1 **Introduction**

2 **Nanoparticles in medicine and biology**

2.1 Polymeric colloids

2.1.1 Functionalization for protein binding

2.1.2 Polymerization consequences (initiator, co-monomer, surfactants...)

2.2 Liposomal nanocarriers (formation for amphiphilic lipids)

2.2.1 phospholipid bilayer (typical molecules HSPC, DPPC, cholesterol, PEG...)

2.2.2 polydispersity control (extrusion, paper w/ Zoltan)

2.2.3 Drug carrier, SSLs (stealth function, bilayer stabiliy, filling)

2.3 Physicochemical characterization

2.3.1 Dimensional metrology and traceability

2.3.2 Characterization tools

2.3.2.1 Single-particle (AFM, TEM, SEM, TSEM...)

2.3.2.2 Ensemble (DLS, DCS, SAXS)

3 **Theoretical Background**

3.1 Interaction of light and matter

3.1.1 X-ray cross sections

3.1.2 Rayleight (and Mie) scattering

3.2 Small Angle X-ray Scattering (SAXS)

3.2.1 Physical Process

3.2.2 Evaluation of the scattering intensity (Form factor * S(q) , electron density, number of colloids)

3.2.2.1 What is q?

3.2.2.2 Modelling

3.2.2.2.1 Sphere (Gudrun polymeric colloids)

3.2.2.2.2 Core-shell (interface effects???)

3.2.2.2.3 Vesicle model (5 gaussian) ????

3.2.2.2.4 Inclusion of background ??? (a+b*q^-4)

3.2.2.3 Guinier approach (deviation when using few points, polydispersity...)

3.2.3 Contrast variation (solvent variation, ASAXS...)

3.2.3.1 Isoscattering point

3.2.3.1.1 Polydispersity and elipticity smearing (simulation, calculation)

3.2.3.2 Basic functions approach

3.2.3.2.1 Shape factor

3.2.3.2.2 Guinier rule

3.2.3.2.3 I (0) for polydisperse systems