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Possible Roles of Fluoride and Carbonate in Biochemical Carbonated Apatite Formation

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Marine phosphorites are predominantly composed of carbonated fluorapatite (CFA = $Ca_{10-a-b-c}Na_aMg_b(PO_4)_{6-x}(CO_3)_{x-y-z}(CO_3.F)_y(SO_4)_zF_2$, where x=y+a+2c, and c represents the number of Ca vacancies, with a P_2O_5 content that ranges from 18-40 %. Sulphur-oxidizing bacteria of the *Beggiatoa* genus concentration phosphorous as intracellular polyphosphate ($(PO_3^-)_n$) which is depolymerized into inorganic orthophosphate (Pi). Consequently, an increase in pore water Pi concentration favours carbonated apatite precipitation.

The carbonate and fluoride that is characteristic of phosphorite CFA is also located in the vertebrate skeleton. This similarity suggests a biochemical pathway for CFA precipitation. Preliminary Raman spectroscopy and powder x-ray diffraction results that suggest a role for fluoride, and possibly carbonate, in the biochemical depolymerisation of polyphosphates with alkaline phosphatase will be presented.