Miltenyi Biotec

The CliniMACS Prodigy® HSC Engineering process

CliniMACS Prodigy HSC Engineering process

Reliable and safe engineering of hematopoietic stem cells. Today.

Automated

Robust

Flexible

Functionally closed system

Overview

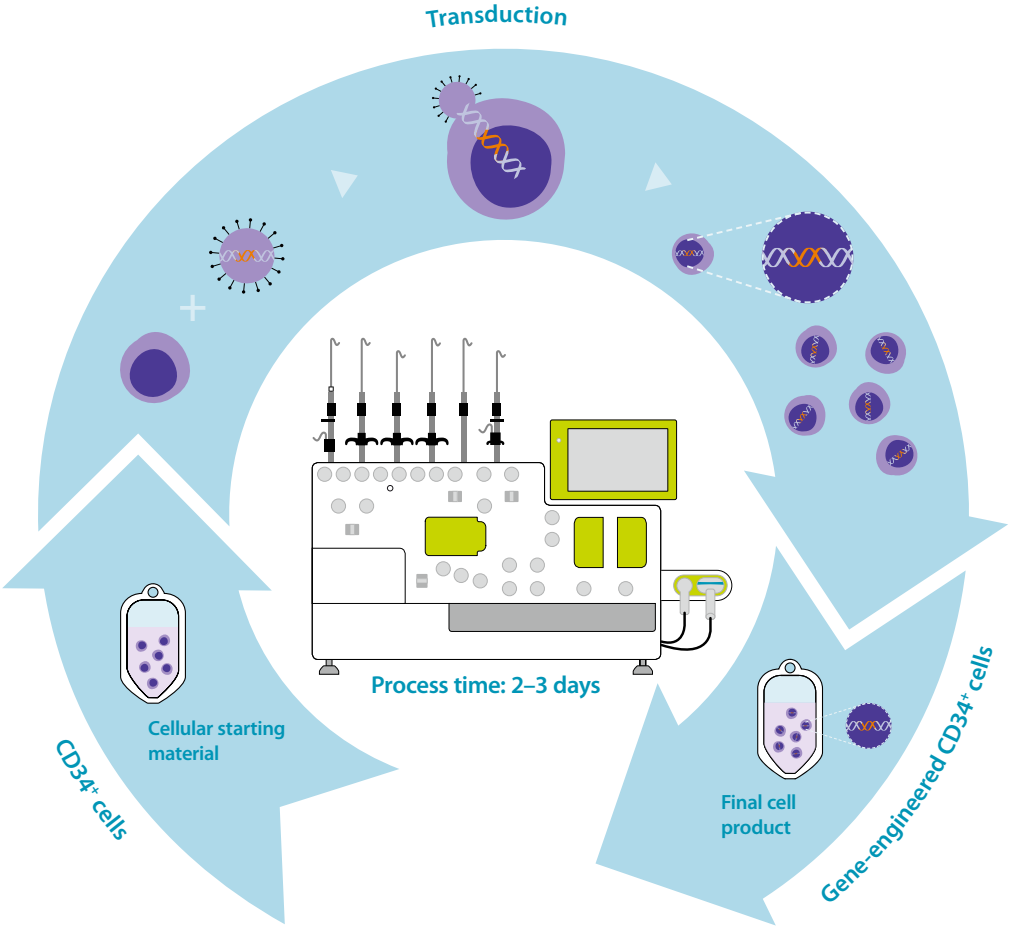

Figure 1: Overview of the CliniMACS Prodigy HSC Engineering process. Day 0, connect your cell bag containing enriched CD34⁺ cells to the CliniMACS Prodigy Tubing Set (TS) 520 installed on the CliniMACS Prodigy Instrument. After pre-cultivation in HSC-Brew GMP Medium supplemented with cytokines within the chamber, cells can be transduced on day 1 and additionally on day 2 if two transduction rounds are needed (further transduction rounds can also be executed if required). Gene-engineered HSCs can be harvested on day 2 or 3, respectively.

Specifications

Cellular starting material:	CD34⁺ cells, e.g., enriched from mobilized leukapheresis
Starting cell number:	at least 2×10^7 cells
Starting sample volume:	40–250 mL
Final product:	gene-engineered CD34⁺ cells
Final product volume:	100 mL
Process time:	2–3 days
Hands-on time:	approx. 2 hours

Viral transduction of CD34⁺ cells is a promising approach to understand inherited disorders, such as sickle cell disease, ß-thalassemia, or primary immunodeficiencies.[1–3] The CliniMACS Prodigy HSC Engineering process allows for the manufacturing of gene-engineered hematopoietic stem cells (HSCs) from human CD34⁺ cells, e.g., from mobilized leukapheresis. All manufacturing steps take place in the functionally closed, sterile, and single-use tubing set, ensuring safe manufacturing and cell products.

LEARN MORE

The CliniMACS Prodigy can generate CD34⁺-enriched cells with up to 95% purity. Visit us to learn more.

▸ **miltenyibiotec.com/CD34-cell-enrichment**

IPC/QC and performance

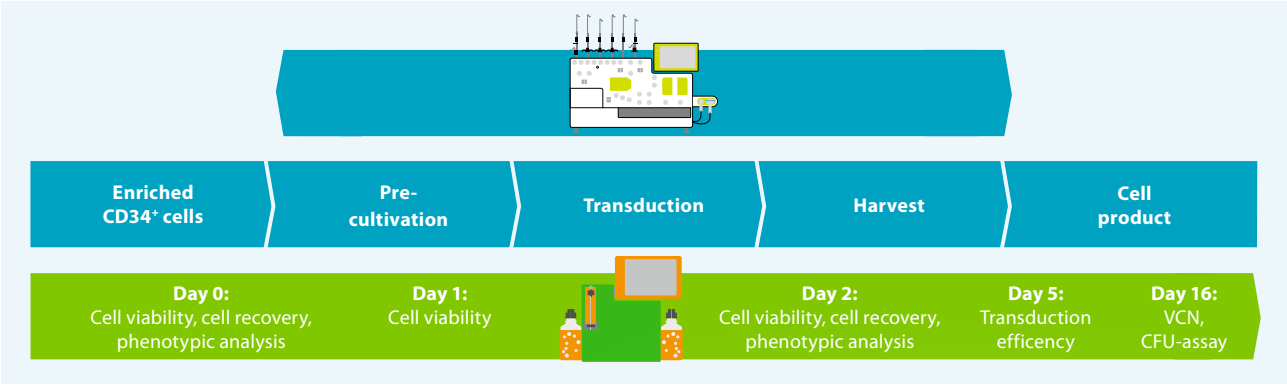

Figure 2: Overview of the IPC/QC timeline of gene-engineered HSCs. For IPC, cell viability over time and recovery are investigated on days 1–2. For QC, the functionality of the gene-engineered HSCs is analyzed by phenotypic analysis of CD34, CD90, and by colony-forming unit (CFU) assays. Furthermore, the efficiency of the viral transduction is studied by the transduction efficiency and vector copy number (VCN).

In-process and quality control (IPC/QC) are required for consistent cell manufacturing of gene-engineered HSCs. Integrated sampling pouches on the CliniMACS Prodigy TS 520 allow for controls to be collected at any time throughout the cell manufacturing process. In addition, with the MACSQuant® Flow Cytometers and a wide portfolio of MACS® Antibodies, Miltenyi Biotec provides complete solutions for IPC/QC of gene-engineered HSCs.

The CliniMACS Prodigy HSC Engineering process results in a more consistent recovery of viable CD34+ cells compared to manual processing (fig. 3). This generates higher transduction rates at low, non-saturating multiplicity of infections (MOIs) for the lentiviral transduction of human CD34+ cells with GFP vector (fig. 4).

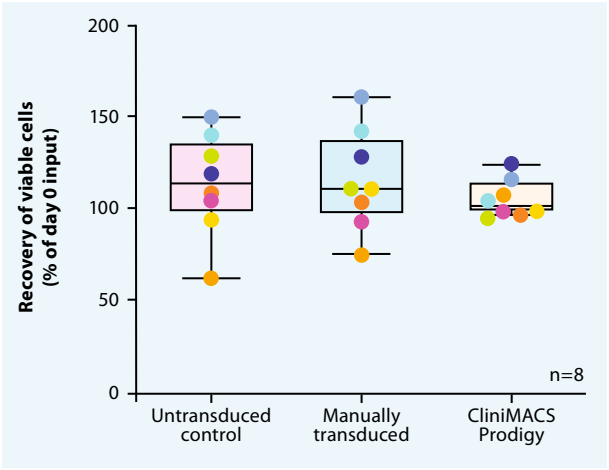

Figure 3: Cell recovery of viable cells on day 2 related to the number of viable cells measured on day 0 as set to 100%.

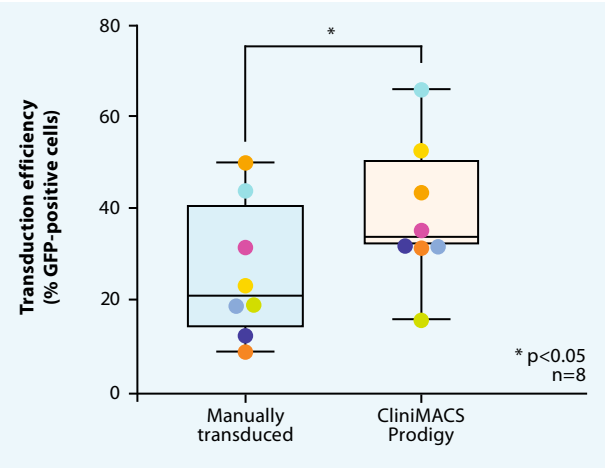

Figure 4: Transduction efficiency of viable CD34+CD45+ cells detected on day 5 by flow cytometric measurement of GFP+ cells.

LEARN MORE

Check out how to conduct IPC/QC with our application note!

▸ **miltenyibiotec.com/HSC_IPC_QC**

Training and resources

CliniMACS Prodigy HSC Engineering process user training

This two-day training offers an application-specific introduction to the HSC Engineering process on the CliniMACS Prodigy Instrument. During the training, all process steps including culture set up, transduction, cultivation, and harvest are explained and demonstrated to provide an extensive hands-on understanding of the versatility of the process.

Further questions?
MITC_University@miltenyi.com

LEARN MORE

Browse through our clinical cell manufacturing training courses!
▸ **miltenyibiotec.com/clinical-cell-manufacturing-training-courses**

Product List

Products	Order no.
CliniMACS Prodigy Instrument	200-075-301
CliniMACS Prodigy TS 520	170-076-600
HSC-Brew GMP Medium	170-076-310
MACS GMP Recombinant Human Flt3-Ligand	170-076-132
MACS GMP Recombinant Human SCF	170-076-133
MACS GMP Recombinant Human TPO	170-076-134
MACS GMP Recombinant Human IL-3	170-076-110
MACSQuant Analyzer 10	130-096-343
CD34 Antibody, anti-human, PE-Vio® 770	130-113-180
CD45 Antibody, anti-human, VioBlue®	130-113-122
CD90 Antibody, anti-human, APC, REAfinity™	130-114-861
StemMACS™ HSC-CFU Assay Kit, human	130-125-042

References

1. de Dreuzy E. *et al.* (2016) Current and future alternative therapies for beta-thalassemia major. Biomed. J. 39: 24–38.
2. Lebensburger, J. and Persons D. A. (2008) Progress toward safe and effective gene therapy for beta-thalassemia and sickle cell disease. Curr. Opin. Drug Discov. Devel. 11: 225–232.
3. Papanikolaou E. and Anagnou N. P. (2010) Major challenges for gene therapy of thalassemia and sickle cell disease. Curr. Gene Ther. 10: 404–412.

RESOURCES

Master the complexity of cell processing with a CliniMACS Prodigy introduction.
▸ **miltenyibiotec.com/prodigyintroduction**

View the HSC Engineering process in action!
▸ **miltenyibiotec.com/HSCEvideo**

Take a look at the manual vs. automated process comparison data.
▸ **miltenyibiotec.com/HSCautomatedmanual**

Learn more about the HSC Engineering process with our webinar.
▸ **miltenyibiotec.com/HSCEwebinar**

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Miltenyi Biotec

Germany/Austria
Miltenyi Biotec B.V. & Co. KG
Friedrich-Ebert-Straße 68
51429 Bergisch Gladbach
Germany
Phone +49 2204 8306-0
Fax +49 2204 85197
macsde@miltenyi.com

USA/Canada
Miltenyi Biotec, Inc.
2303 Lindbergh Street
Auburn, CA 95602, USA
Phone 800 FOR MACS
Phone +1 866 811 4466
Fax +1 877 591 1060
macsus@miltenyi.com

Australia
Miltenyi Biotec
Australia Pty. Ltd.
Unit 11, 2 Eden Park Drive
Macquarie Park, NSW 2113
Australia
Phone +61 2 8877 7400
Fax +61 2 9889 5044
macsau@miltenyi.com

Benelux
Miltenyi Biotec B.V.
Sandifortdreef 17
2333 ZZ Leiden
The Netherlands
macsnl@miltenyi.com
Customer service
The Netherlands
Phone 0800 4020120
Fax 0800 4020100
Customer service Belgium
Phone 0800 94016
Fax 0800 99626
Customer service Luxembourg
Phone 800 24971
Fax 800 24984

China
Miltenyi Biotec Technology &
Trading (Shanghai) Co., Ltd.
Room A401, 4/F
No. 1077, Zhangheng Road
Pudong New Area
201203 Shanghai, P.R. China
Phone +86 21 6235 1005-0
Fax +86 21 6235 0953
macscn@miltenyi.com.cn

France
Miltenyi Biotec SAS
10 rue Mercoeur
75011 Paris, France
Phone +33 1 56 98 16 16
macsfr@miltenyi.com

Hong Kong
Miltenyi Biotec Hong Kong Ltd.
Unit 301, Lakeside 1
No. 8 Science Park West Avenue
Hong Kong Science Park
Pak Shek Kok, New Territories
Hong Kong
Phone +852 3751 6698
Fax +852 3619 5772
macshk@miltenyi.com.hk

Italy
Miltenyi Biotec S.r.l.
Via Paolo Nanni Costa, 30
40133 Bologna
Italy
Phone +39 051 6 460 411
Fax +39 051 6 460 499
macsit@miltenyi.com

Japan
Miltenyi Biotec K.K.
NEX-Eitai Building 5F
16-10 Fuyuki, Koto-ku
Tokyo 135-0041, Japan
Phone +81 3 5646 8910
Fax +81 3 5646 8911
macsjp@miltenyi.com

Nordics and Baltics
Miltenyi Biotec Norden AB
Medicon Village
Scheeletorget 1
223 81 Lund
Sweden
macsse@miltenyi.com
Customer service Sweden
Phone 0200 111 800
Fax +46 280 72 99
Customer service Denmark
Phone 80 20 30 10
Fax +46 46 280 72 99
Customer service
Norway, Finland, Iceland,
and Baltic countries
Phone +46 46 280 72 80
Fax +46 46 280 72 99

Singapore
Miltenyi Biotec Asia Pacific Pte Ltd.
438B Alexandra Road, Block B
Alexandra Technopark
#06-01
Singapore 119968
Phone +65 6238 8183
Fax +65 6238 0302
macssg@miltenyi.com

South Korea
Miltenyi Biotec Korea Co., Ltd.
Arigi Bldg. 8F
562 Nonhyeon-ro
Gangnam-gu
Seoul 06136, South Korea
Phone +82 2 555 1988
Fax +82 2 555 8890
macskr@miltenyi.com

Spain
Miltenyi Biotec S.L.
C/Luis Buñuel 2
Ciudad de la Imagen
28223 Pozuelo de Alarcón (Madrid)
Spain
Phone +34 91 512 12 90
Fax +34 91 512 12 91
macses@miltenyi.com

Switzerland
Miltenyi Biotec Swiss AG
Gibelinstrasse 27
4500 Solothurn
Switzerland
Phone +41 32 623 08 47
Fax +49 2204 85197
macsch@miltenyi.com

United Kingdom
Miltenyi Biotec Ltd.
Almac House, Church Lane
Bisley, Surrey GU24 9DR, UK
Phone +44 1483 799 800
Fax +44 1483 799 811
macsuk@miltenyi.com

www.miltenyibiotec.com

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