CURRICULUM VITAE

ChoKyun Rha

Professor of Biomaterials Science and Engineering

Biomaterials Science and Engineering Laboratory
Room 56-265
Massachusetts Institute of Technology
Cambridge, MA 02139

I. EDUCATION:

1967 Sc.D. in Food Science, Massachusetts Institute of Technology.
Thesis entitled "Thermal Sterilization of Flexible Packaged Foods."

1966 M.S. in Chemical Engineering, Massachusetts Institute of Technology.

1964 M.S. in Food Technology, Massachusetts Institute of Technology.

1962 B.S. in Life Sciences, Massachusetts Institute of Technology

II. CURRENT RESEARCH AREA:

Structure, Property and Function of Biopolymers and Biomaterials; Design and Engineering of Biopolymers and Biomaterials; Microstructure Synthesis and Fabrications; Drug and Natural Product Discovery

III. ACADEMIC EXPERIENCE:

1990-	Professor of Biomaterials Science and Engineering Provost's Office Massachusetts Institute of Technology
1982-90	Associate Professor of Biomaterials Science and Engineering Department of Applied Biological Sciences Massachusetts Institute of Technology
1974-82	Associate Professor of Food Process Engineering Department of Applied Biological Sciences

Massachusetts Institute of Technology

1969-73 Assistant Professor of Food and Biological Process Engineering
Department of Food and Agricultural Engineering
University of Massachusetts

1967 Post Doctorate Fellow
Massachusetts Institute of Technology

IV. INDUSTRIAL EXPERIENCE

1967-69 Senior Research Engineer, Anheuser-Busch, Inc.
St. Louis, Missouri

V. COURSES TAUGHT:

7.30 BIOTECHNOLOGY: ENGINEERING OF MACROMOLECULES (Undergraduate Seminar) Taught at MIT, Spring Semesters since 1997

20.S44 BIOTECHNOLOGY: ENGINEERING OF MACROMOLECULES FOR SPECIFIC FUNCTIONS (Undergraduate Seminar) Taught at MIT, Spring Semesters since 1986

20.721 PHYSICAL AND ENGINEERING PROPERTIES OF BIOMATERIALS (Graduate Course) Taught at MIT, alternate Fall Semesters since 1982

20.723 FABRICATION AND STRUCTURE SYNTHESIS OF BIOMATERIALS (Graduate Course) Taught at MIT, alternate Fall Semesters since 1981

PST108 POLYMER LABORATORY II
(Experimental Laboratory Course, Rheometry Section) Taught at MIT, Spring Semester, 1987, 1988, 1989, 1990

20.721 PHYSICAL AND ENGINEERING PROPERTIES OF FOOD MATERIALS (Graduate Course) Taught at MIT, Fall Semester 1974, 1976, 1978, 1979

20.723 FOOD FABRICATION AND STRUCTURE SYNTHESIS
(Graduate Course) Taught at MIT, Fall Semester 1977, 1879

20.S13 ENGINEERING OF FOODS FOR THE OVERFED AND UNDERFED (Freshman Seminar) Taught at MIT, Fall Semester 1974, 1976

20.701 FOOD ENGINEERING
(Graduate Course) Taught at MIT, Spring Semester 1979, 1981

20.711 FOOD ENGINEERING LABORATORY
(Graduate Course) Taught at MIT, Spring Semester 1976

PHYSICAL PROPERTIES OF BIOLOGICAL MATERIALS
(Graduate Course) Taught at University of Massachusetts 1969, 1971, 1973

PHYSIOLOGICAL UNIT OPERATIONS
(Graduate Course) Taught at University of Massachusetts, 1970, 1972

BIOLOGICAL PROCESS ENGINEERING
(Graduate Course) Taught at University of Massachusetts 1972

VI. RESEARCH SUPERVISION

Doctorate Theses
More than 20 in Doctor of Philosophy and Doctor of Science

Engineering Theses
Several in Engineering Degree

Master Theses
More than 30 in Master of Science in Food Science and Master of Science in Chemical Engineering

UROP Students
More than 100 students

VII. PUBLICATIONS

1. Song, Rha, C.K., Charm, S. and Kurlarnd, G. (1963). Energy Losses for Blood Flowing Through Tapered and Curved Tubes. Symposium on Biorheology, Interscience Publisher, John Wiley & Sons, p. 255.
2. Charm, S., Kurland, G., Mc.Comis, W., Rha, C.K. and Song, (1964). Energy Losses in Steady and Pulsatile Blood Flow. 3rd European Conference on Microcirculation, Jersusalem, Bibl. Anat. Col. 7, Karger, Basel, NY, pp. 340-345.
3. Rha, C.K. (1966). Rheological Properties of Food Materials, Phi Tau Sigma Symposium, Cornell University, Ithaca, NY.
4. Balmaceda, E., Rha, C.K. and Huang, F. (1970). Rheological Properties of Food Binders, ASEA Paper No. 70-877, Chicago, IL.
5. Rha, C.K. and Clayton, J.T. (1970). Synthetic and Simulated Foods, ASAE Paper No. 70-882, Chicago, IL.

6. Chen, C.S. and Rha, C.K. (1971). Investigation of Shrinkage in Dehydration of Grapes, Paper No. 71-387. American Society of Agricultural Engineers Annual Meeting, Pullman, WA.

7. Huang, F., and Rha, C.K. (1971). Rheological Properties of Single-Cell Protein Concentrate: Dope Formation and Its Flow Behavior. *J. Food Sci.* 36 (Nov-Dec):1131-1134.

8. Balmaceda, E. and Rha, C.K. (1972). Diffusion Mechanisms in Coagulation of Single Cell Protein. Proceedings of International Symposium on Heat and Mass Transfer Problems in Food Engineering. Wageningen, The Netherlands, Oct.

9. Huang, F. and Rha, C.K. (1972). Fiber Formation from Single-Cell Protein. *Biotechnol. Bioeng.,* XIV (6):1047-1048.

10. Scrimshaw, N.S., Austin, J.E., Harris, J.R., Rha, C.K. and Sinskey, A.J. (1973). High Protein Product Development Efforts in Thailand, MIT International Nutrition Planning Program, Technical Report Series No. 1, July.

11. Balmaceda, E. and Rha, C.K. (1973). Rate of Coagulation of Single-Cell Protein Concentrate. *Biotechnol. Bioeng.* Vol. XV:819-820.

12. Balmaceda, E. and Rha, C.K. (1973). Rate of Coagulation of Zein. *J. Food Sci.* 38(Nov-Dec):1169-1173.

13. Balmaceda, E., Rha, C.K. and Huang, F. (1973). Rheological Properties of Hydrocolloids. *J. Food Sci.* 38:1169-1173.

14. Balmaceda, E. and Rha, C.K. (1974). Spinning of Zein. *J. Food Sci.* 39(Mar-Apr): 226-229.

15. Huang, F. and Rha, C.K. (1974). Protein Structures and Fibers — A Review. *Polym. Eng. Sci.* 14(2):81-91.

16. Olkku, J. and Rha, C.K. (1975). Textural Parameters of Candy Licorice. *J. Food Sci.* 40(Sept-Oct): 1050-1054.

17. Rha, C.K. (1975). Theories and Principles of Viscosity, Chpt. II. In *Theory, Determination and Control of Physical Properties of Food Materials*, C.K. Rha, ed., D. Reidel Publ. Co., Holland, pp. 7-24.

18. Rha, C.K. (1975). Thermal Properties of Food Materials, Chpt XVII. In *Theory, Determination and Control of Physical Properties of Food Materials*, C.K. Rha, ed., D. Reidel Publ. Co., Holland, pp. 311-355.

19. Rha, C.K. (1975). Utilization of Single Cell Protein for Human Food. In *Single Cell Protein II*. S.R. Tannenbaum and D.I.C. Wang, eds., MIT Press, Cambridge, MA 587-602.

20. Rha, C.K. (1976). The Functional Properties of Single Cell Protein, Paper No. 27, Report of the US/USSR Conference on Single-Cell Protein in Cambridge, Mass., American Society for Microbiology.

21. Holmes, A.B., Gilber, L.D. and Rha, C.K. (1977). Rheological Properties of Cranberry Cell Wall Materials. *J. Food Sci.* 42(1):19-21.

22. Lee, C.H. and Rha, C.K. (1977). Thickening of Soybean Protein Suspension with Calcium. *J. Texture Studies 7*:441-449.

23. Lynch, C.J., Rha, C.K. and Catsimpoolas, N. (1977). Note on the Rapid Hydrolysis of Glycinin by Trypsin and Pepsin. *Cereal Chem.* 54(6):1282-1285.

24. Lynch, C.J., Rha, C.K. and Catsimpoolas, N. (1977). Tryptic Hydrolysis of Glycinin and Its Subunits. *J. Sci. Fd. Agric.* 28(3):971-979.

25. Pradipasena, P., and Rha, C.K. (1977). Effect of Concentration on Apparent Viscosity of a Globular Protein Solution. *Polym. Eng. Sci.* 17(12):861-864.

26. Pradipasena, P., and Rha, C.K. (1977). Pseudoplastic and Rheopectic Properties of a Globular Protein. *J. Texture Studies* 8(3):311-325.

27. Holmes, A.B. and Rha, C.K. (1978). Structure and Chemical Composition of Cranberry Cell Wall Material. *J. Food Sci.* 43(Jan-Feb):112-113.

28. Huang, F. and Rha, C.K. (1978). Formation of Single Cell Protein Filament with Hydrocolloids. *J. Food Sci.* 43(3):780-782.

29. Huang, F. and Rha, C.K. (1978). Rheological Properties and Spinnability of Single Cell Protein/Additive Mixture. *J. Food Sci.* 43(3):772-773.

30. Inda, A. and Rha, C.K. (1978). Rheological Properties of Seeds of *Yucca Filifera*. *Transactions ASAE* 21(5):986-989, 992.

31. Lee, C.H., Imoto, E.M. and Rha, C.K. (1978). Evaluation of Cheese Texture. *J. Food Sci.* 43(5)1600-1605.

32. Lee, C.H. and Rha, C.K. (1978). Microstructure of Soybean Protein Aggregates and Its Relation to the Physical and Textural Properties of the Curd. *J. Food Sci.* 43(1):79-84.

33. Lee, C.H. and Rha, C.K. (1978). Rheological Properties of Protein in Solution. In *Food Texture and Rheology*. P. Sherman, ed., Academic Press, NY, pp. 245-263.

34. Olkku, J. and Rha, C.K. (1978). Gelatinization of Starch and Wheat Flour Starch - A Review. *Food Chem.* 3(4)293-317.

35. Olkku, J., Rha., C.K. and Fletcher, S.W., III (1978). Studies on Wheat Starch and Wheat Flour Model Paste Systems. *J. Food Sci.* 43(Jan-Feb):52-59.

36. Rha, C.K. (1978). Rheology of Fluid Foods. *Food Technol. 32*(July):77-82.

37. Rha, C.K., Flink, J., Catsimpoolas, N., Karel, M., Sinskey, A., Tannenbaum, S., Wang, D., Hsieh, D., Circle, S., Hartman, W., Martinez, W., Schoen, H., and Wolfe, W. (1978). Basic Food and Science and Technology Problems Affecting the Properties and Processing of Protein Resources. In: Chpt 12, *Protein Resources and Technology,* M. Milner, N. Scrimshaw, and D. Wang, eds., AVI Pub. Co., Westport, Conn. pp.184-194.

38. Sinskey, A.J., Bourdant, J., Lee, C., DeAngelo, J., Miyasaka, Y., Rha, C.K. and Tannenbaum, S.R. (1978). Applications of Temperature-Sensitive Mutants for Single-Cell Protein Production, Proceedings of the Join US/USSR Seminar on the Mechanisms and Kinetics of Uptake and Utilization of Substrates in Processes for the Production of Single Cell Protein of the US/USSR Joint Group on the Production of Substances by Microbiological Means, Moscow-Puschino, June 4-11, PB-283-330-T, pp. 362-383.

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43. Lee, C.H. and Rha, C.K. (1979). Application of Scanning Electron Microscopy for the Development of Materials for Foods. *Scanning Electron Microscopy*/1979, O. Jahari, ed., SEM, Inc., AMF O'Hare, Ill., pp.465-472.

44. Lee, C.H., Tsang, S.K., Urakabe, R. and Rha, C.K. (1979). Disintegration of Dried Yeast Cells and its Effects on Protein Extractability, Sedimentation Property, and Viscosity of the Cell Suspension. *Biotech. Bioeng.* 21:1-17.

45. Menjivar, J.A., Chen, R. and Rha, C.K. (1979). Investigation of Mechanical Properties of Raw Flesh and Skin of Spiny Dogfish (*Squalus acanthias*). *J. Texture Studies* 10(2):169-172.

46. Rha, C.K. (1979). Physical Parameters Attributing to the Mouthfeel of Liquid and Semi-Solid Foods. Proceedings of the Fifth International Congress of Food Science and Technology, Hodansha Ltd., Tokyo, Japan, pp. 301-310.

47. Rha, C.K. (1979). Viscoelastic Properties of Food as Related to Micro- and Molecular Structures. *Food Technol.* 33:71-76.

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51. Menjivar, J.A. and Rha, C.K. (1980). Characterization of Concentrated Systems: Constraints and Compressibility Effects. In: *Rheology* (Fluids, vol. 2). G. Astarita, G. Marrucci, and L. Nicolais, eds., Plenum Press, New York, pp. 293-299.

52. Menjivar, J.A. and Rha, C.K. (1980). Viscoelastic Effect in Concentration Protein Dispersions. *Rheologica Acta* 19:212-219.

53. Miyasaka, Y., Sinskey, A.J., DeAngelo, J. and Rha, C.K. (1980). Characterization of a Morphological Mutant of *Saccharomyces Cerevisiae* for Single Cell Protein Production. *J. Food Sci.* 45(3):558-563.

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55. Rha, C.K., Menjivar J.A. and Lang, E.R. (1980). Rheology of Bronchial Secretions: Structural Model. In: *Rheology* (Applications, vol. 3). G. Astarita, G. Marrucci, and L. Nicolais, eds., Plenum Press, New York, pp. 753-761.

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58. Kimball, M., Hsieh, D. and Rha, C.K. (1981). Chymotrypsin Hydrolysis of Soybean Protein. *J. Agri. Food Chem.* 20:872-874.

59. Lang, E.R. and Rha, C.K. (1981). Determination of the Yield Stress of Hydrocolloid Dispersions. *J. Texture Studies* 12:47-52.

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61. Olkku, J., Rha, C.K., Rosenau, J.R. and Fletcher, S.W. III (1981). Texture Prediction with a Model System. *J. Food Quality* 4:1.

62. Peil, A., Barrett, F., Rha, C.K. and Langer, R. (1981). Retention of Micronutrients by Polymer Coatings Used to Fortify Rice. *J. Food Sci.* 47:260-262.

63. Rodriguez-Sanchez, D. and Rha, C.K. (1981). Chitosan globules. *J. Food Technol.* 16: 469-479.

64. Inda, A.E. and Rha, C.K. (1982). Analysis of Tensile Behavior of Wheat Gluten at Constant Strain Rates. The Effect of Secondary Bonding Modification. *J. Rheol.* 26(6):513-533.

65. Inda, A.E. and Rha, C.K. (1982). Rupture Properties of Wheat Gluten in Simple Tension: The Role of Hydrogen Bonds. *J. Food Sci.* 47(1):177-180.

66. Kienzle-Sterzer, C.A., Rodriguez-Sanchez, D., Karalekas, D. and Rha, C.K. (1982). Stress Relaxation of a Polyelectrolyte Network as Affected by Ionic Strength. *Macromolecules* 15(12):631-634.

67. Kienzle-Sterzer, C.A, Rodriguez-Sanchez, D. and Rha, C.K. (1982). Dilute Solution Behavior of a Cationic Polyelectrolyte. *J. Appl. Polym. Sci.* 27:4467-4470.

68. Kienzle-Sterzer, C.A., Rodriguez-Sanchez, D. and Rha, C.K. (1982). Mechanical Properties of Chitosan Films: Effect of Solvent Acid: *Makrol. Chem.* 183:1353-1359.

69. Kienzle-Sterzer, C.A., Rodriguez-Sanchez, D. and Rha, C.K. (1982). Viscoelastic Properties of Semiconcentrated Chitosan Solutions: Effect of Chitosan Concentration. In: *Chitin and Chitosan,* S. Hirano and S. Tokura, eds., The Japanese Society of Chitin and Chitosan, p.26.

70. Lang, E.R., Kienzle-Sterzer, C.A., Rodriguez-Sanchez, D. and Rha, C.K. (1982). Rheological Behavior of a Typical Random Coil Polyelectrolyte: Chitosan. In: *Chitin and Chitosan,* S. Hirano and S. Tokura, eds., The Japanese Society of Chitin and Chitosan.

71. Lang, E.R. and Rha, C.K. (1982). Coating Behavior of Suspensions. *J. Food Sci.* 47(1): 324-325.

72. Lang, E.R. and Rha, C.K. (1982). Apparent Shear Viscosity of Native Egg White. *J. Food Technol.* 17:595-606.

73. Lee, D.S., Rha, C.K., and Suh, K-B. (1982). Properties of Barley for Extrusion Processing. *J. Korean Agri. Chem. Society* 25(3):119-126.

74. Nakhost, Z., Hsieh, D.S.T., Shih, V. and Rha, C.K. (1982). Synthesis of low-phenylalanine polypeptides. *International J. Peptide Protein Res.* 20:267-275.

75. Rodriguez-Sanchez, D., Kienzle-Sterzer, C.A. and Rha, C.K. (1982). Intrinsic Viscosity of Chitosan Solutions as Affected by Ionic Strength. In: *Chitin and Chitosan,* S. Hirano and S. Tokura, eds., The Japanese Society of Chitin and Chitosan, p. 30.

76. Schaffeld, G., Sinskey, A.J. and Rha, C.K. (1982). Release of Single-Cell Protein by Induced Cell Lysis. *J. Food Sci.* 47:2072-2073.

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85. Easson, Jr., D.D., Peoples, O.P., Rha, C.K. and Sinskey, A.J. (1986). Engineering of Biopolymer Flocculants: A Recombinant DNA Approach. In: *Symposium on Flocculation in Biotechnology and Separations Systems*, Y.A. Attia (ed.), Elsevier, Amsterdam, pp. 369-381.

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94. Jamas, S., Rha, C.K. and Sinskey, A.J. (1987). Tailoring of Yeast b-Glucans by Strain Selection. In: *Industrial Polysaccharides. The Impact of Biotechnology and Advanced Metholodologies*. Stivala, S.S., Crescenzi, V., and Dea, I.C.M., eds. Gordon and Breach, New York, pp.35-44.

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103. Nakamura, T., Pradipasena, P. and Rha, C.K. (1988). Hydrodynamic Volume and Chain Flexibility of Extracellular Polysaccharide Produced by *Zoogloea ramigera* 115. *Carbohydrate Polymers* . Proceedings of International Symposium on Flocculation in Biotechnology and Separation Systems. Y.A. Attia, ed., Elsevier Science Publishers B.V., Amsterdam.

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VIII. RECENT PRESENTATIONS

1. "Toward Production of Polyhydroxybutyrate in Oil Palm" by Gregory York, Young Bae Jo, Phillip Lessard, Omar bin Abdul Rasid, ChoKyun Rha, and Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

2. "Toward Production of Poly-[hydroxybutyrate-co-hydroxyvalerate] in Oil Palm" by Gregory York, Young Bae Jo, Phillip Lessard, Arif Manaf, ChoKyun Rha, and Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

3. "Development of Interspecies cDNA Microarrays to Study Oil Palm Callogenesis and Embryogenesis" by Andrea C. Loos, Laura B. Willis, Philip A. Lessard, Jennie Cho, Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

4. "Enzyme Immunoassay for the Bioactivities of Centella asiatica," by Se-Kyung Oh and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

5. "Molecular Characterization of the Wound Healing Effect of Centella Asiatica," by Christopher D. Coldren, Se-Kyung Oh, Rebecca Fry, Saufiah Binti Abdul Rahim, and Chokyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

6. "Towards Metabolic Engineering of Oil Palm," by Laura B. Willis, Wan Saridah Wan Omar, Philip A. Lessard, Ravigadevi Sambanthamurthi, Anthony J. Sinskey and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

7. "Assay for aqueous extract of Eurycoma longifolia (Tongkat Ali)," by Norhaniza Aminudin, T.G. Sambandan, and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 16-18, 2000.

8. "Special Report on Bioreactor for Oil Palm Tissue Cultivation," by Sheldon Oppenheim, Nathalie Gorret, Anthony J. Sinskey and ChoKyun Rha. Presented at Massachusetts Institute of Technology, Cambridge, Massachusetts, USA, September 2001.

9. "Expression analysis for the study of Centella asiatica bioactivity," by Christopher D. Coldren, Puziah binti Hashim, Johari Mohd. Ali, Anthony J. Sinskey and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

10. "Transcriptional response of mouse fibroblast tissue to cytotoxic extracts of Eurycoma longifolia (Tongkat Ali) by microarray hybridization," by Rebecca C. Fry, Ong Boo Kean and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

11. "Development of a model of oil palm metabolism," by Nathalie Gorret, Stephane Guillouet, Sheldon Oppenheim, Samsul Kamal bin Rosli, Laura B. Willis, Philip A. Lessard, ChoKyun Rha and Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

12. "Comparative hormonal levels of embryogenic and non-embryogenic oil palm tissue culture," by Abdul Karim Abdul Ghani and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

13. "Isolation of tissue-specific genes and their regulatory sequences from oil palm," by Andrea C. Loos, Meilina O. Abdullah, Amie J. Strong, Laura B. Willis, Philip A. Lessard, ChoKyun Rha and Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

14. "Development of interspecies cDNA microarrays to study oil palm callogenesis and embryogenesis," by Meilina O. Abdullah, Amie J. Strong, Andrea C. Loos, Laura B. Willis, Philip A. Lessard, Jennie Cho, ChoKyun Rha and Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

15. "Isolation of 4,300 Dalton component from the aqueous extract of Eurycoma longifolia," by Norhaniza Aminudin, T.G. Sambandan and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

16. "Selective cytotoxic compounds isolated from methanolic extract of Eurycoma longifolia (Tongkat Ali)," by Ong Boo Kean, Shamsul Muhamad, T.G. Sambandan, Se-Kyung Oh and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

17. "Titrated extract of Centella asiatica, vitamins A, E, C, and their combination, enhances collagen and fibronectin synthesis," by Puziah Hashim, Se-Kyung Oh and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

18. "Genetic engineering of oil palm for production of polyhydroxyalkanoates," by Gregory York, Young Bae Jo, Philip A. Lessard, Chung Park, Omar bin Abdul Rasid, Arif Manaf, ChoKyun Rha and Anthony J. Sinskey. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

19. "Cell growth, triterpenoids production, and induction of potentially stress-related compounds in Centella asiatica cell cultures," by Mohd. Azmuddin Abdullah, Nathalie Gorret, Sheldon Oppenheim, Dae-Sung Choi and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

20. "Enhanced detection of SNPs by SELDI-TOF mass spectrometry," by Mohd. Puad Abdullah, T.G. Sambandan, Philip A. Lessard and ChoKyun Rha. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

21. "Partnership in Natural Product Development," by ChoKyun Rha, T.G. Sambandan, Se-Kyung Oh, Rebecca Fry, Sheldon Oppenheim, Estela Balmaceda, Shamsul bin Muhamad, Ong Boo Kean, Norhaniza binti Aminudin, Asiah binti Osman, Saufiah binti Abdul Rahim, Mohd. Azmuddin Abdullah, Puziah binti Hashim, Rozita binti Baharom, Puteri Jamilatul Noor binti Megat Baharuddin, Fadhilah binti Zainudin, Mohd. Puad Abdullah, Johari Mohd. Ali, Badrul Amini Abd. Rashid and Mohd. Noor Ahmad. Presented at the Malaysia-MIT Biotechnology Partnership Program Symposium, November 5-6, 2001.

22. "Oil Palm Metabolomics and Genomics," by Nathalie Gorret, Samsul Kamal bin Rosli, Andrea C. Loos, Meilina Ong Abdullah, Sheldon Oppenheim, Laura B. Willis, Philip A. Lessard, Anthony J. Sinskey and ChoKyun Rha. Presented at the First International Congress on Plant Metabolomics, in Wageningen, the Netherlands, April 7-11, 2002.

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27. "Business Opportunities for Agricultural Biotechnology in APEC. Key Considerations & Strategies to Foster Investments in Biotechnology and Promote the Development of the Agriculture Sector" by C.K. Rha. Presented at APEC High Level Policy Dialogue on Agricultural Biotechnology, Kuala Lumpur, Malaysia, December, 2004

28. "Biotechnology for Malaysia" by C.K. Rha. Presented at BioMalaysia 2005, Kuala Lumpur, Malaysia, April 2005.

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30. "At the Threshold of the Next Big Thing: Biotechnology Prospectus" by C.K. Rha. Presented at Biotechnology Asia, Putra World Trade Center, Malaysia, August 2005.

31. "Strategies for Natural and Novel Products" by C.K. Rha. Presented at the National Conference on Biotechnology for Plantation Commodities 2005, Mines Resort City, Malaysia, August 2005

32. "Anti-aging Skincare" by C.K. Rha. Presented at Beautyweek 2005 International Anti-Aging and Nutracosmeceutical Forum, Beijing, China, October 2005.

33. "MIT-SIRIM research collaboration" by C.K. Rha Presented at The First MMBPP Workshop on Bioconversion of Palm Oil and its Products to Polyhydroxyalkanoates PHA Biodegradable Plastics, Kuala Lumpur, Malaysia, January 2008.

IX. BOOKS:

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X. INVENTIONS:

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23. Chewing gum. Teng, J. and Rha, C.K. U.S. Patent 3,666,492.

Recent Disclosures

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2. Bioactive extracts containing carotenoids and delta tocotrienol. Estela Balmaceda, TG Sambandan and ChoKyun Rha.

3. Conversion of Oils, Lipids and Fatty Acids to PHA Including medium Chain and Long Chain PHA using Rhodococcus as the Production Organism Phillip A. Lessard, ChoKyun Rha, Anthony J. Sinksey

4. Madecassic acid as a protective material against nitric oxide-induced cytotoxicity. Dae-Sung Choi, ChoKyun Rha

5. Triterpenoids, Related Compounds and Vitamin E for Coating or Treating Stents and Other Biomedical Devices. ChoKyun Rha, T.G. Sambandan, Se-Kyung Oh.

6. Methoxy-canthine-6-one and Related Compounds: Anti HIV-1 Agents. Ong Boo Kean, Azizol Abdul Kadir, T.G. Sambandan, Se-Kyung Oh, ChoKyun Rha and Chan Kit Lam.

7. Bioactive peptide components of *Eurycoma longifolia* (Tongkat Ali) and their production. Norhaniza Aminudin, T.G. Sambandan and ChoKyun Rha.

8. The 4.3kDa peptide component from *Eurycoma longifolia* (Tongkat Ali) extracts and the peptide that promotes androgen production and the up-regulation of corresponding genes involved in the androgen biosynthesis pathway. Norhaniza Aminudin, T.G. Sambandan, Rebecca Fry, Se-Kyung Oh and ChoKyun Rha.

9. New cytotoxic agents isolated from *Centella asiatica.* Badrul Amini Abdul Rashid, Se-Kyung Oh, T.G. Sambandan and ChoKyun Rha.

10. Selective Cytotoxic Compounds Isolated from Methanolic Extract of *Eurycoma Longifolia* (Tongkat Ali). Ong Boo Kean, Se-Kyung Oh, ChoKyun Rha, Shamsul B. Muhamad, T.G. Sambandan and Azizol Abd. Kadir.

11. An anti-HIV compound: Compound OBK-250 for anti-retroviral treatment. Ong Boo Kean, T.G. Sambandan, ChoKyun Rha, Se-Kyung Oh, Chan Kit Lam and Azizol Abd. Kadir.

12. Interspecies DNA microarrays. Philip A. Lessard, ChoKyun Rha and Anthony J. Sinskey.

13. Concerted effect of multi-antioxidants for anti-aging or juvenating dietary or nutritional supplement and personal care products. ChoKyun Rha.

14. Antioxidants as anti-aging, juvenating and vitalizing remedy. ChoKyun Rha.

15. Novel surface for oligonucleotide determination by SELDI-MALDI-TOF mass spectroscopy. T.G. Sambandan, Mohd. Puad Abdullah, Philip A. Lessard and ChoKyun Rha.

16. Genetic markers (Single Nucleotide Polymorphisms) for *Eurycoma* spp. Asiah Osman, Barbara Jordan, David Housman, Philip A. Lessard, ChoKyun Rha, Anthony J. Sinskey and Azizol Abd. Kadir.

17. A procedure for the isolation of asiatic acid and madecassic acid from *Centella asiatica*. In-Ho Kim, ChoKyun Rha and T.G. Sambandan.

18. Natural acids promote collagen synthesis. Se-Kyung Oh and ChoKyun Rha.

XI. ADVISORY AND EDITORIAL BOARD

International Advisory Panel to the Prime Minister of Malaysia on Biotechnology