Transcription factors which drive differentiation are shared between cells of the growth plate and VSMCs in the tunica intima of vesicles with pathological calcification.

Matrix vesicles

ECM vesicles are present in growth plate cartilage. The size of ECM vesicles ranges from 30-1000 nm, requiring an electron microscope for visualisation. The vesicles are rich in calcium, inorganic phosphate, and ALP. ALP squesteres calcium and phosphate in vesicles, thus when bone forms there is a store of calcium and phosphate for the mineralisation process. Sodium phosphate transport protein (NaPiTPs, also known as Glur1) is expressed in matrix vesicles and uses the sodium concentration gradient to drive sequestering of phosphate.

The size of VSMC matrix vesicles ranges from 100-700 nm, and thus are similar in size to growth plate vesicles. Other similarities between VSMC vesicles and growth plate vesicles include: vesicle contents, and the presence of NaPiTP.

The first crystals of appetite bone mineral are formed within matrix vesicles close to the inner surfaces of their investing membranes. Matrix vesicle biogenesis occurs by polarised building and pinching off vesicles from specific regions of the outer plasma membranes of differentiating growth plate chondrocytes and osteoblast. Polarized release of matrix vesicles into selected areas of the developing matrix determines the nonrandom distribution of calcification. Initiation of the first mineral crystals within matrix vesicles (phase 1), is augmented by the activity of matrix vesicle phosphatases, for example ALP, and calcium binding molecules, for example annexin I, all of which are concentrated in or near the matrix vesicle membrane. Phase 2 of biologic mineralisation begins with crustal release through matrix vesicle membrane, exposing preformed hydroxyapatite crystals to the extracellular fluid. The extracellular fluid normally contains sufficient calcium and phosphate to support crystal proliferation, with preformed crystals serving as nuclei (templates) for the formation of new crystals by homogeneous nucleation. In diseases such as osteoarthritis, crystal deposition arthritis, and atherosclerosis, matrix vesicles initiate pathologic calcification, which in turn, arguments disease progression.

Apoptosis

Chondrocytes in the degeneration zone of the growth plate undergo chondromatosis. Apoptotic bodies, if not cleared, may classify.

The presence of apoptotic bodies in atherosclerosis is well documented. VSMC remnats and apoptotic odies are present in atheroscleortic plaques.