Cell therapy GMP manufacturing in the UK: Capability and capacity analysis May 2014
7.4.4 Track record and experience ................................................................. 26
7.4.5 Personnel ............................................................................................. 26
7.4.6 Capacity .................................................................................................. 27

7.5 Rayne Cell Therapy Suite (RCTS) and The Wellcome Trust / BRC Clinical Research Facility and Cell Therapy Unit (CTU) at King’s College London ................................................................. 28
7.5.1 Details .................................................................................................... 28
7.5.2 Facility .................................................................................................... 28
7.5.3 Licence .................................................................................................... 29
7.5.4 Track record and experience .................................................................. 29
7.5.5 Personnel ................................................................................................ 30
7.5.6 Capacity .................................................................................................. 30

7.6 NHS Blood and Transplant (NHSBT) ......................................................... 31
7.6.1 Details .................................................................................................... 31
7.6.2 Facilities at Speke .................................................................................. 32
7.6.3 Licence .................................................................................................... 33
7.6.4 Track record and experience .................................................................. 33
7.6.5 Personnel ................................................................................................ 34
7.6.6 Capacity .................................................................................................. 34
7.6.7 Facilities at the Clinical Biotechnology Centre, Langford ...................... 35
7.6.8 Licence .................................................................................................... 37
7.6.9 Track record and experience .................................................................. 37
7.6.10 Personnel ................................................................................................ 37
7.6.11 Capacity .................................................................................................. 37

7.7 Scottish Centre for Regenerative Medicine (Roslin Cells) and Scottish National Blood Transfusion Service (SNBTS) Cellular Therapy Facility ......................................................... 38
7.7.1 Details .................................................................................................... 38
7.7.2 Facility .................................................................................................... 38
7.7.3 Licence .................................................................................................... 39
7.7.4 Track record and experience .................................................................. 39
7.7.5 Personnel ................................................................................................ 40
7.7.6 Capacity .................................................................................................. 41

7.8 Cellular Therapies, Great Ormond Street Hospital ................................. 42
7.8.1 Details .................................................................................................... 42
7.8.2 Facility .................................................................................................... 42
7.8.3 Licence .................................................................................................... 43
7.8.4 Track record and experience .................................................................. 43
7.8.5 Personnel ................................................................................................ 44
7.8.6 Capacity .................................................................................................. 44

7.9 Moorfields Eye Hospital, Cells for Sight Cell Research Unit .................. 45
7.9.1 Details .................................................................................................... 45
7.9.2 Facility .................................................................................................................. 45
7.9.3 Licence ................................................................................................................ 46
7.9.4 Track record and experience ............................................................................. 46
7.9.5 Personnel ........................................................................................................... 46
7.9.6 Capacity ............................................................................................................. 46
7.10 Newcastle Biomedicine Cellular Therapy Facility .............................................. 47
  7.10.1 Details ............................................................................................................. 47
  7.10.2 Facility ........................................................................................................... 47
  7.10.3 Licence .......................................................................................................... 48
  7.10.4 Track record and experience ....................................................................... 48
  7.10.5 Personnel ..................................................................................................... 48
  7.10.6 Capacity ....................................................................................................... 49
7.11 Intercytx Ltd (Cell2Therapy) .............................................................................. 50
  7.11.1 Details .......................................................................................................... 50
  7.11.2 Facility ......................................................................................................... 50
  7.11.3 Licence ......................................................................................................... 51
  7.11.4 Track record and experience ..................................................................... 51
  7.11.5 Personnel .................................................................................................... 52
  7.11.6 Capacity ....................................................................................................... 52
7.12 University of Oxford Clinical BioManufacturing Facility ................................ 53
  7.12.1 Details ......................................................................................................... 53
  7.12.2 Facility ......................................................................................................... 53
  7.12.3 Licence ......................................................................................................... 54
  7.12.4 Track record and experience .................................................................... 54
  7.12.5 Personnel .................................................................................................... 54
  7.12.6 Capacity ....................................................................................................... 55

8 Conclusions ............................................................................................................... 56
1 Executive summary

A survey of the GMP manufacturing capability and capacity in the UK was performed by the Cell Therapy Catapult in April 2013. The study was designed to collect evidenced-based information to provide an overall picture on the capability and capacity of cell therapy manufacture within the UK. The data in the report were updated in March 2014 prior to publication.

A total of 22 different organisations were contacted. Of those that replied, only facilities with current spare GMP capacity were shortlisted and analysed further. A list of the shortlisted facilities can be found below.

- Cancer Research UK, Biotherapeutics Development Unit
- Cellular Therapeutics Ltd
- Guy’s & St Thomas’ Hospital, GMP Facility
- Imperial College London, John Goldman Centre for Cellular Therapy
- Kings College London, Rayne Cell Therapy Suite
- King’s College London, Cell Therapy Unit, Clinical Research Facility
- NHSBT - Speke
- Scottish Centre for Regenerative Medicine (Roslin Cells and SNBTS)
- University College London, Great Ormond Street Hospital Cellular Therapy Laboratories
- Moorfields Eye Hospital, Institute of Ophthalmology, Cells for Sight ATMP Manufacturing Unit
- University of Newcastle Biomanufacturing Facility
- Intercytex Ltd, Manchester
- University of Oxford, Clinical Biomanufacturing Facility

The facilities offer 56 clean rooms facilitating 56 parallel processes. Analysis of the technical capability of these facilities is very positive, showing that the UK manufacturing sector covers the sphere of current cell therapy manufacturing requirements. This shows that the UK has a strong manufacturing base to facilitate the translation of early phase academic research into the clinic.

Most of the above facilities are located in the NHS or UK academia. Intercytex and Cellular Therapeutics are commercial organisations. Roslin Cells are a not for profit commercial organisation offering contract manufacturing services. The majority of these facilities have been established to enable the translation of academic research into clinical trials.

The large-scale Cell Therapy Manufacturing Centre that will be built and run by the Cell Therapy Catapult has not been included in this analysis. The funding for this facility was announced in the 2014 budget and the plan is for it to be operational in 2017. This manufacturing centre will complement the existing early phase network and will complete the translational landscape in the UK allowing therapies to move from basic research, into the clinic and finally to commercial products.

The combination of world leading cell therapy research, the network of early phase clinical manufacturing centres and the large-scale manufacturing facility mean that the UK is well positioned within the global cell therapy industry. This situation will allow the growth of the industry within the UK and also the attraction of inward investment from outside of the UK.
2 Introduction
The Cell Therapy Catapult has been established by the Technology Strategy Board (TSB) with the remit to grow the UK cell therapy industry, increasing health and wealth.

One component of this remit is to ensure that the UK has a strong and competitive manufacturing base for cell therapies. With this in mind, the Cell Therapy Catapult has performed a study on the current capacity and capability of this manufacturing base within the UK in April 2013.

The aim of the study was to collect information on each of the manufacturing sites and to compile the data to provide an overview. This overview comprises the technical and quality capabilities of each of these facilities as well as their spare capacity. For example:

- What types of cells and manufacturing processes does the site have experience with?
- What types of processing equipment does each site have available?
- What grade of clean rooms, MBSC and isolator technology does the site have?
- What Licences does the site have?
- How many different suites of clean rooms does the site have?
- How many staff does the site employ and what is the distribution between production, QC and QA?
- How many parallel projects and products can the site deal with?

In addition to this overview a more detailed description of each manufacturing site is documented.
3 Glossary of terms

- CMO – Contract Manufacturing Organisation
- CoG – Cost of Goods
- HTA – Human Tissue Authority
- IMP – Investigational Medicinal Product
- GMO – Genetically Modified Organism
- GMP – Good Manufacturing Practice
- MBSC – Microbiological Safety Cabinet
- MHRA – Medicines and Healthcare Products Regulatory Agency
- MIA(IMP) – MHRA manufacturing authorisation licence for Investigation Medicinal Products
- TSB – Technology Strategy Board
- QA – Quality Assurance
- QC – Quality Control
- Auto – Autologous, patient is treated with their own cells (i.e. each patient requires their own product)
- Allo – Allogeneic, all patients are treated with cells derived from one donor (i.e. one product for all patients)
4 Methodology
The Cell Therapy Catapult has contacted 22 organisations with the capability, or the potential future capability, for the manufacture of cell therapy products within the UK. The various organisations were sent a questionnaire, which was designed to collect evidence, based on the requirements outlined in the introduction. The list of organisations contacted and their response can be found in Table 1. The organisations that responded, that also had facilities that were available for GMP manufacture of cell therapies were progressed to a short list for further analysis (highlighted in bold). The data in the report was updated in March 2014 prior to publication.

Table 1 Summary of organisations contacted

<table>
<thead>
<tr>
<th>Organisation / facility name</th>
<th>Contact name(s)</th>
<th>Progress to shortlist?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham University Stem Cell Centre</td>
<td>Philip Newsome</td>
<td>No – not yet Licenced</td>
</tr>
<tr>
<td>Cancer Research UK, Biotherapeutics Development Unit</td>
<td>Heike Lentfer and Rob Williams</td>
<td>Yes</td>
</tr>
<tr>
<td>Cellular Therapeutics Ltd</td>
<td>Ryan Guest</td>
<td>Yes</td>
</tr>
<tr>
<td>Fujifilm Diosynth Biotechnology</td>
<td>Stephen Taylor</td>
<td>No – longer term strategic interest</td>
</tr>
<tr>
<td>Guy’s &amp; St Thomas’ Hospital, GMP Facility</td>
<td>Chris Fisher and Drew Hope</td>
<td>Yes</td>
</tr>
<tr>
<td>Imperial College London, John Goldman Centre for Cellular Therapy</td>
<td>Anne Bradshaw</td>
<td>Yes</td>
</tr>
<tr>
<td>Keele University Medical School, Guy Hilton research Laboratories</td>
<td>Nick Forsyth</td>
<td>No – no GMP Licence</td>
</tr>
<tr>
<td>Kings College London, Rayne Cell Therapy Suite</td>
<td>Farzin Farzaneh</td>
<td>Yes</td>
</tr>
<tr>
<td>King’s Cell Therapy Unit, Clinical Research Facility</td>
<td>Peter Bishai</td>
<td>Yes (combined with Rayne Suite in analysis)</td>
</tr>
<tr>
<td>Lonza Biologics</td>
<td>Gordon Bates</td>
<td>No – longer term strategic interest</td>
</tr>
<tr>
<td>NHSBT - Birmingham, Bristol, Oxford, Speke</td>
<td>Jon Smythe</td>
<td>Yes – Speke site only</td>
</tr>
<tr>
<td>Pharmacells</td>
<td>Angela Scott</td>
<td>No – no GMP facility currently</td>
</tr>
<tr>
<td>Roslin Cells, Scottish Centre for Regenerative Medicine</td>
<td>Janet Downie</td>
<td>Yes</td>
</tr>
<tr>
<td>SNBTS, Scottish Centre for Regenerative Medicine</td>
<td>Tom McQuillan</td>
<td>Yes (combined with Roslin cells in analysis)</td>
</tr>
<tr>
<td>UK Stem Cell Bank</td>
<td>Lyn Healy</td>
<td>No</td>
</tr>
<tr>
<td>University College London, Great Ormond Street Hospital Cellular Therapy Laboratories</td>
<td>Sue Swift</td>
<td>Yes</td>
</tr>
<tr>
<td>University College London, Royal Free, Paul O’Gorman Laboratory of Cellular Therapy</td>
<td>Mark Lowdell</td>
<td>Current facilities full, but significant extra capacity available in 2014</td>
</tr>
<tr>
<td>Moorfields Eye Hospital, Institute of Ophthalmology, Cells for Sight ATMP Manufacturing Unit</td>
<td>Julie Daniels</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>University College London Hospital, Wolfson Cellular and Gene Therapy Unit</td>
<td>Mike Watts</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>20</td>
<td>University of Newcastle Biomanufacturing Facility</td>
<td>Anne Dickinson</td>
</tr>
<tr>
<td>21</td>
<td>University of Oxford, Clinical Biomanufacturing Facility</td>
<td>Sarah Moyle</td>
</tr>
<tr>
<td>22</td>
<td>Intercytex (Cell₂Therapy), Manchester</td>
<td>Joan Benson</td>
</tr>
</tbody>
</table>
5 High level summary of data

The 13 facilities (including one partnership) that were short listed in Table 1 were further analysed to produce a high level summary of the UK’s current capability and capacity for cell therapy manufacture. These data are summarised in the section below.

5.1 High level summary

- 13 individual facilities short listed based on current ability to manufacture cell therapy products to GMP regulations
- 56 manufacturing cleanrooms
- 56 parallel processes possible (dependent on enclosure of processes)
- 111 full time staff
- 43 part time staff

Most of the shortlisted organisations reside within the public sector or charities; with the exception of Intercytex, Cellular Therapeutics and Roslin Cells. Several of the organisations surveyed, but not short listed, are commercial biopharmaceutical entities and are looking into the possibility of diversifying or expanding into the cell therapy manufacturing arena. None of these organisations currently have GMP Licences for cell therapy products however.

5.2 Classification of clean rooms

Table 2 shows that there is a wide variety of different types of facility available within the UK both for processing via open systems (grade B clean rooms with grade A MBSCs) or within closed systems or isolators in lower classification suites. This data shows that the UK has the flexibility to manufacture using different process types.

Table 2 Classification of clean rooms

<table>
<thead>
<tr>
<th>Grade of clean room</th>
<th>Grade B</th>
<th>Grade C</th>
<th>Classified area with isolator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of rooms</td>
<td>27</td>
<td>12</td>
<td>19</td>
</tr>
</tbody>
</table>
5.3 Summary of experience and track record

Figure 1 shows a breakdown of the types of processes and cell types that the various organisations have dealt with in the past. It is promising to see that as a national resource, the current UK capability covers the whole technology sphere of cell therapy manufacturing requirements as it currently stands.

Table 3 shows a summary of the capacity, capability and availability of the 13 manufacturing facilities that were further analysed. Again the table highlights that the UK has a strong and diverse manufacturing base to support early phase clinical development for a wide variety of different manufacturing processes and product types.

Figure 1 Facility process experience
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Capacity per annum (open / closed)</th>
<th>Parallel products</th>
<th>Capability</th>
<th>Availability 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer Research UK, BDU</td>
<td>3 / 3</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cellular Therapeutics Ltd</td>
<td>1 / 3</td>
<td>4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Guy’s &amp; St Thomas’ Hospital, GMP Facility</td>
<td>5 / 10</td>
<td>4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Imperial College London, John Goldman Centre for Cellular Therapy</td>
<td>4 / 5</td>
<td>4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Kings College London, Rayne Cell Therapy Suite and Clinical Research Facility</td>
<td>5 / 12</td>
<td>10</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>NHSBT - Speke</td>
<td>8 / 6</td>
<td>4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Scottish Centre for Regenerative Medicine (Roslin Cells and SNBTS)</td>
<td>12 / 20</td>
<td>5</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>University College London, Great Ormond Street Hospital Cellular Therapy Laboratories</td>
<td>12 / 12</td>
<td>2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Moorfields Eye Hospital, Institute of Ophthalmology, Cells for Sight ATMP Manufacturing Unit</td>
<td>3+ / 0</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Newcastle Biomanufacturing Facility</td>
<td>9 / 9</td>
<td>9</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Intercytex Ltd (Cell2Therapy)</td>
<td>5 / TBC</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxford Clinical BioManufacturing Facility</td>
<td>DoP</td>
<td>DoP</td>
<td>PE</td>
<td>✓</td>
</tr>
</tbody>
</table>

Key: PE – Key staff have previous experience but not at this organisation, DoP – Dependent on Process, CB – Cell Banking, VV – Viral Vector Manufacture, GM – Gene Modification
5.4 Geographic locations of short listed facilities
The geographical analysis shows a diverse geography across UK with a clear cluster of 7 sites around greater London area.

Figure 2 Map showing locations of MHRA Licenced cell therapy manufacturing sites within the UK
6 Future capacity expansion

This survey was conducted in April 2013 and was updated in March 2014 prior to publication. It is anticipated that this report will be reviewed and updated on an annual basis to ensure that the information contained is up to date. This will be important as facilities expand and increase their track-record.

As a forward looking statement the following description of potential expansions of existing facilities or new sites has been drafted.

6.1 Expansion of existing sites

Two of the sites that were surveyed were currently at their maximum capacity but have plans to expand in the future. These sites are the University of Oxford Clinical Biomanufacturing Facility and the UCL Royal Free Paul O’Gorman Laboratory. Both of these expansions will add significantly to the capacity at these centres.

6.2 New sites

An additional cell therapy manufacturing site at the University of Birmingham Stem Cell Centre is due to come online in 2014. Further details of the site will be provided in the annual update when available.

NHSBT currently have one site licenced to manufacture IMP cell therapies at Speke. Two additional sites in Birmingham and Filton (Bristol) are due to be licenced for cell therapy manufacture (IMP) in Q2 and Q3 2014 respectively.

6.3 Large-scale commercial supply capacity

In the 2014 budget the Chancellor of the Exchequer announced that the Cell Therapy Catapult, through the TSB, has been awarded £55 million over five years to fund the capital build of a large-scale cell therapy manufacturing centre, to cover revenue whilst operations are established and for the TSB to operate associated competition funding for firms to access the centre.

The manufacturing facility will be run as a subsidiary of the Cell Therapy Catapult with a General Manager and local team present at the facility. The Cell Therapy Catapult will be responsible for the design, build and commissioning of the facility and will supply the corporate functions from the core organisation.

The way in which the facility will operate is best described as a ‘manufacturing hotel’, where a quality management system, relevant licenses, core equipment and personnel would be supplied. Clients could then either supply their own qualified staff to work on the manufacture and analytical testing or request additional staff from the facility. The client would agree the space required to make the product for trial and subsequent initial in market supply. The client could be a product development company or a CMO. This facility takes the risk out of committing capital to a permanent commercial facility before knowing whether the product will be successful in the clinic. It is envisaged that successful products could eventually be manufactured from purpose built facilities operated by successful firms.

It is anticipated that the facility will open for business 2017.

6.4 Biopharma CMOs

Two biopharmaceutical CMOs were contacted as part of the survey process (Lonza Biologics, Slough and Fujifilm Diosynth, Billingham). The main business of these organisations, within the UK, involves the manufacture of recombinant proteins for clinical trials and commercial supply. Many of the core technologies, facilities and experience are similar to the requirements in large-scale cell therapy, however there are some key differences. Lonza Biologics have established cell therapy manufacturing operations in the US and Singapore.
7 Contract Manufacturing Organisations

7.1 Cancer Research UK Biotherapeutics Development Unit

7.1.1 Details

Address
Clare Hall Laboratories,
Blanche Lane,
South Mimms,
Potters Bar,
Hertfordshire EN6 3LD

Contact: Heike Lentfer heike.lentfer@cancer.org.uk
Tel: 01707 625700

7.1.2 Facility

Manufacturing suites
- Two suites each with two grade C clean rooms for closed processing.
- One suite with two grade C clean rooms for closed processing and a third grade C clean room with an isolator.
- One suite with one grade C clean room for closed processing and a third grade C clean room with an isolator designed for virus processing.
- HVAC is fully segregated between suites allowing multi-product manufacture. Areas are all designed for cat II containment.

Cell culture processing equipment
- Various Microbiological Safety Class II and Laminar Air Flow Cabinets
- Static and Shaking Incubator with CO₂ control
- AppliFlex Bioreactor 20L and 50L (disposable)
- Single-use Bioreactor (SUB Hyclone) 50L, 100L, 250L
- NucleoCounter for automated cell counting
- CubiAnalyzer for metabolite analysis

Other processing equipment
- Millipore Mobius Disposable Mixer System
- Millipore Cogent µScale and M1 TFF System
- AKTA Explorer, AKTA Pilot and AKTA Ready (Disposable) Chromatography Controller
Sterile filling equipment
- Flexicon FP50 Filling Machine
- Two 6-Glove Isolators

Analytical equipment
- UV/VIS Spectrophotometers
- Plate Readers (visible light only - can be upgraded to bioluminescence or fluorescence)
- HPLC
- FTIR
- TOC Analyzer
- Q-PCR
- Stability Cabinets
- Sterility Test Isolator

Photos showing the finish of the clean rooms can be seen in Figure 3.

Figure 3 Example photos of CR UK BDU facility

7.1.3 Licence
MHRA licence for IMPs has been granted, currently does not cover cell therapy products. The site does not have an HTA licence.

7.1.4 Track record and experience
The main experience to date has been with biologics production (recombinant proteins, DNA and viruses etc.). Adherent and suspension cell cultures have therefore been used for this purpose (CHO and human cell lines). Some staff have experience during previous employment with primary cell culture. A summary of their experience can be found in Table 4.

The organisation has experience with manufacture of cell banks.

The organisation has experience of large (250L) scale stirred tank and rocking bioreactors. This applies to both single use and CIP/SIP vessels.
Table 4 Summary of experience for CR UK BDU

<table>
<thead>
<tr>
<th></th>
<th>Suspension</th>
<th>Adherent</th>
<th>2D</th>
<th>3D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allo</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Human ES Cell</th>
<th>iPS Cell</th>
<th>Cell isolation from donor tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Previous experience</td>
</tr>
</tbody>
</table>

7.1.5 Personnel
In total there are 15 members of staff are working within the facility. Staff are deployed where necessary but strict controls are in place to prevent staff working on multiple different product streams. Main areas of experience have been focused on production of biologics from various cellular expression systems.

An organogram showing the organisation structure of the team can be found in Figure 4.

Figure 4 CR UK BDU Organogram

7.1.6 Capacity
CR UK BDU indicated that they could run up to three projects per year on the assumption that each would require lengthy tech transfer activities prior to GMP manufacture. The multiple GMP suites with separate air handling, personnel, material and waste segregation would enable multiple simultaneous production campaigns.

The main bottleneck limiting further increases in capacity appear to be staff numbers. A second bottleneck defined as space within process development labs to run through the process prior to GMP manufacture was also identified.
Standard methodology to plan capacity and occupancy are used and updated monthly. Available capacity is described below.

2014 – 0%
2015 – 0%
2016 – 50%
2017 – 100%
7.2 Cellular Therapeutics Ltd (CTL)

7.2.1 Details

Address
Cellular Therapeutics Unit
48 Grafton Street
Manchester M13 9XX

Contact: info@cellulartherapeutics.co.uk
Tel: 0161 606 7278
Web: www.cellulartherapeutics.co.uk

7.2.2 Facility
This facility comprises of one large multiproduct manufacturing suite (grade D) with three isolators (grade A) and associated transfer hatches (grade B). Each open product is incubated within a product specific secondary containment system to avoid cross contamination.

Processing equipment
- Process development laboratory
- Environment Monitoring System to log parameters (particle count, pressures, temperature etc) from the isolators, incubators and storage locations.
- CliniMACS – bench top platform enabling the separation of different cell types within a closed system using magnetic bead conjugates.
- Automated closed system to aseptically concentrate and wash cells.
- Standard incubators for static cell culture
- Bag/closed vessel centrifuge and ‘bag squeezer’ (to remove supernatant).
- Perfusion bioreactors for actively managed cultures (10L scale)

Analytical equipment
- Flow cytometer
- Microbiology QC
- GMP and process development assays
Figure 5 Example of clean room at the Cellular Therapeutics Unit

7.2.3 Licence
MHRA licence for IMPs and an MS specials licence. The facility does not have an HTA licence (at present).

7.2.4 Track record and experience
CTL have experience of manufacturing both closed and open cell therapy products. CTL have experience of manufacturing gene modified T cell (viral vectors) and Tumour Infiltrating Lymphocyte products: having completed two cell therapy trials; four trials ongoing; and further trails in the pipeline. A summary of their experience with cell therapies can be found in Table 5.

Table 5 Summary of experience for Cell Therapeutics Unit

<table>
<thead>
<tr>
<th></th>
<th>Suspension</th>
<th>Adherent</th>
<th>2D</th>
<th>3D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Allo</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human ES Cell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iPS Cell</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell isolation from donor tissue</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

7.2.5 Personnel
An organogram for CTL can be found in Figure 6. The unit operates under the CTL Board which is responsible for determining the direction and oversight of products in the pipeline and in process. There are individual board members responsible for finance and contracts; production and quality and process translation, scientific review; and GMP research and development. Within the facility we have access to consultant qualified personnel and dedicated product management and production staff.
7.2.6 Capacity
Cellular Therapeutics have the capability to manufacture six different products simultaneously with a current maximum of four open processes at any one time. This assumes a manufacturing cycle of two to three weeks per product.

2014 – 20%
2015 – 50%
2016 – 50%
2017 – 70%
7.3 Biomedical Research Centres (BRC) Clinical Research Facility (CRF)
GMP Unit at Guy’s and St Thomas’

7.3.1 Details

Address
NIHR Guy’s and St Thomas’ Biomedical Research Centre
GMP Unit
Clinical Research Facility
15th Floor, Tower Wing
Guy’s Hospital
Great Maze Pond
London SE1 9RT

Contact: Chris Fisher Christopher.fisher@gstt.nhs.uk
Contact: Drew Hope Andrew.hope@gstt.nhs.uk
Tel: 0207 188 7188 (ext 52362 or 52703)
Web: http://www.guysandstthomasbrc.nihr.ac.uk/

7.3.2 Facility
Guy’s and St Thomas’ Clinical Research Facility is a 125m² facility located on the 15th floor of Guy’s hospital tower wing. The main manufacturing area houses three grade D clean rooms which are in total 95m². Each clean room is equipped with an isolator for open processing. Closed processes can also be accommodated.

Processing equipment
- 3 x Rigid four-glove Grade A isolators
- Incubators
- Controller rate freezer
- Rocking platforms
- Centrifuge
- CliniMACS Plus, CliniMACS Prodigy cell isolators
- Sepax and SynGenX1000 cell isolators
- MACS Quant Tyto FACS cell isolator
- Rocking Bioreactor

Analytical equipment
- 1 x Countless cell counter
- 4 x Scepter cell counter
- 2 x Inverted microscopes
- 1 x ImageStreamX (Luminex)
- 1 x Cytoff Mas Spectrometer
- 3 x FACS CANTO II
- 1 x LSR
- 1 x FORTESSA
- 1 x INFLUX
- 2 x ARIA
- 1 x Luminex FlexMap3D
7.3.3 Licence
MHRA licence for IMPs. HTA licence for procurement and donor testing.

7.3.4 Track record and experience
Experience with autologous T cells and autologous Treg cells at the facility. A summary of the experience can be found in Table 6.

Table 6 Summary of experience for Guy’s and St Thomas’

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7.3.5 Personnel
Two members of staff are permanently employed in the CRF to oversee the quality management system; a head of advanced therapy production and a head of advanced therapy quality. A contract QP is used for batch release. An advanced therapy production scientist is employed to assist with projects being undertaken within the unit. Teams of up to four operators are recruited by the principle investigator and are then trained to work in production to comply with GMP regulations.
7.3.6 Capacity
Guy’s and St Thomas’ CRF has indicated that it would be possible for them run up to five open and 10 closed projects per year. Forecasts of future spare capacity can be found below.

2014 – 60%
2015 – 50%
2016 – 50%
2017 – 40%
7.4 Imperial College London, John Goldman Centre for Cellular Therapy

7.4.1 Details

Address
Catherine Lewis Building, Hammersmith Hospital, Ducane Road, LONDON W12 0HS

Contact: Anne Bradshaw anne.bradshaw@imperial.nhs.uk
Tel: 0203 313 2056
Web: n/a

7.4.2 Facility
The centre is equipped with two independent clean room suites. Each suite has two grade B rooms for processing and a grade C room for preparation. Class II MBSCs provide grade A environments for open processing. One of the suites is designed to work with GMO level 2 material (for example for gene replacement work). Work with genetic modification would require an update to the IMP Licence however.

Processing equipment
- Class II ducted cabinets
- Laminar airflow stations (LAF)
- Cell separators e.g. Cobe 2991, Cobe Spectra
- Immunoselection devices e.g. Miltenyi CliniMacs, Baxter Isolex 300i
- Tubing heat sealers
- Automated Cell washer – Baxter Cytomate
- Sterile Docker – Terumo SCDC
- Tissue Culture incubators
- Vacuum wrapping device
- Tissue Culture incubators
- Pharmacy grade fridge/freezer
- Controlled rate freezer

Analytical equipment
- Flow Cytometer
- Bench top centrifuges
- Pharmacy grade fridge

Figure 9 Example of clean room at John Goldman Centre for Cellular Therapy
No photographs provided.
7.4.3 **Licence**
MHRA Licences to manufacture IMPs and Specials. HTA licences have also been awarded for various operations.

7.4.4 **Track record and experience**
The centre has a long history of experience immune-selection and separation (CD34+) using devices such as the CliniMACS. The centre has experience with Haematopoietic Progenitor Cells and T lymphocytes for both autologous and allogeneic use. A summary of the centre’s experience can be found in Table 7

### Table 7 Summary of experience for John Goldman Centre for Cellular Therapy

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7.4.5 **Personnel**
Key personnel at the centre include a head of operations and regulatory affairs, a medical director, consultant QP, head of processing and a head of quality. A description of the organisation of the centre can be found in Figure 10.

**Figure 10 Organogram of John Goldman Centre for Cellular Therapy**
7.4.6 Capacity
The centre has two independent suites each with two grade B rooms enabling up to four simultaneous projects. The spare capacity over the next few years is indicated below.

2014 – 25%
2015 – 25%
2016 – 25%
2017 – 25%
7.5 Rayne Cell Therapy Suite (RCTS) and The Wellcome Trust / BRC Clinical Research Facility and Cell Therapy Unit (CTU) at King’s College London

7.5.1 Details

Address
King’s College London,
The Rayne Institute,
123 Coldharbour Lane,
London SE5 9NU

Contact: Farzin Farzaneh Farzin.farzaneh@kcl.ac.uk
Tel: 020 7848 5902/2900
Web: [http://www.kcl.ac.uk/medicine/research/divisions/cancer/research/sections/haematooncology/celltherapysuite.aspx](http://www.kcl.ac.uk/medicine/research/divisions/cancer/research/sections/haematooncology/celltherapysuite.aspx)

7.5.2 Facility
The RCTS premises contains 40m² of grade D clean rooms with two grade A isolators. This facility has operated as a GMP facility for the production of cell and gene therapy based investigational medicinal products since 2001.

The CTU facility has a floor area of 258m² and is separated into three suites. The Cell Therapy Suite contains with separate grade D areas complete with isolators. Each area is designed to handle separate products. The Gene Therapy Suite is a grade D processing area with an isolator. Production runs in The Cell and Gene Therapy Suite are conducted on a campaign basis with a “deep clean/decontamination” between the manufacture of different products. The Cell Isolation Suite has two grade C areas with Class II MBSC for initial isolation of the starting material from donor tissue. The final steps of processing the material are carried out in an isolator in the same grade C background. Although the grade C areas in this suite are declared as such they are designed to function as grade B rooms.

Processing equipment
- Cell culture incubators
- Centrifuges
- Cryovial filler/capper
- Controlled Rate Freezer
- 2 x Plasmatherm
- Micro-encapsulator
- 2 x CliniMACS cell processing systems
- Plasma expressor
- Sepax cell separation system

Analytical equipment
- 4 x Microscope - inverted
- 2 x Microscope - fluorescent
- 5 x Microscope – normal
- FACS cell sorting
7.5.3 Licence
The RCTS facility holds MHRA licences for IMP and specials. In addition it also has a HTA licence. The IMP and Specials licences have recently been extended to cover the new facility.

7.5.4 Track record and experience
The organisation has experience with dendritic cells for a variety of different indications, donor NK cells, mesenchymal stem cells and haematopoietic stem cells. They also have extensive experience with the manufacture of gene therapy products such as retrovirus and lentivirus vectors.

Table 8 Summary of experience for the Rayne Cell Therapy Suite and the Cell Therapy Unit

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Cell isolation from donor tissue
7.5.5 Personnel
There are four permanent members of staff at the RCTS; the RCTS director, a QP, the quality manager and the production manager. An organogram for RCTS can be found in Figure 10.

The CTU is still in a start-up phase and organisational structure is still being defined. Key personnel include the unit director, a QP, a quality director and a production manager.

Figure 12 Organogram of the Rayne Cell Therapy Suite

7.5.6 Capacity
The RCTS can handle two separate projects at any time. Each production run lasts two to four weeks for cell products and four to eight weeks for viral vectors.

2014 – 60%
2015 – 60%
2016 – 60%
2017 – 60%
7.6  NHS Blood and Transplant (NHSBT)

7.6.1 Details

NHS Blood and Transplant (NHSBT) has two sites with MHRA Manufacturer’s Authorisation for IMPs covering cellular and molecular therapies. In addition, there are a further six laboratory sites with HTA licences (two of which are due to add an MHRA licence during 2014).

**Site address one**
NHS Blood and Transplant
Advanced Therapies Unit
14 Estuary Banks
Estuary Commerce Park
Speke
Liverpool L24 8RB

**Contact:** Dr Eric Austin, Head of Laboratory, eric.austin@nhsbt.nhs.uk  
**Tel:** 01512 687200

**Site address two**
NHS Blood and Transplant
Clinical Biotechnology Centre
Langford House
Lower Langford, near Bristol BS40 5DU

**Contact:** Dr Paul Lloyd-Evans, Head of Laboratory, paul.lloyd-evans@nhsbt.nhs.uk  
**Tel:** 0117 9289388

**Additional contacts:**
**Contact:** Teresina Pinnington, Business Development Manager, teresina.pinnington@nhsbt.nhs.uk  
**Tel:** 07889 304615

**Contact:** Dr Jon Smythe, Head of Cellular and Molecular Therapies, jon.smythe@nhsbt.nhs.uk  
**Tel:** 01865 38 7967  
**Web:** [http://www.nhsbt.nhs.uk](http://www.nhsbt.nhs.uk)
7.6.2 Facilities at Speke
The NHSBT Speke facility has two grade B rooms with Class II MBSC dedicated to the manufacture of cell therapies. There is also an additional grade B room and a grade C room shared with the NHSBT Tissue Services department.

Processing equipment
- Class II cabinets
- CO₂ incubators
- Sterile connecting devices
- Controlled rate freezers
- Liquid nitrogen storage vessel
- Centrifuges
- Orbital shaker
- 4°C storage pharmacy fridges
- Peristaltic pump
- Filter integrity tester
- Endosafe PTS
- Cytospin
- Line sealers

Analytical equipment
- Haematology analyser
- Fluorescent microscope
- Flowcytometer
7.6.3 Licence
The Speke site has a MHRA licence for IMPs and a HTA licence.

7.6.4 Track record and experience
The ATU has experience of the genetic manipulation of T cells, cell selection and depletion protocols and broad cell culture knowledge. The unit also has experience of the selection and culture of mesenchymal stem cells from bone marrow and peripheral blood stem cells for clinical trials. The laboratory has prepared working and master cell banks under GMP.

Table 9 Summary of experience for NHSBT

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7.6.5 Personnel
The NHSBT site in Speke has six dedicated staff for IMP manufacture.

Figure 14 Organogram of NHSBT, Speke site

7.6.6 Capacity
2014 – 90%
2015 – 90%
2016 – 90%
2017 – 90%
Facilities at the Clinical Biotechnology Centre, Langford
The NHSBT Clinical Biotechnology Centre has four grade D rooms and three grade C rooms. One grade C room is dedicated to the aseptic filling of products in a pharmaceutical grade positive pressure isolator. Class II MBSC or laminar flow cabinets are present in the other rooms dedicated to the manufacture of gene therapy and biotechnology products.

Processing equipment
- HVAC System
- Class II cabinets / laminar flow hoods
- Pharmaceutical grade positive pressure isolator
- Fermentation systems
- AKTA chromatography equipment
- Highly purified water plant
- Incubators and shaker incubators
- Freezers, fridges and storage areas including liquid nitrogen storage vessel
- Centrifuges
- Peristaltic pumps
- Autoclave
- Laboratory grade dishwasher
- Emulsiflex high pressure homogeniser
- Dose-It 910 Filling equipment for dispensing of products

Analytical equipment
- UV / Visible spectrophotometer
- Filter integrity tester
- Endosafe PTS
- Microplate plate reader with fluorescence capability
- Osmometer
- pH & Conductivity meter
- TOC analyser
- PCR equipment
- HPLC
- Electrophoresis equipment
- Gel analysis and documentation system
- Access to DNA capillary sequencer
- Environmental testing equipment
Figure 15 Example of clean room at NHSBT (CBC site)
7.6.8 Licence
The CBC site has a MHRA licence for the manufacture and importation of molecular IMPs.

7.6.9 Track record and experience
The facility has experience in the manufacture of plasmid DNA vectors as direct vaccines or for use in viral vector manufacture, production of recombinant proteins, production of monoclonal antibodies and the conjugation of antibodies for therapy. To date the facility has manufactured over 50 plasmid DNA vectors, five recombinant proteins and been involved in over 14 clinical trials since 2001 (with over 400 patients treated). The CBC has developed an expertise in the manufacturing and testing of patient-specific DNA vaccines to current regulatory requirements.

7.6.10 Personnel
The NHSBT site in Langford has eight dedicated staff for IMP manufacture.

Figure 16 Organogram of CBC site

7.6.11 Capacity
CBC can process two to three products in parallel with a capacity of up to 15 to 20 products per year, depending upon scale. Current available capacity is shown below:

- 2014 – 30%
- 2015 – 70%
- 2016 – 80%
- 2017 – 90%
7.7 Scottish Centre for Regenerative Medicine (Roslin Cells) and Scottish National Blood Transfusion Service (SNBTS) Cellular Therapy Facility

7.7.1 Details

Address
Cellular Therapy Facility
Scottish Centre for Regenerative Medicine
5 Little France Drive
Edinburgh BioQuarter
Edinburgh
EH16 4UU

Contacts

Roslin Cells
Janet Downie, Chief Operating Officer
Email: janet.downie@roslincells.com
Tel 0131 658 5182
Web: www.roslincells.com

SNBTS
John Campbell: Associate Director, Research, Development and Innovation
Email: johncampbell3@nhs.net
Tel:0131 314 5677
Web: http://www.scotblood.co.uk

7.7.2 Facility
The Cellular Therapy Facility is a shared facility between Roslin Cells and SNBTS and contains two separate suites. Both suites house 2 Grade B rooms with Class II MBSCs, 1 Grade C clean room (Isolator Ready) and 1 Grade C support room.

Processing equipment
- Cell culture incubators
- Centrifuges
- Controlled rate freezer
- Ohaus Analytical Balance
- Closed system cell processing – TSCD, Tube sealers, Transfer Bag centrifuges etc.
- CliniMACS plus cell selection system
- CliniMACS Prodigy cell selection system

Analytical equipment
- AB 7900 HT Real Time PCR system
- Flow Cytometer (Guava EasyCyte and BD FACS Canto II)
- Sysmex Haematology Analyser
- Biotek Plate Reader
- Nanodrop and BC DU800 Spectrophotometer
- ABX Pentra 400
- HPLC
- BioWhittaker ELX 808 Plate reader
- Viral testing capabilities
- Beckman Coulter PK 7200/7300 and Ortho Innova (ABO, RhD, RH/K Phenotype etc)

The SCRM is located close to a number of MHRA licenced contract testing facilities who provide a full range of testing capabilities.

7.7.3 Licence
Roslin Cells and SNBTS both hold individual HTA licences, MHRA MIA(IMP) and Manufacturer’s Specials licences for the facility.

7.7.4 Track record and experience

**Roslin Cells - Contract Manufacturing**
Roslin Cells has its contract manufacturing operation within the Scottish Centre for Regenerative Medicine. The team at Roslin Cells has a depth of experience in the cell therapy field and in Good Manufacturing Practice.

The GMP team has many years’ experience in the production and testing of pluripotent stem cell seed lots and Master Cell Banks to GMP. The team are also performing the manufacturing for the ReNeuron, CTXoE03 Product for Phase II Clinical Trials and are engaged in the development of protocols and the production of clinical grade induced pluripotent stem cells in collaboration with the Cell Therapy Catapult.

The Cell Therapy Development Team have many years’ experience of translating academic cell therapy protocols to GMP, process development and associated documentation required for GMP manufacturing.
The team will also be performing the technology transfer and manufacture of the scaled –up process for manufacturing red cells from human pluripotent stem cells and the manufacture of endothelial cells from human pluripotent stem cells.

**SNBTS**

SNBTS currently produces 3 different cellular therapy products, under appropriate HTA, MHRA specials or MAI IMP licences. These are CD133+ autologous stem cells, EBV-specific Cytotoxic T cells, and Corneal Epithelial Stem Cells. CD133+ stem cells and Corneal Epithelial Stem cells are currently produced at SCRM.

SNBTS also has extensive cell therapy translational research laboratories at SCRM which are involved in the final translation of several other novel cell therapy products.

Table 10 summaries the experience at SCRM.

**Table 10 Summary of experience for Roslin Cells and SNBTS**

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7.7.5 **Personnel**

Roslin Cells currently has twenty five full time employees based both at the SCRM and Nine Edinburgh BioQuarter. The core team are organised into 4 departments; Production, Quality Control, Quality Assurance and Cell Therapy Development. The Organogram for Roslin Cells (April 2014) is shown in Figure 18.

SNBTS Cell Therapy Development centre at SCRM is part of the Research, Development and Innovation Directorate (RDI). The SNBTS group is managed by the Cell Therapy Development Manager, reporting to the Associate Director of RDI. Cell therapy work is carried out by close integration with the Quality and Regulatory Compliance Directorate and other clinical divisions within SNBTS such as Tissues and Cells; Histocompatibility and Immunogenetics; Clinical Apheresis.

Organograms for both Roslin Cells and SNBTS can be found in Figure 18.
7.7.6 Capacity
SCRM has indicated that it could run up to 12 open and nine closed processes per year. The amount of spare capacity currently forecast can be seen below.

2014 – 50%
2015 – 40%
2016 – 20%
2017 – 10%
7.8 Cellular Therapies, Great Ormond Street Hospital

7.8.1 Details

Address
Cellular Therapies
Great Ormond Street
London WC1N 3JH

Contact: Sue Swift s.swift@ucl.ac.uk
Tel: 0207 905 2830
Web: n/a

7.8.2 Facility
There are two suites within Cellular Therapies. The first consists of a grade C clean room with a grade A isolator for aseptic processing. The second suite has a grade C preparation room and aseptic processing with two grade A isolators. The facility is licenced for gene and cell therapy products by the MHRA (MIA(IMP) and MS 17328).

Processing equipment
- Centrifuges (various)
- Incubators (various)
- Plasmatherm
- Tube welder and sealer and bag sealer
- Dynal ClinExVivo (magnetic particle concentrator for removal of beads)
- CliniMACS cell separation

Analytical equipment
- Nikon stereoscopic and inverted microscopes
7.8.3 Licence
MHRA licence for IMP and specials. The facility is also licenced by the HTA.

7.8.4 Track record and experience
The facility has the experience of manufacturing gene and cell therapy products for Phase I / II trials. In total around 10 products have been manufactured for clinical trials and another 10 are in progress.

Table 11 Summary of experience for GOSH Cellular Therapies

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7.8.5 Personnel
The unit is organised under a chief pharmacist with an aseptic services manager, a quality assurance manager and a contract QP. The organogram for the unit can be found in Figure 20.

Figure 20 Organogram of Cell Therapies GOSH

7.8.6 Capacity
The facility has indicated that it is capable of manufacturing up to 12 open or 12 closed products per year in the facility.

2014 – 30%
2015 – 20%
2016 – 20%
2017 – 100%
7.9  Moorfields Eye Hospital, Cells for Sight Cell Research Unit

7.9.1  Details

Address  
UCL Institute of Ophthalmology  
11-43 Bath Street  
London, EC1V 9EL, UK

Contact: Julie Daniels  
j.daniels@ucl.ac.uk  
Tel: 0207 608 6893  
Web: http://www.ucl.ac.uk/cells-for-sight/cell-therapy

7.9.2  Facility

The facility is split into two grade B manufacturing areas. The smaller area contains one MBSC and one CO₂ incubator. The larger area contains three MBSCs and three CO₂ incubators.

Processing equipment
- 4 x Class II MBSCs
- 4 x CO₂ incubators
- Fridges and freezers

Analytical equipment
- 2 x Microscopes
- Microbiological incubators

Figure 21 Example of clean room at Cells for Sight
7.9.3 Licence
The facility has an MHRA licence for IMP manufacture, a Specials licence and a HTA licence.

7.9.4 Track record and experience
The main area of experience involves both allogeneic and autologous manufacture of limbal stem cell cultivation on a scaffold. There is also manufacturing experience with retinal pigmented epithelial cells derived from human ES cells.

Table 12 Summary of experience for Cells for Sight

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7.9.5 Personnel
The facility employs production and quality managers a contract QP and one technician. Additional staff are supplied by the client/PI.

Figure 22 Organogram of Cells for Sight

7.9.6 Capacity
The organisation indicated that they were capable of running greater than 3 open process products per year.

2014 – 20%
2015 – 66%
2016 – 66%
2017 – 66%
7.10  Newcastle Biomedicine Cellular Therapy Facility

7.10.1 Details

Address
Newcastle Cellular Therapies Facility
Newcastle University
3rd Floor, West Wing
Bioscience Centre
Times Sq
Newcastle University NE1 4EP

Contact: Anne Dickinson  anne.dickinson@ncl.ac.uk
Tel: 0191 2226794
Web:  www.ncl.ac.uk/ctf

7.10.2 Facility
The facility contains two suites one with four grade B clean rooms and a second with five grade B rooms. These processing labs are supported by two grade C preparation rooms that also provide access to the rooms.

Processing equipment
- MBSC (Class II)
- CO₂ incubators
- Refrigerated centrifuges
- Caridion Cobe 2991 cell processing equipment
- Water baths
- Blood warmer
- CliniMACS Plus
- Miltenyi Prodigy

Analytical equipment
- Microscope
- FACS
- PCR Thermocycler

Figure 23 Example of clean room at Newcastle Biomedicine Cellular Therapy Facility
7.10.3 Licence
MHRA licence for manufacture of IMPs and a specials licence. The facility also has a HTA licence.

7.10.4 Track record and experience
The facility has experience with stem cell cryopreservation using controlled rate freezing, cell manipulation using COBE 2991 (separation of blood and bone marrow) and isolation of sub-populations using a CliniMACS. Development and culture of dendritic cells and mesenchymal stem cells, limbal stem cells and tolerogenic dendritic cells for ATMP clinical trials.

Table 13 Summary of experience for Newcastle Biomedicine Cellular Therapy Facility

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7.10.5 Personnel
The facility employs four staff in production and two QC analysts. An organogram for the company can be found in Figure 24 Organogram of Newcastle Biomedicine Cellular Therapy Facility.

Figure 24 Organogram of Newcastle Biomedicine Cellular Therapy Facility
7.10.6 Capacity
The facility has nine separate clean rooms allowing it to run up to nine separate projects at any time.

2014 – 50%
2015 – 60%
2016 – 70%
2017 – 80%
7.11  Intercytex Ltd (Cell2Therapy)

7.11.1 Details

Address

Core Technology Facility
46 Grafton Street
Manchester M13 9NT

Contact: Joan Benson  jbenson@intercytex.com
Tel: 0161 606 7204
Web: www.Intercytex.com and www.cell2therapy.com

7.11.2 Facility
The facility houses two grade B processing areas which are each complemented with preparation areas. A QC area is available for environmental monitoring, endotoxin and sterility testing. The facility also has a clean room mimic area for training and development purposes.

Processing equipment
- CO₂ Incubators
- Class II MBSCs
- Bench-top centrifuges
- Inverted microscopes
- Peristaltic pumps
- LN₂ cell bank storage
- -80°C freezer

Analytical equipment
- Automated endotoxin testing
- Automated sterility testing (BacT Alert)
- Vial integrity testing machine
- Colony counter
- Guava FACS
- Plate reader
- Fluorescent microscope
7.11.3 Licence

MHRA licence for manufacture of IMPs and a specials licence. The organisation has a partner for their HTA activities.

7.11.4 Track record and experience

Intercytex have manufactured and shipped product for several cell therapy clinical trials (Phase I, II and III) in the UK, US, Canada and Poland. These include manufacture of allogeneic fibroblast suspensions for treatment of Epidermolysis bullosa, skin rejuvenation, restrictive scar contractures, naso-labial folds and acne scars and the manufacture of autologous dermal papilla cells suspensions for the treatment of male pattern baldness. Two other projects focused on a Phase II trial for the treatment of full thickness skin excisions, a Phase II trial for the treatment of diabetic ulcers and a 400 patient Phase III trial for treatment of venous ulcers, all using various 3D cell populated gels.

In addition to the physical manufacture of products, Intercytex also offer consultancy services offering assistance with manufacturing, quality systems, analytical development and supporting IND and CTA clinical trials applications in the US and UK.
Table 14 Summary of experience for Intercytex Ltd

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7.11.5 Personnel
Intercytex employs six GMP trained manufacturing, QC and QA operators and has access to a further three via their partner. The site uses three contract QPs for product release.

7.11.6 Capacity
The facility has two separate clean rooms allowing it to run up to two separate projects at any time. Intercytex indicated they could run three to five projects per year depending on the scale.

2014 – 75%
2015 – 75%
2016 – 75%
2017 – 75%
7.12 University of Oxford Clinical BioManufacturing Facility

7.12.1 Details

Address
Clinical BioManufacturing Facility
University of Oxford
Old Rd
Headington
Oxford OX3 7JT

Contact: Sarah Moyle sarah.moyle@ndm.ox.ac.uk
Tel: 01865 744845
Web: http://www.cbf.ox.ac.uk/home

7.12.2 Facility

Manufacturing suites
- Three grade B suites; one large 51m² area with two MBSCs, 23m² room with one MBSC and a smaller room 10m² with an isolator.
- Two grade C suites; one 17.4m² with a 4 glove isolator for fill/finish but could also be used for manufacture and one 11m² with an MBSC
- One grade D area 22.9m² for preparation, staging and inspection and a through wall pharmaceutical autoclave.

Processing equipment
- 2 x CO₂ shaking incubators
- 2 x static CO₂ incubators
- 4 x Class II MBSCs
- 4-glove isolator
- 2 glove isolator
- 2 ultracentrifuges
- 3 low speed centrifuges
- AKTA pilot

Analytical capabilities
- Endotoxin measurement
- Sterility check
- DNA and protein quantification
- Access to FACS analysis
- Molecular Biological Capabilities (QPCR, PCR, enzyme restriction analysis, sequencing)
- Analytical QC testing for viral vector applications
- Analytical QC testing for residuals
- Other QC testing can be outsourced
Photos showing the finish of the clean rooms can be seen in Figure 26.

Figure 26 Example photos of Oxford CBMF facility

7.12.3 Licence
An MHRA MIA (IMP) licence has been granted which authorises cell therapy gene therapy and many additional manufacturing capabilities. The facility does not currently have an HTA licence but key personnel have previous experience with HTA requirements and licensing. The CBF has prior experience importing IMPs from outside the EU and certifying these to clinical trial in the EU.

7.12.4 Track record and experience
The facility has a great deal of experience with biologics production (recombinant proteins and viruses etc.). Adherent and suspension cell cultures have therefore been used for this purpose. Key staffs have experience during previous employment with cell therapy manufacture (including viral transduction). A summary of their experience can be found in Table 15. Personnel at the Oxford CBMF have a large degree of experience with viral vector manufacture which is a key component of gene modified cell therapies.

Table 15 Summary of experience for Oxford CBMF

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Previous Experience

7.12.5 Personnel
In total there are 14 members of staff are working within the facility. The site has one permanent QP onsite and 2 named contract QPs on their licence.
An organogram showing the organisation structure of the team can be found in Figure 27.

Figure 27 University of Oxford CBMF Organogram

7.12.6 Capacity
The facility is currently working at capacity with respect to manufacturing work. The facility has plans for future expansion which would mean a greater degree of capacity in the future.

2014 – 0%
2015 – 10%
2016 – 100-300%
2017 – 300%
8 Conclusions

The UK has a strong research base in cell therapies and this is supported by a network of early phase GMP manufacturing centres. In total 13 facilities were highlighted with the current capability and capacity to manufacture cell therapies to licensed GMP.

The centres are highly experienced and their combined knowledge and track-record covers the sphere of current requirements for cell therapy manufacture. A wide variety of equipment is available at the sites that supports this proficiency. Most experience so far is based around manufacture using ‘open systems’ either in grade A/B environments or in isolators. Some of the facilities do have experience of working with ‘closed systems’.

The centres are mainly clustered in and around central London with additional sites in Oxford, Speke, Manchester, Newcastle and Edinburgh.

Many of the centres have spare capacity over the next few years and so the manufacture of new products for early phase clinical trials can be well supported within this network. In addition several new or expanded sites are due to be available in 2014.

The current centres are mostly based in UK academia or the NHS and are not commercial in nature. The three commercial organisations on the short list are Cellular Therapeutics Ltd (a spin out from the University of Manchester), Roslin Cells and Intercytex Ltd.

The large-scale Cell Therapy Catapult Manufacturing Centre, which was recently announced in the 2014 budget by the Chancellor of the Exchequer, will complement this existing network. This centre will provide a step change in capacity for cell therapy manufacture in the UK. It will complete the translational picture thus allowing transfer from the research stage into the clinic and finally to later phase trials and commercial manufacture.

The combination of the high quality research taking place in UK academia, the network of early phase manufacturing centres and the large-scale facility will mean that the UK is a very attractive location for the global cell therapy industry.