REFERENCES

Ahn, J.S., Choi, H.K. and Cho, C.S. (2001) A novel mucoadhesive polymer prepared by template polymerization of acrylic acid in the presence of chitosan. Biomaterials, 22, 923-928.

Aiedeh, K. and Taha, M.O. (1999) Synthesis of Chitosan succinate and chitosan phthalate and their evaluation as suggested matrices in orally administered, colon-specific drug delivery systems Archiv der Pharmazie, 332, 103 – 107.

Al-Assaf, S., Navaratnam, S., Parsons, B.J. and Phillips, G.O. (2003) The chain scission of hyaluronan by peroxynitrite. Arch Biochem Biophy, 411, 73–82.

Aoyagi, S., Onishi, H. and Machida, S.(2007) Novel chitosan wound dressing loaded with minocycline for the treatment of severe burn wounds International Journal of Pharmaceutics, 330, 138-145.

Aydin, Z. and Akbuğa, J. (1996) Chitosan beads for the delivery of salmon calcitonin: Preparation and release characteristics. International Journal of Pharmaceutics, 131, 101-103.

Bhattarai, N., Ramay, H.R., Gunn, J., Matsen, F.A. and Zhang, M.Q. (2005) PEG-grafted chitosan as an injectable thermosensitive hydrogel for sustained protein release. Journal of Control Release, 103, 609–624.

Chien, P.J., Sheu, F., Huang, W.T. and Su, M.S. (2007) Effect of molecular weight of chitosans on their antioxidative activities in apple juice. Food Chemistry, 102, 1192–1198.

Choi, W.S., Ahn, K.J., Lee, D.W., Byun, M.W. and Park, H.J. (2002) Preparation of chitosan oligomers by irradiation. Polymer Degradation and Stability,78, 533–538.

Dai, Y.N., Li, P., Zhang, J.P., Wang, A.Q. and Wei, Q. (2008) A novel pH sensitive *N*-succinyl chitosan/alginate hydrogel bead for nifedipine delivery Biopharmaceutics and Drug Disposition, 29, 173–184.

Felinto, M.C.F.C., Parra, D.F., Silva, C.C.D, Angerami, J., Oliveira, M.J.A. and Lugão, A.B. (2007) The swelling behavior of chitosan hydrogels membranes obtained by UV- and γ-radiation. Nuclear Instruments and Methods in Physics Research B, 265, 418–424.

Feng, T., Du, Y., Li, J., Hu, Y. and Kennedy, J.F. (2008) Enhancement of antioxidant activity of chitosan by irradiation. Carbohydrate Polymers, 73, 126–132.

Freier, T., Koh, H.S., Kazazian, K. and Shoichet, M.S. (2005) Controlling cell adhesion and degradation of chitosan films by *N*-acetylation. Biomaterials, 26, 5872–5878.

Grabovac, V., Guggi, D. and Schnürch, A.B. (2005) Comparison of the mucoadhesive properties of various polymers B. Advanced Drug Delivery Reviews, 57, 1713– 1723.

Griffon, D.J., Sedighi, M.R., Schaeffer, D.V., Eurell, J.A. and Johnson, A.L. (2006) Chitosan scaffolds: Interconnective pore size and cartilage engineering Acta Biomaterialia, 2, 313–320.

Hai, L., Diep, T.B., Nagasawa, N., Yoshii, F. and Kume, T. (2003) Radiation depolymerization of chitosan to prepare oligomers. Nuclear Instruments and Methods in Physics Research B; 208, 466–470.

Heinemann, C., Heinemann, S., Lode, A., Bernhardt, A., Worch, H. and Hanke, T., (2009) In vitro Evaluation of textile chitosan scaffolds for tissue engineering using human bone marrow stromal cells. Biomacromolecules, 10, 1305–1310.

Helander, I.M., Nurmiaho-Lassila, E.L., Ahvenainen, R., Rhoades, J. and Roller, S. (2001) Chitosan disrupts the barrier properties of the outer membrane of gram-negative bacteria. International Journal of Food Microbiology, 71, 235– 244.

Huang, L., Peng, J., Zhai, M., Li, J. and Wei, G. (2007) Radiation-induced changes in carboxymethylated chitosan. Radiation Physics and Chemistry, 76, 1679-1683.

Huang, L., Zhai, M., Peng, J., Li, J. and Wei, G. (2007) Radiation-induced degradation of carboxymethylated chitosan in aqueous solution. Carbohydrate Polymers, 67, 305-312.

Izume, M. (1998) The application of chitin and chitosan to cosmetics. Chitin Chitosan Research, 4, 12–17.

Jameela, S.R. and Jayakrishnan, A. (1996) Glutaraldehyde cross-linked chitosan microspheres as a long acting biodegradable drug delivery vehicle: studies

on the *in vitro* release of mitoxantrone and *in vivo* degradation of microspheres in rat muscle.Biomaterials, 16, 769-775.

Kamiyama, K., Onishi, H. and Machida, Y. (1999) Biodisposition characteristics of *N*-succinyl-chitosan and glycol-chitosan in normal and tumor-bearing mice. Biological and Pharmaceutical Bulletin, 22, 179-186.

Kang, B., Dai, Y.D., Zhang, H.Q. and Chen, D. (2007) Synergetic degradation of chitosan with gamma radiation and hydrogen peroxide. Polymer Degradation and Stability, 92, 359-362.

Kato,Y., Onishi, H., Machida, Y.(2004) *N*-succinyl-chitosan as a drug carrier:water-insoluble and water-soluble conjugates (review). Biomaterial, 25, 907–915.

Khan, T.A. and Peh, K.K. (2003) A preliminary investigation of chitosan film as dressing for punch biopsy wounds in rats. Journal of Pharmacy and Pharmaceutical Sciences, 6, 20-26.

Kurita, K. (2001) Controlled fractionalization of the polysaccharide chitin. Progress in Polymer science, 26, 1921-1971.

Kurita, K., Tomita, K., Tada, T., Ishii, S., Nishimura, S.I and Shimoda, K. (1993) Squid chitin as a potential alternative chitin source: deacetylation behavior and characteristic property. Journal of Polymer science, Part A: Polymer Chemistry, 31, 485-491.

Lam, N.D. and Diep, T.B. (2003) A preliminary study on radiation treatment of chitosan for enhancement of antifungal activity tested on fruit-spoiling strains Nuclear Science and Technology, 2, 54 – 60.

Liu, H., Du, Y., Wang, X. and Sun, L. (2004) Chitosan kills bacteria through cell membrane damage. International Journal of Food Microbiology, 95, 147–155.

Martino, A.D., Sittinger, M. and Risbuda, M.V., (2005) Chitosan: A versatile biopolymer for orthopaedic tissue-engineering. Biomaterials, 26, 5983–5990.

Masson, V., Maurin, F., Fessi, H. and Devissaguet, J.P. (1997) Influence of sterilization processes on poly(caprolactone) nanospheres. Biomaterials, 18, 327–335.

Matsuhashi, S. and Kume, T. (1997) Enhancement of antimicrobial activity of chitosan by irradiation. Journal of the Science of Food and Agriculture, 73, 237–241.

Mi, F.L., Sung, H.W. and Shyu, S.S. (2000) Synthesis and characterization of a novel chitosan-based network prepared using naturally occurring crosslinker. Journal of Polymer Science Part B: Polymer Chemistry, 38, 2804 – 2814.

Mia, F.L., Sung, H.W., Shin-Shing Shyu, S.S., Sua, C.C. and Peng, C.K. (2003) Synthesis and characterization of biodegradable TPP/genipin cocrosslinked chitosan gel beads. Polymer, 44, 6521–6530.

Minagawa, T., Okamura, Y. Shigemasa, Y., Minami, S and Okamoto, Y. (2007) Effects of molecular weight and deacetylation degree of chitin/chitosan on wound healing. Carbohydrate Polymers, 67, 640–644.

Muzzarelli, R., Tarsi, R., Filippini, O., Giovanetti,E., Biagini, G. and Varaldo, P.E. (1990) Antimicrobial Properties of *N*-Carboxybutyl Chitosan, Antimicrobial Agents and Chemotherapy, 34, 2019-2023.

Nordtveit, R.J., Varum, K.M. and Smidstrod, O. (1996) Degradation of partially *N*-acetylated chitosans with hen egg white and human lysozyme. Carbohydrate Polymer, 29, 163–167.

Noble, L., Gray, A.I., Sadiq, L. and Uchegbu, I.F. (1999) A non-covalently cross-linked chitosan based hydrogel. International Journal of Pharmaceutics, 192, 173–182.

Ono, K., Saito, Y., Yura, H., Ishikawa, K., Kurita, A. and Akaike, T. (2000) Photocrosslinkable chitosan as a biological adhesive. Journal of Biomedical Materials Research., 49, 289–295.

Papineau, A.M., Hoover, D.G., Dnorr, D. and Farkas, D.F. (1991) Antimicrobial effect of water-soluble chitosans with high hydrostatic pressure. Food Biotechnology, 5, 45– 57.

Park, K.M., Lee, S.Y., Joung, Y.K., Na, J.S., Lee, M.C. and Park, K.D. (2009) Thermosensitive chitosan–pluronic hydrogel as an injectable cell delivery carrier for cartilage regeneration. Acta Biomaterialia, 5, 1956–1965.

Park, P.J., Je, J.Y. and Kim, S.K. (2004) Free radical scavenging activities of differently deacetylated chitosan using an ESR spectrometer. Carbohydrate Polymers, 55, 17–22.

Raafat, D., Bargen, K.V., Haas, A. and Sahl, H.G. (2008) Insights into the mode of action of chitosan as an antibacterial compound. Applied and environmental microbiology, 74, 3764–3773.

Sangsanoh, P., Waleetorncheepsawat, S., Suwantong, O., Wutticharoenmongkol P., Weeranantanapan, O., Chuenjitbuntaworn, B., Cheepsunthorn, P., Pavasant, P. and Supaphol, P. (2007) In vitro biocompatibility of schwann cells on surfaces of biocompatible polymeric electrospun fibrous and solution-cast film scaffolds. Biomacromolecules, 8, 1587-159.

Sezer, A.D., Hatipoğlu, F, Cevher, E.,Oğurtan, Z., Baş, A. L. and Akbuğa, J. (2007) Chitosan film containing fucoidan as a wound dressing for dermal burn healing: Preparation and in vitro/in vivo evaluation. AAPS Pharmaceutical Science and Technology, 8, E1-E8.

Shu, X.Z. and Zhu, K.J. (2002) Controlled drug release properties of ionically cross-linked chitosan beads: the influence of anion structure. International Journal of Pharmaceutics,233, 217-225.

Sudarshan, N.R., Hoover, D.G. and Knorr, D. (1992) Antibacterial action of chitosan. Food Biotechnology,6, 257– 272.

Tajima, M, Izume, M, Fukuhara, T, Kimura, T and Kuroyanagi, Y. (2000) Development of new wound dressing composed of *N*-succinyl chitosan and gelatin. Seitai Zairyo, 18, 220–226.

Takahashi, T. (2004) Trend of radiation sterilization business in Japan and how to develop new applications. Radiation Physics and Chemistry, 71, 539–542.

Tolaimate, A., Desbrieres, J., Rhazia, M. and Alagui, A. (2003) Contribution to the preparation of chitins and chitosans with controlled physico-chemical properties. Polymer,44, 7939–7952.

Ueno, H., Mori, T. and Fujinaga, T. (2001) Topical formulations and wound healing applications of chitosan. Advanced Drug Delivery Reviews, 52, 105–115.

Ueno, H., Yamada, H., Tanaka, I., Kaba, N., Matsuura, M., Okumura, M., Kadosawa, T. and Fujinaga, T. (1999) Accelerating effects of chitosan for

healing at early phase of experimental open wound in dogs. Biomaterials, 20, 1407–1414.

VandeVord, P.J., Matthew, H.W., DeSilva, S.P., Mayton, L., Wu, B. and Wooley, P.H. (2002) Evaluation of the biocompatibility of a chitosan scaffold in mice. Journal of Biomedical Materials Research, 59, 585-590.

Varum, K.M., Ottoy, M.H. and Smidsrod, O. (1994) Water-solubility of partially *N*-acetylated chitosans as a function of pH: effect of chemical composition and depolymerization. Carbohydrated Polymer, 25, 65–70.

Vongchan, P., Sajomsang, W., Subyen, D. and Kongtawelert, P. (2002) Anticoagulant activity of a sulfated chitosan. Carbohydrate Research, 337, 1239–1242.

Sannan, T., Kurita, K. and Iwakura, Y. (1976) Studies on chitin, 2 Effect of deacetylation on solubility Die Makromolekulare Chemie, 177, 3589–3600.

Song, Y., Onishi, H. and Nagai, T. (1993) Conjugate of mitomycin C with *N*-succinyl-chitosan: In vitro drug release properties, toxicity and antitumor activity. International Journal of Pharmaceutics, 98, 121-130.

Sun, S. and Wang, A. (2006) Adsorption properties of *N*-succinyl-chitosan and cross-linked *N*-succinyl-chitosan resin with Pb(II) as template ions. Separation and Purification Technology, 51, 409–415.

Sun, S., Wang, Q. and Wang, A. (2007) Adsorption properties of Cu (II) ions onto *N*-succinyl-chitosan and crosslinked *N*-succinyl-chitosan template resin. Biochemical Engineering Journal, 36, 131–138.

Wasikiewicz, J.M., Yoshii, F., Nagasawa, N., Wach, R.A. and Mitomo, H. (2005) Degradation of chitosan and sodium alginate by gamma radiation, sonochemical and ultraviolet method. Radiation Physics and Chemistry, 73, 287-295.

Xie, W., Xu, P. and Liu, Q. (2001) Antioxidant activity of water soluble chitosan derivatives. Bioorganic and Medical Chemistry Letters, 11, 1699–1701.

Xing, R., Liu, S., Guo, Z., Yu, H., Wang, P. and Li, C. (2005) Relevance of molecular weight of chitosan and its derivatives and their antioxidant activities in vitro. Bioorganic and Medicinal Chemistry, 13, 1573–1577.

Xue, C., Yu, G., Hirata, T., Terao, J. and Lin, H. (1998) Antioxidative activities of several marine polysaccharides evaluated in a phosphatidylcholine-liposomal suspension and organic solvents. Bioscience, Biotechnology and Biochemistry, 62, 206–209.

Yang, Q., Dou, F., Liang, B. and Shen, Q. (2005) Studies of cross-linking reaction on chitosan fiber with glyoxal. Carbohydrate Polymers, 59, 205-210.

Yen, M.T., Yang, J.H. and Mau, J.L. (2008) Antioxidant properties of chitosan from crab shells. Carbohydrate Polymers, 74, 840–844.

Yin, X.Q., Lin, Q., Zhang, Q. and Yang, L.C. (2002) Reactive oxygen scavenging activity of chitosan and its metal complexes. Chemical Abstracts,138, 66601.

Yoshii, F., Zhao, L., Wach, R.A., Nagasawa, N., Mitomo, H. and Kume, T. (2003) Hydrogels of polysaccharide derivatives crosslinked with irradiation at paste-like condition. Nuclear Instruments and Methods in Physics Research B, 208, 320-324.

Yuan, Y., Chesnutt, B.M., Utturkar, G., Haggard, W.O., Yang, Y., On, J.L. and Bumgardner, J.D. (2007) The effect of cross-linking of chitosan microspheres with genipin on protein release. Carbohydrate Polymers, 68, 561-567.

Yui, T., Imada, K., Okuyama, K., Obata, Y., Suzuki, K. and Ogawa, K. (1994) Molecular and crystal structure of the anhydrous form of chitosan. Macromolecules, 27, 7601-7605.

Zheng, L.Y. and Zhu, J.F. (2003) Study on antimicrobial activity of chitosan with different molecular weights. Carbohydrate Polymers, 54, 527–530.

Zhong, Z., Ji, X., Xing, R., Liu, S., Guo, Z., Chen, X. and Li, P. (2007) Thepreparation and antioxidant activity of the sulfanilamide derivatives of chitosan and chitosan sulfates. Bioorganic and Medicinal Chemistry, 15, 3775–3782.

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2. Vanichvattanadecha C., Supaphol P., and Rujiravanit R. (2008) Preparation and physico-chemical characteristics of *N*-maleoyl chitosan films. Macromolecular Symposia, 264, 121-126.

Proceedings:

1. Vanichvattanadecha C., Supaphol P., Tokura S., Furuike T., Tamura H., and Rujiravanit R. (2009, August 20-21) Succinylation of chitosan hydrogel via citric acid and their characterization. Proceedings of the 23th Symposium on Chitin and Chitosan, Saga, Japan.

2. Vanichvattanadecha C., Supaphol P., and Rujiravanit R. (2006, April 23-26) Antimicrobial activity of chitosan and *N*-(carboxyacyl) chitosan. Proceedings of

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Presentations:

1. Vanichvattanadecha C., Supaphol P., Nagasawa N., Tamada M., Tokura S., Furuike T., Tamura H., and Rujiravanit R. (2009, August 24-25) Modification and characterization of *N*- succinyl chitosan hydrogel. Paper presented at International Symposium in Science and Technology-Collaboration between ASEAN Countries in Environment and Life Science, Information Technology and Civil Engineering, Osaka, Japan.
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3. Vanichvattanadecha C., Supaphol P., Nagasawa N., Tamada M., Tokura S., Furuike T., Tamura H., and Rujiravanit R. (2008, September 24-26) Effect of radiation on *N* - succinyl chitosan in solid state and dilute aqueous solution. Paper presented at The 57th (2) SPSJ Symposium on Macromolecules, Osaka, Japan.
4. Vanichvattanadecha C., Supaphol P., Nagasawa N., Tamada M., Tokura S., Furuike T., Tamura H., and Rujiravanit R. (2008, August 5-6) Effect of radiation on aqueous solution of succinyl chitosan. Paper presented at The 22th Symposium on Chitin and Chitosan, Niigata, Japan.
5. Vanichvattanadecha C., Supaphol P., Tokura S., Furuike T., Tamura H., and Rujiravanit R. (2008, May 28-30) Release behavior of *N*-maleoyl chitosan films. Paper presented at The 57th (1) SPSJ Symposium on Macromolecules, Yokohama, Japan.
6. Vanichvattanadecha C., Supaphol P., Tokura S., Furuike T., Tamura H., and Rujiravanit R. (2007, December 4-7) Release behavior of *N*-maleoyl chitosan films Paper presented at The 10th Pacific Polymer Conference (PPC10), Kobe, Japan.

7. Vanichvattanadecha C., Supaphol P., Tokura S., Tamura H., and Rujiravanit R. (2007, July 31-August 1) Self crosslinking and swelling characteristic of *N*-maleoyl chitosan film. Paper presented at Paper presented at International Symposium in Science and Technology-Collaboration between ASEAN Countries in Environment and Life Science, Information Technology and Civil Engineering, Osaka, Japan.
8. Vanichvattanadecha C., Supaphol P., Tokura S., Tamura H., and Rujiravanit R. (2007, June 25-28) Self crosslinking and swelling characteristic of *N*-maleoyl chitosan film Paper presented at The 2nd International Conference on Advances in Petrochemicals and Polymers (The 2nd ICAPP), Bangkok, Thailand.
9. Vanichvattanadecha C., Supaphol P., and Rujiravanit R., (2006, April 23-26) Antimicrobial activity of chitosan and *N*-(carboxyacyl) chitosan. Paper presented at The 7th Asia-Pacific Chitin and Chitosan Symposium (The 7th APCCS), Busan, Korea.