Platelet lysate maintains chondrogenic potential and promotes cartilage regeneration

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Platelet rich plasma (PRP), a cocktail of platelet growth factors and bio-active proteins, has been proposed as therapeutic agent to restore damaged articular cartilage. We report the biological effect of the platelet lysate (PL), a PRP derivative, on primary human articular chondrocytes (HAC) cultured under both physiological and inflammatory condition. Added to the culture medium, PL induced a strong mitogenic response in the chondrocytes. The in vitro expanded cell population maintained a chondrogenic re-differentiation potential as revealed by micromass culture in vitro as well as in vivo as demonstrated by ectopic cartilage formation in nude mice. Furthermore, in chondrocytes cultured in the presence of the pro-inflammatory cytokine IL-1α, the PL induced a drastic enhancement of the synthesis of the cytokines IL-6 and IL-8 and of NGAL, a lipocalin expressed in cells of the chondrogenic lineage. These events were controlled by the p38 MAP kinase and NF-κB pathways. The pro-inflammatory effect of the PL was a transient phenomenon. In fact, after an initial up regulation, we observed a significant reduction of the NF-κB activity together with the repression of the inflammatory enzyme ciclooxygenase-2 (COX-2). Moreover, the medium of chondrocytes cultured in the contemporary presence of PL and IL-1α, showed a significant enhancement of the chemoattractant activity versus untreated chondrocytes.
On the whole, our findings support the concept that the platelet products have a direct beneficial effect on articular chondrocytes and at the same time could drive in sequence a transient activation and the resolution of the inflammatory process, thus providing a rational for their use as therapeutic agents in cartilage inflammation and damage.