

## Functional derivatives of human dentin matrix protein 1 modulate morphology of calcium carbonate crystals.

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### Streszczenie

Dentin matrix protein 1 (DMP1) is an acidic, extracellular matrix protein essential for biomineralization of calcium phosphate, in bone and dentin. It is proteolytically processed into two fragments, 44K and 56K. Recently, the presence of DMP1 was noticed in inner ear, specifically in otoconia, which are calcium carbonate biominerals involved in sensing of balance. In this study, the solution structure and biomineralization activity of otoconial 44K and 56K fragments toward calcium carbonate were investigated. The results of analytical ultracentrifugation, circular dichroism, and gel filtration indicated that DMP1 fragments are disordered in solution. Notably, 56K formed oligomers in the presence of calcium ions. It was also observed that both fragments influenced the crystal growth by in vitro biomineralization assay and scanning electron microscopy. In addition, they sequester the calcium ions during the calcite formation. Calcium carbonate crystals precipitated in vitro changed their size and shape in the presence of DMP1 fragments. Oligomerization propensity of 56K may significantly enhance this function. Our study indicates that intrinsically disordered DMP1 has a previously unknown regulatory function for biomineralization of otoconia.

### Słowa kluczowe

Biomineralization, Intrinsically disordered proteins, otoconia, calcium complexes

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