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## **Insulin secretion**

Diabetes, in all forms, has at its core the inadequate production of insulin. For type 1 diabetics the insulin-producing beta cells are destroyed, usually in childhood, leading to a lifelong dependence on insulin injections. Even with sophisticated mechanisms of injecting insulin, such as through pumps, it is still very difficult to maintain the normal tight control of blood glucose. The resultant wider excursions of blood glucose concentrations lead to accumulating damaging effects, including kidney disease and blindness.

There is now a lot of excitement in the scientific community that stem cell therapies to replace the lost beta cells will become a viable option for the treatment of type 1 diabetes. The goal is to produce cells that behave like normal pancreatic beta cells and both sense blood glucose levels and respond to them by secreting insulin.

This PBL aims to get you to layout the principle mechanisms that a stem cell would need to recapitulate beta cell function. It also aims for you to put forward ideas about how stem cells might have to be packaged for them to function inside the type 1 diabetic's body.

### **Your task**

You are a team of young post-docs who are looking to crowd-source a project to create a synthetic insulin-secreting cell that can be implanted into people living with Type 1 diabetes. Your job is to create a “pitch” that outlines the physiological challenges you face, what the key features are that you want to build into your cell and how you might go about it. Remember, the investors are looking for a novel angle!

Before the start of the first session of each PBL topic, you should refresh your knowledge of the key subject areas. **All students** will read the introductory references

*General review*

CBL reference 1 ([Blackboard](#))

*Specific examples of iPSCs to generate beta cells*

<http://www.sciencedirect.com/science/article/pii/S0092867414012288>

<http://www.nature.com/nm/journal/v22/n3/full/nm.4030.html>

*Commercial application*

<http://viacyte.com/> 2

## **PBL organisation**

### *Session 1:*

- Knowledge content recapitulation questions MCQ (10 min)
- Discussion of recap knowledge (20 min)
- Introduction of “PBL topic” (15 min)
- Work in groups of 5 (will be pre-allocated) to start formulate a strategy to address the problem
- ***HALF the groups will work on an oral presentation and the other half on creating a short ~3 min video.***

**Between Sessions 1 and 2 you are expected to plan your project and allocate tasks and start to refine the focus of the project.**

### *Session 2:*

- Plan and decide structure and prepare materials for the project with assistance from academic tutors

**Between Sessions 2 and 3 you are expected to work with your group members to prepare group presentation.**

### *Session 3:*

- 15 minute group presentations with 5 min questions from students. Marked by staff and students.