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Study shows that human hearts generate new cells after birth

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Researchers at Boston Children's Hospital have found, for the first time that young humans (infants, children and adolescents) are capable of generating new heart muscle cells. These findings refute the long-held belief that the human heart grows after birth exclusively by enlargement of existing cells, and raise the possibility that scientists could stimulate production of new cells to repair injured hearts.

Findings of the study, "Cardiomyocyte proliferation contributes to post-natal heart growth in young humans," were published in Proceedings of the National Academy of Sciences, Online Early Edition, the week of Jan 7-Jan 11, 2013. The study was led by Bernhard Kühn, MD, of the Department of Cardiology at Boston Children's.

Beginning in 2009, Dr. Kühn and his team looked at specimens from healthy human hearts, ranging in age from 0 to 59 years. Using several laboratory assays, they documented that cells in these hearts were still dividing after birth, significantly expanding the heart cell population. The cells regenerated at their highest rates during infancy. Regeneration declined after infancy, rose during the adolescent growth spurt, and continued up until around age 20.

The findings offer the strongest evidence to date that proliferation of cardiomyocytes (the cells making up heart muscle) contributes to growth in healthy young human hearts.

"For more than 100 years," Kühn says, "people have been debating

whether human heart muscle cells are generated after birth or whether they simply grow larger." Kühn points out that research in the 1930s and 1940s suggested that cardiomyocyte division may continue after birth, and recent reports about myocardial regeneration in zebrafish and neonatal mice suggest that some young animals regenerate heart muscle by using mechanisms of muscle cell division. Still, for many years, the accepted belief in the scientific community was that human hearts grow after birth only because cells grow larger.

Kühn's work challenges the accepted wisdom and offers hope for new treatments for heart failure. Babies and children may be able to increase heart muscle cell proliferation and regenerate damaged parts of their heart muscle. In addition, the study points to new research directions by suggesting that abnormal cardiomyocyte proliferation may be involved in diseases of the heart muscle (cardiomyopathy) that affect young humans, and that cardiomyocyte proliferation could be stimulated in young humans for the treatment of heart failure.

The findings, according to Kühn, help to create a "cellular blueprint for how the human heart grows after birth." Using this blueprint, treatment strategies could be developed to treat heart failure in children

Provided by Children's Hospital Boston

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