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Synergistic Effects of Serotonin and Cyclic Stretch on Aortic Valve Leaflets

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Objectives:

Serotonin (5HT) is known to have potent vasoactive effects. 5HT and its receptors have also been linked to the carcinoid syndrome, and in cases of the use of fenfluramine. These are potentially related to altered matrix turnover. The objective of this study was therefore to understand the effect of different concentrations of 5HT on aortic valve collagen content.

Method:

10x15mm segments were isolated from the belly region of porcine aortic valve cusps, and were subject to 10% stretch for 120 hours under: (i) normal DMEM (control); (ii) DMEM with 10^{-6} M 5HT; and (iii) DMEM with 10^{-4} M 5HT, and statically incubated under: (iv) DMEM; and (v) DMEM with 10^{-4} M 5HT. Total soluble collagen content within samples was analyzed using a Sircol collagen assay. Anti-brDu immunostaining was used for cell proliferation.

Results:

Collagen content in the 10^{-6} M 5HT group (10.54 ± 0.78 $\mu\text{g}/\text{mg}$ tissue dry weight) was comparable with controls (10.60 ± 0.64). Collagen content significantly decreased (6.02 ± 1.06 $\mu\text{g}/\text{mg}$) for the 10^{-4} M 5HT group. Collagen content was also significantly lower for the static groups compared to control. Cell proliferation was significantly higher in the 10^{-4} M 5HT group compared to all other groups.

Conclusions:

Synergistic effects of 5HT and cyclic stretch are investigated for the first time ex vivo. Cell proliferation is significantly increased as observed in carcinoid syndrome. Interestingly, collagen content decreased when incubated with high concentrations of 5HT. Further study is needed on the mechanisms involved and whether this translates to changes in mechanical properties and altered function.