

FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Bone biomaterials developed by bone microstructure

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1. Background of research

It is necessary to clearly diagnose bone disease and then to newly establish bone regeneration and medical treatment processes in aging society, Japan. Diagnosis of bone based on bone mineral density is approaching the limitation on the medical treatment of diseased bone. Thus, the limitation for bone treatment is viewed with suspicion in the world.

2. Research objectives

Since the anisotropy of bone microstructure, especially degree of preferential alignment of biological apatite, dominates bone mechanical properties, development of bone materials science and control of bone microstructure are being tired. Concretely, research from the opposite sides of both biological tissue and artificial tissue believes to be enable essential healing ability by using novel biomaterials produced from the view point of anisotropic bone microstructure.

3. Research characteristics (incl. originality and creativity)

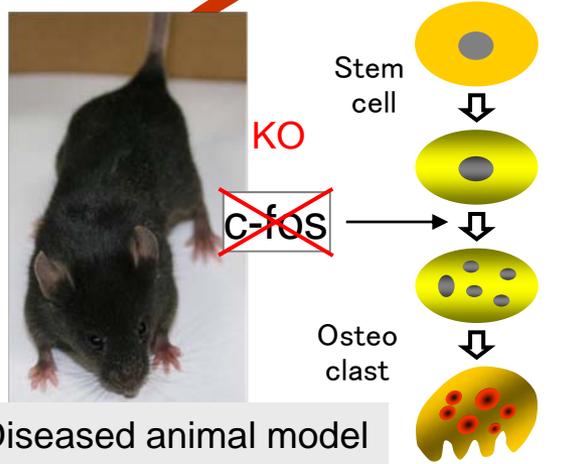
The bone disease which is difficult to diagnose and improve focusing on the bone mineral density has been planned to assess from the viewpoint of preferential alignment of biological apatite. Material scientific method, for example, microbeam X-ray diffraction, will be applied on the bone medical treatment, resulting in contribution to development of the near future style of bone care.

4. Anticipated effects and future applications of research

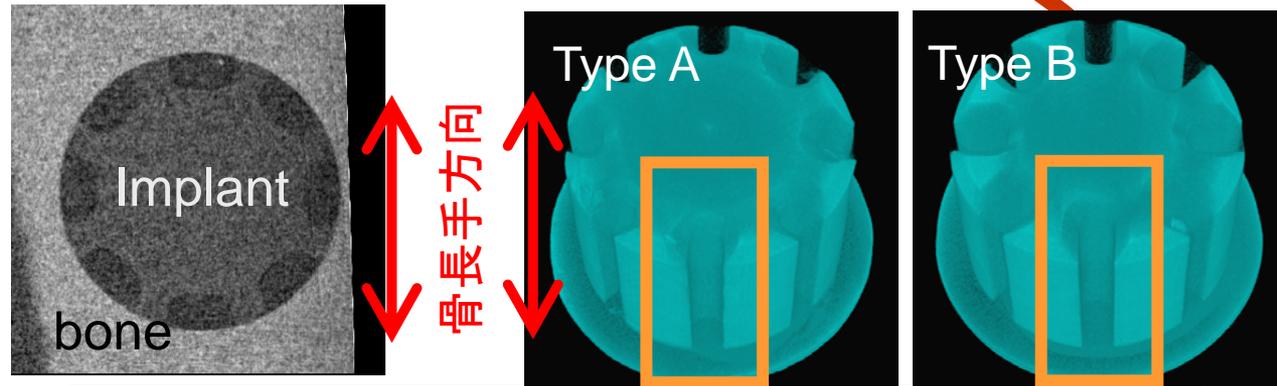
To clarify the mechanism of preferential alignment of apatite will realize the novel methods for bone regeneration and treatment. In addition, development of new drug for osteoporosis and novel artificial joint, clarification of mechanism of bone disease, accomplishment of low invasive diagnosis will be expected. Finally, biomaterials design for bone and the related theory may be turned upside down.

Bone biomaterials developed by bone microstructure

Bone embryology

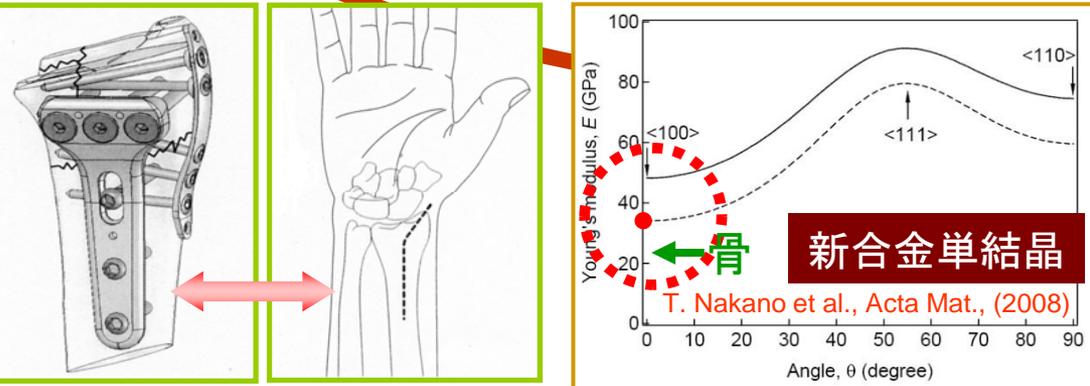


Bone regeneration



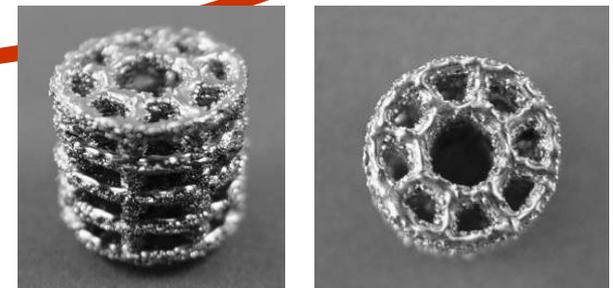
Aligned groove and pore for promoting good bone quality

Bone implant design



Development of novel implants

Robotics and skeletal design



EMB method for suppressing stress shielding