

Apatite Biofilm Forming Agent: Nanobacteria as a Model System for Biomineralization & Biological Standard for Noa-a Preliminary Study

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Abstract

Since 1985 we have detected and cultured an agent in human blood that mediates apatite nucleation and crystal growth under terrestrial conditions simulating blood and urine (Kajander et al, 1997; Kajander & Ciftcioglu 1998). The agent is passageable and has been continuously cultured in laboratory, with monthly passages for 10 years. It grows in mammalian cell culture media and does not need mammalian cells or serum for growth. However, growth is more rapid when supplemented with serum or with a growth factor preparation produced by the nanobacteria itself into its growth medium, and by *Bacillus* sp. (Ciftcioglu & Kajander 2000). We named the agent, autonomously replicating biological particles alias nanobacteria, to separate it from common bacteria in the 1990 timeframe. Independently from us, other mineral-associated nanosized possible microorganisms have been detected. Tiny coccoid particles were found in sedimentary rocks using scanning electron microscopy (SEM) after acid etching of samples and were named as nanobacteria (Folk 1993). Possible fossils of nanobacteria were detected with SEM in a Martian meteorite (McKay et al, 1996) and nanoorganisms in deep Australian sandstone (Uwins et al, 1998). The latter ones, named as nanobe, could also be cultured.