

Better scaffolds for cardiovascular tissue engineering; improved mechanical characteristics and better cell attachment realized by precoating of the scaffold.

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BACKGROUND:

Scaffolds for cardiovascular tissue engineering must fulfil two conditions:

They have to be pliable into any necessary shape and they should offer an optimal surface for cell attachment, growth and differentiation. Best results are obtained with biodegradable polymers, which mimic the extracellular matrix (ECM) and therefore give the required mechanical stability to the construct, until the newly grown tissue will fulfil this task.

METHODS: We coated biodegradable poly glycolic acid (PGA) with polyhydroxyalcanoates (PHA) 1% and 5% aiming at better mechanical characteristics and improved cell attachment. Human V. saphena magna myofibroblasts were seeded onto the precoated scaffold strips, which were statically cultured for two weeks. Non-coated PGA-strips were used as control.

Cell viability and the amount of cells were estimated with MTT and DNA assays. Hydroxyproline and GAG (glycosaminoglycan) contents was determined in order to characterize the ECM. Finally representative parts of the strips were fixed, stained and examined by light and scanning electron microscopy.

RESULTS: The highest amounts of viable cells were found in the groups of PGA and PGA + 1% PHA as well as the highest total cell numbers and better developed ECM. The histological examinations supported these findings: ECM development and cell ingrowth were higher in the PGA and PGA + 1% PHA groups. The best biomechanical test results were the PGA-strips coated with PHA 5%.

CONCLUSION: Precoating of PGA scaffolds with PHA improves, depending on the concentration used, the mechanical characteristics, cell attachment and tissue formation, therefore this is a promising concept for the development of better scaffolds for cardiovascular tissue engineering.

Keywords: *tissue engineering, polymers, myofibroblast*