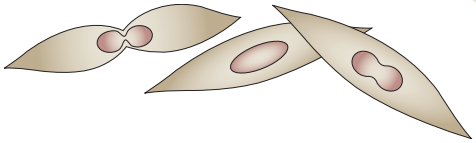
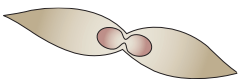
INTERVENTION

Growing new heart muscle cells

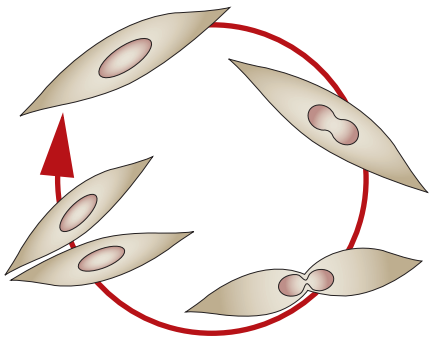


The adult human heart retains the capacity to generate new cardiomyocytes, a finding that could potentially lead to the development of new regenerative therapies for heart diseases caused by myocardial damage.

Damage of cardiac muscle, for example through ischemic heart disease, compromises the ability of the heart to function efficiently and often leads to heart failure. Replacement of damaged myocardium was not thought possible, as there has been no clear evidence whether, and if so to what extent, adult cardiomyocytes regenerate; studies in animals have produced conflicting results and the methods used are not easily adapted to humans. Jonas Frisen and colleagues in Sweden, France and the US have been interested in resolving the question of whether adult human cardiomyocytes are indeed capable of renewal.



Cell turnover is usually assessed using radiolabeled nucleotide analogs, a method that for safety reasons is not feasible for studies in humans. Frisen and colleagues circumvented this problem by taking advantage of ^{14}C present in the DNA of individuals born up to 22 years before the onset of nuclear testing in the 1950s. The radioactive isotope, generated as a result of nuclear testing, was incorporated into human DNA through consumption of plants that had taken up ^{14}C during photosynthesis. By 'carbon-dating'



ventricular cell types, Frisen and colleagues found that cardiomyocytes are renewed at a rate of 1% a year up to the age of 20 years and then the rate gradually decreases to about 0.5% in old age.

Their findings show that human adult cardiomyocytes are capable of renewal under normal conditions. They are now investigating the molecular mechanisms that regulate cardiomyocyte regeneration and are interested in assessing cardiomyocyte turnover in diseased hearts to determine whether disease processes can trigger regenerative responses. Frisen commented that "understanding of the molecular mechanisms that regulate cardiomyocyte generation would be necessary to develop rational pharmaceutical strategies to promote regeneration in heart pathology".

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Original article Bergmann, O. *et al.* Evidence for cardiomyocyte renewal in humans. *Science* **324**, 98–102 (2009).