YJ Chuang Laboratory for Wound Healing and Cancer Therapy

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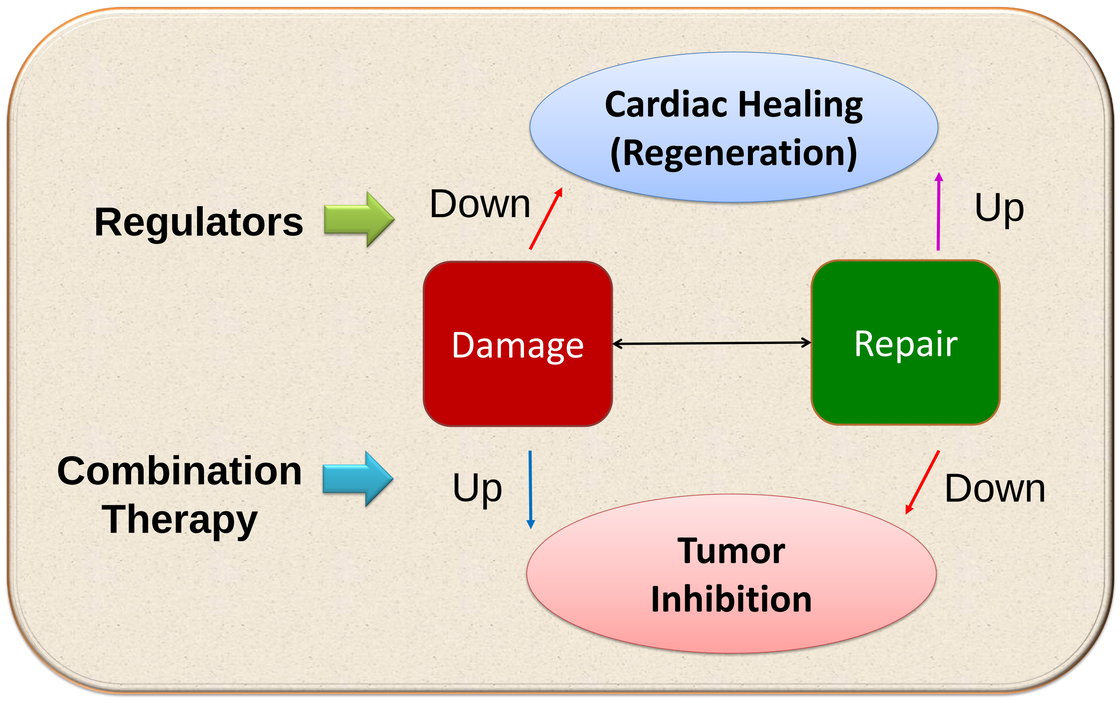


Current Projects

- Heart Regeneration of zebrafish
- Cancer Combination Therapy
- Neutron Capture Therapy of Cancer (BNCT)
- Analytical Methods for Preclinical studies

研究主題

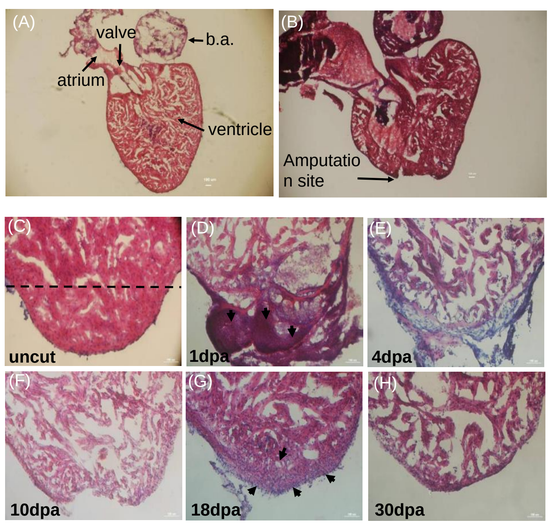
傷口癒合和**腫瘤**可被視為一體之兩面。涉及傷口癒合的調控機制，在癌症中也很活躍。具體來說，創傷後發炎，是為了組織修復，修復又與細胞增生、移動，血管生長...息息相關。這些反應與癌症進程極為相似。因此，癌症也被稱為「不癒的傷口」。

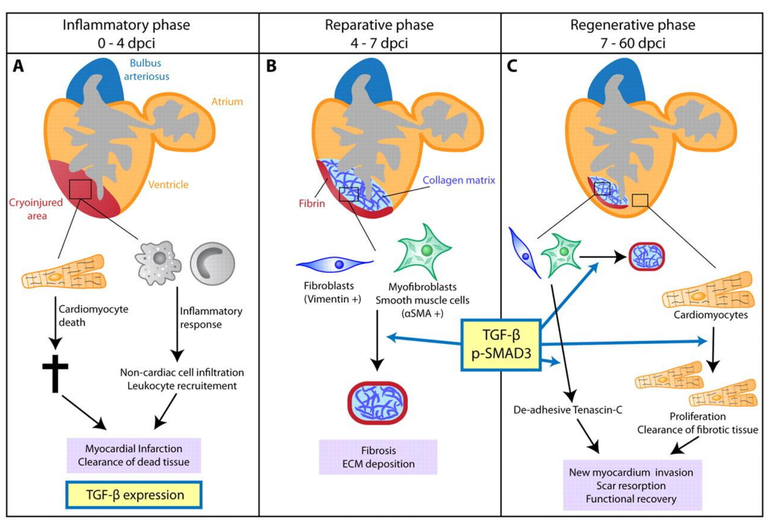
What we are doing

To search for strategies that might improve the body's regeneration capacity, we need to have a thorough understanding of the basic biology of damage responses and repair mechanisms. In our lab, we are searching for key regulators involved in wound healing during zebrafish heart regeneration. Specifically, we wish to resolve why human suffers from cardiac fibrosis and arrhythmias after cardiac injury, while zebrafish would not.

On the other hand, we are developing combination strategies to target cell death and DNA repair pathways that will increase cancer cell's sensitivity to traditional chemotherapeutics or radiation therapy. Our goal is to translate current knowledge into viable clinical approaches for treating cancer patients.

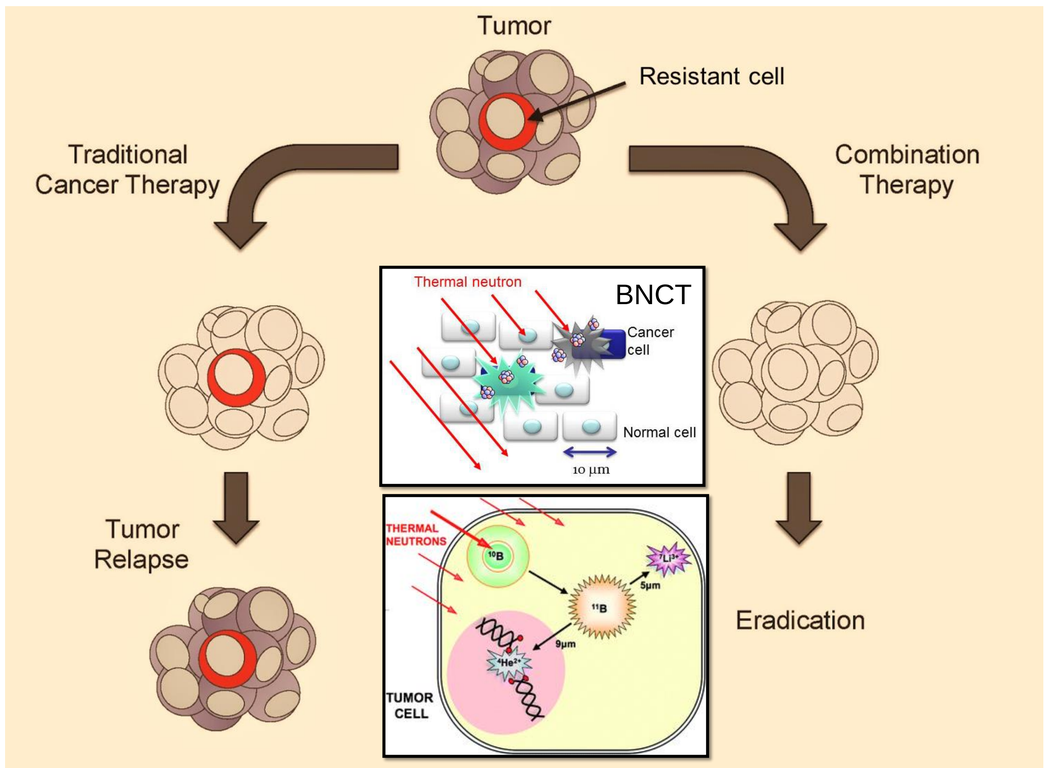
Heart Regeneration & Wound Healing



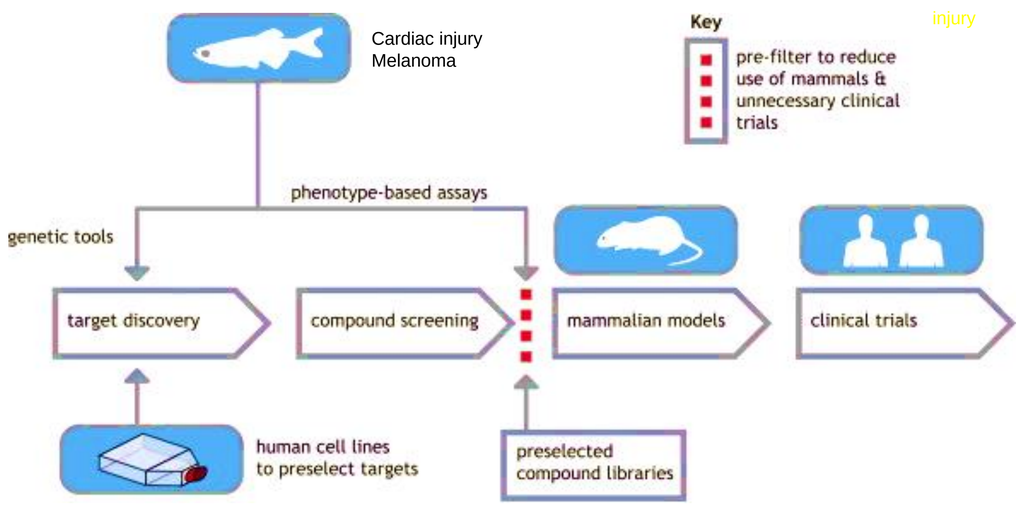


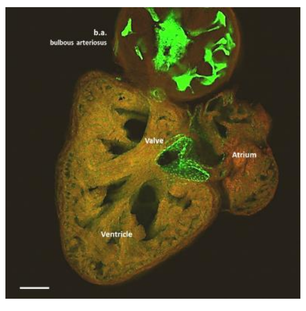
Adult zebrafish heart can regenerate within one month post injury without scarring.
Studies of zebrafish heart regeneration have yielded biological insights that may be effectively deployed to regenerate the human heart after myocardial injury. The injury response of the zebrafish heart can be described in three phases – inflammation, reparative, and regenerative phases. (Right figure is adapted from Development 2012 139: 1921-1930)

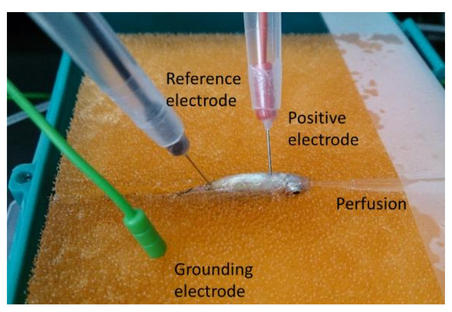
Anti-Cancer Therapy with Multi-drug Combination and/or Radiation Approach

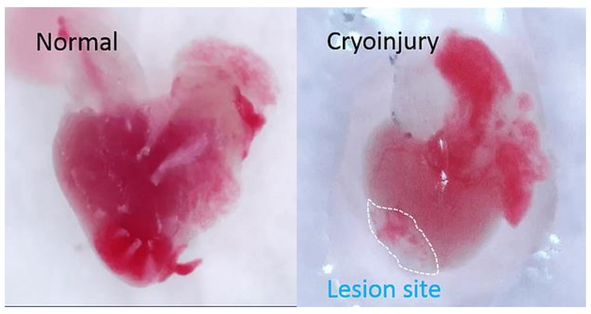


Combination therapy as a strategy to eliminate resistant cells and eradicate tumors.
Combined therapy is defined as the use of 2 or more pharmacologic agents/approaches in a single treatment. The hypothesis behind this type of therapy is that, considering that a single tumor is composed of malignant cells with different genetic mutations, cancer cells might need different drugs and/or approach to be killed. (Figure is adapted from *Science2015* 347(6219):226-229]









Novel Analytical Devices and Methods for Translational Research & Drug Development. To advance our understanding on **regeneration and cancer therapy,** We established various analytical methods, including disease models (i.e. cardiac cryoinjury, melanoma) to monitor the pathophysiological processes in real time. For example, adult zebrafish ECG technique was established in our lab to monitor the normal or injured electrophysiological properties of the heart during regeneration. Furthermore, we were able to generate spontaneous skin cancer in zebrafish for anti-cancer drug screening. Our assay system has great potential to become a powerful **drug and toxicity screening platform**. It shall be noted that this system is not to replace the mammalian models in the drug development pipeline. Rather, the zebrafish system serve as an auxiliary tool to reduce cost and time.