Matrix vesicles: biochemical, biophysical, and biological properties

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Matrix vesicles are a specific class of extracellular vesicles with diameter between 100 to 300 nm.[1] They are secreted, under physiological conditions, by hypertrophied chondrocytes during endochondral ossification, by osteoblasts during intramembranous ossification and by odontoblasts during dentin formation. Matrix vesicles, by accumulating calcium and phosphates, can form apatite in their lumen by accumulating Ca^{2+} and inorganic phosphate within their lumen and forming a nucleation core. Once apatites are formed, the crystals are released from matrix vesicles in the extracellular medium in the vicinity of collagen fibers due to strong association of matrix vesicles with collagen. In this talk I will discuss what is currently known about the biogenesis, composition, and functions of matrix vesicles. I will discuss the recent discovery from our research group about the existence of the nucleational core and its maturation into crystalline complexes by using state-of-the-art atomic force microscopy.