CDB SEMINAR

Kazu Kikuchi

Duke University Medical Center
Department of Cell Biology

Thursday, January 28, 2010

16:00~17:00 A7F Seminar Room

Primary contribution to zebrafish heart regeneration by a subpopulation of cardiomyocytes

Summary

Recent studies indicate that mammals, including humans, maintain some capacity to renew cardiomyocytes throughout postnatal life. Yet, there is little or no significant cardiac muscle regeneration after an injury like acute myocardial infarction. By contrast, zebrafish efficiently regenerate lost cardiac muscle, providing a model for understanding how natural heart regeneration may be enhanced or blocked. In the absence of lineage-tracing technology applicable to adult zebrafish, the cellular origins of newly regenerated cardiac muscle have remained unclear. Here, we used new genetic fate-mapping approaches to identify a population of cardiomyocytes that become activated after resection of the ventricular apex and contribute prominently to cardiac muscle regeneration. Through use of a transgenic reporter strain, we found that cardiomyocytes throughout the subepicardial ventricular layer trigger expression of embryonic cardiogenesis genes within a week of trauma, before expression localizes to proliferating cardiomyocytes surrounding and within the injury site. Inducible Cre-based lineage-tracing of the subepicardial cardiomyocytes labeled a majority of cardiac muscle in the regenerate. By optical voltage mapping of surface myocardium in whole ventricles, we found that electrical conduction is re-established between existing and regenerated cardiomyocytes between 2 and 4 weeks post-injury. Our results provide evidence that functional cardiac muscle regenerates after resection injury primarily through activation and expansion of cardiomyocyte populations, findings with implications for promoting regeneration of the injured human heart.

Host:
Yoshiteru Sasaki
Stem Cell Biology, CDB
yoshisasaki@cdb.riken.jp
Tel:078-306-1893
(ext : 5301)