Evidence for Cyclooxygenase-1 Association with Caveolin-1 and 2 in Cultured Human Embryonic Kidney (HEK 293) Cells

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Arachidonic acid was metabolized into the unstable prostaglandins G2 and H2 by cyclooxygenase (COX). Two isoforms of COX have been identified, cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2). Both isoforms of the COX gene are found at detectable levels in most human tissues, COX-1, believed to be responsible for synthesis of prostglandins during homeostasis, is constitutively co-expressed at low levels. Caveolins (Cav) are integral membrane proteins present in caveola, the small flask-shaped and detergent insoluble invaginations in plasma membrane and are implicated to function in the vesicular transport processes and the transduction of receptor generated signals. Recent studies have shown that many signal proteins, enzymes and receptors are localized in the caveolae by being anchored through caveolins. The purpose of this study was to confirm protein-protein interaction between cyclooxygenase-1 (COX -1) and caveolins. The interaction of cyclooxygenase-1 and caveolins in the cultured human embryonic kidney (HEK 293) cells was investigated using immuno-precipitation and Western blot analysis. In HEK 293 cells, high levels of caveolin-2 and low level of caveolin-1 at mRNA and protein level were observed without any detectable expression of caveolin-3. Caveolae rich membranous fractions from the HEK 293s contained both COX -1 and caveolin-1 or caveolin-2 in same fractions. The experiments of immuno-precipitation showed complex formation between the COX -1 and caveolin-1 or caveolin-2 in the HEK 293 cells. Confocal microscopic results also support co-localization of COX -1 and caveolin-1 or caveolin-2 at the plasma membrane. Co-localization of caveolins with cylooxygenase-1 in caveolae suggested that caveolin would play an important role in regulating the function of COX.