TCS/18/25 – Nanoparticle-Mediated microRNA Delivery for Increased Osteogenesis in a 3D Osteoporotic Bone Marrow Model.

Osteoporosis (OP) is a disease that affects the quality and density of bone. The underlying cause is due to an altered bone marrow environment, where the resident mesenchymal stem cells (MSCs) tend towards making fat cells rather than bone cells, resulting in ‘fatty marrow’. Current OP treatments focus on stopping bone resorption (break down); in this project, we want to instead focus on encouraging new bone formation from MSCs in OP patient bone marrow. In particular we will (1) identify differentiation profiles for control and OP MSCs in both 2D and 3D culture models (i.e. the bone-making:fat-making potential of both MSC populations), and (2) use our established gold nanoparticle delivery system to target OP MSCs with specific microRNAs, which promote bone formation. Overall, we will thus determine whether we can control OP MSC fate and encourage bone rather than fat formation, which may lead towards a new therapy for OP patients.