

CURRICULUM VITAE

Koichi Masuda, M.D.

PERSONAL DATA

Citizenship: Japan (USA Permanent Resident)
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EDUCATION

M.D. National Defense Medical College, Japan, 1984
Postdoctoral Fellowship Department of Biochemistry, Rush Medical College, 1992

ACADEMIC APPOINTMENTS/PROFESSIONAL EMPLOYMENT

1984-1986	Junior Resident, Department of Orthopedic Surgery, National Defense Medical College, Saitama, Japan
1986-1988	Research Fellow, Department of Orthopedic Surgery, National Defense Medical College, Saitama, Japan
1988-1990	Senior Resident, Department of Orthopedic Surgery, National Defense Medical College, Saitama, Japan
1990-1992	Medical Staff, Orthopedic Surgery, Self Defense Force Fuji Hospital, Shizuoka, Japan
1992-1994	Postdoctoral Fellow/Instructor, Department of Biochemistry, Rush Medical College at Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL
1994-1995	Chief of Orthopedic Surgery, Self Defense Force Fuji Hospital, Shizuoka, Japan
1994-1995	Visiting Assistant Professor, Department of Biochemistry, Rush Medical College at Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL
1995-2003	Assistant Professor, Department of Biochemistry, Rush Medical College at Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL
1997-2003	Assistant Professor, Department of Orthopedic Surgery, Rush Medical College at Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL
2000-present	Founder, Vice President, Director of Research and Development, Articular Engineering, LLC, Northbrook, IL
2003-present	Founder, Vice President, Director of Research and Development, Articular Engineering-Japan (AE-Japan), Tokyo, Japan
2003-2007	Associate Professor, Department of Orthopedic Surgery, Rush Medical College at

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	Rush University Medical Center, Chicago, IL
2003-2007	Associate Professor, Department of Biochemistry, Rush Medical College at Rush University Medical Center, Chicago, IL
2007 - 2008	Professor, Department of Orthopedic Surgery, Rush Medical College at Rush University Medical Center, Chicago, IL
2007 – 2008	Professor, Department of Biochemistry, Rush Medical College at Rush University Medical Center, Chicago, IL
2008 - 2011	Professor-in-Residence, Department of Orthopaedic Surgery, School of Medicine, University of California, San Diego, La Jolla, CA
2008 - 2013	Visiting Professor, Doshisha University, Kyoto, Japan
2008 - present	Director of Skeletal Translational Research Laboratory, Department of Orthopaedic Surgery, School of Medicine, University of California, San Diego, La Jolla, CA
2011 - present	Professor, Department of Orthopaedic Surgery, School of Medicine, University of California, San Diego, La Jolla, CA

LICENSES AND CERTIFICATIONS:

1984	Medical Practitioner License (Japan)
1989	Japanese Board of Sports Medicine
1991	Japanese Board of Orthopedic Surgery
1991	Japanese Board of Rheumatology

HONORS AND AWARDS:

1992	Recipient of a grant from the Japanese Rheumatism Association for Medical Training in America
1997	Recipient of a Falk Award of Excellence research grant, Arthritis Foundation, Greater Chicago Chapter
2000	Winner of North American Spine Society Research Award: "Gene gun-mediated gene transfer: Osteogenic protein-1 to promote regeneration of the intervertebral disc in rabbits."
2000	Best Poster Award: "Increases of proteoglycan content and disc heights in rabbit intervertebral disc by in vivo administration of osteogenic protein-1." International Society of the Study of the Lumbar Spine (As a mentor to Dr. Takegami).
2003	New Investigator Research Award: "Intervertebral disc regeneration with cells transfected with the OP-1 gene: An ex vivo gene transfer using the rabbit model." Orthopedic Research Society (As a mentor to Dr. Matsumoto).
2003	AAOS overall Best Poster Award: "Biomechanical properties of tissue-engineered cartilage from adult human chondrocytes." 70 th Annual Meeting, American Academy of Orthopaedic Surgeons, New Orleans, LA - February 5 - 9, P160, 2003.
2006	New Investigator Research Award: "Intradiscal injection of osteogenic protein can restore viscoelastic properties of degenerated intervertebral discs." Orthopedic Research Society (As a mentor to Dr. Miyamoto).
2006	Russell Hibbs Award, Best Basic Science Paper: "An intradiscal injection of osteogenic protein-1 restores the viscoelastic properties of degenerated intervertebral discs in the rabbit anular puncture model." Scoliosis Research Society 41st Annual Meeting, 2006.
2006	First Place Basic Science Research Award: "Effects of recombinant human growth

- and differentiation factor-5 on the repair of the mature rabbit intervertebral disc." Cervical Spine Research Society, 34th Annual Meeting (As a mentor to Dr. Chujo).
- 2006 Third Place Basic Science Research Award: "Low oxygen tension and osteogenic protein-1 synergistically stimulate extracellular matrix production by bovine intervertebral disc cells." Cervical Spine Research Society, 34th Annual Meeting (As a mentor to Dr. Miyamoto).
- 2011 Kappa Delta Elizabeth Winston Lanier Award: "Intervertebral disc repair or regeneration by growth factor and/or cytokine inhibitor protein injection." American Academy of Orthopaedic Surgeons, 2011 Annual Meeting.
- 2011 The ISSLS Prize for Lumbar Spine Research (Biomechanics): "Adaptations to the multifidus muscle in response to experimentally induced intervertebral disc degeneration." 2011 Annual Meeting of the International Society for the Study of the Lumbar Spine (ISSLS).
- 2018 ISSLS Prize in basic science 2018: "Growth differentiation factor-6 attenuated pro-inflammatory molecular changes in the rabbit anular-puncture model and degenerated disc-induced pain generation in the rat xenograft radiculopathy model". 2018 Annual Meeting of the International Society for the Study of the Lumbar Spine (ISSLS).

EDITORIAL BOARD:

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|--------------|---|
| 2001-present | The Spine Journal: Advisory Editor |
| 2015-present | Tissue Engineering, Editorial Board |
| 2015-present | Journal of Orthopedic Research: Editorial Review Board |
| 2016-present | The Spine Surgery and Related Research (SSRR) |
| 2017-present | Journal of Orthopedic Research Spine: Advisory Review Board |

SOCIETY MEMBERSHIPS:

Japanese Orthopedic Association
Japanese Rheumatism Association
Japanese Association of Rehabilitation Medicine
Japanese Association of Connective Tissue Research
Japanese Society of Cartilage Metabolism
Orthopedic Research Society (ORS)
International Cartilage Repair Society (ICRS)
The International Society for the Study of the Lumbar Spine (ISSLS)

PATENTS/PATENTS PENDING

▪ Patents

1. **Masuda K**, Thonar EJ-MA, Hejna M. "*In vitro* Production of Transplantable Cartilage Tissue"
 - **U.S. Patent #6,197,061**, WO 00/51527 PCT/US2000/051122, filed March 1, 1999, awarded March 6, 2001
 - **Australian Patent #771,467**
 - **Japanese Patent #4,237,415**, filed February 29, 2000
 - **German Patent #600 44 793.6-08**
 - **Hong Kong Patent #1102081**
 - **EU Patent #EP1158938**, filed on February 29, 2000)
2. **Masuda K**, Thonar EJ-MA, Hejna M. "Cartilage Matrix and In Vitro Production of Transplantable

Cartilage Tissue

- **U.S Patent #6,451,060**, filed March 5, 2001, awarded September 17, 2002
- 3. **Masuda K**, Thonar EJ-MA, An H, Sampath TK. "Method for the Treatment of Chemonucleolysis"
 - **U.S. Patent #7,132,098 B2**, WO 00/20559, PCT/US99/17392, filed February 24, 2003, awarded November 7, 2006
 - **Australian Patent #770725**, filed February 24, 2003
 - **EU Patent #EP1119611**, filed July 30, 2003.
- 4. Sah RL, Li KW, Klein TJ, Schumacher BL, **Masuda K**, Thonar EJ-MA. "Methods to Engineer Stratified Cartilage Tissue"
 - **U.S Patent #7,476,257**, WO 03/024463, PCT/US02/29078, filed September 13, 2002, awarded January 13, 2009
 - **Australian Patent 2002335747**
 - **Korean Patent #2004-7003836**, filed September 13, 2002
- 5. **Masuda K**, Gemba T. "Methods and Compositions for Treating, Inhibiting and Reversing Disorders of the Intervertebral Disc"
 - **U.S. Patent #7,585,848**, filed January 11, 2005, awarded September 8, 2009
- 6. **Masuda K**, Hejna M, Pfister B. "Tissue Engineered Osteochondral Implant"
 - **U.S. Patent #7,931,687**, PCT/US03/14996, filed May 12, 2003, awarded April 26, 2011
 - **Australian Patent application No. 2003237838**, filed May 13, 2003, awarded Feb 25, 2010
- 7. **Masuda K**, Naiki M. "A Method for Promoting the Synthesis of Collagen and Proteoglycan in Chondrocytes"
 - **Australian Patent 2011316756**, April 19, 2012 Grant
 - **Chinese Patent, CN103476923B** 2015-04-29 Grant
 - **EU Patent, EP2627343 B1**, Jan 10, 2018 Grant
 - **Japan Patent, JP5937089B2**, June 22, 2016 Grant

Patents Pending

1. **Masuda K**, Naiki M. "A Method for Promoting the Synthesis of Collagen and Proteoglycan in Chondrocytes"
 - **Pending, PCT/US2011/055757**, filed October 11, 2011
 - **Pending, Canadian Patent No. CA2808927**, filed on February, 19, 2013
 - **Korean Patent application No. 2013-7006684**, filed March 15, 2013
2. Jamieson C, Kulidjian AA, Jamieson CH, Kane KJ, **Masuda K**, Wu CCN, Raheem OA. "Xenograft Model of Human Bone Metastatic Prostate Cancer"
 - **Pending, PCT/US2012/060128**, filed on October, 12, 2012
3. Seki E, Masuda K, Naiki M. "A Method for Protecting Liver and A Liver Protecting Agent".
 - **Pending, Provisional US62/035191, filed on August 8, 2014**
 - **PCT/US2015/, filed on August 7, 2015**

PUBLICATIONS:

Original full-length Manuscripts

1. Shimada K, Shinmei M, Kikuchi T, **Masuda K**, Shimomura Y and Miyazaki M. Effects of anti-inflammatory drugs on matrix degradation of rabbit articular chondrocytes *in vitro*. Jpn J Inflamm. 1986;6(1):71-73 (Japanese).
2. Shinmei M, Wakisaka T, Kuwahara S, **Masuda K**, Matsuda S and Shimomura Y. Anterior cruciate ligament using Dacron artificial ligament. Hiza. 1986;12:117-122 (Japanese).

3. **Masuda K**, Shinmei M, Shimada K, Mizuno K, Nagahama A and Shimomura Y. Total knee replacement in rheumatoid arthritis. *J Joint Surg.* 1987;6(2):193-200 (Japanese).
4. Shinmei M, Kikuchi T, **Masuda K** and Shimomura Y. Effects of interleukin-1 and anti-inflammatory drugs on the degradation of human articular cartilage: New perspectives in rheumatological treatment. *Proceedings of the International Symposium on Rheumatology, Excerpta Medica, in New Trends in Rheumatology.* 1987;5:47-59.
5. **Masuda K**, Shinmei M, Takasu M, Naramatsu M, Nemoto O, Murakoshi S and Shimomura Y. The elbow disorders in top athletes. *Jpn J Orthop Sports Med* 1988, 7:169-173 (Japanese)
6. Shinmei M, Kikuchi T, **Masuda K** and Shimomura Y. Effects of interleukin-1 and anti-inflammatory drugs on the degradation of human articular cartilage. *Drugs*, 1988;35 (suppl.1):33-41.
7. Harigai M, Hara M, Norioka K, Kitani A, Hirose T, Suzuki K, Kawakami M, **Masuda K**, Shinmei M, Kawagoe M and Nakamura H. Stimulation of interleukin-6-like B-cell differentiation factor production in human adherent synovial cells by recombinant interleukin-1. *Scand J Immunol.* 1989;29:289-297.
8. Shinmei M and **Masuda K**. The destruction and repair of articular cartilage. *Bone Joint Ligament.* 1989;2:137-148 (Japanese).
9. Shinmei M, **Masuda K**, Kikuchi T and Shimomura Y. Interleukin-1, tumor necrosis factor, and interleukin-6 as mediators of cartilage destruction. *Semin Arthritis Rheum*, 1989;18 (Suppl 1):27-32.
10. Shinmei M, **Masuda K**, Kikuchi T and Shimomura Y. The role of cytokines in chondrocyte mediated cartilage degradation. *J Rheumatol* 1989;16 (Suppl.18):32-34.
11. Shinmei M, **Masuda K**, Naramatsu M, Tanaka O, Inamori Y, Kikuchi T and Shimomura Y. The mechanism of articular cartilage degradation in rheumatoid arthritis. *Ryumachi* 1989;29:449-450. (Japanese)
12. **Masuda K** and Shinmei M. The mechanism of cartilage destruction. *Orthop Surg Traumatol* 1990;33:483-495. (Japanese)
13. Shinmei M and **Masuda K**. Cartilage degradation. Its immunological and biochemical aspect. *Clin Immunol* 1990;222:888-897. (Japanese)
14. Shinmei M, Okada Y, **Masuda K**, Naramatsu, M, Kikuchi T, Harigai M and Shimomura Y. The mechanism of cartilage degradation in osteoarthritic joints. *Semin Arthritis Rheum* 1990;19 (suppl.1):16-20.
15. Harigai M, Hara M, Kitani A, Norioka K, Hirose T, Hirose W, Suzuki K, Kawakami M, **Masuda K**, Shinmei M, et al. Interleukin 1 and tumor necrosis factor- α synergistically increase the production of interleukin 6 in human synovial fibroblast. *J Clin Lab Immunol*, 1991;34:107-13.
16. Shinmei M, **Masuda K**, Kikuchi T and Shimomura Y. Production of cytokines and its role in proteoglycan degradation. *J Rheumatol.* 1991;18 (Suppl. 27):89-91.
17. **Masuda K** and Shinmei M. Prevention of adult disease in orthopedics. *J Adult Diseases*, 1992;22:147-150. (Japanese)
18. **Masuda K**, Yoshiwara Y, Shinmei M. TIMP in the inflammatory response. *Clin Immunol*, 1992;24:650-659. (Japanese)
19. **Masuda K**, Shirota H and Thonar EJ-MA. Quantification of ^{35}S -labeled proteoglycans complexed to alcian blue by rapid filtration in multiwell plates. *Anal Biochem* 1994;217:167-175.
20. Mok SS, **Masuda K**, Häuselmann HJ, Aydelotte MB and Thonar EJ-MA. Aggrecan synthesized by mature bovine chondrocytes suspended in alginate: identification of two distinct metabolic matrix pools. *J Biol Chem* 1995;269:33021-33027.
21. Thonar EJ-MA, **Masuda K**, Häuselmann HJ, Uebelhart D, Lenz ME, and Manicourt DH. Keratan sulfate in body fluids in joint disease. *Acta Orthop Scand* 1995;66(Suppl 266):103-106.
22. Thonar EJ-MA, **Masuda K**, Lenz ME, Häuselmann HJ, Kuettner KE, Manicourt DH. Serum markers of systemic disease processed in osteoarthritis. *J Rheumatol (Suppl 43)* 1995;22:68-70.
23. Häuselmann HJ, **Masuda K**, Hunziker EB, Neidhart M, Mok SS, Micheal BA and Thonar EJ-MA. Adult human chondrocytes cultured in alginate form a matrix similar to native human articular

- cartilage. *AM J Physiol* 1996;271 (Cell Physiol. 40):C742-C752.
24. Petit B, **Masuda K**, D'Souza AL, Otten L, Pietryla D, Hartmann DJ, Morris NP and Thonar EJ-MA. Characterization of crosslinked collagens synthesized by mature articular cartilage chondrocytes cultured in alginate beads: Comparison of two distinct matrix compartments. *Exp Cell Res* 1996;225:151-161.
25. Chiba K, Andersson GBJ, **Masuda K** and Thonar EJ-MA. Metabolism of the extracellular matrix formed by intervertebral disc cells cultured in alginate. *Spine* 22:2885-2893.
26. **Masuda K**, Cartilage Repair. *The Bone* 11:97-104, 1997. (Japanese)
27. Vilim V, Lenz ME, Vytasek R, **Masuda K**, Pavelka K, Kuettner KE and Thonar EJ-MA. Characterization of monoclonal antibodies recognizing different fragments of cartilage oligomeric matrix protein (COMP) in human body fluids. *Arch Biochem Biophys* 1997;341:8-16, 1997.
28. Chiba K, Andersson GBJ, **Masuda K**, Momohara S and Thonar EJ-MA. A new culture system to study the metabolism of the intervertebral disc *in vitro*. *Spine*, 1998;23(17):1821-1828.
29. D'Souza AL, **Masuda K**, Otten LM, Nishida Y, Knudson W and Thonar EJ-MA. Differential effects of interleukin-1 on hyaluronan and proteoglycan metabolism in two compartments of the matrix formed by articular chondrocytes maintained in alginate. *Arch Biochem Biophys* 2000;374:59-65.
30. Ragan PM, Chin VI, Hung H-HK, **Masuda K**, Thonar EJ-MA, Grodzinsky A.J and Sandy JD. Chondrocyte extracellular matrix synthesis and turnover is influenced by static compression in a new alginate disk culture system. *Arch Biochem Biophys* 2000;383:256-264.
31. **Masuda K** and Cole BJ. Cartilage repair; Autologous chondrocyte transplantation. [Review] *Bone, Joint, Ligament* 2001;14:845-853. (Japanese)
32. Cs-Szabo G, Ragasa-San Juan D, Turumella V, **Masuda K**, Thonar EJ-MA and An HS. Changes in message and protein levels of proteoglycans of the annulus fibrosus and nucleus pulposus during intervertebral disc degeneration. *Spine* 2002;27:2212-2219.
33. Kamada H, **Masuda K**, D'Souza AL, Lenz ME, Pietryla D, Otten L and Thonar EJ-MA. Age-related differences in the accumulation and size of hyaluronan in alginate culture. *Arch Biochem Biophys* 2002;408:192-199.
34. Qureshi AA, Viridi AS, DiDonna ML, Jacobs JJ, **Masuda K**, Paprosky WP, Thonar EJ-MA and Sumner DR. Implant design affects markers of bone resorption and formation in total hip replacement. *J Bone Mineral Res* 2002;17(5):800-7.
35. Takegami K, Thonar EJ-MA, An HS, Kamada H and **Masuda K**. Osteogenic protein-1 enhances matrix replenishment by intervertebral disc cells previously exposed to interleukin-1. *Spine* 2002;27(12):1318-25.
36. Thonar EJ-MA, An HS and **Masuda K**. Compartmentalization of the matrix formed by nucleus pulposus and annulus fibrosus cells in alginate gel. *Biochem Soc Trans* 2002;30:874-8.
37. An HS, Thonar EJ, **Masuda K**. Biological repair of intervertebral disc. *Spine* 2003;28:S86-92.
38. Homicz MR, Chia SH, Schumacher BL, **Masuda K**, Thonar EJ-MA, Sah RL and Watson D. Human septal chondrocyte redifferentiation in alginate, polyglycolic acid scaffold, and monolayer culture. *Laryngoscope* 2003;113:25-32.
39. Kim KW, Lim TH, Kim JG, Jeong ST, **Masuda K** and An HS. The origin of chondrocytes in the nucleus pulposus and histologic findings associated with the transition of a notochordal nucleus pulposus to a fibrocartilaginous nucleus pulposus in intact rabbit intervertebral discs. *Spine* 2003; 28:982-90.
40. Klein TJ, Schumacher BL, Schmidt TA, Li KW, Voegtline MS, **Masuda K**, Thonar EJ-MA and Sah RL. Tissue engineering of stratified articular cartilage from chondrocyte subpopulations. *Osteoarthritis Cartilage* 2003;11:595-602.
41. **Masuda K**, Sah RL, Hejna MJ, Thonar EJ-MA. A novel two-step method for the formation of tissue engineered cartilage by mature bovine chondrocytes: the alginate-recovered-chondrocyte (ARC) method. *J Orthop Res* 2003;21:139-148.
42. **Masuda K**, Takegami K, An HS, Kumano F, Chiba K, Andersson GB, Schmid T and Thonar EJ-MA. Recombinant osteogenic protein-1 upregulates extracellular matrix metabolism by rabbit annulus fibrosus and nucleus pulposus cells cultured in alginate beads. *J Orthop Res*

- 2003;21:922-30.
43. Muehleman C, Chapman LD, Kuettner KE, Rieff J, Mollenhauer JA, **Masuda K** and Zhong Z. Radiography of rabbit articular cartilage with diffraction-enhanced imaging. *Anat Rec A Discov Mol Cell Evol Biol* 2003;272:392-7.
44. Williamson AK, Chen AC, **Masuda K**, Thonar EJ-MA, Sah RL. Tensile mechanical properties of bovine articular cartilage: variations with growth and relationships to collagen network components. *J Orthop Res* 2003;21:872-80.
45. Williamson AK, **Masuda K**, Thonar EJ-MA, Sah RL. Growth of immature articular cartilage *in vitro*: correlated variation in tensile biomechanical and collagen network properties. *Tissue Eng* 2003;9:625-34.
46. Chia SH, Schumacher BL, Klein TJ, Thonar EJ-MA, **Masuda K**, Sah RL and Watson D. Tissue-engineered human nasal septal cartilage using the alginate-recovered-chondrocyte method. *Laryngoscope* 2004;114:38-45.
47. Lakos G, Takagawa S, Chen SJ, Ferreira AM, Han G, **Masuda K**, Wang XJ, DiPietro LA and Varga J. Targeted disruption of TGF-beta/Smad3 signaling modulates skin fibrosis in a mouse model of scleroderma. *Am J Pathol* 2004;165:203-17.
48. **Masuda K** and An HS. Growth factors and the intervertebral disc. *Spine J* 4:330S-340S, 2004.
49. **Masuda K**, Oegema TR, Jr., An HS. Growth factors and treatment of intervertebral disc degeneration. *Spine* 2004;29:2757-69.
50. Zhang Y, An HS, Song S, Toofanfard M, **Masuda K**, Andersson GBJ, Thonar EJ-MA. Growth factor osteogenic protein-1: differing effects on cells from three distinct zones in the bovine intervertebral disc. *Am J Phys Med Rehabil* 2004;83:515-21.
51. An HS, Takegami K, Kamada H, Nguyen CM, Thonar EJ-MA, Singh K, Andersson GBJ. **Masuda K**. Intradiscal administration of osteogenic protein-1 increases intervertebral disc height and proteoglycan content in the nucleus pulposus in normal adolescent rabbits. *Spine* 30:25-31, 2005.
52. Aota Y, An HS, Homandberg G, Thonar EJ-MA, Andersson GBJ, Pichika R, **Masuda K**. Differential effects of fibronectin fragment on proteoglycan metabolism by intervertebral disc cells: a comparison with articular chondrocytes. *Spine* 2005;30:722-728.
53. Chia SH, Homicz MR, Schumacher BL, Thonar EJ-MA, **Masuda K**, Sah RL, Watson D. Characterization of human nasal septal chondrocytes cultured in alginate. *J Am Coll Surg* 2005;200:691-704.
54. Kato S, Yamada H, Terada N, **Masuda K**, Lenz ME, Morita M, Yoshihara Y, Henmi O. Joint biomarkers in idiopathic femoral head osteonecrosis: comparison with hip osteoarthritis. *J Rheumatol* 2005;32:1518-23.
55. **Masuda K**, Aota Y, Muehleman C, Imai Y, Okuma M, Thonar EJ-MA, Andersson GBJ, An HS. A novel rabbit model of mild, reproducible disc degeneration by an annulus needle puncture: correlation between the degree of disc injury and radiological and histological appearances of disc degeneration. *Spine* 2005;30:5-14.
56. Miyamoto K, An HS, Sah RL, Akeda K, Okuma M, Otten L, Thonar EJ-MA, **Masuda K**. Exposure to pulsed low intensity ultrasound stimulates extracellular matrix metabolism of bovine intervertebral disc cells cultured in alginate beads. *Spine* 2005;30:398-405.
57. Singh K, **Masuda K**, An HS. Animal models for human disc degeneration. *Spine* 2005;J 5:267S-279S.
58. Takegami K, An HS, Kumano F, Chiba K, Thonar E, Singh K, **Masuda K**. Osteogenic protein-1 is most effective in stimulating nucleus pulposus and annulus fibrosus cells to repair their matrix after chondroitinase ABC-induced *in vitro* chemonucleolysis. *Spine J* 2005;5:231-8.
59. Akeda K, An HS, Okuma M, Attawia M, Miyamoto K, Thonar EJ-MA, Lenz ME, Sah RL, **Masuda K**. Platelet-rich plasma stimulates porcine articular chondrocyte proliferation and matrix biosynthesis. *Osteoarthritis Cartilage*, 2006;14:1272-80.
60. Akeda K, An HS, Pichika R, Attawia M, Thonar EJ-MA, Lenz ME, Uchida A, **Masuda K**. Platelet-rich plasma (PRP) stimulates the extracellular matrix metabolism of porcine nucleus pulposus and annulus fibrosus cells cultured in alginate beads. *Spine* 2006;31:959-966.

61. An HS and **Masuda K**. Relevance of *in vitro* and *in vivo* models for intervertebral disc degeneration. J Bone Joint Surg Am 2006;88(Suppl 1):88-94.
62. An HS, **Masuda K**, Inoue N. Intervertebral disc degeneration: biological and biomechanical factors. J Orthop Sci, 2006;11:541-52. PMID: PMC2778630.
63. Aoki Y, Akeda K, An H, Muehleman C, Takahashi K, Moriya H, **Masuda K**. Nerve fiber ingrowth into scar tissue formed following nucleus pulposus extrusion in the rabbit anular-puncture disc degeneration model: effects of depth of puncture. Spine 2006;31:E774-80.
64. Aota Y, An HS, Imai Y, Thonar EJ-MA, Muehleman C, **Masuda K**. Comparison of cellular response in bovine intervertebral disc cells and articular chondrocytes: effects of lipopolysaccharide on proteoglycan metabolism. Cell Tissue Res 2006;326:787-93.
65. Chawla K, Klein TJ, Schumacher BL, Schmidt TA, Voegtline MS, Thonar EJ-MA, **Masuda K**, Sah RL. Tracking chondrocytes and assessing their proliferation with PKH26: Effect on secretion of proteoglycan 4 (PG4). J Orthop Res 2006;24:1499-1508.
66. Chujo T, An HS, Akeda K, Miyamoto K, Muehleman C, Attawia M, Andersson GBJ, **Masuda K**. Effects of growth differentiation factor-5 on the intervertebral disc--*in vitro* bovine study and *in vivo* rabbit disc degeneration model study. Spine 2006;31:2909-17.
67. Klein TJ, Schumacher BL, Blewis ME, Schmidt TA, Voegtline MS, Thonar EJ-MA, **Masuda K**, Sah RL. Tailoring secretion of proteoglycan 4 (PRG4) in tissue-engineered cartilage. Tissue Eng. 2006 Jun;12(6):1429-39.
68. Li J, Jadin K, **Masuda K**, Sah RL, Muehleman C. Characterization of lesions of the talus and description of tram-track lesions. Foot Ankle Int 2006;27:344-55.
69. **Masuda K**, Abe Y, Setton L, Bonassar L. Current status of biomaterial and biological repair in the intervertebral disc. Biomaterial 2006 (Japanese) 2006;24(6):432-42,.
70. **Masuda K** and An HS. Prevention of disc degeneration with growth factors. Eur Spine J 2006;15(Suppl 3):S422-32. PMID: PMC2335371.
71. **Masuda K**, Imai Y, Okuma M, Muehleman C, Nakagawa K, Akeda K, Thonar EJ-MA, Andersson GBJ, An HS. Osteogenic protein-1 injection into a degenerated disc induces the restoration of disc height and structural changes in the rabbit anular puncture model. Spine 2006;31:742-754.
72. **Masuda K**, Pfister BE, Sah RL, Thonar EJ-MA. Osteogenic protein-1 promotes the formation of tissue-engineered cartilage using the alginate-recovered-chondrocyte method. Osteoarthritis Cartilage 2006;14:384-91.
73. Miyamoto K, **Masuda K**, Inoue N, Okuma M, Muehleman C, An HS. Anti-adhesion properties of a thrombin-based hemostatic gelatin in a canine laminectomy model: A biomechanical, biochemical, and histologic study. Spine 2006;31:E91-7.
74. Miyamoto K, **Masuda K**, Kim JG, Inoue N, Akeda K, Andersson GBJ, An HS. Intradiscal injections of osteogenic protein-1 restore the viscoelastic properties of degenerated intervertebral discs. Spine J, 2006;6:692-703.
75. Abe Y, Akeda K, An HS, Aoki Y, Pichika R, Muehleman C, Kimura T, **Masuda K**. Proinflammatory cytokines stimulate the expression of nerve growth factor by human intervertebral disc cells. Spine (Phila Pa 1976). 2007 Mar 15;32(6):635-42.
76. Akeda K, An HS, Pichika R, Patel K, Muehleman C, Nakagawa K, Uchida A, **Masuda K**. The expression of NG2 proteoglycan in the human intervertebral disc. Spine (Phila Pa 1976). 2007 Feb 1;32(3):306-14.
77. Aoki Y, An HS, Takahashi K, Miyamoto K, Lenz ME, Moriya H, **Masuda K**. Axonal growth potential of lumbar dorsal root ganglion neurons in an organ culture system: Response of nerve growth factor-sensitive neurons to neuronal injury and an inflammatory cytokine. Spine (Phila Pa 1976). 2007 Apr 15;32(8):857-63.
78. Asanbaeva A, **Masuda K**, Thonar EJ, Klisch SM, Sah RL. Mechanisms of cartilage growth: Modulation of balance between proteoglycan and collagen *in vitro* using chondroitinase ABC. Arthritis Rheum. 2007 Jan;56(1):188-98.
79. Chawla K, Klein T, Schumacher B, Jadin K, Shah B, Nakagawa K, Wong V, Chen AC, **Masuda K**, Sah RL. Short-term retention of chondrocytes in stratified tissue-engineered cartilaginous

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INVITED LECTURES

1. "Chondrocyte Culture in Alginate - from Cartilage Matrix Metabolism to Chondrocyte Transplantation." The 32nd Annual Meeting of Japanese Rheumatoid Arthritis Association, Tokyo, May 8, 1998.
2. "Alginate-Recovered-Chondrocyte Method (ARC Method). A new Approach for the Formation of Cartilaginous Tissue *In Vitro*, Advances in Tissue & Genetic Engineering for the Treatment of Arthritic Diseases." Organized by the Knowledge Foundation, Boston, September 11-12, 2000.
3. "The New Approach for Tissue Engineering." Annual Meeting of the Japanese Society of Cartilage Metabolism, March 9-10, 2001.
4. "The Alginate-Recovered-Chondrocyte Method (ARC Method): A Scaffold-Free Approach for the Formation of Cartilaginous Tissue *In Vitro*." 5th Annual Orthopaedic Tissue Engineering conference, Boston, MA, May 17-18, 2001.
5. "The Regeneration of Cartilage and Intervertebral Disc." The Tokai Nankotsu – Symposium. Nagoya, Japan, February 28, 2002.
6. "The Tissue Engineering of Articular Cartilage." The Mie Symposium of Tissue Engineering and Regeneration Medicine, Mie, Japan, March 2, 2002.
7. "Tissue Engineering of the Intervertebral Disc." The Study Group for Nerve and Spine, Tokyo, Japan, March 16, 2002.
8. "The Intervertebral Disc: The Use of Growth Factors and Tissue Engineering." The 17th Annual Meeting of the Japanese Society of Spinal Surgery, Shizuoka, Japan, June 13, 2002.
9. "Intervertebral Disc Repair." Gordon Research Conference on Musculoskeletal Biology & Bioengineering, July 25-30, 2004.
10. "Biological Regeneration of the Intervertebral Disc." The 5th Annual Meeting of the Locomotor

- Science, Tateyama, Toyama, Japan, August 27-28, 2004.
11. "Biological Repair of Intervertebral Disc." The 18th Annual Meeting of the Japanese Society of Cartilage Metabolism, Osaka, March 18-19, 2005.
 12. "Growth Factors in Disc Repair." ECM VI/SRNI: Spinal Motion Segment: From Basic Science to Clinical Application, Davos, July 4-7, 2005.
 13. "New Approaches for Degenerated Disc Disease – Targeting the Catabolic Pathway. The 20th Annual Orthopedic Research Meeting of the Japanese Orthopedic Association, Tsu, Japan, October 20-21, 2005.
 14. "Research as an Orthopedic Surgeon – Translational Approach. The 20th Annual Orthopedic Research Meeting of the Japanese Orthopedic Association, Tsu, Japan, October 20-21, 2005.
 15. "Repair of Degenerated Disc by an Injection of Growth Factor." Key Note Lecture, Fraunhofer Life Science Symposium Leipzig 2006. Leipzig, Germany, October 22-25, 2006.
 16. "GDF-5 Treatment of Degenerative Discs." First International Conference on the Biology and Therapeutic Potential of GDF-5, Boston, USA, October 24-25, 2006.
 17. "The In Vivo Therapeutic Effect of rhBMP-7 on Disc Degeneration." Biospine 2, Leipzig, Germany, September 20-22, 2007.
 18. "Growth Factor Therapy for Intervertebral Disc Repair." Workshop 3, 6th Combined Meeting of the Orthopedic Research Societies of Australia/New Zealand, Britain, Canada, Europe, Japan, Korea, Taiwan, USA. Honolulu, Oct 20-24, 2007.
 19. "Disc Degeneration Models and Advancement of IVD Therapies into Clinical Trials." 2008 Pre-Tissue Engineering International & Regenerative Medicine Society (TERMIS)-NA Special Interest Group Workshop Sponsored by NIAMS, NIH: Translational Models for Musculoskeletal Tissue Engineering and Regenerative Medicine, La Jolla, CA, December 7, 2008.
 20. "Degeneration and Regeneration of the Intervertebral Disc and Facet Joint." Chubu Seikei Saigai, Kobe, Japan, Oct 2-3, 2009.
 21. "Dominant-negative tumor necrosis factor effectively antagonizes interleukin-1beta-induced catabolic changes in human intervertebral disc cells." World Forum for Spine Research 2010—The Intervertebral Disc. Montreal, Canada, July 5-8, 2010 (ST1).
 22. "Facet cartilage degeneration correlated with disc degeneration in human cadaveric spines: quantitative analysis of facet joint cartilage surface degeneration pattern." World Forum for Spine Research 2010—The Intervertebral Disc. Montreal, Canada, July 5-8, 2010 (ST10).
 23. "Biological repair and maintenance of cytokine homeostasis in the intervertebral disc." World Forum for Spine Research 2010—The Intervertebral Disc, Symposium 3: Motion preservation synthetic/hybrid/biological, Montreal, Canada, July 5-8, 2010 (S3.3).
 24. "Growth factor therapy for intervertebral disc repair." Workshop 2. The 7th Combined Meeting of the Orthopaedic Research Societies (CORS), Kyoto, Japan, Oct 16-20, 2010.
 25. "Intradiscal injection therapy: How can molecules be systematically tested?" Symposium 5: Translational and Clinical Studies. Spine Research Symposium: New Horizons in Intervertebral Disc Research, Philadelphia, PA USA, Nov 16-18, 2011 (S5.2).
 26. "Translational research – in vitro to preclinical." World Forum for Spine Research 2012—Pre-meeting tutorial - starting disc research. Helsinki, Finland, June 18-21, 2012 (T1.02).
 27. "Rabbit models for degenerative disc disease: Structure and symptoms." World Forum for Spine Research 2012—Disc preservation I: Evaluation models. Helsinki, Finland, June 18-21, 2012

(S4.02).

28. "Regeneration of degenerated disc; pain suppression?" The 27th Annual Research Meeting of the Japanese Orthopaedic Association: Instructional lecture 2. Nayoya City, Japan, October 26-27, 2012.

SCIENTIFIC MEETING MODERATOR

- 2006 North American Spine Society, 21st Annual Meeting.
- 2007 BIOSPINE 2, 2nd International Congress, Biotechnologies for Spinal Surgery, September 20-22, 2007 in Leipzig, Germany. Session: Biomolecular Engineering, moderator.
- 2008 Orthopedic Research Society (ORS), 54th Annual Meeting. Session 1: Disc Biology, moderator
- 2008 World Forum for Spine Research, Kyoto, Japan. Session: Mechanisms of Disc Degeneration/Animal Models, moderator.
- 2009 International Society for the Study of the Lumbar Spine (ISSLS), 36th Annual Meeting. Special Emphasis Poster Session moderator.
- 2010 International Society for the Study of the Lumbar Spine (ISSLS), 37th Annual Meeting. Auckland NZ, Special Emphasis Poster Session #1C, Nerve/Cell Biology, moderator.
- 2011 Spine Research Symposium: New Horizons in Intervertebral Disc Research, Philadelphia, PA USA. Symposium 4: Tissue Engineering and Regenerative Medicine, moderator.
- 2012 World Forum for Spine Research, Helsinki, Finland, Session: Disc preservation II: From bench to bedside, where do we stand?, moderator.
- 2012 Orthopedic Research Society (ORS), Annual Meeting. San Francisco, CA USA, Spotlight Session 011: Spine, moderator.
- 2013-14 Orthopedic Research Society (ORS), Annual Meeting, Session Chair, Spine Therapeutics

VISITING FELLOWS/SCHOLARS:

- 11/2012 – 8/2013 Tsutao Katayama, Ph.D., (Visiting Scholar) on sabbatical from Faculty of Engineering, Doshisha University, Kyoto, Japan
- 4/2013 – 4/2014 Daisuke Sakai, M.D., Ph.D. (Visiting Scholar) on sabbatical from Tokai University School of Medicine, Kanagawa, Japan

SERVICE

Participation in peer review for funding agency

- 2000-2004 National Institute of Aging Initial Review Group, Biological Aging Review Committee
- 2006- Canadian Institute of Health, Reviewer, CIHR Team grant (Canada)
- 2006- Research into Ageing, Referee (UK)
- 2009- AOSpine Research Commission, reviewer

Peer review for scientific meeting abstracts

- 2005–2007 Annual meeting abstract review, International Society for the Study of the Lumbar Spine
- 2008 54th Annual Meeting of the Orthopedic Research Society, adjunct reviewer

Koichi Masuda, M.D.

2008	World Forum for Spine Research, reviewer
2010	56 th Annual Meeting of the Orthopedic Research Society, adjunct reviewer
2010	World Forum for Spine Research, reviewer

Reviewer

Present	J Rheumatology, Spine Journal, Eur Spine J, J Orthop Res, Medical & Biological Engineering & Computing, Spine, Biomaterial, Cytokine, Tissue Engineering, Osteoarthritis and Cartilage, Spine, Arthritis Rheumatism, Cell Tissue Research, Arthritis Research and Therapy, Clinical Orthopaedics and Related Research
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