



**Miniature Tissue Culture System** (*Samuel Lieber & Stephen Vatner, NJMS 06-09*)  
Research Tool

**Background**

Currently there is great interest in using Tissue Engineering techniques and Gene Therapy towards the treatment of disease and dysfunction. The development of these concepts, however, requires a better understanding of the mechanical and biochemical mechanisms that regulate normal and diseased tissue growth and development. The present invention discloses an engineered system that allows the culture and mechanical/biochemical testing of small-scale rodent tissues. This miniature tissue culture system can be used to develop new tissue engineering methods and novel gene therapy solutions towards potential clinical treatments.

**Description of the Technology**

The design of the Miniature Tissue Culture System (MTCS) is unique in that manipulations can be conducted for positioning and cannulating small scale tissues all in a sealed culture bath environment. Currently, the MTCS has been configured to perfuse the mitral and aortic valves while they sit in their natural position in the heart, where we have successfully cultured the mitral valve of 10-day old mouse hearts for four days. However, other small-scale rodent tissues could also be cultured under perfusion in the MTCS; including: the whole heart, arteries, veins, kidneys, stomach, and intestines. The MTCS can also be used to study Gene Therapy techniques where it has already been successfully used to induce adenovirus-mediated gene transfer into the cultured valve.

**Applications**

- To culture rodent tissues under perfusion allowing mechanical and biochemical testing of tissues
- To study Gene Therapy methods by inducing adenovirus-mediated gene transfer into the cultured tissues
- To study the genetic (signaling pathways) and epigenetic (shear flow) factors involved in developing rodent tissues.
- To culture rodent heart valves, i.e. the mitral and the aortic valves, while sitting in their natural position in the heart.

**Patent Status**

United States Provisional Application filed 2006.

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