

## C19

### ***In Vivo* Tissue Engineering of Heart Valves Using High Specific DNA-Aptamers as Capture Molecules for Circulating Endothelial Progenitor Cells (EPCs)**

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#### **Objectives:**

Currently tissue engineering principles of heart valves include tissue or stem cell derived cells. Limitations of this approach include a long *in vitro* culture, an accompanied risk of infection and sophisticated, cost intensive infrastructures. Objective of this study is the application of stem cell technologies to create of the shelf heart valves for *in vivo* tissue engineering.

#### **Method:**

Glutaraldehyde-fixed biologic tissues (porcine heart valves and bovine pericardium) were functionalized using star-PEG. A control group consisted of non-fixed biologic tissues. The functionalization is required to immobilize high specific DNA-aptamers, which specifically bind EPCs on surfaces with cross-linked (due to glutaraldehyde fixation) and subsequently reduced binding capacity. On non-fixed tissues direct aptamer immobilization can be achieved. For proof of concept, DNA-aptamers with binding sides to an immortalized mouse EPC line were selected.

#### **Results:**

EPCs possess binding sides for species specific DNA-aptamers. On non-treated surfaces these DNA-aptamers can be directly coupled to the tissues. On glutaraldehyde fixed surfaces with cross-linked amino groups of the extracellular matrix the required DNA-aptamer binding sides are significantly reduced. A functionalization using hydrogels is decisive.

#### **Conclusions:**

Surface immobilization of high specific DNA-aptamers on glutaraldehyde-fixed and non-fixed biologic tissues enables manufacturing of an of the shelf heart valve for *in vivo* endothelialization of fixed tissues. Furthermore this approach opens new perspectives for complete *in vivo* tissue engineering of non-fixed valve matrices.