

[Keywords] Biomaterials, Biocompatibility, Tissue Regeneration, Cytotoxicity, Pulp-Stimulating Properties

[Academics] Separately known

[Course aims]

Biomaterials must function in harmony with biological tissues, without causing side effects to systemic or local tissue. In other words, biomaterials are required to show high biocompatibility. In the field of regenerative dentistry, which has made huge strides in research over recent years, new types of biocompatible materials that promote tissue regeneration are being developed.

This course aims to provide an understanding of interactions between biomaterials and biological tissues. Students will systematically learn about the *in vivo* dynamics and side effects of dental biomaterials and those of biocompatible materials used in tissue regeneration. Particular focus will be placed on dental pulp capping materials and oral implant materials that come in direct contact with tissues undergoing long-term remodeling, in order to deepen the students' understanding of biomaterial biocompatibility and safety.

[Course objectives]

At the end of this course, students should be able to:

1. Explain the *in vivo* dynamics and harmful effects of biomaterials.
2. Explain methods of evaluating the risk and safety of biomaterials.
3. Understand correctly the concept of biocompatibility and explain the underlying academic and clinical importance.
4. Explain bonding between oral implant materials and biological tissues (bone tissue, connective tissue, and epidermis).
5. Explain surface treatment methods to improve the biocompatibility of oral implant materials.
6. Explain the details and clinical importance of the pulp-stimulating effects of dental cement.
7. Explain the materials used in and mechanisms of dentin regeneration.

[Course content]

Class	Theme	Content	Academics
1	In vivo dynamics and side effects of biomaterials		
2	Safety and harmful side-effects of biomaterials		
3	Biocompatibility		
4	Biocompatibility testing		
5	Interactions between oral implant materials and biological tissues		
6	Techniques for improving the biocompatibility of oral implant materials		
7	Pulp-stimulating effects of dental cement and their clinical importance		
8	Dentin regeneration trials and materials used		Takashi Saito

[Class implementation method]

Combination of face-to-face learning and distance learning

Class implementation depends on the implementation policy of each department (graduate school) or school.

[Grading policies]

The students' overall grade in the class will be based on class attendance and reports.

[Textbook]

Students will be informed regarding the textbook.

[Reference book]

Same as above

[Preparation for course]

Students should read papers and books regarding the structure of the interface between biomaterials and biological tissues (hard and soft tissues); familiarize themselves with current issues on oral implants and be prepared to have in-depth discussions regarding these issues; and attend lectures and practical training.