Voorstel MDO-opdracht
Opleiding Technische Geneeskunde
Universiteit Twente

A. Algemeen

1. Titel MDO-opdracht: **Advanced quality control parameters for human pancreatic islets used for transplantation (Type I diabetes - Part 4)**

2. Gegevens instelling/indiener:

Naam indiener:	Marten Engelse / Aart van Apeldoorn
Instelling/afdeling:	Leids Universitair Medisch Centrum, Afdeling Nierziekten / Universiteit Twente, Department of Tissue Regeneration
Medisch begeleider:	Eelco de Koning / Marten Engelse (Hoofd Eilandjeslab)
Technologisch begeleider (UT):	Janneke Hilderink / Mijke Buitinga
Contactgegevens:	M.A.Engelse@LUMC.NL / +31 71 5266855 J.Hilderink@utwente.nl / +31 53 4893496

B. Faciliteiten

1. Welke faciliteiten zijn nodig voor een adequate uitvoering van de vraagstelling?
   - Toegang tot literatuur via de UB;
   - Blackboard voor het formeren van een discussie platform binnen de groep.

2. Wat zijn daarbij mogelijke risico's voor de voortgang van de opdracht?
   - Geen bijzonderheden

C. Overige opmerkingen

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D. Inhoudelijke informatie MDO-opdracht

Omschrijving van de technisch geneeskundige vraagstelling:

Background.

In the Netherlands there are approximately 74.000 people with type-1 diabetes, of which 31.300 are male en 42.700 are female. About 4.300 children with the age of 0-19 years are diagnosed for type-1 diabetes. The general treatment for type-1 diabetes patients is subcutaneous self

injections with insulin. If self-injection of insulin is ineffective, a “whole-organ” pancreas transplantation may be considered. As an alternative to this whole-organ transplantation, isolation and subsequent transplantation of pancreatic islets from a donor pancreas (3-4 donors/patient) is currently performed at the Leiden University Medical Center. It must be kept in mind that this experimental therapy is only available to a very select group of recipients.

The entire process of islet isolation takes the better part of 5-10 hours and subjects the islets to a number of strains that may be detrimental to their quality. At present, the release criteria for pancreatic islets for clinical application are quite simple, yet provide an overview of the general condition of the islet tissue. Several tests are performed to evaluate sterility, general islet condition, viability, the amount of insulin present and the insulin-production. Currently, any of these parameters needs to be assessed “off-line”, at the expense of considerable time and effort. So far, little or non of these aforementioned parameters provide an adequate perspective into 1) islet engraftment, 2) islet function in the recipient, 3) islet survival and overall medical outcome.

The goal of this MDO research is to improve the quality assessment of pancreatic islets used for transplantation for the treatment of type-1 diabetes patients.

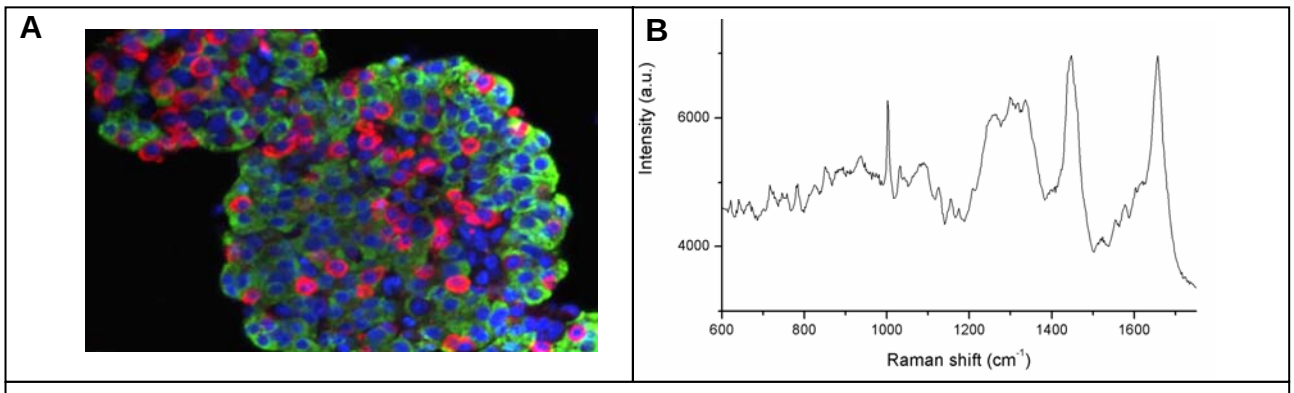
Research topics.
In order to meet the set goal efficiently and successful several important topics are being addressed during this research of which the most important ones are;

(A) Improve current quality control
The students are requested to inform themselves about the status quo of islet quality / clinical outcome assessment and to give suggestions on how to improve the current islet quality control methods.

In order to improve the current techniques, we propose the search of:
- parameters of pancreatic islet quality
- parameters that predict overall clinical outcome

Suggestions for further research comprise:
- advanced glucose-induced-insulin-release-test (GIIST) techniques
- non- dithizone insulin-content determinations
- islet viability assays
- tests to determine the ability for engraftment of the final islet product

(B) “On-line” assessment of islet quality
Alternative techniques to test the islet quality in, preferably in an “on-line” manner (for instance during islet isolation), need to be explored.



Fluorescent image (A) and Raman spectrum (B) of islets of Langerhans

Suggested techniques to monitor islet function are:

1) Fluorescent microscopy
2) Raman spectroscopy, which is a non-invasive technique that allows real-time monitoring of for instance biological samples. This technique is based on inelastic scattering of monochromatic light; the frequency of photons in the light changes upon interaction with a sample. This frequency shift provides information about the vibrational, rotational and other low frequency transitions in molecules.