PHACILITATE:

THE EVOLUTION OF ADVANCED THERAPIES: **A 200-YEAR HISTORY**

1818
First recorded successful blood transfusion to a patient who had haemorrhaged during childbirth, performed by British physician Dr James Blundell

1901
Discovery of first human blood groups

1931
Paul Niehans successfully treats a patient suffering from tetany using injections of parathyroid gland from a bull

1936
First blood bank established in Madrid during the Spanish Civil War

1946
National Blood Transfusion Service established in the UK

1951
HeLa established as the first immortal cell line used in scientific research, derived from cervical cancer cells taken from Henrietta Lacks

1953
Watson and Crick describe the double-helix structure of DNA facilitated by Rosalind Franklin's X-ray crystallography images

1954
Kidney transplant is the first successful organ transplant

1962
Waclaw Sybalski performs the first documented heritable gene transfer in mammalian cell lines using lambda phages

1963
James Till, University of Toronto proves the existence of colony-forming stem cells in bone marrow

1965
Jose Barraquer describes the first conjunctival limbal stem cell autograft, the first surgical autologous stem cell therapy

1968
Two successful bone marrow transplants performed in unrelated patients for the first time Rogers and Pfuderer demonstrate proof-of-concept for virus mediated gene transfer

1978
First baby conceived using in vitro fertilisation (IVF) is born. Robert Edwards goes on to receive the 2010 Nobel Prize in Physiology or Medicine for his work in establishing IVF

1981
First stem cell lines are derived from mouse embryos achieved independently by two groups; at the University of Cambridge and the University of California

1986
Andrew Lassar, Bruce Paterson and Harold Weintraub show that somatic cells could be changed to another type by inserting and activating a specific gene

1988
First umbilical cord blood transplant in a patient with Fanconi anaemia.

1989
Steven Rosenburg conducts the first approved gene transfer into humans

1990
FDA approve Michael Blaese to undertake the first gene therapy trial in two children. One patient exhibited a temporary response, while the other did not

1992
The term 'regenerative medicine' is first used in a publication by L. R. Kaiser

1995
ADA-SCID gene therapy trials expand into Europe

1997
Dolly the sheep becomes the first cloned animal in an experiment led by Ian Wilmut in Edinburgh

1997
Carticel® is the first approved autologous stem cell medicine, authorised by the FDA

1999
Death of Jesse Gelsinger at University of Pennsylvania, after an experimental adenoviral gene therapy led to a fatal immune response

1999
Science journal announces stem cell research as breakthrough of the year after publishing more than a dozen landmark papers on the abilities of stem cells

2003
China is the first country to approve a gene therapy medicine, Gendicine™ which is a non-replicative adenoviral therapy. The license was granted without phase III trial data

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2003
Phacilitate Leaders World launches in Washington, DC with 300 attendees

2004
Ark Therapeutics receives the first commercial GMP certification in the EU for manufacture of commercial supplies of gene-based medicines

2006
Induced pluripotent stem cells (iPSCs) are first produced by Shinya Yamanaka, who goes on to receive the 2012 Nobel Prize in Physiology or Medicine

2007
The definition of ATMPs appears in Directive 2001/83/EC as amended by the ATMP Regulation 1394/2007 and includes combination ATMPs

2009
ChondroCelect becomes the first ATMP to be authorised by the EMA

2010
Embryonic stem cells are used therapeutically in humans for the first time, in a trial run by Geron

2011
FDA approves the first commercial allogeneic cell therapy, HEMACORD™

2012 November
Glybera is the first gene therapy approved by the EMA, priced at over €1M. The therapy is an adeno-associated viral vector indicated for the treatment of lipoprotein lipase deficiency, and is the first licensed gene therapy worldwide

2012 June
Emmanuelle Charpentier and Jennifer Doudna, working at UC Berkley, publish their pivotal paper describing the use of CRISPR-Cas9 to gene-edit bacterial cell lines

2013 January
Feng Zhang's team at the Broad Institute describes the application of CRISPR-Cas9 to human and mouse cell lines. George Church's team publishes similar results in the same edition of Science.

2013 June
EMA approves MACI®, a therapy developed by Vericel constituted of autologous chondrocytes seeded onto a porcine collagen matrix

2013 August
First trial testing iPSCs in humans is authorised at the RIKEN institute in Japan

2013 September
EMA approves Provenge®, an autologous dendritic cell vaccine developed by Dendreon

2014 September
MACI® EU market authorisation suspended, purportedly due to poor commercial performance

2014 December
Holoclar® becomes the first stem cell therapy approved by the EMA, indicated for the treatment of severe limbal stem cell deficiency, developed by Chiesi

2015 May
Provenge® market authorisation voluntarily withdrawn in the EU by Dendreon. Poor commercial performance is thought to be responsible

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2015 September
Phacilitate Leaders Europe is born in Barcelona

2015 December
EMA approves Imlygic®, a gene therapy developed by Amgen, indicated for the treatment of metastatic melanoma

2016 May
Strimvelis, an ex vivo gene therapy developed by GSK, is approved for the treatment of ADA-SCID

2016 July
TiGenix withdraws ChondroCelect from the market due to commercial reasons

2016 December
FDA approves MACI®
FDA creates the RMAT designation to speed the review of cell therapies, therapeutic tissue engineering products, human cell and tissue product

2017 April
UniQure announce the withdrawal of Glybera following poor sales

2017 August
Kymriah® is approved by the FDA as the first licensed CAR-T therapy, indicated for the treatment of relapsed refractory acute lymphoblastic leukaemia
Gilead Sciences acquires Kite Pharma for $11.9 billion

2017 October
Yescarta® becomes the second FDA-approved CAR-T therapy, approved for the treatment of non-Hodgkin lymphoma

2017 December
FDA Approves Spark Therapeutics' LUXTURNA™, the first adeno-associated virus vector gene therapy approved in U.S.

2018 January
Celgene Corporation acquires Juno Therapeutics, Inc. for £9 billion

2018 July
FDA issues six scientific guidance documents to evolve the regulatory framework and support the advancement of the field of gene therapy