Diabetic cardiomyopathy (DC) and diabetic nephropathy (DN) are two major complications of diabetes that account for more than two thirds of deaths in the diabetic population. The primary hallmarks of these conditions are cell dedifferentiation, hypertrophy and maladaptive proliferation through the reactivation of classic developmental pathways. Previous studies have indicated that thyroid hormone (TH) treatment could be a potential strategy for reversing or preventing this maladaptive recapitulation of organ development. However, the high doses of TH that are needed to induce tissue repair and regeneration may cause several adverse effects.

To maximise the therapeutic efficacy of TH and minimise its adverse effects we aim to develop innovative nanoparticle-based drug delivery systems that will be able to target and deliver L-triiodothyronine (T3) to diabetes-injured cells and hopefully regenerate damaged tissue. To this end, we will develop smart T3-nanocarriers that will be functionalised for a molecule that can specifically bind stressed-injured cardiomyocytes and podocytes. In parallel we will develop a targeting strategy that will confine the drug to a magnetically targeted site after injection. We will evaluate the therapeutic efficacy of the system in animal models of DC and DN with intention to bring the treatment of DC and DN one step closer to clinical translation.