Gene therapy is a promising modality for the treatment of various cardiovascular diseases such as ischaemia, heart failure, restenosis after revascularisation, hypertension and hyperlipidaemia. An increasing number of approaches are moving from experimental and preclinical validation to clinical application, and several multi-centre trials are currently underway. Despite the rapid progress in cardiac gene therapy, many basic tools and principles remain under development. Questions with regard to the optimal method for gene delivery in a given situation remain open, as do questions concerning therapeutic efficacy and the time course and magnitude of gene expression in target and remote areas. Nuclear imaging provides valuable tools to address these open issues non-invasively. Functional effects of molecular therapy at the tissue level can be identified using tracers of blood flow, metabolism, innervation or cell death. The use of reporter genes and radiolabelled reporter probes allows for non-invasive assessment of location, magnitude and persistence of transgene expression in the heart and the whole body. Co-expression of a reporter gene will allow for indirect imaging of the expression of a therapeutic gene of choice, and linkage of measures of transgene expression to downstream functional effects will enhance the understanding of basic mechanisms of cardiac gene therapy. Hence, nuclear imaging offers great potential to facilitate and refine the determination of therapeutic
effects in preclinical and clinical cardiovascular gene therapy.

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