 survey reported headcount	2026 anticipated growth	2023 survey reported headcount	2028 anticipated growth	2028 Increase %	Level of concern indicated
R&D/ Discovery	590	+1080	1343	+897	1284	+705	55%	
Manufacturing	491	+1456	1863	+3426	1808	+1037	57%	
Supply Chain and Logistics	104	+306	321	+407	187	+105	56%	
Process development	623	+1214	752	+897	571	+314	55%	
Total Quality	502	+919	1049	+1305	978	+456	47%	
Regulatory Affairs	66	+156	75	+82	69	+42	61%	
Digital and Informatics	New for 2023	New for 2023	New for 2023	New for 2023	86	+81	94%	
Commercial	208	+511	121	+245	117	+216	185%	
Clinical Trials	Included in Commercial category in 2019	Included in Commercial category in 2019	161	+164	189	+76	40%	
Support Services	345	+580	780	+571	562	+117	21%	
Other	104	+198	491	+164	381*	+780**	NIA	
Total	3033	6420	6956	+8158	6232	+3929	63%	

* 2023 Other Figure: one respondent confirmed that it has an existing headcount of 200 but have not provided information on the breakdown of the skill area or 2028 anticipated growth

** 2028 Other figure: some 2023 respondents indicated a growth of an additional +757 roles, but unable to confirm which skill area these will be allocated against. These have therefore been included within 'other' to ensure these are factored into the total numbers

Level of concern

 Low concern  Medium concern  High concern



The 2023 survey data indicates that by 2028 81% of the roles are expected to be across the following areas:

- 54% of roles will be in bioprocessing (manufacturing, process development, supply chain and logistics and total quality), compared to 57% in 2023
- 20% of roles will be in research, development and discovery, compared to 21% in 2023
- 7% of roles will be in support services, such as HR, Learning & Development, Finance and Marketing, compared to 9% in 2023

In addition to providing current employment data and forecasts, the organisations surveyed also provided qualitative information on how concerned they are about being able to hire sufficient levels of skilled staff in different specialisms, to enable their future growth. This information has been used to indicate the 'level of concern' for each specialism.

Both the areas of Manufacturing and Total Quality were identified consistently as concerns across the current and previous surveys. The 'level of concern' for the 2023 report has highlighted additional areas, compared to previous reports:

- Regulatory Affairs increased as a level of concern compared to 2021
- Digital and informatics has been added as a new specific skill area in the 2023 survey and is of concern
- Commercial skills have been raised as a possible concern that needs attention
- Supply Chain skills have also been raised as a possible concern that needs attention

These findings are similar to those that the Alliance of Regenerative Medicine (ARM) identified in a 2023 report into the workforce needed for the biomanufacturing of cell and gene therapies in the United States. This report found that 73% of subject matter experts identified either quality control, analytical development, or manufacturing as the most challenging sector positions to fill.

Overall, the 2023 skills demand survey findings indicate that, while bioprocessing still remains the focus of growth with the largest number of anticipated new roles falling within this category, skills requirements are broad and there are various areas of concern.

2.1 Anticipated source of skills

The chart below provides an overview of where organisations expect to source skilled workers, to fulfil their anticipated growth, between 2023 and 2028.

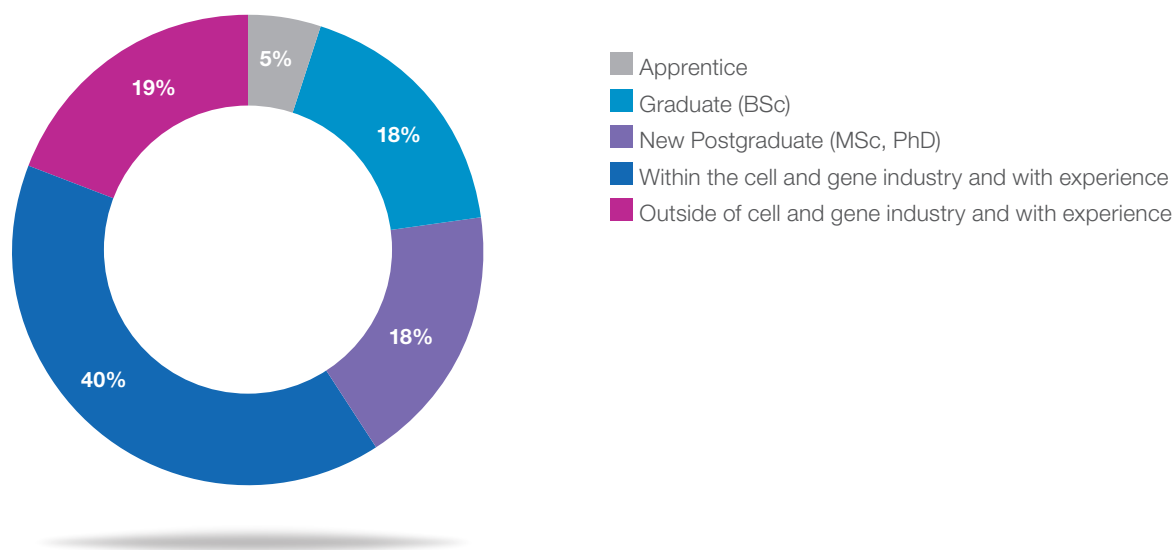
The 2023 survey shows that many of the roles over the next five years (40%) are expected to be filled by workers currently within the industry. This is similar to the 2021 survey, which put this figure at 37%.

Compared with the 2021 survey, there has been a 5% increase in the proportion of roles expected to be filled by Graduates (BSc) and Postgraduates (MSc, PhD). This aligns to feedback from the survey respondents which indicated that an industry-ready

national or regional graduate and placement programme would be beneficial.

While organisations continue to appreciate the benefits of apprenticeships, some feel less comfortable hiring apprentices currently, due to uncertainty in the wider economic and regulatory landscape. Others are exploring alternative early career programmes. This has led to the proportion of roles expected to be filled by apprentices falling to 5%, from 9% in the 2021 survey.

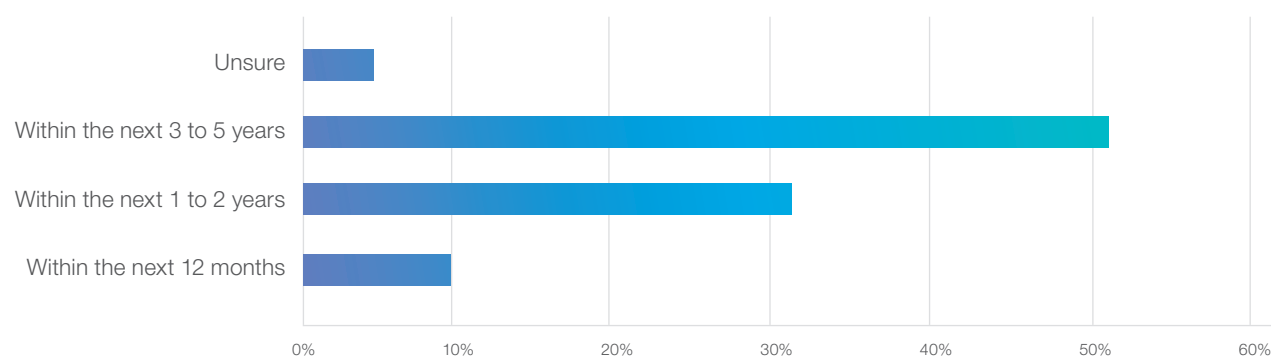
Anticipated source of talent for the industry



Looking forward, the 2023 survey results indicate that organisations anticipate that the majority of expansion in their workforce will come over the next three to five years, 2026 to 2028, with also significant growth in the next one to two years.

It is imperative that end-to-end skills and training solutions are scoped, designed and implemented over the next 12-months to ensure these are in place for when the expansions are predicted to occur.

When do companies anticipate they will be hiring?



Case study: Autolus



Autolus is a biotechnology company specialising in CAR-T cell therapy. It is applying its extensive programming capabilities to develop advanced autologous T-cell therapies that have the potential to deliver life-changing benefits to patients suffering from cancer and autoimmune diseases. The company has a new 70,000² ft commercial manufacturing facility, The Nucleus, in Stevenage, UK, and is working towards commercialisation of its lead CAR-T cell therapy.

- Autolus has developed a specialised training and qualification programme for cell therapy manufacturing and quality control operators within its dedicated training facility in Stevenage
- It offers a combination of internal and external training for technical training across all functions, as well as internal soft skills development, such as management, leadership and team development
- In addition, Autolus has a focus on early careers by offering apprenticeships, work experience, internships, and university placements to develop skills and inspire young people to work in the cell and gene therapy industry

One of the challenges that Autolus has faced is the demand and time it takes to train its manufacturing staff. This team are critical to the successful development of a cell therapy and with the industry still being relatively new there are few fully trained operators. To overcome this, Autolus has developed an extensive training programme and built a highly trained and motivated workforce.



3 Challenges and opportunities identified by industry

3.1 Recruitment and retention challenges

According to the organisations surveyed, the top five barriers to recruitment and retention of people over the next five years, in order of concern, are:

1. Being able to identify skilled and experienced people within the industry, and having access to a trained talent pool
2. Strong salary competition, as a result of some companies driving up salaries which makes it harder for others to compete for talent
3. Being able to access international talent
4. The existence of suitable graduate programmes to ensure that graduates are industry-ready and have GMP skills
5. The lack of a central jobs board which would provide centralised information for organisations looking to hire talent and for individuals looking for roles

The top two barriers listed above are the same as those identified in 2021.

Respondents also indicated other concerns in the 2023 survey that could be a potential risk. These included:

- Graduate apprenticeships and Modern Apprenticeship in Quality in Scotland remains a gap to attract and retain people
- A lack of clarity regarding industry career roadmaps and pathways
- The location of companies outside of clusters can make it difficult to attract and retain talent

Number of organisations who have indicated these barriers as a concern to the recruitment or retention of employees



These figures are a count of the number of organisations that have indicated these areas as a barrier

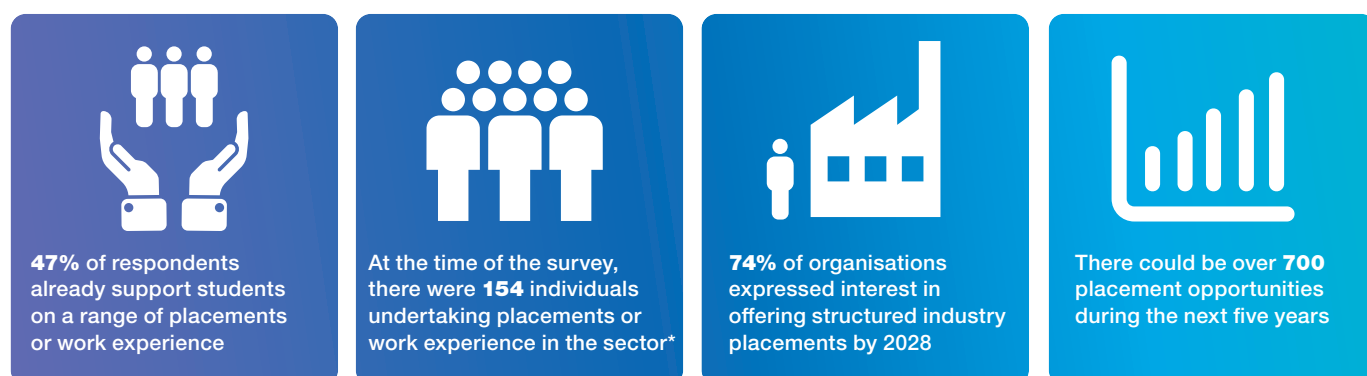
3.2 Skills challenges

Skills challenges and training needs over the next five years were explored within the survey. The following are the top five skills challenge themes that respondents identified are:



3.3 Work ready graduate challenges

Industry has indicated a strong interest in placements over the next five years.



However, the 2023 survey identified that there are potential barriers that could prevent the opportunities and growth associated with industry placements. These include:

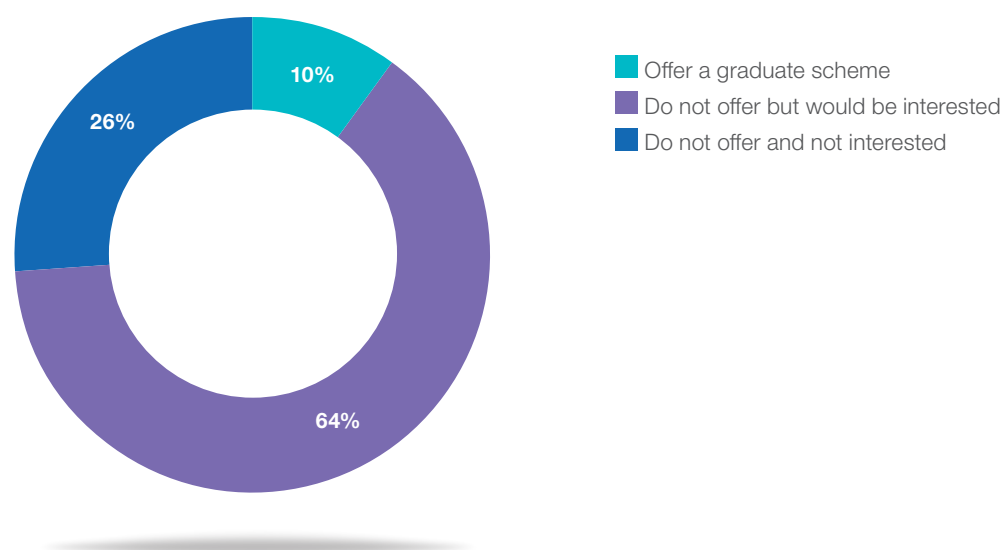
- Insufficient organisational capacity, resource and finance to support these placements
- A lack of awareness about what is available, including timelines and maintaining confidentiality, amongst educators, students and organisations
- Insufficient infrastructure, including processes, procedures and administration

- The complex nature of some roles, such as within GMP, means that they are not always appropriate for short-term placements as it takes a significant length of time for individuals to the understand the role
- A lack of the business stability that is needed to support long-term placements
- A preference amongst organisations to support apprenticeships instead of placements at this time

Respondents have highlighted solutions that may lessen or remove these barriers. These are described in section 3.4.

* Of these 154 placements, 75 are within one organisation

Number of organisations that currently offer graduate schemes



Case study: exMoor pharma

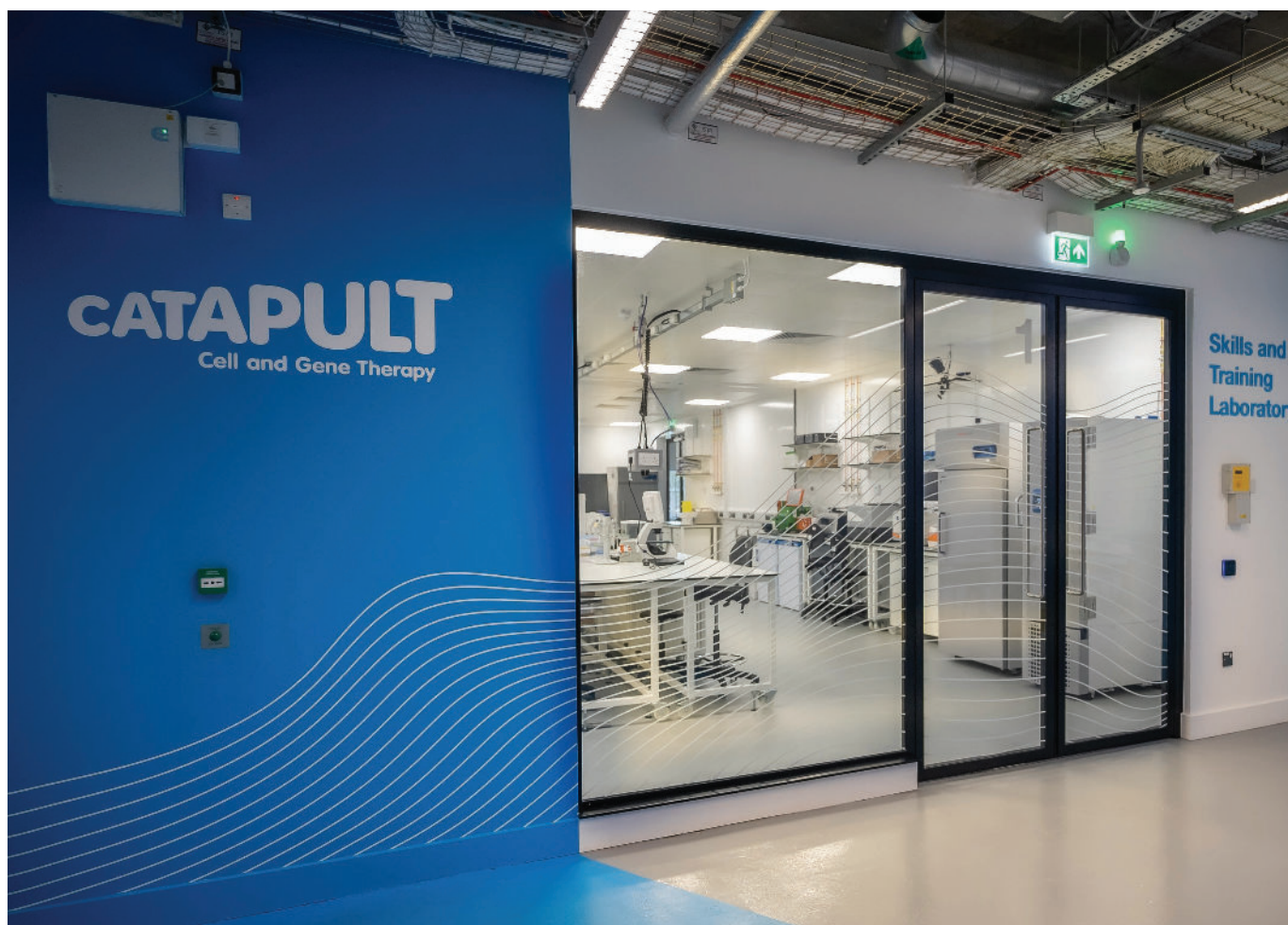
Founded in 2004, exMoor pharma is a one-stop cell and gene therapy partner accelerating the manufacturing journey from research to patients. Since 2007, exMoor has specialised in the cell and gene therapy sector, helping organisations to understand, plan and implement the appropriate chemistry, manufacturing and controls (CMC) strategy.



Early in 2023, exMoor pharma raised additional funding to expand its services by constructing a new 65,000² ft GMP manufacturing facility in Bristol. With the launch of this Cell and Gene Therapy Centre, exMoor has become a full-service contract development and manufacturing organisation (CDMO), and is on track to more than double its headcount in the next four years.

- exMoor is expanding its GMP team to support the growth of new areas in its business and has recruited four apprentices with the support of the Advanced Therapies Apprenticeship Community (ATAC). The apprentices will have the opportunity to develop over the next three to four years across both the process development labs and GMP teams with additional opportunities to be involved in the build, set-up and eventual licensing of the GMP facility, then supporting exMoor's first clients through to clinical trial
- exMoor is committed to building the South West of England into a regional powerhouse for cell and gene therapy manufacturing. However, there are challenges in attracting talent and therefore the company has focused on growing its early careers pipeline, developing the talent and supporting them as they learn the necessary roles





3.4 Skills solutions and opportunities identified by industry

The 2023 skills demand survey identified various risks and opportunities that could impact the cell and gene therapy sector's growth within the UK.

When respondents were asked about possible solutions to assist with skills demand, five key recommendations were identified. These are:

1. Promotion of skills landscape – so that there is greater understanding of the options available, including apprenticeships, T-Levels, industry placements and degrees
2. Introduction of a centralised scheme to make graduates more industry-ready through providing support with attraction, recruitment and management
3. Enhancement of the current skills programmes, including CGT Catapult continuing to deliver programmes such as ATAC and ATSTN, to meet industry need. This includes increasing capacity of courses and offering different training courses
4. Development of additional easy-to-access training programmes to help address skills challenges such as (but not limited to) ATAC and ATSTN
5. Reduction of current barriers to accessing international talent as this currently is a heavily resource intensive process

Case study: RoslinCT



RoslinCT is a leading global contract development and manufacturing services organisation (CDMO) focused on advanced cell and gene therapies. It has undergone rapid growth and has developed an award-winning skills programme focused on developing talent and the skilled workforce necessary for success.

- A Training Academy that provides specialist manufacturing skills training for the RoslinCT team, alongside upskilling for external industry and academic representatives. The skills training has significantly reduced the time taken for entry-level employees to be work ready, with this falling from six months to four weeks
- A People Strategy focusing on delivering a 'highly skilled, knowledgeable and dynamic staff who are continuously developing' by implementing training plans, regular staff development and review time and setting up the RoslinCT Training Committee. This focus has contributed to a notable increase in staff retention and engagement
- A Leadership Academy that provides bespoke six-month personal development programmes for leaders, managers, supervisors and rising stars within the business. Over a third of the workforce has access to workshops, psychometric testing, coaching and practical action learning sessions centred around seven leadership principles to guide leadership development and behaviours
- A continuous performance and development framework that ensures a constant focus on staff development. This also provides a mechanism to identify key talent, improve succession planning and ultimately support and engage its staff
- Apprenticeships and Student Placements are offered across the business attracting specialist early career talent and STEM and recruitment outreach initiatives to enhance the talent pipeline
- A RoslinCT SharePoint has been created to provide a central source of skills and training information, with this including a company-wide training calendar, knowledge bank, resources, access to training materials and recordings and link to the ATSTN Online Training Platform
- Lunch and Learn sessions are held for managers and supervisors, focusing on HR topics to ensure they have the skills and tools to deliver on their role and can support all employees

As RoslinCT continues its growth and development there will be a focus on digital and data skills, operational excellence and remaining dedicated to the GMP and regulatory skills required for a successful organisation in this sector.





4 Conclusion

The 2023 Cell and Gene Therapy Skills Demand Survey indicates that the industry's workforce is anticipated to grow by 63% by 2028, equating to a total workforce of 10,161 employees. These additional roles have wide ranging benefits, not only for the individuals employed in the sector but for the UK economy as a whole.

However this growth is not guaranteed, as recognised by other bodies such as the Medicines Manufacturing Industry Partnership, which noted that, "Talent is critical for UK medicines manufacturing to drive innovation, attract investment, build health resilience, and boost productivity and competitiveness." While LifeArc reported that, "significant expansion of the workforce is required" and "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."

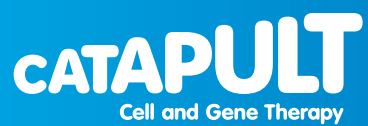
To secure its future growth, action needs to be taken now to ensure that a shortfall in skilled talent does not negatively impact the sector, which would have significant consequences on both access to transformative advanced therapies and the economy in the UK.

By identifying the scale of need, specific industry concerns, and providing guidance on how to address these challenges, the CGT Catapult hopes to help support the continued growth of the industry.

Special thanks to all respondents*



* 49 out of 58 participating employers consented to their logos being shared



Cell and Gene Therapy Catapult

12th Floor Tower Wing, Guy's Hospital,
Great Maze Pond, London SE1 9RT

t +44 (0)20 3728 9500

e info@ct.catapult.org.uk

w ct.catapult.org.uk

X [@CGTCatapult](https://twitter.com/CGTCatapult)