Decellularization of xenogeneic artery for small-diameter vascular graft: Mild alkaline treatment removes galactose-alpha-1,3-galactose and retains vascular extracellular matrix

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Decellularization of porcine blood vessels provides an alternative approach to produce small diameter vascular graft (SDVG) of diameter < 4mm required in plastic reconstruction, coronary bypass and peripheral vascular disease. Galactose-alpha-1,3-galactose (α-gal) is believed to account for hyperacute rejection in pig-to-human transplantation. In proteomics, alkaline treatment serves as one of the non-enzymatic methods in deglycoslation but has not been explored in the area of α-gal removal in decellularization as pH is usually considered to be damaging to the native extracellular matrix (ECM). This work investigated alkali concentration on removal of α-gal from porcine carotid artery (PCA), together with its effect on removal of cellular protein and retention of main vascular ECM proteins. PCAs (diameter = 1.5-2mm) were treated with 0, 0.01 and 0.1M alkali at 37°C overnight. α-gal (Isolectin B4), α-actin (western), collagen (Direct Red and Sircol® assay) and elastin (Orcein and Fastin® assay) were studied in treated arteries to evaluate xenoantigen removal and ECM retention. α-gal level was reduced with NaOH concentration by about 70±10% (0.01M) and 80±5% (0.1M). No α-actin was detected in 1mg of tissue treated with NaOH. Above 90.0±2.5% of collagen was retained in PCA treated with 0.01M NaOH but only about 60.0±7.5% collagen was left at 0.1M NaOH. Furthermore, no elastin loss was observed in all treatments. In conclusion, this study suggests mild alkaline treatment provides a simple and promising treatment to produce SDVG from xenogeneic artery by high degree of α-gal removal, total removal of α-actin and high retention of important vascular ECM. (250 words)

Biography

Chan Wing Yue has completed his PhD in 2010 from Nanyang Technological University, Singapore. He is currently working as scientific officer in Department of Plastic, Reconstructive & Aesthetic Surgery, Singapore General Hospital, responsible for cultured epithelial autograft and skin allograft processing for burn patients.

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