

## Comparison of FREE and RESILIA Pericardial Treatment for Prosthetic Heart Valve Tissue in a Small Animal Model.

Ever since the first valvular bioprosthesis was used by Carpentier in 1965, one of the main challenges has been to extend the lifespan of such bioprostheses. The main disadvantage of tissue valves remains progressive structural valve deterioration. As calcification is one of the main drivers, numerous anticalcification treatments have been developed. Glutaraldehyde is needed to cross-link and stabilize xenogenic tissue. Nevertheless, over the last decades, several studies have shown that free aldehyde residues can also trigger calcification, leading to different aldehyde detoxification strategies.

In recent years, two different pericardial tissues were brought on the market: the RESILIA treatment used on the Inspiris prosthesis (Edwards Lifescience Corporation) and the FREE treatment used on the Perceval Plus (Corcym group). Our aim was to evaluate and compare both treatments in a small animal model, using glutaraldehyde-fixed pericardium as a control (PC). All samples were subcutaneously implanted in juvenile rats, for a duration of 8 weeks. After macroscopical examination and x-ray imaging, each sample was divided in two allowing to perform calcium quantitative determination and histological analysis.

First, macroscopically, all pericardial control samples were homogeneously stiffened by calcification. FREE and RESILIA samples remained flexible and did not reveal macroscopical signs of mineralization. The X-ray analysis showed dense and clear calcifications on all PC samples, while samples from the FREE and the RESILIA treatment did not show calcification at all.

Calcium content measurement was performed using absorption spectrometry. The calcium content was significantly lower in the FREE ( $3.03 \pm 0.73 \mu\text{g Ca /mg dry weight}$ ,  $p < 0.001$ ) and RESILIA ( $3.36 \pm 1.45$ ,  $p 0.001$ ) treatments when compared to the PC treatment ( $120.51 \pm 16.85$ ). There was no significant difference between FREE and RESILIA ( $p=0.982$ ).

Last, histological examination using hematoxylin and eosin and Van Kossa stainings was carried out. FREE and RESILIA samples showed no calcifications in contrast with PC samples.

In light of these results, we can conclude that FREE and RESILIA treatments for bovine pericardial valve tissue show excellent results in a juvenile rat model of subcutaneous implantation. No calcification was observed macroscopically, nor on x-ray and histology. The calcium content of the RESILIA and FREE samples were similarly low and were significantly lower than the calcium content in control group.