Innovations
UNIVERSITY OF COLORADO
ANSCHUTZ MEDICAL CAMPUS

Enhancement of Islet β-cell based therapies for T1D

Product

Mature stem cell-derived β-like cells as a cell therapy

Indication

Long-lasting insulin independence for T1D patients

Value Propositions

- Hypoglycemia & insulin resistance associated with insulin replacement therapy
- Long-term insulin independence
- Abundance, scalability, and controlled differentiation of human pluripotent stem cells

Market (via GlobalData)

- T1D
  - $24 B (2029)
  - CAGR = 17.2 % (2019-2029)
- Stem Cell Transplantation
  - $3.3 B (2029)
  - CAGR = 5 % (2019-2029)

Intellectual Property

- Pending applications in US, EP, JP, AU, and CA.
  - US filing: US17/704,429
  - CA filing: CA3157532
  - AU filing: AU2020361709A1
  - JP filing: JP2022550918
  - EP filing: EP4041305A1

Key Documents

- ENTPD3 Marks Mature Stem Cell-Derived B-Cells Formed by Self-Aggregation In Vitro

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Cell Therapy for T1D

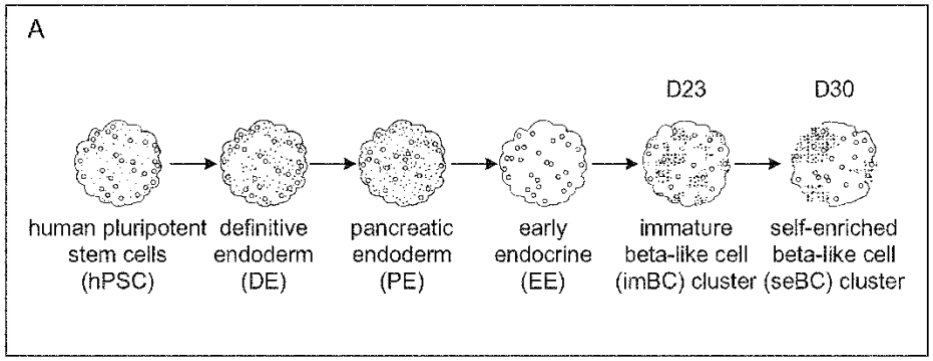
While insulin replacement therapy has long been the standard of care for individuals with Type 1 Diabetes (T1D), it represents a lifelong treatment burden, replete with associated complications, such as hypoglycemia from repeated insulin injections, neuropathies, as well as kidney failure, and ongoing financial costs. In contrast, cell replacement therapy utilizing cadaveric human islets offers the promise of attaining enduring insulin independence, heralding a significant enhancement in the quality of life while mitigating the grave complications linked to exogenous insulin. Yet, the shortage of a readily available supply of insulin-producing cells has impeded the widespread adoption of this treatment approach.

ENTPD3^{+} Stem cell-derived β-like cells

Current direct differentiation protocols result in the generation of heterogneous insulin proiducing cell popualtions with different function. Nucleoside triphosphate diphosphohydrolase-3, ENTPD3, is a surface protein that is a marker for mature, highly fucntional stem cell-derived β-like cells (sBC). ENTPD3 can be used to monitor or enriche for mature sBCs generation in vitro, resulting in imrpoved quantity and quality of insulin-producing cells available for transplantation, thereby reducing also the numbers of sBCs needed (**Figure A**).

Overall Advantage: Monitor and enrich for most mature sBCs

1. **Improved Function** = increased insulin content & enhanced insulin secretion from mature population.
2. **Homogenous population** = mitigates unwanted cell proliferation within graft.



ENTPD3 can serve as a valuable tool for both monitoring and enhancing the generation of mature sBCs in vitro. This contributes to an increased quantity and improved quality of insulin-producing cells suitable for transplantation. Consequently, it also leads to a reduction in the number of sBCs required for transplantation. By enhancing the functionality and characteristics of sBCs (1) and refining the cell population by eliminating unwanted cells (2), this approach optimizes cell therapy for Type 1 Diabetes (T1D), making it more efficient and precisely targeted.

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