



REFERENCES

- Altman, G.H., Horan, R.L., Lu, H.H., Moreau, J., Martin, I., Richmond, J.C., and Kaplan, D.L. (2002) Silk matrix for tissue engineered anterior cruciate ligaments. *Biomaterials*, 23(20), 4131-4141.
- Altman, G.H., Diaz, F., Jakuba, C., Calabro, T., Horan, R.L., Chen, J., Lu, H., Richmond, J., and Kaplan, D.L. (2003) Silk-based materials. *Biomaterials*, 24(3), 401-416.
- Atiyeh, B.S., Costagliola, M., Hayek, S.N., and Dibo, S.A. (2007) Effect of silver on burn wound infection control and healing: review of the literature. *Burns*, 33(2), 139-148.
- Barclay, T.L. (1970) Chemical Thesis. University of Edinburgh.
- Barclay, T.L. (1971) Faecal *Pseudomonas aeruginosa* in patients with burns. In Transactions of Fifth International Congress of Plastic and Reconstructive Surgery. p.843. Sydney: Butterworths.
- Brett, D.W. (2006) A discussion of silver as an antimicrobial agent: Alleviating the confusion. *Ostomy Wound Manage* 52(1), 34-41.
- Burkatovskaya, M., Tegos, G.P., Swietlik, E., Demidova, T.N., Castano, A.P., and Hamblin, M.R. (2006) Use of chitosan bandage to prevent fatal infections developing from highly contaminated wounds in mice. *Biomaterials*, 27(22), 4157-4164.
- Burrell, R.E. (2003) A scientific perspective on the use of topical silver preparation. *Ostomy Wound Manage* 49(5A Suppl), 19-24.
- Cason, J.S. and Lowbury, E.J.L. (1960) Prophylactic chemotherapy for burns. *Lancet*, ii, 501.
- Chen, D. H. and Chen, Y.Y. (2002) Synthesis of strontium ferrite nanoparticles by coprecipitation in the presence of polyacrylic acid. *Materials Research Bulletin* 37(4), 801-810.
- Chirila, T.V., Barnard Z., Harkin, D.G., Schwab, I.R., and Hirst, L.W. (2008) *Bombyx mori* silk fibroin membranes as potential substrata for epithelial

- constructs used in the management of ocular surface disorders. Tissue Engineering Part A, 14(7), 1203-1211.
- Cho, K.H., Park, J.E., Osaka, T., and Park, S.G. (2005) The study of antimicrobial activity and preservative effects of nanosilver ingredient. Electrochimica Acta, 51(5), 956-960.
- Colebrook, L., Clark, A.M. Gibson, T., and Todd, J.P. (1945) Studies of burns and scalds. Special Report Series of the Medical Research Council (London), no. 249.
- Colebrook, L. (1950) A new approach to the treatment of burns and scalds. London: Fine Technical Publications.
- Cooper, M. L., Boyce, S.T., Hansbrough, J.F., Foreman, T.J., and Frank, D.H. (1990) Cytotoxicity to cultured human keratinocytes of topical antimicrobial agents. Journal of Surgical Research 48(3), 190-195.
- Daniel, M.C. and Astruc, D. (2004) Gold nanoparticles: Assembly, supramolecular chemistry, quantum-size-related properties, and applications toward biology, catalysis, and nanotechnology. Chemical Reviews 104(1), 293-346.
- Davis, J.H., Artz, C.P., Reiss, E., and Amspacher, W.H. (1953) Practical technics in the care of the burn patient. American Journal of Surgery 86(6), 713-717.
- Draye, J.P., Delaey, B., Van de Voorde, A., Van Den Bulcke A., De Reu, B., and Schacht, E. (1998) In vitro and in vivo biocompatibility of dextran dialdehyde cross-linked gelatin hydrogel films. Biomaterials, 19(18), 1677-1687.
- Dror, Y., Cohen, Y., and Rozen, R.Y. (2006) Structure of gum arabic in aqueous solution. Journal of Polymer Science Part B: Polymer Physics, 44, 3265-3271.
- Einerson, N.J., Stevens, K.R., and Koa W.J. (2003) Synthesis and physicochemical analysis of gelatin-based hydrogels for drug carrier matrices. Biomaterials, 24(3), 509-523.
- Fan, F.R. and Bard, A.J. (1999) Proc. Natl. Acad. Sci. USA 96, 14222 -14227.

- Fox, C.L. (1967) Silver sulphadiazine, addendum to local therapy. In: Modern treatment Hoeber Medical Division." New York:Harper and Row: 1259.
- Fox, C.L. and Stanford, J.W. (1971) Anti-bacterial action of silver sulphadiazine and DNA binding. Research in burns. Bern: H Huber Publishers, 133-138.
- Gamgee, S. (1876) The treatment of wounds. Lancet, ii, 885.
- Gamo, T., Inokuchi, T., and Laufer, H. (1977) Polypeptides of fibroin and sericin secreted from the different sections of the silk gland in Bombyx mori. Insect Biochemistry, 7(3), 285-295.
- Gao, J., Fu, J. Lin, C., Lin, J., Han, Y., Yu, X., and Pan, C. (2004) Formation and photoluminescence of silver nanoparticles stabilized by a two-armed polymer with a crown ether core. Langmuir 20(22), 9775-9779.
- Geckeler, K. E. and Rosenberg, E. (2006) Functional Nanomaterials, American Scientific Publishers, Valencia, USA.
- Geronemus, R.G., Mertz, P.M., and Eagistein, W.H. (1979) Wound healing: the effects of topical antimicrobial agents. Archives of Dermatology, 115(11), 1311-1314.
- Hanawa, T., Watanabe, A., Tsuchiya, T., Ikoma, R., Hidaka, M., and Sugihara, M. (1995) New oral dosage form for elderly patients: preparation and characterization of silk fibroin gel. Chemical and Pharmaceutical Bulletin, 43(2), 284-288.
- Hayward, R.C., Saville, D.A., and Aksay, I.A. (2000) Electrophoretic assembly of colloidal crystals with optically tunable micropatterns. Nature 404(6773), 56-59.
- Hermans, M.H. (2006) Silver-containing dressings and the need for evidence. American Journal of Nursing, 106(6), 60-68.
- Hermans, M.H. (2006) Silver-containing dressings and the need for evidence. American Journal of Nursing, 106(12), 60-69.
- Ispasoiu, R.G., Balogh, L., Varnavski, O.P., Tomalia, D.A., and Goodson, T. (2000) Large optical limiting from novel metal-dendrimer nanocomposite materials. Journal of the American Chemical Society 122(44), 11005-11006.
- Keenan, T.R. (1994) Gelatin. In M. H. Grant (ed.), Encyclopedia of Chemical

- Technology Canada: A Wiley-Interscience, 406-416.
- Kiesow, A., Morris, J. E., Radehaus, C., and Heilmann, A. (2003) Switching behavior of plasma polymer films containing silver nanoparticles Journal of Applied Physics 94(10), 6988-6990.
- Kim, D.S., Lee, T., and Geckeler, K.E. (2006) Hole-doped single-walled carbon nanotubes: Ornamenting with gold nanoparticles in water. Angewandte Chemie International Edition 45(1), 104-107.
- Kirsner, R.S., Orstead, H., and Wright, J.B. (2001) Matrix metalloproteinases in normal and impaired wound healing: a potential role for nanocrystalline silver. Wounds 13(3 Suppl. C): 5-12.
- Klasen, H. J. (2000) A historical review of the use of silver in the treatment of burns. II. Renewed interest for silver. Burns, 26(2), 131-138.
- Klasen, H. J. (2001) Historical review of the use of silver in the treatment of burns. I. Early Uses. Burns 26(2), 117-130.
- Konishi, M., Tabata, Y., Kariya, M., Suzuki, A., Mandai, M., Nanbu, K., Takakura, K., and Fujii, S. (2003) In vivo anti-tumor effect through the controlled release of cisplatin from biodegradable gelatin hydrogel. Journal of Controlled Release, 92(3), 301-313.
- Konishi, M., Tabata, Y., Kariya, M., Hosseinkhani, H., Suzuki, A., Fukuhara, K., Mandai, M., Takakura, K., and Fujii, S. (2005) In vivo anti-tumor effect of dual release of cisplatin and adriamycin from biodegradable gelatin hydrogel. Journal of Controlled Release, 103(1), 7-19.
- Kwon, J.W., Yoon, S.H., Lee, S.S., Seo, K.W., and Shim, I.W. (2005) Preparation of silver nanoparticles in cellulose acetate polymer and the reaction chemistry of silver complexes in the polymer. Bull Korean Chemical Society, 26, 837-840.
- Lansdown, A.B., Sampson, B., Laupattarakasem, P., and Vuttivirojana, A. (1997) Silver aids healing in the sterile skin wound: experimental studies in the laboratory rat. British Journal of Dermatology, 137(5), 728-735.
- Lansdown, A.B. (2002) Silver. 1. Its antibacterial properties and mechanism of Action. Journal of Wound Care 11(5), 125-130.

- Lansdown, A.B. (2002) Silver. 2. Toxicity in mammals and how its products aid wound repair. Journal of Wound Care 11(5), 173-177.
- Laufman, H. (1989) Current use of skin and wound cleansers and antiseptics. The American Journal of Surgery, 157(3), 359-365.
- Lewis, L.N. (1993) Chemical catalysis by colloids and clusters. Chemical Reviews 93(8), 2693-2730.
- Li, J.K., Wang, N., and Wu, X.S. (1998) Gelatin nanoencapsulation of protein/peptide drugs using an emulsifier-free emulsion method. Journal of Microencapsulation, 15(2), 163-172.
- Lien, S.M., Li, W.T., and Huang, T.J. (2008) Genipin-crosslinked gelatin scaffolds for articular cartilage tissue engineering with a novel crosslinking method. Material Science and Engineering: C, 28(1), 36-43.
- Lindberg, R., Moncrief, J.A., Switzer, W.E., Odder, S.E., and Mills, W. (1965) The successful control of burn wound sepsis. Journal of Trauma -Injury Infection & Critical Care 6(3), 407-419.
- Lisiecki, I. and Pilani, M.P. (1993) Synthesis of copper metallic clusters using reverse micelles as microreactors Journal of the American Chemical Society 115(10), 3887-3896.
- Lister, J. (1907) Note on the double cyanide of mercury and zinc as an antiseptic dressing British Medical Journal 1, 795.
- Lloyd, J.R. and Hight, D.W. (1978) Early laminar excision: Improved control of burn wound sepsis by partial dermatome debridement. Journal of Pediatric Surgery, 13(6), 698-706.
- Lowbury, E.J. (1960) Infection of burns. British Medical Journal 1(5178), 194.
- Lopez, V.C., Hadgraft, J., and Snowden, M.J. (2005) The use of colloidal microgels as a (trans) dermal drug delivery system. International Journal of Pharmaceutics, 292(1-2), 137-147.
- Lu, H.W., Liu, S.H., Wang, X.L., Qian, X.F., Yin, J., and Zhu, Z.K. (2003) Silver nanocrystals by hyperbranched polyurethane-assisted photochemical reduction of Ag⁺. Materials Chemistry and Physics, 81(1), 104-107.
- Luo, C., Zhang, Y., Zeng, X., Zeng, Y., and Wang, Y. (2005) The role of

- poly(ethylene glycol) in the formation of silver nanoparticles. Journal of Colloid and Interface Science, 288(2), 444-448.
- Maillard, J.-Y. and Denyer, S.P. (2006) Demystifying silver. In the role of topical antimicrobials in managing wound infection. European Wound Management Association Position Document. London: Medical Education Partnership.
- Minoura, N., Tsukada, M., and Nagura, M. (1990) Fine structure and oxygen permeability of silk fibroin membrane treated with methanol. Polymer, 31(2), 265-269.
- Minoura, N., Tsukada, M., and Nagura, M. (1990) Physico-chemical properties of silk fibroin membrane as a biomaterial. Biomaterials, 11(6), 430-434.
- Mooney, E.K., Lippitt, C., and Friedman, J. (2006) Silver dressings [Electronic version] Plastic and Reconstructive Surgery 117(2): 666-669.
- Motta, A., Migliaresi, C., Faccioni, F., Torricelli, P., and Fini, M. (2004) Fibroin hydrogels for biomedical applications: preparation, characterization and in vitro cell culture studies. Journal of Biomaterial Science Polymer Edition 15(7), 851-864.
- Moyer, C.A., Brentano, L., Cravens, D.L., Margraf, H.W., and Monafo, W.W. Jr (1965) Treatment of large human burns with 0.5 per cent silver nitrate solution. Archives of Surgery 90(6), 812-867.
- Muir, I.F.K., Owen, D., and Murphy, J. (1969) Sulfamylon acetate in the treatment of *Pseudomonas pocyanea* infection of burns. British Journal of Plastic Surgery 22(3-4), 201-206.
- Mwangi, J.W. and Ofner III, C.M. (2004) Crosslinked gelatin matrices: release of a random coil macromolecular solute. International Journal of Pharmaceutics, 278(2), 319-327.
- Ottenbrite, R.M., Huang, S.J., Park, K. (1996) Hydrogels and Biodegradable Polymers for Bioapplications, 2-7.
- Pal, T. (1997) Gelatin-a compound for all reasons. Journal of Chemical Education, 71, 679-680.

- Pal, T. (2002) Nucleophile-induced dissolution of gold and silver in micelle. Current Science 83(5), 627-628
- Poizot, P., Laruelle,S., Grugeon, S., Dupont, L., and Tarascon, J.M. (2000) Nano-sized transition-metal oxides as negative-electrode materials for lithium-ion batteries. Nature 407(6803), 496-499.
- Poon, V.K. and Burd, A. (2004) In vitro cytotoxicity of silver: implication for clinical wound care. Burns, 30(2), 140-147.
- Qin, Y. (2005) Silver-containing alginate fibres and dressings. International Wound Journal, 2(2), 172-176.
- Rathna, G.V., Mohan, Rao. D.V., and Chatterji, P.R. (1996) Hydrogels of gelatin-sodium carboxymethyl cellulose: synthesis and swelling kinetics. Journal of Macromolecular Science: Pure and Applied Chemistry, 33(9), 1199-1207.
- Russell, A.D. and Hugo, W.B. (1994) Antimicrobial activity and action of silver. Prog Med Chem, 31(), 351-370.
- Searle, A. (1919) The use of metal colloids in health & disease. New York, NY: EP Sutton: 75.
- Shahverdi, A.R., Fakhimi, A., Shahverdi, H.R., and Minaian, S. (2007) Synthesis and effect of silver nanoparticles on the antibacterial activity of different antibiotics against *Staphylococcus aureus* and *Escherichia coli*. Nanomedicine: Nanotechnology, Biology and Medicine, 3(2), 168-171.
- Stanford, W., Rappole, B.W., Fox, and Jr. CL. (1969) Clinical experience with silver sulphadiazine, a new topical agent for control of pseudomonas infections in burns. The Journal of Trauma-Injury Infection & Critical Care 9(5), 377-388.
- Suzuki, Y., Yoshimaru, T., Yamashita, K., Matsui, T., Yamaki, M., and Shimizu, K. (2001) Exposure of RBL-2H3 mast cells to Ag⁺ induces cell degranulation and mediator release. Biochemical and Biophysical Research Communications, 283(3), 707-714.
- Syme, J. (1837) The principles of Surgery, 2nd edn. Edinburgh: John Stark.
- Tabata, Y., Hijikata, S., and Ikada, Y. (1994) Enhanced vascularization and tissue granulation by basic fibroblast growth factor impregnated in gelatin

- hydrogels. *Journal of Controlled Release*, 31(2), 189-199.
- Tabata, Y., Nagano, A., Muniruzzaman, Y., and Ikada, M. (1998) In vitro sorption and desorption of basic fibroblast growth factor from biodegradable hydrogels. *Biomaterials*, 19(19), 1781-1789.
- Takasu, Y., Hiromi, Y., and Kozo, T. (2002) Isolation of three main sericin components from the cocoon of the silkworm, *Bombyx mori*. *Bioscience Biotechnology and Biochemistry*, 66(12), 2715-2718.
- Ugwoke, M.I. and Kinget, R. (1998) Influence of processing variables on the properties of gelatin microspheres prepared by the emulsification solvent extraction technique. *Journal of Microencapsulation*, 15(2), 273-81.
- Vlachou, E., Chipp, E., Shale, E., Wilson, Y.T., Papini, R., and Moiemen, N.S. (2007) The safety of nanocrystalline silver dressings on burns: A study of systemic silver absorption. *Burns*, 33(8), 979-985.
- Walker, M., Cochrane, C.A., Bowler, P.G., Parsons, D., and Bradshaw, P. (2005) Silver deposition and tissue staining associated with wound dressings containing silver. *Ostomy Wound Manage* 52(1), 42-50.
- Wang, R., Yang, J., Zheng, Z., Carducci, M.D., Jiao, J., and Seraphin, S. (2001) Dendron-controlled nucleation and growth of gold nanoparticles communication. *Angewandte Chemie International Edition* 40(3), 549-552.
- Wang, W. and Asher, S.A. (2001) Photochemical incorporation of silver quantum dots in monodisperse silica colloids for photonic crystal applications. *Journal of the American Chemistry Society*, 123(50), 12528-12535.
- Ward, A.G. and Courts, A. (1997) *The science and technology of gelatin*. (pp. 241). London: New York academic press
- Warriner, R. and Burrell, R. (2005) Infection and the chronic wound: a focus on silver. *Advance Skin Wound Care* 18(8), 2-12.
- Wright, J. B., Lam, K., Hansen, D., and Burrell, R.E. (1999) Efficacy of topical silver against fungal burn wound pathogens. *American Journal of Infection Control* 27(4), 344-350.
- Wright, J. B., Hansen, D.L., and Burrell, R.E. (1998) The comparative efficacy of two antimicrobial barrier dressings: in vitro examination of two controlled-

- release silver dressings. Wounds 10(6), 179-188.
- Wuand, C. and Tian, B. (1996) Third International Silk Conference, Suzhou.
- Yanagihara, N., Tanaka, Y., and Okamoto, H. (2001) Formation of silver nanoparticles in poly(methyl methacrylate) by UV irradiation. Chemistry Letters 30(8), 796.
- Yu, F., Liu, Y., and Zhuo, R. (2004) A novel method for the preparation of core-shell nanoparticles and hollow polymer nanospheres. Journal of Applied Polymer Science, 91(4), 2594-2600.
- Zhang, Z., Zhang, L., Wang, S., Chen, W., and Lei, Y. (2001) A convenient route to polyacrylonitrile/silver nanoparticle composite by simultaneous polymerization-reduction approach. Polymer, 42(19), 8315-8318.

CURRICULUM VITAE



Name: Ms. Vichayarat Rattanaruengsrikul

Date of Birth: August 3, 1981

Nationality: Thai

University Education:

2000-2003 Bachelor Degree of Industrial Chemistry, Faculty of Science, King Mongkut's Institute of Technology Ladkrabang, Bangkok, Thailand.

2003-2005 Master Degree of Applied Polymer Science and Textile Technology, Faculty of Science, Chulalongkorn University, Bangkok, Thailand.

Publications:

1. Rattanaruengsrikul, V.; Pimpha, N.; Wetprasit, N.; and Supaphol, P. Alginate and aloe vera hydrogel for using as wound dressings, in preparation.
2. Rattanaruengsrikul, V.; Pimpha, N.; Wetprasit, N.; and Supaphol, P., Development of silk fibroin film as antimicrobial wound dressings, in preparation.
3. Rattanaruengsrikul, V.; Pimpha, N.; and Supaphol, P. *In vitro* efficacy and toxicology evaluation of silver nanoparticle-loaded gelatin hydrogel pads as antibacterial wound dressings. *Journal of Applied Polymer Science*, 124(2), 1668-1682.
4. Rattanaruengsrikul, V.; Pimpha, N.; and Supaphol, P. (2009) Development of gelatin hydrogel pads as antibacterial wound dressings. *Macromolecular Bioscience*, 9(10), 1004-1015.
5. Choktaweesap, N.; Arayanarakul, K.; Aht-ong, D.; Meechaisue C.; and Supaphol, P. (2007) Electrospun gelatin fibers: Effect of solvent system on morphology and fiber diameters, *Polymer Journal*, 39(6), 622-631.
6. Arayanarakul, K.; Choktaweesap, N.; D., Meechaisue C.; and Supaphol, P. (2006) Effects of poly(ethylene glycol), inorganic salt, sodium dodecyl sulfate and solvent system on electrospinning of poly(ethylene oxide), *Macromolecular Materials and Engineering*, 291(6), 581-591.