

3) Tissue engineered human tracheas for *in vivo* implantation

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Abstract

Two years ago we performed the first clinical successful transplantation of a fully tissue engineered trachea. Despite the clinically positive outcome, the graft production took almost 3 months, a not feasible period of time for patients with the need of an urgent transplantation. We have then improved decellularization process and herein, for the first time, we completely describe and characterize the obtainment of human tracheal bioactive supports. Histological and molecular biology analysis demonstrated that all cellular components and nuclear material were removed and quantitative PCR confirmed it. SEM analysis revealed that the decellularized matrices retained the hierarchical structures of native trachea, and biomechanical tests showed that decellularization approach did not led to any influence on tracheal morphological and mechanical properties. Moreover immunohistological staining showed the preservation of angiogenic factors and angiogenic assays demonstrated that acellular human tracheal scaffolds exert an *in vitro* chemoactive action and induce strong *in vivo* angiogenic response (CAM analysis). We are now able to obtain, in a short and clinically useful time (approximately 3 weeks), a bioengineered trachea that is structurally and mechanically similar to native trachea, which exert chemotactive and pro-angiogenic properties and which could be successfully used for clinical tissue engineered airway clinical replacements.