Manufacturing & characterization of lipid nanoparticles by microfluidics

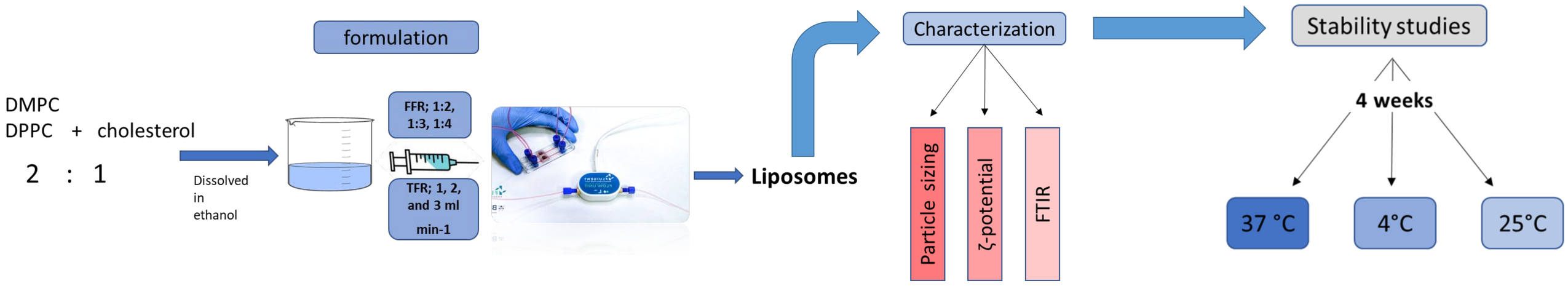
Eman Jaradat[1], Edward Weaver[1], Adam Meziane[2], Dimitrios Lamprou[1]

[1]School of Pharmacy, Queen's University Belfast, Belfast, UK; [2]Fluigent,, 94270 Le Kremlin-Bicêtre, France

Introduction

- Nanoparticles (NPs) have been used for different applications, including targeting drug delivery.
- Among the different platforms of NPs that used for drug delivery applications, lipid NPs (e.g., liposomes) reported as the less toxic *in vivo,* besides the ability to carry hydrophobic and hydrophilic molecules.
- For effective used to target cell intake, liposomes should possess particle sizing < 200 nm and low PDI.
- In this study, microfluidics have been investigated providing high-level control on the process's parameters, which enables the production of liposomes with controlled particle size and low PDI.

Methods



Particle size *vs* different TFRs

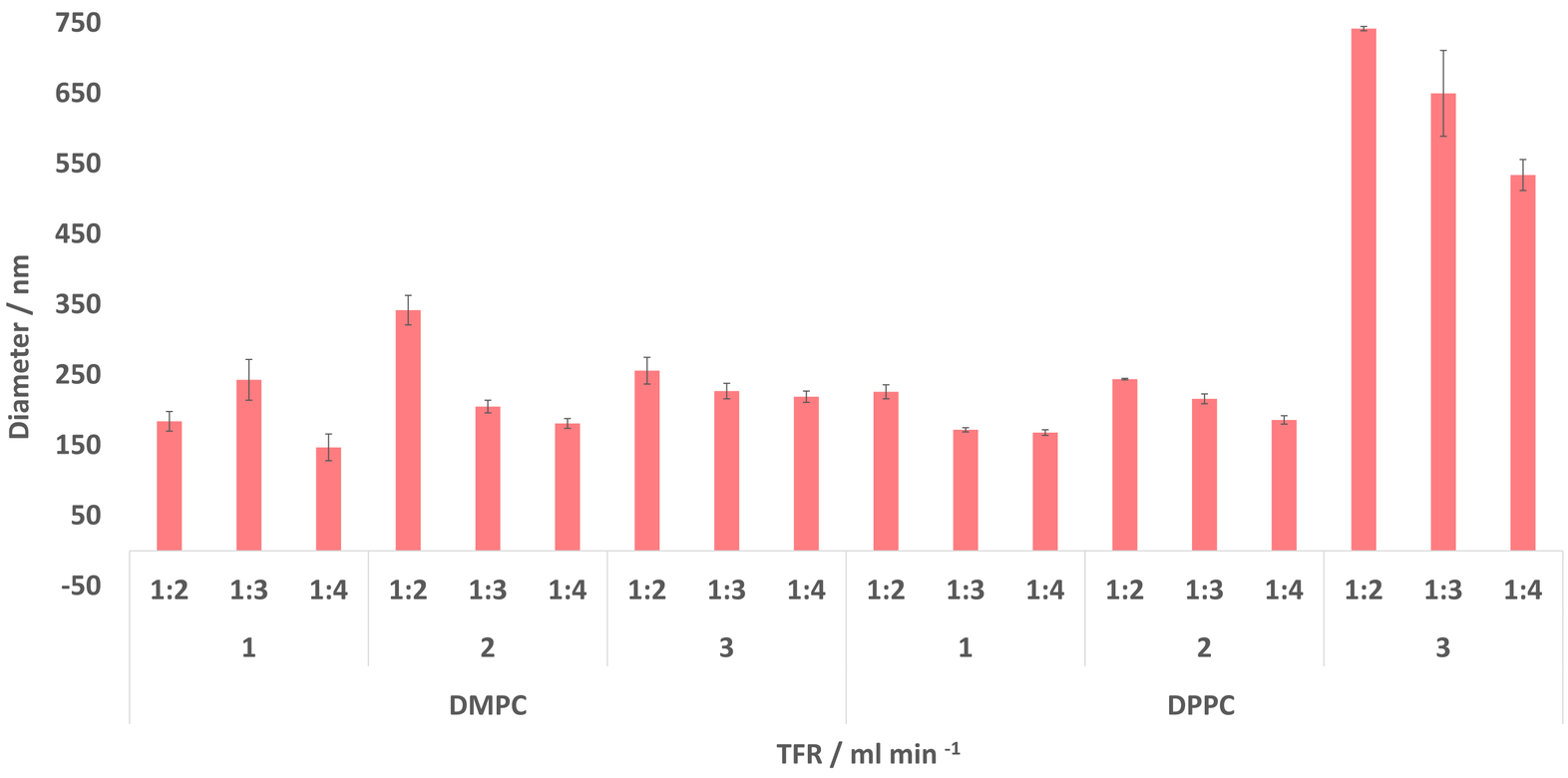


Figure 1: Particle size of DMPC and DPPC lipids under different TFR and FFRs.

FTIR results

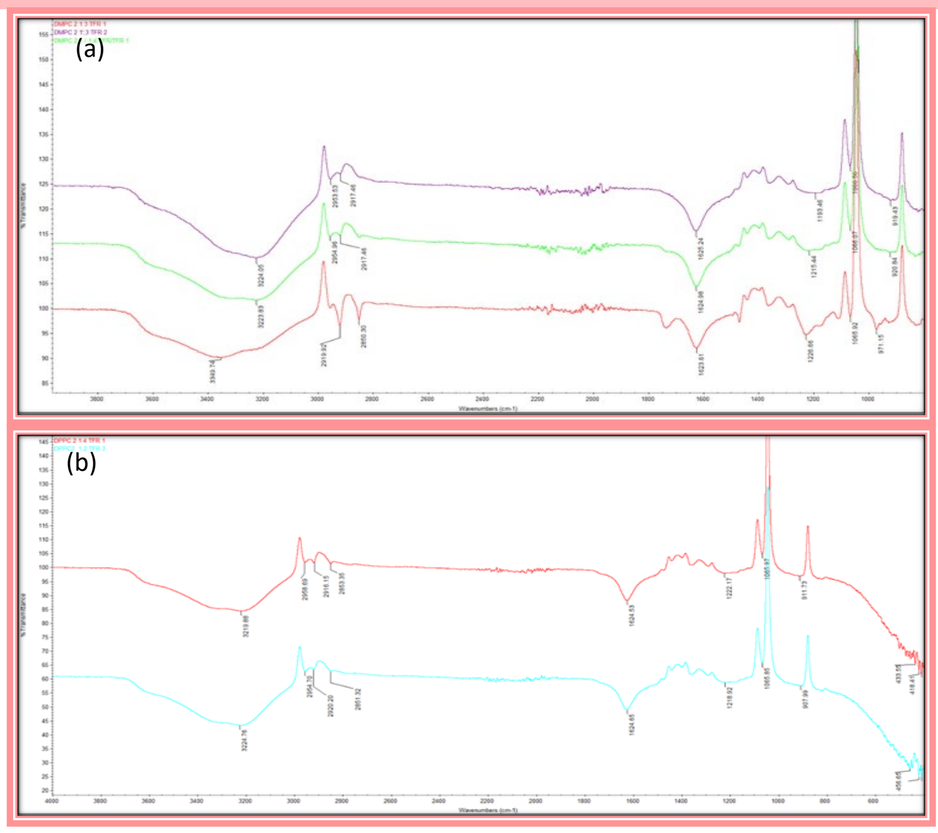


Figure 2: FTIR analysis of DMPC TFR 1 (a) and DPPC TFR 2 (b).

Stability studies

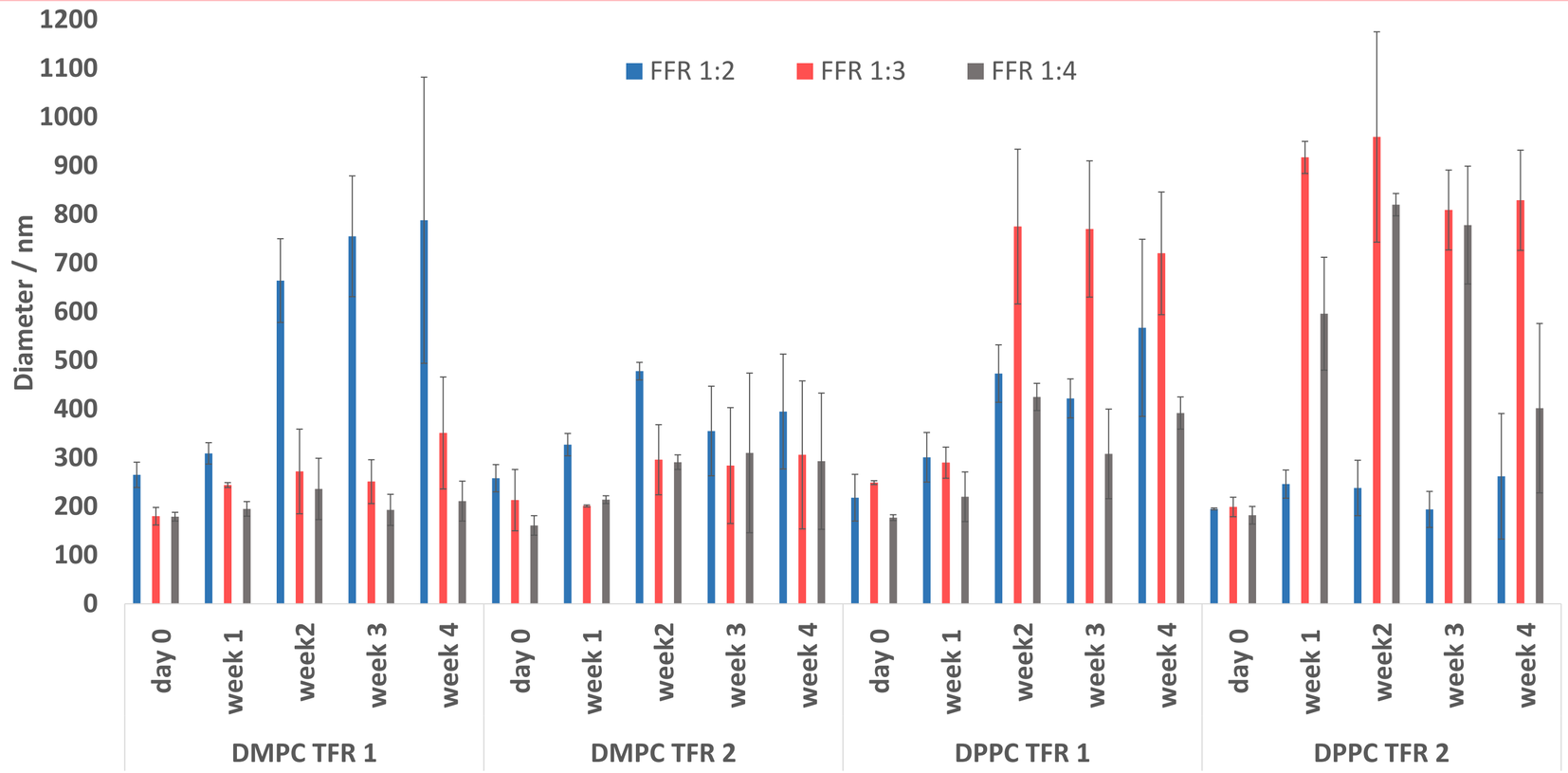


Figure 3: Stability studies obtained for DMPC and DPPC at 37 °C.

Conclusions

- DMPC and DPPC, produced particle sizes < 200 nm.
- TFR 1 with 1:4 FFR produced the smallest particle sizes for DMPC and DPPC.
- The PDI average of DPPC was 0.22 and for DMPC 0.25.
- FTIR results show the same functional groups; however, different absorption within each peaks.
- DMPC formulations appeared more stable at 37°C than DPPC formulations.
- TFR 1 with 1:4 FFR has showing the most suitable formulation of DMPC and DPPC.