Cell Signaling

1. Staffs and Students (April, 2009)

Professor	Hiroshi TAKAYANAGI	
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2. Purpose of Education

Organized signal networks in the body are crucial for the higher physiological functions and the tissue organization. To understand the regulation of signal events, we take on cell signaling course including the molecular mechanism of both the "intra" cellular and the "inter" cellular signal transduction. Especially, the course will be focused on the molecular networks of signal transduction in osteoclasts and osteoblasts, but also on the osteoimmunology, which is a new integrated field of bone biology and immunology. Besides, to promote the practical and clinical understanding, the course will deal with the molecular mechanism of osteoporosis and inflammatory bone diseases, such as periodontal disease and rheumatoid arthritis, in parallel with the basic molecular biology.

3. Research Subjects

1) Function and transcriptional regulation of NFATc1, a master regulator of osteoclast differentiation
2) Transcriptome and Proteome of cytokine-induced genes
3) Regulation of bone homeostasis by immunoglobulin receptors
4) Identification of bone-derived systemic regulatory factors (osteokines)
5) Mechanism of sensing and adapting to mechanical stress
6) Functional analysis of genes by gene manipulations, RNAi and gene-disrupted mice
7) Development of clinical application by experimental animal disease models

4. Publications

【Original Article】

1. Taguchi Y., Gohda J., Koga T., Takayanagi, H. and Inoue J.: A unique domain in RANK is required for Gab2 and PLC γ 2 bindiing to establish osteoclastogenic signals. **Genes Cells**. 14(11), 1331- 1345 (2009)
2. Zhao, B., Takami, M., Yamada, A., Wang, X., Koga, T., Hu, X., Tamura, T., Ozato, K., Choi, Y., Ivashkiv, L. B., Takayanagi, H. and Kamijo, R.: Interferon Regulatory Factor-8 Regulates Bone Metabolism by Suppressing Osteoclastogenesis. **Nat Med.** 15, 1066-1071 (2009)
3. Negishi-Koga, T. and Takayanagi, H. Mysteries in Ca^{2+} Signaling During Osteoclast Differentiation. **IBMS BoneKEy.** 301- 306 (2009) Epub.
4. Kayama, H., Koga, R., Atarashi, K., Okuyama, M., Kimura, T., Mak, T. W., Uematsu, S., Akira, S., Takayanagi, H., Honda, K., Yamamoro, M., and Takeda, K. NFATc1 Mediates Toll-Like Receptor-Independent Innate Immune Responses during Trypanosoma cruzi Indection. **PLoS Pathogens.** 5(7), (2009) e1000514 (2009)
5. Kadono, Y., Tanaka, S., Nishino, J., Nishimura, K., Nakamura, I., Miyazaki, T., Takayanagi, H. and Nakamura, K. Rheumatoid arthritis associated with osteopetrosis. **Mod Rheumatol.** 19(6), 687-90 (2009)

【Review Article】

1. Takayanagi, H.: Osteoimmunology and the effects of the immune system on bone. **Nat Rev Rheumatol.** 5(12),667-76 (2009)
2. Gober, H. J. and Takayanagi, H.: The interactions and shared mechanisms of T cells and osteoclasts. **Inflammation and Regeneration.** 29 (4), 239-248 (2009)
3. Negishi-Koga, T. and Takayanagi, H.: Ca^{2+} -NFATc1 signaling is an essential axis of osteoclast differentiation. **Immunological Reviews.** 231, 241-256 (2009)

4. Nakashima, T. and Takayanagi, H. Osteoimmunology: crosstalk between the immune and bone systems. **J Clin Immunol.** 29(5), 555-567 (2009)
5. Nakashima, T. and Takayanagi, H. Osteoclasts and the immune systems. **J Bone Miner Metab.** 27(5), 519-529 (2009)

【Book】

1. Takayanagi, H.: Cytokine and Growth Factor Regulation of Osteoclastogenesis. **The Skeletal System.** 263-270 (2009)

【Presentation】

1. Hiroshi Takayanagi: Bone destruction in arthritis and osteoimmunology, Rheumatology Association, R.O.C.(Taiwan), 2009.12.6, Yilan, Taiwan.
2. Hiroshi Takayanagi: RANK Ligand and Osteoimmunology, The 26th Naito Conference 2009.11.7、Hyogo
3. Hiroshi Takayanagi: Molecular Mechanisms of Monocyte Lineage Commitment and Function, ACR/ARHP Scientific Meeting, 2009.10.18, Philadelphia, U.S.A.
4. Hiroshi Takayanagi: New immune regulator of bone, The Bone & Teeth Gordon Research Conference, 2009.7.15, Maine, U.S.A.
5. Hiroshi Takayanagi: Anti-Osteoclast Therapy for Bone Destruction in Inflammation, The 9th World Congress on Inflammation, 2009.7.10, Tokyo
6. Hiroshi Takayanagi: TNF-α and Bone Destruction in Arthritis - from the Viewpoint of Basic Research -, The 9th World Congress on Inflammation, 2009.7.8, Tokyo
7. Hiroshi Takayanagi: Immune Regulation of Osteoclastogenesis, The 3rd Global COE International Symposium, Tokyo Medical and Dental University, 2009.6.10, Tokyo
8. Hiroshi Takayanagi: RANKL Signaling and Osteoimmunology, The 66th KSBMB Annual Meeting, World Trade Center, 2009.5.13, Seoul, Korea
9. Hiroshi Takayanagi: New Immune Connections During Osteoclatogenesis, The 3rd New York Skeletal Biology and Medicine Conference, Mount Sinai School of Medicine, 2009.4.30, New York, U.S.A.
10. Hiroshi Takayanagi: Osteoimmunology-Interactions and shared mechanisms between the immune system and bone, The Annual Symposium of IFReC (Immunology Frontier Research Center), Osaka University, 2009.2.12, Osaka

【Academic and professional awards】

1. Inoue Prize for Science (2009)
2. JSBMR Distinguished Scientist Award (2009)