

# Laboratory heart model for drug screening

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## Video Abstract

**Keywords:** drug safety, model, in vitro, cardiac

**Posted Date:** November 21st, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-113114/v1>

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# Abstract

Scientists have recently developed a new system to screen cardiovascular medications for potential complications – using human heart cells. In the US the average time to develop and release a new drug to the public is 10-15 years. The average cost is nearly 5 billion dollars. A significant amount of this time and money is put into preclinical trials, in which animal models are used to test the safety of the drugs before human trials can begin. Due to biological differences, however, these models can't fully capture the physiological properties of humans and, therefore, often fail to predict complications. In an attempt to remedy this, a team of researchers in the US set out to develop an alternative system to screen and predict potential safety concerns of drugs. To do this, the researchers used human induced pluripotent stem cells – cells derived from adults that have the ability to form many different types of tissues. These cells went through a differentiation protocol to create heart cells and loaded into a microfabricated 3-D structure – a mold of sorts – to precisely align and orient them. Within 24 hours the tissue spontaneously began beating. To validate the utility of this new system, the team then tested four classes of cardiac drugs with well known effects on beat rate. In all cases, they found a high level of concordance between expected and observed rate changes in response to the drugs. This system – which mimics both the structure and function of human heart muscle – has the potential to, one day, replace animal models and significantly improve the ability of clinicians to test the efficacy and toxicity of new drugs, reducing both the time and cost associated with their development.