Influence of human plasma versus serum on transfection efficiency of mRNA nanoparticles

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The primary objective of this study is to examine whether the in vitro cellular transfection efficiency of PF14-mRNA nanoparticles is higher in medium supplemented with plasma or serum.

Ethical review	Approved WMO
Status	Pending
Health condition type	Other condition
Study type	Observational invasive

Summary

ID

NL-OMON51048

Source
ToetsingOnline

Brief title
SerPmRNA

Condition

- Other condition

Synonym
-

Health condition

Geen: het betreft fundamenteel onderzoek naar de werking van PepFect14-mRNA nanodeeltjes

Research involving
Human

Sponsors and support

Primary sponsor: Radboud Universitair Medisch Centrum
Source(s) of monetary or material Support: Ministerie van OC&W

Intervention

Keyword: mRNA nanoparticles, Plasma, Serum, Transfection

Outcome measures

Primary outcome

The main parameters are the Cy5-mRNA uptake and EGFP expression after transfection of cells with PF14-EGFP mRNA or PF14 with Cy5-labeled EGFP mRNA, in the presence of plasma or serum. Cy5 and EGFP levels will be measured by confocal laser scanning microscopy (CLSM).

Secondary outcome

N.a.

Study description

Background summary

Cell penetrating peptides (CPPs) are a potential novel platform for mRNA-based therapies. An example of a specific cell penetrating peptide is PepFect14 (PF14), which is a polycationic oligopeptide that form nanoparticles with RNA based on electrostatic interactions. After entering a cell, this RNA can be released from the nanoparticles and subsequently translated by the cellular protein synthesis machinery.

As of now, research into PF14-based mRNA delivery is still being conducted on various delivery strategies, transfection efficiency and cytotoxicity, which is takes place in a laboratory setting. In in vitro experiments in which cells are transfected with PF14-mRNA, the cells are cultivated in medium supplemented with 10% serum to provide necessary nutrients and growth hormones. However, serum could contain endonucleases and serine proteases, which could be detrimental for the PF14-mRNA nanoparticles since they consist largely of oligopeptides and RNA. In contrast, plasma does not contain these activated

enzymes, and therefore we hypothesize that cellular transfection with PF14-mRNA nanoparticles is more successful in medium supplemented with plasma than with serum. In addition, studying the mRNA delivery in plasma instead of serum is more physiologically relevant.

In order to qualitatively compare the transfection efficiency in the presence of plasma or serum, we want to draw a small amount blood from a healthy individual in order to collect fresh plasma. This way, we can avoid working with plasma to which anticoagulants like EDTA, citrate or heparin have been added, because of their cytotoxicity or detrimental effect on the PF14-mRNA particles. Instead, we will use the anticoagulant aprotinin.

Study objective

The primary objective of this study is to examine whether the in vitro cellular transfection efficiency of PF14-mRNA nanoparticles is higher in medium supplemented with plasma or serum.

Study design

In vitro experimental study: collection of blood from a healthy donor for use in in vitro research

Study burden and risks

The medical intervention, a venapuncture, is a standard procedure and causes only minor inconvenience and negligible risks for the subject. In addition, the procedure takes a very short period of time.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)

Inclusion criteria

Healthy indivuals, 18-60 years of age, bodyweight: above 50 kg. Being able and willing to complete the informed consent process.

Exclusion criteria

Known to have a condition which results in more than minimal risk upon blood drawing, e.g. hemophilia.
A medical condition which requires active medical intervention or monitoring to avert serious danger to the individual's health or well-being.

Study design

Design

Study type: Observational invasive

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Pending

Start date (anticipated):	01-06-2021
Enrollment:	3
Type:	Anticipated

Ethics review

Approved WMO Date:	07-07-2021
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL77254.091.21