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Myocardial Tissue Engineering: The *in vitro* generation of a vascularized 3D matrix.

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Objectives:
A major problem in generating 3D-artificial myocardial tissue is an efficient supply of oxygen and nutrients to cells in vitro. Here we report the generation of an in vitro vessel-bed based on biological vessel structures for vascularization of artificial tissue constructs.

Method:
Dezellularized segments of porcine small intestine with preserved pedicles were cut open along longitudinal axis and resulting patches were sutured to silicone cushions. Vessel structures were reseeded with 5x10^7 TAMRA labeled human cord blood derived endothelial cells (hCBEC) and cultivated in perfusion bioreactor for 4 or 14d. Fluorescence microscopy was performed to detect seeded cells in the construct. Oxygen saturation, pH, Glucose and Lactate were measured during cultivation.

Results:
Immunohistochemistry against Laminin and Collagen IV revealed the intactness of the basal lamina in the vessel bed. Adherence of hCBEC to these proteins was shown by attachment experiments *in vitro*. Glucose reduction and Lactate accumulation were indicative for the metabolic activity of the seeded hCBEC. Monitoring of pH and oxygen saturation showed a slight shift in pH to 7.0 and a constant level of oxygen saturation of 99%, indicating proper culture conditions provided by the bioreactor. Over time an increasing colonisation of vessels by hCBEC was observed. Dil-acLDL assay revealed endothelial character of seeded hCBEC.

Conclusions:
Our constructs may be a first step towards the generation of 3D-artificial vascularized myocardial tissue for surgical reconstruction. The use of these patches might serve for other 3D-artificial tissue constructions as well.