Investigating the Synergistic Role of IL-1BETA and TGF-BETA in Endothelial-to- Mesenchymal Transition in Coronary Artery Disease

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The endothelium, a layer of cells lining the inner wall of coronary arteries, contributes to blood hemostasis and healthy function of the heart. In coronary artery disease (CAD), endothelial cells (ECs) acquire changes in their functions in a process called endothelial-to-mesenchymal transition (EndMT). EndMT is a multi-stage phenotypic change by which ECs become pro-migratory, pro-proliferative, and profibrotic, contributing to plaque formation and arterial occlusion. It is understood that the cytokines interleukin-1 beta (IL-1B) and transforming growth factor beta (TGFB) influence the progression of EndMT, but their specific roles are still not fully understood. We hypothesize that IL-1B and TGFB uniquely impact endothelial cells and develop atherosclerotic plaques, and hope to identify potential biomarkers and therapeutic targets for developing new treatments. In this project, human aortic ECs were stimulated with IL-1B, TGFB, or both for 72 hours. Relevant EndMT markers were assessed by western blotting for protein expression, qRT-PCR for gene expression, and immunocytochemistry. It was found that IL-1B alone induces partial EndMT, upregulating inflammatory markers like IRAK1, IRAK4, and ICAM-1. This indicates its role in early vascular remodeling in CAD. TGFßB alone upregulates the mesenchymal marker smooth muscle actin (SMA), promoting later-stage fibrosis. Together, the cytokines enhance mesenchymal markers (Vimentin, SNAIL1) and suppress endothelial markers (VE-Cadherin, eNOS), accelerating disease progression. IL-1B and TGFB play distinct yet synergistic roles in promoting EndMT, with IL-1B driving inflammation and TGFB inducing fibrosis. Targeting these pathways offers strategies to slow or prevent CAD progression by mitigating EndMT & vascular remodeling.

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