

CURRICULUM VITA

Name: Ban-An Khaw (Chit Myine Cho)

Address: 69 Meadowview Road, Milton, MA 02186

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Address: 69 Meadowview Road, Milton, MA 02186

Bouve College of Health Sciences
 School of Pharmacy
 Northeastern University, X138, 140 The Fenway
 Boston, MA 02115
 Tel: (617) 373-4203, Fax: (617)373-3663
 E-mail: b.khaw@ neu.edu

Date of Birth: July 25, 1947

Place of Birth: Bassein, Burma

Education:

1965 High School	St. Joseph's College, School, Darjeeling, India
1965-1967	St Joseph's College, College, Darjeeling, India
1969 B.A.	State University of New York at Oswego
1970 M.S.	Boston College (Biology/Immunology)
1973 Ph.D.	Boston College (Biology/Immunology)
2009 D.Sc.(honorary)	State University of New York at Oswego.

Postdoctoral Training:

Research Fellowships:	
1973-1976	Research Fellow in Medicine, Harvard Medical School
1973-1976	Research Fellow in Medicine, Massachusetts General Hospital

Academic Appointments:

1976-1978	Instructor in Pathology, Harvard Medical School
1978-1983	Assistant Professor of Pathology, Harvard Medical School
1983-1984	Assistant Professor of Radiology, Harvard Medical School
1984- 2010	Associate Professor of Radiology, Harvard Medical School
1991-	George D. Behrakis Professor of Pharmaceutical Sciences, Northeastern University

Hospital Appointments:

1976-1979	Assistant in Biochemistry, Massachusetts General Hospital
1980-1981	Assistant Biochemist, Massachusetts General Hospital
1981-	Associate Biochemist, Massachusetts General Hospital
1983-1990	Assistant Radiochemist, Massachusetts General Hospital
1990-	Associate Radiochemist, Massachusetts General Hospital

University Appointments:

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Research Fellowships:

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1978-1983	Assistant Professor of Pathology, Harvard Medical School
1983-1984	Assistant Professor of Radiology, Harvard Medical School
1984- 2010	Associate Professor of Radiology, Harvard Medical School
1991- Present	George D. Behrakis Professor of Pharmaceutical Sciences, Northeastern University

Hospital Appointments:

1976-1979	Assistant in Biochemistry, Massachusetts General Hospital
1980-1981	Assistant Biochemist, Massachusetts General Hospital
1981-	Associate Biochemist, Massachusetts General Hospital
1983-1990	Assistant Radiochemist, Massachusetts General Hospital
1990-	Associate Radiochemist, Massachusetts General Hospital

University Appointments:

1991-1996	Director of Center for Drug Targeting and Analysis, Northeastern University
1996-2009	Director, Center for Cardiovascular Targeting, Northeastern University
2017 (July)-	Interim Chair, Department of Pharmaceutical Sciences

Awards and Honors:

1965	Fr. Depelchin Gold Medal for Studies, Games and Character, St. Joseph's College (School), Darjeeling, India.
1975	American Heart Association Fellowship (Massachusetts Division)
1980, 1983, 1990	Exchange Scientist, US/USSR Exchange Program in Cardiovascular Research - Myocardial metabolism
1990-1992	President, Chinese American Society of Nuclear Medicine.
1990	Nominated for Marie Curie Award. <i>Demonstration of reduction of non-target organ activities by negative-charge modification of monoclonal antimyosin Fab in canine myocardial infarction.</i> European J Nucl Med. 1990; 16, 7:392.
1991	Berson-Yalow Award, the Society of Nuclear Medicine. <i>Synthetic peptide immunogens for the development of human cardiac myosin light chain I specific monoclonal antibodies for radioimmunoassay.</i> J Nucl Med. 1989; 30(5):785.
1993	Outstanding Pharmaceutical Paper at the 20th International Symposium on Controlled Release of Bioactive Materials, July 25-29, 1993. <i>Polymer-Coated Immunoliposomes for Delivery of Pharmaceuticals: Targeting and Biological Stability.</i> Award to be presented on June 27, 1994 at Nice, France.
1993	Journal of Controlled Release Outstanding Paper of the Year. <i>Chelating polymer modified monoclonal antibodies for radioimmunodiagnosics and radioimmunotherapy.</i> J Controlled Release. 24:111-118, 1993. To be presented on June 27, 1994 at Nice, France.
1994	2nd Prize for best Poster Session of the 2nd National Congress of the Italian Association of Nuclear Medicine, May 30-June 2, 1994. <i>Preliminary Biodistribution and Pharmacokinetic Studies of Tc-99m-Glucaric Acid in Humans.</i> J Nucl Biol Med. 1994; 38:279-280.
1995	Best Abstract from the US Award at the 2nd International Conference of Nuclear Cardiology. Narula J, Petrov A, Pak C, Khaw BA. <i>Hyperacute Scintigraphic Visualization of Experimental Reperfused Myocardial Infarction with Tc-99m Glucarate.</i> J Nucl Cardiol. 1995; 2:S112
Dec. 1995	<i>Honorary Member of the International College of Nuclear Medicine Physicians.</i>
May 24, 1996	Best Abstract at the III International Symposium "Nuclear Cardiology Today-1996: Role in Clinical Decision Making" at Cesena, Italy.
June 3, 1996	Abstract Nominated for Young Investigator Award. Awarded third place. Narula J, Elmaleh DR, Petrov A, Babich J, Zamecnik PC, Rapoport E, Fischman AJ, Khaw BA. <i>Evaluation of Upregulation of</i>

- Adenosine Receptors on Proliferating Smooth Muscle Cells Allows Instant noninvasive localization of Atherosclerotic Lesions.* J Nucl Med. 1996;37#5:4P.
- June 4, 1996 **Best Clinical Paper** in 1995 in the Journal of Nucl Cardiol. Narula J, Southern JF, Dec GW, Palacios IF, Newell JB, Fallon JT, Strauss HW, Khaw BA, Yasuda T. *Antimyosin Uptake and Myofibrillarlysis in Dilated Cardiomyopathy.* J Nucl Cardiol. 1995; 2.6:470-477.
- April 8, 1997 Winner of the Young Investigator Award of the 4th International Conference on Nuclear Cardiology. Narula J, Elmaleh DR, Petrov A, Babich J, Fischman AJ, Khaw BA. *Targeting proliferating smooth muscle cell phenotype for noninvasive localization of experimental atherosclerotic lesions.* J Nucl Cardiol. 1997;4 #1 Part 2:S43.
- April 8, 1997 **Best Basic Science Paper** in 1996 in the Journal of Nuclear Cardiology. Narula J, Petrov A, O'Donnell SM, Ditlow C, Pieslak I, Dilley J, Chen F, Khaw BA. *Gamma imaging of atherosclerotic lesions: The role of antibody affinity in in vivo target localization.* J Nucl Cardiol. 1996; 3:231-241.
- June 2, 1997 Winner of Cardiovascular Young Investigator Competition. Narula J, Kolodgie F, Virmani R, Petrov A, Khaw BA. *Should Assessment of the Rate of Smooth Muscle Cell Proliferation by Indium-111-Z2D3 Antibody imaging Allow for Predicting Post-Angioplastic Restenosis.* J Nucl Med. 1997;38#5:3P.
- September 20, 1997 Runner-up, Best Abstract Competition of Boscat '97, Targeting the Cardiovascular System: Biologics, Genes and Pharmaceuticals in Diagnosis and Therapy. Boston, MA September 19-21, 1997. *Vural I, Haider N, Narula J, Torchilin VP, Khaw BA. A model for target specific Gene Delivery in Cardiocytes.*
- September 20, 1997 Runner-up, Best Abstract Competition of Boscat '97, Targeting the Cardiovascular System: Biologics, Genes and Pharmaceuticals in Diagnosis and Therapy. Boston, MA September 19-21, 1997. *Johnson LL, Schofield LM, Sharaf BL, Virmani R, Khaw BA. In-vivo Uptake of Radiolabeled Antibody to Proliferating Smooth Muscle Cells in a Swine Model of Coronary Stent Restenosis.*
- May 1, 2000 Gwathmey Inc. Research Development Award. Gwathmey Inc., Cambridge MA.
- May 23, 2000 Northeastern University Academy of Distinction Awards 2000 for Innovation. Sponsored by the Center for Technological Entrepreneurship, Northeastern University.
- May, 2001 Abstract Nominated for Young Investigator Award. DaSilva, J, Narula J, Khaw BA. *Effects of preconditioning on myocardial microvascular injury assessed by radiolabeled fibrinogen.* 5th International Conference of Nuclear Cardiology. May 2-5, 2001. Vienna, Austria.
- June 23, 2001 Berson-Yalow Award, Society of Nuclear Medicine for Scientific paper entitled "*Signal Amplification of Immunoassays: Can Immunoassays Be Developed to Detect a Few Hundred Molecules?*" By Khaw BA and Rammohan R. at the 48th Annual Meeting in Toronto, Ontario, Canada.

Oct 2, 2001	Who's Who Massachusetts Outstanding Asian-Americans.
July, 2002	Distinguished Alumnus Award. State University of New York at Oswego, Oswego, NY.
Feb. 2004	2004 Bouve Interdisciplinary Week Best Student Poster Awards.
2004	Who's Who in Pharmaceutical Sciences Education.
2005	Finalist for Young Investigator Award competition. Tekabe, Y, Abu-Taha A, Johnson L, Khaw BA. Enhanced imaging of very small experimental atherosclerotic lesions in ApoE ^{-/-} mice: Use of Bispecific antibody and Tc-99m labeled polymeric probes. (7 th International Conference of Nuclear Cardiology. 8-11, May, 2005. Lisbon, Portugal).
March 2007.	Very Distinguished North Point Alumnus Life Time Achievement Award.
May 16, 2009	Honorary Doctor of Sciences, State University of New York at Oswego, Oswego, N.Y.
Oct. 7, 2010	White Coat Award for three athletic colors. St. Joseph's School, North Point, Darjeeling.
June 5, 2011	Young Investigator Award finalist. Patil V, Gada K, Panwar R, TekabeY, Majewski S, Varvarigou A, Weisenberger A , Khaw BA. Imaging prostate cancer PC-3 xenografts pretargeted with bispecific Bombesin-anti-DTPA-Fab' complexes and targeting with Tc-99m labeled polymers. Nuclear Oncology Council Young Investigator Award Competition Symposium. San Antonio, TX, 2011.
March 2014	Key Scientific Article contributing to excellence in biomedical research, by Global Medical Discovery. "In vitro demonstration of enhanced prostate cancer toxicity: pretargeting with Bombesin bispecific complexes and targeting with polymer-drug-conjugates."
June 2017	Lifetime Achievement Award. Chinese American Society of Nuclear Medicine and Molecular Imaging.

Professional Societies:

1985	Society of Nuclear Medicine
1985	American Heart Association, Basic Science Member
1986	Chinese American Society of Nuclear Medicine
1993-2000	American Chemical Society
1993	American Society of Nuclear Cardiology
2005-	European Society of Nuclear Medicine and Molecular Imaging

Committees:

1987-1995	Radiation Safety Committee/Radioactive Drug Research Committee, Massachusetts General Hospital
1987-1988	Committee on Research, Massachusetts General Hospital
1989	Ad Hoc Research Peer Review Committee, American Heart Association, Massachusetts Affiliate
1991	Organizing Committee of the 2nd Sino-American Nuclear Medicine Conference, Beijing, China, August 18020, 1991.

1991-3	Tenure Appeals Committee, College of Pharmacy and Allied Health Professions, Northeastern University.
1992	Search Committee, Pharmaceutics, Dept. Pharmaceutical Sciences, Northeastern University.
1993-1995	Secretary, Tenure & Promotions Committee, Bouve College of Pharmacy and Health Sciences.
1995	Subchairman/Radioassay, Society of Nuclear Medicine, 42nd Annual Meeting Scientific Program Committee. 1994-1995
1995-1996	AHA Mass Affiliate, Peer Review Committee. Scientific Committee, III International Symposium "Nuclear Cardiology Today-1996; Role in Clinical Decision Making". Cesena, Italy. May 23-25, 1996.
1996	Subchairman/Radioassay, Society of Nuclear Medicine, 43rd Annual Meeting Scientific Program Committee. 1995-1996
1996 (Oct)-1997	Member, Task Force to Recommend Implementation Plan for Enhancing Technology Transfer at Northeastern University.
1996-1997	Search Committee for the Chair of the Department of Pharmaceutical Sciences.
1997-1998	Research Committee for New England Association of Schools and Colleges Re-Accreditation
1997-1998	Committee for Research and Sponsored Project Enhancement at Northeastern.
1998	Evaluation Committee for the Appointment of the Acting Dean of the Bouvé College of Health Sciences
1998-	Transfer Students Admissions Committee
1998	Ad Hoc RFA review Committee, NIH, NHLBI.
1999	Promotion committee for Dean Plunkett to be considered for promotion to full professor.
1999-	Professional Affairs Advisory Council.
1999-	Presidential American Asian Advisory Group on Diversity
1999-	Member. American Society of Nuclear Cardiology Task Force on Molecular Imaging.
1999-02	Merit Review Committee-Alternate
2000-2001	Faculty Search Committee, Department of Pharmaceutical Sciences
2000-01	Dean Search Committee, School of Pharmacy.
2001-	Assessment Committee
2001	Transfer Student Admissions Committee
2002-	School of Pharmacy Awards Committee
2002-	Organizing Committee; Cardiovascular Molecular Imaging Symposium. May 3-4, 2004.
2003	Search Committee "Vice President of Student's Affairs"
2003	Moderator, Meeting of the Candidates with Faculty and Staff.
2003	Diversity Awards Committee
2003	Organizing Committee, Symposium on Cardiovascular Molecular Imaging. May 3-4, 2004. Natcher Auditorium, National Institutes of Health, Bethesda, MD
2003	Work Load Agenda Committee
2003-	Joy and Alfred Viola Undergraduate Award Committee.

2003-2006	Committee of Enquiry
2004-2007	Chair, Merit Review
2004.	Faculty Search Committee
2006	Graduate Committee
	Merit Review Committee, Chair
	By-Laws Committee (School and College)
	Award Committee
	Joy and Alfred Viola Award Committee
2007-2008	Academic Standing Committee
2007-	Biotech Student Advisory Committee (College)
2010	Research and Policy Oversight Committee (University)
2010	Diversity Committee (College)
2010	Admissions and Recruitment Committee (School)
2010-2012	Orphan Drug Grant application Review Committee Member
2012	Promotions Committee (Chair) for Dr. Devlin to full Professor
2013	Chair, Graduate Committee of Dept. of Pharm Sci
2013	Graduate Director of Dept. of Pharm Sci

Editorial Boards:

1989-2000	Bioconjugate Chemistry
1990-1993	Associate Editor, Journal of Nuclear Medicine (Editor-in-Chief H. William Strauss, M.D.)
1994-1998	Journal of Nuclear Medicine
1993-2012	Journal of Nuclear Cardiology
1995	Annals of Nuclear Medicine and Sciences
2003-2011	Journal of Nuclear Medicine
2004-	Medical Science Monitor
2005 (Nov)	European Journal of Nuclear Medicine and Molecular Imaging.
2007-2011	Journal of American College of Cardiology
2012-	The Open Cardiovascular Imaging Journal
2014-	International Journal of Nuclear Medicine Research
2014-	The Journal of Nuclear Cardiology
2014-2016	Current Molecular Imaging.

Board of Directors:

1994-1998	Chinese American Society of Nuclear Medicine.
1994	Chairman of the Board & Chief Scientific Officer, Molecular Targeting Technology, Inc.
1993	Co-founder of Molecular Targeting Technology, Inc. Frazer, PA
1999	Advisory board of the Entrepreneurship Center, Northeastern University
2008-2017.	Science Advisory Board, Roxbury Community College, Boston, MA

Companies Started:

1993 Molecular Targeting Technologies Inc. West Chester, PA
 2001-2004 Biospecific Inc., Boston, MA
 2009 AkrivisTech, LLC

Review for Journals:

American J Cardiology
 Bioconjugate Chemistry
 Circulation
 J Am Col Cardiology
 J Immunol
 J Immunological Methods
 J Molecular Cellular Cardiology
 J Nuclear Medicine
 Nuclear Medicine & Biology
 J Nuclear Cardiology,
 New England Journal of Medicine
 Pharmacology Letters
 Journal of Proteome Research.
 Cancer Biotherapy and
 Radiopharmaceuticals

Abstract Reviewer: Soc Nucl Med.
 Soc of Controlled Release
 American Heart Association
 Am Soc Nuclear Cardiol

Organizing Committees of Conferences

Conference co-organizers Pak KY, Liu X, Khaw BA, Lin XT
 The Second Sino-American Nuclear Medicine Conference
 Beijing, China, Aug 1991.

Conference co-organizers John Neumyer and Ban-An Khaw
 AAAS 1993 Annual Meeting. Section on Medical Sciences; Pharmaceutical Sciences.
 "Targeting of Radioligands, Antibodies, and Immunotixins in Diagnosis and Therapy".
 Boston, MA. February 15, 1993.

President of Conference Organizing Committee and Organizer.
 Boscat '97. Northeastern University Centennial Symposium.
 "Targeting the Cardiovascular System: Biologics, Genes and Pharmaceutics in
 Diagnosis and Therapy." September 19-21, 1997. Boston, MA.

Program Committee Member. Multimodal Cardiovascular Molecular Imaging
 Symposium. Natcher Center, national Institutes of Health, Bethesda, MD. April 30-
 May1, 2009.

Research Funding Information:

1977 Ischemia Scor

“Localization and Sizing of Myocardial Infarcts Using Direct Intra-Coronary Administration of Specific Antibody to Cardiac Myosin.”

P.I. Haber, E.

Project Investigators: Gold HK, Khaw BA.

1977-1978 Ischemia Scor. HL-17665

“Utilization of Radioimmunoassay Specific for Cardiac Myosin Light Chains for Detection and Sizing of Myocardial Infarction.”

P.I. Haber, E.

Project Investigators: Khaw, BA. Leinbach RC.

1980-1983 Ischemia Scor

“Immunologic Techniques in the Evaluation of Ischemic Disease”

P.I. Haber E.

Project Investigators: Khaw BA.

1984 -1989 Ischemia Scor P50-HL-26215

“Project IV-A-1. A Physiologic Analysis of Clot Specific Coronary Thrombolysis”

“The Pathology of Infarction after Intravenous rhTPA and Intravenous Streptokinase. Delineation by Antimyosin Imaging”

Scor Director Haber E.

PI Gold HK

Co-Investigators Khaw BA, Leinbach RC, Yasuda T.

1987-1988 Ischemia Scor

“Pathophysiology of Acute Reperfusion in Cardiac Ischemia”

Scor Director Haber E.

PI Powell, Jr. Wm.J., Khaw BA.

1980-1990 Centocor Research Grant

1990-1993 NCI CA50505

“Negative Charge-Modified Monoclonal Antibodies”

PI Khaw BA.

1991-1995 Scotgen Research Grant

“Development of Antibody Imaging of Atherosclerotic Lesions”

PI Khaw BA.

June -Nov. 1995

Molecular Targeting Technology Inc.’s SBIR NIH grant

“Hyperacute Diagnosis of Myocardial Infarction with Tc-99m-Glucaric Acid”

PI Khaw BA.

Centocor

“Demonstration of Myocardial Injury in Antimyosin Scan-Positive/Endomyocardial Biopsy-Negative Patients with Clinically Suspected Myocarditis: A Question of High Sensitivity versus False Positivity.”

PI Khaw BA.

NIH Grant resubmission (1996-1999).

“Negative Charge-Modified Monoclonal Antibodies”

PI Khaw BA.

NIH RO1 Grant submission (1996-1999)

“Membrane Sealing for Preservation of Myocardial Viability”.

PI Khaw BA

NIH RFP Grant submission (1996-1998)

“Programmed Cell Death in Dilated Cardiomyopathy”.

PI Khaw BA

Molecular Targeting Technology Inc.,

Funded Research Grant July 1996-June 1997. \$100,000

Ben Franklin Institute Fund. Philadelphia, PA to Molecular Targeting Technology Inc.,
Frazer, PA Subcontract 1996-1997 \$7,500

NIH SBIR Phase I grant to Molecular Targeting Technology Inc., Frazer, PA.
Subcontract \$33,000

AHA, Rhode Island Affiliate grant to Dr. L. Johnson
Subcontract \$5,000

NIH RO1 PI Dr. L. Johnson, Rhode Island Hospital September 1998-Aug 2001.
“Imaging intimal hyperplasia, myocyte hypoxia, and necrosis.

Subcontract PI B.A. Khaw \$59,131/yr
Total for 3 yr. \$153,636

NIH RO1 PI Dr. L. Johnson, Rhode Island Hospital September 1998-Aug 2001.
“Imaging intimal hyperplasia, myocyte hypoxia, and necrosis.

Subcontract PI B.A. Khaw
Extension 2 yr. (2001-2003) \$79,124.00

NU Research and Development Fund 1998-1999

Novel Targeted Gene Transfection: In vivo Demonstration. \$10,000

Neuromedica Subcontract PI B.A. Khaw

Test Reagents for Reduction of Acute Myocardial Infarct Size \$15,000

Molecular Targeting Technology Inc Funded Research Grant	PI B.A. Khaw	\$10,000
CereMedix (Formerly Neuromedica) Test Reagents for Reduction of Acute Myocardial Infarct Size	PI B.A. Khaw	\$15,000
Gwathmey Inc. Grant Award 5/1/2000-present.	PI BA Khaw	\$40,000
Collaboration with Hartford Hospital (Dr. Gary Heller), 2002.		\$ 5,000.
Glycogenesis Inc. Grant Award for 6 months. 2003-2005		\$125,000
Gwathmey Inc. Unrestricted Grant. 2008-2009		\$150,000
National Jefferson Laboratories 2008-2009		\$10,000
Akrivis Technologies LLC, SRA 2010-2011		\$60,000
Undergraduate Research Grant 2013:		
Mentor:	B.A. Khaw	
Student	Aakansha Bhalla	\$1,000
Undergraduate Research Grant:		
Mentor:	B.A. Khaw	
Student:	Dylan Vance	
Research Title: <i>“Targeted Drug Delivery and Intracellular trafficking study of the chemotherapeutic drugs.”</i>		
Funding:		\$1,000 (2013) \$1,000 (2014).
Advanced Research and Creative Endeavors Award 9-18-2017.		
Mentor	B.A Khaw	
Student	Cahterine Platt (Pharm D student)	\$2,948.00
<i>“Novel muscle cell membrane lesion therapy in Duchenne Muscular Dystrophy.”</i>		
Annual Personal Funding for the lab:		
\$1000 -\$2,000 for the last 4 years..		

Not Funded:

- Submitted April 15, 1996.
Molecular Targeting Technology Inc.’s SBIR NIH grant
“Gene Transfer with Cytoskeleton-Specific Immunoliposomes”
Subcontract
PI Khaw BA. \$33,000
- NIH RO1 Grant submission (1996-1999)
Resubmission (1997-2000) (Appealed and resubmitted Nov 1998)
“Membrane Sealing for Preservation of Myocardial Viability”.

- | | | | |
|----|----------|-------------------------|-----------------|
| PI | Khaw BA. | Direct Cost | \$158,154 Yr. 1 |
| | | Total Direct Cost 4 yr. | \$1,179,930 |
3. Molecular Targeting Technology Inc.'s Phase II SBIR NIH grant
 "Diagnosis of myocardial infarction with technetium-99m glucarate"
 Subcontract:

PI	Khaw BA.		\$50,000/y x2
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4. Gwathmey Inc. NIH SBIR grants application.
"Optimization of Iron Chelator Delivery Targeted for Heart and Liver"
 University contract PI: Khaw \$33,500/6 months
5. NIH RFA CA-98-024
" γ and MR-Imaging with Tumorocidal Anti-Nuclear Autoantibodies"

PI	Khaw	Direct Cost	\$234,296 Yr. 1
		Total Direct Cost	\$708,291
6. NIH RO1 Grant submission (1999-2004)
 Resubmission (2000-2005) (Nov 1998)
 "Cellular Band-Aid for Sealing Myocyte Membrane Lesions."

PI	Khaw BA.	Direct Cost	\$175,000 Yr. 1
		Total Direct Cost 4 yr.	\$850,000
7. RFA. Submitted March 26, 2003 to NIH
 Title: Cell Membrane Lesion Sealing with Targeted Biomaterials.
 PI: Khaw, BA.
 Direct cost: \$900,000 for 4 years.
 Total cost \$1,414,600
8. NIH RO1 Submitted 01/30/06
 Title: Targeting Smooth Muscle Cells in Vascular Imaging.
 PI: Khaw BA.
 Direct cost: \$750,000 for 3 years
 Total cost: \$1,163,130
 Resubmitted: 11/01/06
 Title: Targeting Smooth Muscle Cells in Vascular Imaging.
 PI: Khaw BA.
 Direct cost: \$750,000 for 3 years
 Total cost: \$1,186,500
9. NIH: PA-03-045 Submitted 02/18/06
 Title: Targeting Low Abundance Targets in Cancer with Bispecific Targeting Agents and Drug Loaded Nanopolymers and Nanoparticles.
 PI: Khaw, BA
 Direct cost: \$750,000
 Total cost: \$1,154,700

10. Detection technology for bioterrorism toxins at zepto moles sensitivity.
NIH SBIR (resubmission). Aug 1, 2006
P.I. Maria Carles, Gwathmey Inc.
Co-PI: Khaw BA
\$460,023 for 2 years. Funding for Khaw: approximately \$140,000.00

11. Optimization of Iron Chelator Delivery System for Orphan Diseases
NIH SBIR Submitted Aug 1, 2006
PI: Maria Carles
Co-PI Ban-An Khaw
\$800,000 for 2 years. Funding for Khaw: \$200,000.00

12. Phase II Clinical Trail with Tc-99m Glucarate in Acute MI patients.
NIH SBIR re-submitted: 06
PI. Molecular Targeting Technologies Inc.
Co-PI: Ban-An Khaw
\$2 million (total)
NU co-investigation: \$50,000/yr

13. NIH RO1. Targeting low abundance targets for cancer diagnosis and therapy.
PI Ban-A Khaw Submitted Oct 5, 2008.
Direct Cost \$1,000,000.00
Total Cost \$1,539,840.00

14. Targeted Theranostics, pretargeting with bispecific complexes NIH, Trans-NIH
Recovery Act Research Support
PI; 20%
Potential starting date: 10/01/09
Total Direct for 2 years \$645,006
Indirect cost for 2 years \$350,004

15. Prostate Cancer Targeted Polymer-drug Conjugate Therapy and Imaging: Enhanced Targeted Cancer Toxicity with Reduced Non-targeted Toxicity.
Department of Defense: Dept. of the Army – USAMRAA; Military Medical Research and Development.
PI 20%
Potential starting date: 01/01/2010-12/31/2011
Total Project Estimated Funding: \$702,001.00

16. Targeted polymer-pro-drug conjugate breast cancer theranostic: Enhanced tumor toxicity-decreased non-tumor toxicity.
Department of Defense: CDMR Breast Cancer.
PI 20%
Preproposal not accepted.

17. Prostate Cancer Targeted Polymer-drug Conjugate Imaging and Therapy: Enhanced Targeted Cancer Toxicity with Reduced Non-targeted Toxicity.
Department of Defense: CDMRPPI 20%
Potential starting date: 10/1/2012 – 9/30/2014

- Total Project Estimated Funding: \$583,093.00
18. Targeted polymer-prodrug conjugate theranostic: Enhanced tumor toxicity.
NIH RO1
PI 20%
Potential starting date: 7/01/2012-6/30/2015
Total Project Estimated Funding: \$1,166,250.00
19. Image-guided polymer-pro-drug conjugate targeted delivery in Cancer.
NIH RO1
PI 20%
Project period: 04/01/2014-03/31/2018
Total Project Estimated Funding: \$1,248,000.00
20. CDMRP (2016):
Targeted Polymer-(Multi)-pro-drug Conjugates to overcome paclitaxel (multi-drug)-resistant ovarian cancer. (Not funded.)
21. RO1 (2016):
Pre-Targeted/Targeted Delivery of Polymer-pro-drug Conjugates to Overcome Drug Resistance in Ovarian and Breast Carcinomas. (Not funded.)
22. *Targeted multi-pro-drug therapy to enhance therapeutic efficacy and decrease off target toxicity in cancer therapy. **Planned for 2018 RO1 submission.***
23. *Duchenne Muscular Dysrophy cell membrane lesion therapy to preserve muscle cell viability and function. **Planned for 2018 Duchenne Muscular Dystrophy Foundation submission.***
24. *Extending the window of opportunity for heart transplants: Development of cardioplegic solution with anti-myosin-immunoliposomes that will extend the window of viability of donor hearts between harvest and transplantation. **Planned for submission in 2018 to AHA.***

Major Research Interests:

1. Utilization of monoclonal antibodies to non-invasively delineate myocardial necrosis associated with various cardiomyopathies.
2. Development of radioimmunoassay (monoclonal and polyclonal) for detection of circulating cardiac myosin light chains released following myocardial necrosis.
3. Tumor detection by radioimmuno-scintigraphy
4. Utilization of specific (antibodies) and non-specific immunoglobulin for non-invasive detection and visualization of atherosclerotic lesions.
5. Transplant rejection and mechanisms to tolerize and/or prolong graft survival by immune-abrogation.
6. Charge modification of immunoglobulin (monoclonal antibodies) to affect better biodistribution characteristic for imaging and therapy with antibodies.
7. Application of antibodies and paramagnetic ions or particles in MRI.
8. Reversible and irreversible injury in myocardial ischemia and infarction. Mechanisms, injury and interventions. Development of novel method for reversal of myocardial cell death.
9. Radio-affinity imaging, utilization of radiolabeled ligands for localization of specific receptors.
10. Immunoliposomes and targeted drug delivery by immunoliposomes.
11. Evolutionary divergence of muscle tissues.
12. Experimental autoimmune, viral and rheumatic myocarditis. Involvement of humoral and T-cells in autoimmune myocarditis. Targeted-Drug therapy.
13. In vivo targeting with Peptides, Carbohydrates and other pharmaceuticals.
14. Markers of Programmed Cell Death, "Apoptosis" in Idiopathic Dilated Cardiomyopathies and other Cardiac disorders.
15. Differentiation of apoptotic from necrotic (oncotic) myocardial cell death.
16. Differentiation versus cell death in cultured embryonic cardiocytes for generation of adult phenotype for cell transplantation.
17. Signal enhancement of immunoassays for very high sensitivity assays.

18. In vivo signal enhancement to visualize very small atherosclerotic lesions by molecular imaging.
19. In vivo signal enhancement to visualize very small cancer lesions to enable targeted prodrug therapy with decreased non-target toxicities in Prostate, Breast and other cancers.
20. Use of targeted pro-drug-polymer-conjugate therapy to enhance therapeutic efficacy and reduce off-target toxicity.

Patents: (Filed or Approved)

1. U.S. Patent #4421735 (April 17, 1980)
Radiolabeled Diagnostic Composition and Method for Making the Same.
Inventors: Ban-An Khaw, Ph.D.
Edgar Haber, M.D.
European Patent Organization Patent #0038546
Japanese Patent Filing Date April 16, 1981
2. U.S. Patent #4036945
Composition and Method for Determining the Size and Location of Myocardial Infarcts.
Inventors: Edgar Haber, M.D.
Ban-An Khaw, Ph.D.
3. U.S. Patent #4859450 (August 22, 1989)
Application # 64305, Filing date, August 13, 1984 - MGH 183
Diagnostic NMR Imaging.
Inventors: Ban An Khaw, Ph.D.
Herman K. Gold, M.D.
Mark Goldman, M.D.
4. US Patent S.N. 07/840,638
US Patent # 5,223,242
Patent Application Allowed Dec, 1992.
Application Submitted: November 5, 1985
Negatively Charged Specific Affinity Reagents
Inventors: Vladimir Torchilin, Ph.D.
Ban An Khaw, Ph.D.
Alexander Klivanov, Ph.D.
5. Patent Application Submitted
Application Submitted: February 26, 1988
Method for the Diagnosis and Treatment of Atherosclerosis
Inventors: H. William Strauss, M.D.
Robert H. Rubin, M.D.
Alan J. Fischman, M.D., Ph.D.
Ban An Khaw, Ph.D.

6. U.S. Patent # 5,277,894 (Jan 11, 1994)
Application # 22,449
Filed Feb. 25, 1993
Method for Tumor Detection and Treatment
Inventors: H. William Strauss, M.D.
Robert H. Rubin, M.D.
Ban An Khaw, Ph.D.
Faina Shtern, M.D.
7. Patent Application Submitted
Serial No. 07/366,913; Application filed: June 14, 1989.
Monoclonal Antibody with Specificity for Human Ventricular Myosin LC1 and use thereof.
Inventors: Philip Nicol, M.D.
Gary Matsueda, Ph.D.
Ban An Khaw, Ph.D.
M.G.H. Reference: MGH-342
Not Approved.
8. U.S. Patent # 04952393
Application date October 7, 1988.
Issue Date August 28, 1990.
Organ Infarct Imaging with Technetium-99m Labeled Glucarate.
Inventors: Harvey J Berger, M.D.
Ban An Khaw, Ph.D.
K.Y. Pak, Ph.D.
H. William Strauss, M.D.
9. U.S. Utility Patent Application
Serial No. 07/592,025; filed October 1, 1990
Patent No. 5,223,241; Date of Issue June 29, 1993.
METHOD FOR EARLY DETECTION OF ALLOGRAFT REJECTION
Inventors: Ban An Khaw
Mitsuaki Isobe
Edgar Haber
M.G.H. Reference: MGH 0390.0
10. U.S. Utility Patent Application
No. 07/644,377; filed January 23, 1991
INDUCTION OF TOLERANCE WITH MODIFIED IMMUNOGENS
Inventors: Ban An Khaw
Mitsuaki Isobe
Philip D. Nicol
M.G.H. Reference: M.G.H. 0384.0
11. U.S. Patent # 5780052.
No. filed April 24, 1995.
Approved Oct, 1997.

COMPOSITIONS AND METHODS USEFUL FOR INHIBITING CELL DEATH
AND FOR DELIVERING AN AGENT INTO A CELL.

Inventors: Ban-An Khaw
Vladimir P. Torchilin
Jagat Narula
Imran Vural.

NU Reference NU-367XX

12. Patent No. US 6,451,980 B1, September 17, 2002.
Signal enhancement of bispecific antibody-polymer probe for immunoassay use.
Inventors: Ban-An Khaw
Jagat Narula
13. Invention Disclosure Submitted:
"Bispecific Antibody-Nanopolymer Drug Conjugate Therapy and Ultrasensitive Companion *In Vivo* Imaging Diagnostics for the Treatment and Detection of Very Small Carcinoma Lesions."
Inventor: B.A. Khaw.
Date Submitted: Feb 15, 2008.
14. **Patent Submitted: March, 2009.**
METHODS AND COMPOSITIONS FOR OVERCOMING DRUG-RESISTANCE IN CANCER BY TARGETED DELIVERY OF PRO-DRUG-NANO-POLYMERS.
Publication No.US-20 16-031 0613-A 1
Publication Date:1 0/27/2016
15. Patent Disclosure 2018:
"Novel liposomal cell membrane lesion repair for Duchenne Muscular Dystrophy."

Lectures and Symposia:

1. Teach Research Fellows, Medical Students and technicians in the Cellular Molecular Research, Cardiac Unit and Division of Nuclear Medicine. M.G.H.
2. Guest Lecturer, Northeastern University, 1981-1982.
3. Intra-laboratory Seminars, 2-3 times per year, Cellular and Molecular Research Laboratory.
4. MGH Research Symposium I. "Localization and Imaging of Myocardial Infarct Following Intravenous Administration of ¹³¹I-labeled Cardiac Myosin-specific Antibody," December 9, 1976.

5. New England Clinical Radioassay Society. RIA Symposium. "Detection of Serum Cardiac Myosin Light Chains in Acute Myocardial Infarction by Radioassay," Lexington, MA. December 1, 1978.
6. State-of-the Science Symposium. Radioimmunochemical Detection of Cancer. "Radioimmunochemical Imaging of Myocardial Infarction: Utilization of Anticardiac Myosin Antibodies," Albuquerque, NM. December 5-6, 1979.
7. Robert S. First International Symposium on Monoclonal Antibodies. "Heterogeneous and Monoclonal Antibodies in Imaging of Myocardial Infarction," Munich, Germany, August 1981; Terrytown, New York, September 1981 and Tokyo, Japan, October 1981.
8. Harvard Medical Society, Monoclonal Antibodies: Applications of a New Technology. "Myocardial Infarct Imaging with Antimyosin: Heterogeneous and Monoclonal Antibodies," May 18, 1982.
9. World Congress of CARDIOLOGY. "Irreversible Ischemic Injury in Anoxic Cultured Myocytes: Demonstration by Cell Sorting with Antimyosin-fluorescent Beads and Scanning Electron Microscopy." Moscow, USSR, June 1982.
10. International Symposium on Radioimmunoimaging. "Radiolabeled Antibodies as Imaging Agents." Albuquerque, MN, November 4-5, 1982.
11. New England Radioligand Society. "Radioimmunoassays." "Diagnosis of Myocardial Infarction by Radioassays," Lexington, MA, March 4, 1983.
12. Seminar, Dana Farber Cancer Institute, Shields Radiation Laboratory. "Myocardial infarct imaging with Antimyosin Antibody." March 10, 1983.
13. MGH Nuclear Medicine Summer Course. "Imaging with Antibodies." July 13, 1983.
14. Second Annual Congress of Hybridoma Research. "Myocardial Infarct Imaging with Monoclonal Antibodies." Philadelphia, PA., February 7-9, 1983.
15. MGH Research Symposium VIII. "Imaging with Monoclonal Antimyosin: Acute Myocardial Infarct Visualization and Sizing by Scintigraphy". December 8, 1983.
16. Lectures on Radioimmunoassays to Nuclear Medicine Residents and Fellows. Six weeks: February through March, 1984.
17. Seminar at the Department of Radiation Oncology, MGH. "Human Mammary Tumor Imaging." May 8, 1984.
18. Seminar at NIH, Department of Nuclear Medicine. "Imaging with In-111 and Tc-99m-labeled Antibodies: Detection of Myocardial Infarction and Tumors." May 15, 1984.
19. MGH Nuclear Medicine Summer Course, 1984.

20. MGH Cardiac Fellows Summer Seminar Course, 1984.
21. Northeastern University Seminar: "Radioimmunodetection: Myocardial Infarct and Tumor Imaging." October 1984.
22. Memorial Sloan-Kettering Cancer Center. "Imaging with Monoclonal Antibodies: Acute Myocardial Infarcts and Tumor Detection." May 6, 1985.
23. Nuclear Cardiology Update. Jackson Hole Wyoming. "Monoclonal Antibodies in Cardiology." August 23, 1985.
24. Philadelphia Nuclear Medicine Conference. Hospital of the University of Pennsylvania, Philadelphia, PA. "Cardiac and Oncologic Applications of Radiolabeled Monoclonal antibodies." October 9, 1985.
25. Nuclear Medicine Research Seminars: "Antibody Imaging." April, 17, 1986.
26. Seminar, MGH Department of Radiology, "In vivo imaging with Monoclonal Antibodies." April 8, 1986.
27. Moderator and Feature Presentation at 1986 Society of Nuclear Medicine 33rd Annual Meeting. "Monoclonal Antibodies for Cardiac Imaging." June 23, 1986.
28. Sino-American Nuclear Medicine Symposium. "In vivo Cardiac Applications of Radiolabeled Monoclonal Antibodies." Wuxi, China, August 23-24, 1986.
29. Peoples' Union Medical College Hospital, Beijing China. "Monoclonal Antibodies in Cardiac and Oncologic Radioimmunoscintigraphy." September 3, 1986.
30. Nuclear Medicine Seminar, UCLA, Los Angeles, CA. "Monoclonal Antimyosin in Radioimmunoscintigraphy." September 30, 1986.
31. MGH Nuclear Medicine Research Conference. "Antimyosin in Scintigraphic Visualization of Myocardial Necrosis." October 29, 1986.
32. MGH Division of Nuclear Medicine, Weekly Lecture Series. "Immunology in Nuclear Medicine." January 20 - March 10, 1987.
33. Lecture to MGH Radiology Residents. "Antibodies." May 13, 1987.
34. European Nuclear Medicine Congress 1987, Centocor Lunch Session, Budapest, Hungary. "1977-1987: Report on Ten Years of Development of Monoclonal Antibodies to Cardiac Myosin." August 26, 1987.
35. Chinese American Medical Society 1987 Annual Scientific Meeting. Armand Hammer Health Science Building, Columbia Presbyterian Medical Center, New York. "Non-invasive Radioimmuno-Scintigraphic Application of Monoclonal Antimyosin in Cardiomyopathies." November 21, 1987.

36. Devices and technology Branch Contractors Meeting, Bethesda, MD. "Monoclonal Antibodies for Imaging: Applications in Cardiomyopathy." December 8, 1987.
37. Research in Progress Seminars, Cedar Sinai Medical Center, Los Angeles, CA. "Monoclonal Antibodies in the Diagnosis of Cardiac Disease." December 17, 1987.
38. New Concepts in Viral Heart Disease, "Diagnosis of Acute Myocarditis with Radiolabeled Monoclonal Antimyosin Antibody: Immunoscintigraphic evaluation." Tegernsee, West Germany, June, 1988.
39. Center for Molecular Medicine and Immunology Second Conference on Radioimmunoassay and Radioimmunotherapy of Cancer, "Antimyosin." September, 9, 1988.
40. Nuclear Medicine Update, "Antimyosin Imaging." Presented at the Chinese American Society of Nuclear Medicine Pre-Congress Teaching Session at the 4th Asia and Oceania Congress of Nuclear Medicine. October 30, 1988.
41. Symposium on "Use of Antibodies for Detection and Therapy of Infection, Infarction and Invasion." Approaches to Antibody Modification. Boston, MA. April 14-16, 1989.
42. Symposium on "Use of Antibodies for Detection and Therapy of Infection, Infarction and Invasion." Radioimmune Imaging for the Detection of Tumor. Boston, MA. April 14-16, 1989.
43. Cellular Molecular Research, Cardiac Unit, Laboratory seminar on "Negatively Charged Modified Monoclonal Antibodies- A different in vivo targeting approach." February 6, 1990.
44. Seminar at Squibb Diagnostics. "Negative Charge modification of monoclonal antibodies - potential in vivo applications." New Brunswick, NJ. February 9, 1990.
45. Radiolabeled antibodies in detection of myocardial necrosis: Present and Future applications. Seminar at the Cardiology Center of the USSR. May 13, 1990.
46. MGH, Division of Nuclear Medicine, Lectures to Fellows and Residents. Radioimmunoassays. April 8 & 10, 1991.
47. Centocor Advisory Board Meeting on "Application of Antimyosin Imaging in Clinical Cardiology." History and Development of ¹¹¹Indium-Labeled Antimyosin. Wiesbaden, Germany. May 30-31, 1991.
48. Symposium at Shanghai Medical University, Satellite Symposium to the 2nd Sino-American Nuclear Medicine Conference at Beijing, August 1991. Experimental Autoimmune Myocarditis. August 14, 1991, Shanghai, China

49. The 2nd Sino-American Nuclear Medicine Conference. Monoclonal Antibodies in the Diagnostic Imaging of Cardiovascular Diseases. The Cardiovascular Institute and Fu Wai Hospital, The Chinese Academy of Medical Sciences. Beijing, China August 18-20, 1991.
50. Nuclear Medicine Seminars at the Memorial Sloan-Kettering Cancer Center. "Application of Monoclonal Antibodies in Cardiovascular Diseases." New York, New York. September 26, 1991.
51. Catalan Society of Nuclear Medicine Annual Meeting. Negative Charge Modification of Monoclonal Antibodies for Enhanced in vivo Targeting. Barcelona, Spain. Nov. 7, 1991.
52. Catalan Society of Cardiology. Monoclonal Antibody in Diagnosis of Cardiovascular Diseases. Barcelona, Spain, Nov. 4, 1991.
53. El-Azhar Medical School, Cairo. Monoclonal Antibodies in Cardiovascular Diseases. Cairo, Egypt. Nov. 12, 1991.
54. Greater Boston Science Teachers Association, West. Sponsored by the College of Pharmacy and Allied Health Professions. Northeastern University. Monoclonal Antibodies in Diagnosis and Therapy. March 4, 1992.
55. Centocor Sponsored Conference on, "Application of Antimyosin Imaging in Clinical Cardiology." "History and Development of 111Indium-Labeled Antimyosin," and "New Application of Antimyosin Antibody." Frankfurt, Germany. March 19-21, 1992.
56. II International Symposium on Nuclear Cardiology Today - 1992, "Applications of monoclonal antibodies in cardiovascular diseases: Atherosclerosis and pulmonary emboli imaging." Cesena, Italy May 28-30, 1992.
57. II International Symposium on Nuclear Cardiology Today - 1992, "Myocardial salvage in reperfusion injury." Cesena, Italy May 28-30, 1992.
58. International Symposium in Nuclear Cardiology, 1992. "New Approaches to Diagnosis and Therapy with Monoclonal Antibodies," at the National Institute of Cardiology Dr. Ignacio Chavez. Mexico DF, Mexico. June 15-16, 1992.
59. 6th International Pharmaceutical Technology Symposium, Recent Advances in Pharmaceutical and Industrial Biotechnology. "Advances in the In Vivo Applications of Monoclonal Antibodies in Cardiovascular Diseases." Hacettepe University, Ankara, Turkey. September 7-10, 1992.
60. Invited speaker at the 3rd Annual IBC International Conference on "ANTIBODY ENGINEERING," Dec 14-16, 1992, San Diego, CA. "Negatively Charge Modified Monoclonal Antimyosin Antibody for Enhanced in vivo Targeting."

61. Enhanced in vivo targeting with negatively charge-modified monoclonal antibodies. AAAS 1993 Annual Meeting. Section on Medical Sciences; Pharmaceutical Sciences. "Targeting of Radioligands, Antibodies, and Immunotoxins in Diagnosis and Therapy". Boston, MA. February 15, 1993.
62. 28th Annual Meeting of the National Council, Northeastern University. "Affinity Targeting in the Cardiovascular System." April 1, 1993.
63. Advances in Monoclonal Antibodies in Cardiovascular Diseases. Seminar at M. Bufalini Hospitale, Cesena. April 30, 1993.
64. Invited Guest Lecture. Visualization of Experimental Atherosclerotic Lesions with Radiolabeled Monoclonal Antibody. World Chinese Conference of Nuclear Medicine. Wuxi, China. Aug 8-11, 1993.
65. 20th Anniversary Conference of the US/Russia (USSR) Scientist Exchange Program in Cardiovascular Diseases. Affinity Targeting Reagents in the Cardiovascular Diseases. September 6-11, 1993.
66. Nuclear Cardiological Methods on the Detection of Graft Rejection: Role of Monoclonal Antimyosin Antibody," a Satellite Symposium of "Thoracic Organ Transplantation; Routine as a Challenge" at Bad Oeynhausen, Germany, September 9-11, 1993. Lecture "Basic Principle of Antimyosin Imaging for Detection of Myocyte Necrosis".
67. Sensitivity and Specificity of Antimyosin for Detection of Myocyte Necrosis.
Sept 10, 1993 University of Frankfurt
Sept 13, 1993 Charite, Berlin
Sept 14, 1993 Urban Hospital, Berlin
Sept 15, 1993 University of Gottingen
Sept 15, 1993 Philips Medical College and Hospital, Marberg
Sept 16, 1993 University Klinikum of Munich.
68. Dana-Farber Cancer Institute, Joint Program in Nuclear Medicine Seminar. Imaging of Experimental Atherosclerotic Lesions with Monoclonal Antibodies. September 30, 1993.
69. Invited Lecture at the Escot heart Institute, New Delhi, India. Imaging acute myocardial infarction: Journey from lab bench to bedside. January 19, 1994.
70. Invited Lecture at the Sitaram Bhatia Institute of Science and Research. New Delhi, India. Will immunoscintigraphy be feasible for non-invasive detection of atherosclerotic lesions? Lessons from experimental data. January, 21, 1994.
71. Guest Lecturer at the annual meeting of the Society of Nuclear Medicine, Northern Chapter, New Delhi, India. Monoclonal antibodies in cardiovascular diseases. January, 22, 1994.

72. Invited Lecture at the SMS Medical College Hospital, Jaipur, Rajasthan, India. Immunoscintigraphy in cardiovascular diseases. January, 27, 1994.
73. Seminar at the Molecular Disease Branch, Section of Cell Biology, National Institutes of Health, Bethesda, Maryland on "Non-invasive Targeting and Visualization in Cardiovascular Diseases." March 28, 1994.
74. Seminar at University of Pisa Medical School, Nuclear Medicine Center, Pisa Italy. Tc-99m Glucarate in Acute Myocardial Infarction, Stroke and Breast Tumor: History and Mechanism. June 25, 1994.
75. Seminar at the University of Nijmegen Medical School, Nuclear Medicine Department, Netherlands. "Non-invasive Detection of Acute MI, Stroke and Breast Tumors: Radiolabeled-Antibodies or Tc-99m Glucarate?" June 29, 1994.
76. 3rd International Symposium on Diagnosis and Treatment in Dilated Heart Muscle Disease. "SR-Ca⁺⁺ ATPase as an autoimmunogen in experimental myocarditis." Berlin, Germany. September 7-9, 1994.
77. 3rd International Symposium on Diagnosis and Treatment in Dilated Heart Muscle Disease. "Myosin imaging methods-an approach to necrosis in dilated cardiomyopathy and myocarditis." Berlin, Germany. September 7-9, 1994.
78. Current Concepts in Cardiovascular Diseases. New Approaches to acute myocardial infarction imaging. December 3, 1995. All India Institute of Medical Sciences, New Delhi, India
79. Current Concepts in Cardiovascular Diseases. Imaging of atherosclerotic lesions. December 3, 1995. All India Institute of Medical Sciences, New Delhi, India
80. III International Symposium "Nuclear Cardiology Today-1996: Role in Clinical Decision Making." "Radionuclide Imaging of Atherosclerosis". May 25, 1996. Cesena, Italy.
81. 43rd Annual meeting of the Society of Nuclear Medicine, Categorical Seminars: Cardiac Nuclear Medicine: The-State-of-the Art. "Early Detection of Myocardial Injury and Infarction". June 2, 1996. Denver, Colorado.
82. Nuclear Cardiology Invitational Conference at Wintergreen. "New Tracers: What is being developed and what will be the future clinical applications? Tc-99m Glucarate, Z2D3 and AP4A in acute MI and atherosclerotic lesion imaging." July 13-16, 1996. Wintergreen, Virginia.
83. Biomedical Science Colloquium. Department of Pharmaceutical Sciences, Northeastern University. Targeting acute MI, breast tumor and stroke: one reagent three applications. Oct. 31, 1996.

84. 4th International Conference on Nuclear Cardiology. Read with the Experts: Diagnosis and Prognosis of Acute MI. April 9, 1997. Florence, Italy.
85. Invited Speaker of the Nuclear Cardiology Working Group of Delaware Valley Conference. Allegheny University. East Falls (formerly MCP), Philadelphia, PA. "Acute Infarct Imaging" May 7, 1997.
86. 44th Annual meeting of the Society of Nuclear Medicine, Categorical Seminars: Cardiovascular: From Science to Clinical Decision Making. "Imaging Myocardial Infarction-New Approaches." San Antonio, TX June 1, 1997.
87. Invited Speaker of the International Symposium on Molecular Nuclear Medicine, sponsored by the International College of Nuclear Medicine Physicians at the "Federico Gomez" Pediatric Hospital of Mexico, Mexico City. June 6, 1997.
88. Speaker, Boscat '97, An International Symposium to Celebrate the Centennial of Northeastern University, "Targeting the Cardiovascular System: Biologics, Genes and Pharmaceuticals in Diagnosis and Therapy." Boston, MA September 19-21, 1997. Lecture on "Specificity and Speed: Targeting the Necrotic Myocardium."
89. Speaker, Boscat '97, An International Symposium to Celebrate the Centennial of Northeastern University, "Targeting the Cardiovascular System: Biologics, Genes and Pharmaceuticals in Diagnosis and Therapy." Boston, MA September 19-21, 1997. Lecture on "Novel Delivery of Genes: Cell Membrane Sealing with Cytoskeleton-specific Immunoliposomes."
90. Biomedical Science Colloquium. Department of Pharmaceutical Sciences, Northeastern University. Specificity and Speed in Scintigraphic Diagnosis of Acute Myocardial Infarction. Oct. 30, 1997.
91. Biology Department Colloquium." Novel Targeting of the Necrotic Myocardium: From Diagnosis to Therapy." Feb 25, 1998.
92. "New Frontiers in Cardiac Imaging" "New Agents to Detect Myocardial Infarction" Symposium sponsored by American Society of Nuclear Cardiology prior to the American Heart Association Annual Meeting. Nov 9, 1977. Orlando, FL.
93. International Research group in Immunoscintigraphy and Immunotherapy (IRIST) Barcelona, May, 1998.
94. 45th Annual meeting of the Society of Nuclear Medicine, Symposium sponsored by American Society of Nuclear Cardiology "New Methods in Nuclear Cardiac Imaging: Infarct Avid Agents." Toronto, Canada. June 9, 1998.
95. Biomedical Science Colloquium. Department of Pharmaceutical Sciences, Northeastern University. Tc-99m glucarate for diagnosis of very acute myocardial oncosis (necrosis): Can it differentiate necrotic from Apoptotic myocardial cell death. Dec 3, 1998.

96. Nuclear Cardiology Invitational Conference at Wintergreen. Invitational Workshop on Nuclear Cardiology. "Molecular Probes in the Future of Nuclear Imaging." July 11-14, 1998. Wintergreen, Virginia.
96. Nuclear Medicine Seminar in the Department of Radiology. "Is Tc-99m glucarate an Oncosis- but not apoptosis-avid agent? Mechanisms of uptake in acute MI, Adriamycin cardiotoxicity and breast tumors." Memorial Sloan Kettering Cancer Center, New York, N.Y. January 25, 1999.
97. Invited Speaker. Update on New Imaging modalities and new Radiotracers in Nuclear Cardiology. Lecture on "New Infarct-Avid Imaging Agents. 46th Annual Meeting of the Society of Nuclear Medicine. June 9, 1999. Los Angeles, CA.
98. Invited speaker, Targeted Drug Delivery section of the Controlled Release Society's annual meeting to be held in Boston, June 20-23, 1999. "Targeting the Necrotic Myocardium for Diagnosis and Therapy,"
99. Invited Speaker: "Hyper Acute Imaging of Acute myocardial infarction with Tc-99m Glucaric Acid." European Association of Nuclear Medicine. Barcelona, Spain. October 9-13, 1999.
100. Seminar at the Center for Interdisciplinary Research on Complex Systems. "Novel approaches to Diagnosis and Therapy in Acute Coronary Syndromes". February 15, 2000.
101. Cardiac Grand Rounds at Massachusetts General Hospital. "From Diagnosis to Cell Membrane Lesion Sealing Therapy of Acute Myocardial Injury. March 1, 2000.
102. Invited lecturer: IV International Meeting: Nuclear Cardiology Today, 2000 and Beyond. "Emerging nuclear cardiology approaches in acute coronary syndromes." Cesena, Italy. May 25-27, 2000.
103. Ph.D. Thesis Defense Committee, Peter Laverman's Thesis Defense. University Medical Center, Nijmegen, Department of Nuclear Medicine. The Netherlands. Nov 9, 2000.
104. Invited lecture at Sino American Technology and Engineering Conference in Shanghai, Beijing China. Oct 15-23, 2001.
105. Nuclear Cardiology Invitational Conference at Winter Valley. Invitational Workshop on Nuclear Cardiology. July 2002. Winter Valley, Tahoe, California.
106. Invited lecture at the University of Arizona, Tucson. "From diagnosis to potential novel therapy of the oncotic (formerly necrotic) myocardium." Feb 25, 2003.
107. Invited speaker at the 6th International Conference on Nuclear Cardiology, Florence, Italy. April 27-30. 2003. "Imaging Apoptosis and Necrosis."

108. Seminar at the Days Neuromuscular Disease Laboratory, at Massachusetts General Hospital –East, Charlestown, MA. Oct, 14, 2003.
109. Invited Speaker: at the Cardiovascular Molecular Imaging Symposium. May 3 & 4, 2004. Natcher Auditorium, National Institutes of Health, Bethesda, MD. “Bispecific Antibodies and Polymer-linkage Methods.
110. Society of Nuclear Medicine, Cardiovascular Council Continuing Medical Education: “Imaging inflammatory and degenerative cardiomyopathies.” At the Society of Nuclear Medicine annual meeting in Philadelphia, June 22, 2004.
111. World Conference on Magic Bullets: To celebrate Paul Ehrlich’s 150th Birthday. Nurnberg, Germany, Sept 9-11, 2004. Invited abstract oral presentation.
112. Cardiovascular Sciences Seminar, UC- Irvine College of Medicine Division of Cardiology. “Noninvasive Targeted Imaging for CV Disorders: *Principles, Implications, and Improvisations.*” Oct 15, 2004. Irvine, CA.
113. Gamma imaging of atherosclerotic lesions: Methods to enhance in vivo targeting. CIMIT Vulnerable Plaque Program Monday Lectures, Massachusetts General Hospital, Boston, MA. June 28, 2004.
114. “The current status of technetium glucarate for evaluation of acute coronary syndromes.” Nuclear Imaging of Acute Ischemia and Acute Coronary Syndromes. American Society of Nuclear Cardiology. 10th Annual Scientific Session. Seattle, WA. Sept 29-Oct 2, 2005.
115. Ph.D. Graduate Student recruitment day speaker, 2005.
116. Pharmaceutical Science Department Show Case Day speaker. May 2005.
117. Invited Expert Participant: Department of Energy Workshop on “Frontiers in Imaging Science: Imaging Low Abundance Targets.” Hyatt Regency, Cambridge, MA Nov 9-10, 2005.
118. Speaker in Northeastern University Graduate Materials Link Symposium on Interdisciplinary Nano, Bio and Materials Research. Friday, 13 January 2006.
119. Ph.D. Graduate Student recruitment day speaker, Feb. 3, 2006.
120. Invited seminar at the Pharmaceutical Research Institute at Albany College of Pharmacy. Seminar title: “Enhancing Targeted Drug Delivery: Road to Imaging of Low Abundance Targets in Cardiovascular Diseases.” May 16, 2006.
121. Invited Speaker: The 9th International Workshop on Scleroderma Research. “Molecular Imaging of vascular injury.” Boston, MA Aug 5-9, 2006.

122. Invited Speaker. The Second Annual Meeting of the American Academy of Nanomedicine. "Nano-lipid vesicles and nano-polymers in targeted cardiovascular imaging and therapy." Cardiovascular Nanomedicine. Washington DC. Sept 9-10, 2006. The National Academy of Sciences.
123. BiogenIdec invited seminar Speaker. Targeting Low Abundance Targets for Diagnosis and Therapy. Nov 16, 2006. Cambridge, MA.
124. Invited speaker. "Targeted drug delivery in cardiovascular injury: molecular imaging of low abundance targets in atherosclerotic lesions." At the Drug Delivery and Translational Research Symposium. Polytechnic University, Brooklyn, NY Dec 4-5, 2006.
125. Invited Speaker. "Novel intervention in Nuclear Cardiology & signal amplification for imaging of low abundance targets in cardiovascular disease." At All India Institutes of Medical Sciences, Delhi, India. March 21, 2007
126. Speaker at the Phase II Clinical Trial Users meeting. Sponsored by Molecular Targeting Technologies, Inc., Washington DC. June 1, 2007.
127. Invited Speaker. "Nano-cytoskeletal-antigen specific immunoliposomes (Nano-CSIL) as Cellular Nano-Band-Aid." The 2nd International Congress of Nanobiotechnology and Nanomedicine, the International Association of Nanotechnology. Advances in NanoBio Research, Track B. San Francisco, CA June 19-21, 2007.
128. Science Today Seminar at the State University of New York at Oswego to present, "Molecular Imaging in Cardiovascular Diseases and Beyond." Oct 2, 2007.
129. Therapeutic Monoclonal Antibody Discovery. "Monoclonal antibody Mediated Signal Amplification and Cellular "Band Aids" for Diagnosis and Repair in Cardiovascular Diseases." The Charles Hotel, Cambridge, MA Oct 4 -5, 2007.
130. NU Pharm Sci Show Case: "Targeting Low Abundance Targets for Diagnosis and Therapy." May 18, 2007.
131. "Imaging very Small Lesions by Signal Amplification." Harvard Medical School JPNM Seminar. 11/7/2007.
132. Mini-Symposium "Recent Advances in Drug Delivery" in honor of Dr. Atilla Hincal's Retirement from Hacettepe University, Ankara, Turkey. Nov 30, 2007.
133. Invited Seminar at the University of Izmir, Faculty of Pharmacy. "Enhancing Targeted Drug Delivery to Low Abundance Targets: Imaging Atherosclerotic Lesions to Cancer Therapy (Full seminar)." Dec 07, 2007. Ege (Agean) Faculty of Pharmacy. Izmir, Turkey.

134. NU Pharm Sci Show Case: “Novel Targeted Imaging and Therapy of Cancer.” May 16, 2008.
135. Invited speaker: 9th Asia Oceania Congress of Nuclear Medicine and Biology. Oct 31 to Nov 4th, 2008.
136. Mid-Winter Educational Symposium. Society of Nuclear Medicine. “Novel Techniques and Drug Development to Prevent Cardiotoxicity of Cancer Chemotherapy,” in Evaluating Cardiac Toxicity of Cancer Chemotherapy. Feb, 8, 2009. Clearwater, Florida.
137. Annual Society of Nuclear Medicine Meeting. “Novel Techniques and Drug Development to Prevent Cardiotoxicity of Cancer Chemotherapy,” in Cardiotoxicity of Chemotherapy. Toronto, Canada. June 17, 2009.
138. Pre-targeting for nano-drug conjugates for enhanced diagnosis and therapy of cancer. College of Engineering. Bio-Related Engineering Research Retreat. March 20, 2009.
139. Bispecific Antibodies and Poly-linkage Methods. At the Multimodal Cardiovascular Molecular Imaging Symposium. Natcher Center, national Institutes of Health, Bethesda, MD. April 30-May1, 2009.
140. Background/ Former protocol images review. ^{99m}Tc-Glucarate Investigator’s Meeting. June 12, 2009 – 3:00 to 6:00 PM. Toronto Marriott Downtown Eaton Centre
141. Development of Methods for Imaging and Therapy of Ultra-small Lesions from Cardiovascular to Diseases to Cancer. Druk Holding and Investments Meeting. Thimpu, Bhutan. October, 2010.
142. Seminar at Fu Wai Hospital, National Cardiovascular Institute, Beijing China. “Molecular Imaging of Very Small Lesions in Cardiovascular to Oncology and back to Cardiovascular: Potential therapeutic applications.” October 22, 2012.
143. Invited speaker. Visualizing Targeted Delivery of Polymer-Drug Conjugates. *At Accelerating Development of Difficult-to-Delivery Drugs. World Pharma Congress. June 4-6, 2013. Loews Philadelphia Hotel, Philadelphia, PA.*
144. Invited Speaker. An alternate in vivo ADC approach to enhance diagnostic imaging and therapy for cancer. *At Toxicologic Pathology and Preclinical Development of Antibody Drug Conjugates. CHARLES LOUIS DAVIS, D.V.M. FOUNDATION. For the International Advancement of Veterinary and Comparative Pathology, NORTHEAST DIVISION. Friday, November 1, 2013. Novartis Pharmaceuticals Inc., Building 438 auditorium. ne Health Plaza, East Hanover, New Jersey*
145. Present to Undergraduate students interested in Research event; Connect with Bouve Researcher-Undergraduate Research, “**Meet the Researchers**”. Feb. 3, 2014.
146. Present to incoming Bouve undergraduate students. **Explore Research.** Welcome day. April 6, 2014.

147. Targeted- Nano-polymers and -Nano-vesicles for Diagnosis and Therapy in Cardiovascular Disorders. HMRI (Houston Methodist Research Institute)-NEU Cardiovascular Nanomedicine Workshop, Aug 13-14, 2015.
148. Targeted Nano-polymer pro-drug cancer therapy; Potential theranostic applications. First International Nanomedicine Symposium and Workshop. Impact of Nanobiotechnology Applications on the Future of Medicine and Personalized Medicine (Aug 3-7/2015)
149. Nano-polymer-based Immuno-Gamma Imaging for Enhancement of Sensitivity and Specificity in Cardiovascular and Cancer Diagnosis. First International Nanomedicine Symposium and Workshop. Impact of Nanobiotechnology Applications on the Future of Medicine and Personalized Medicine (Aug 3-7/2015).
150. Present to Undergraduate students interested in Research event; Connect with Bouve Researcher-Undergraduate Research, “Meet the Researchers”. Jan 21, 2016.
151. Road to enhanced targeted nano-drug delivery: In vitro signal amplification and in vivo imaging to therapy in cardiovascular disorders and cancer. Pharmacology and Experimental Therapeutics Program, Tufts Medical Center- Jaharis Building, Jan 26, 2016.
152. Singapore Heart Institute: “Road to enhanced targeted nano-drug delivery: In vitro signal amplification and in vivo imaging in cardiovascular disorders.” Sept 9-16, 2016 (Dr. Felix Keng Young Jih, Dr. Tan Ru San).
153. Department of Biomedical Engineering, National University of Singapore: “Targeted Prodrug Delivery for Cancer Therapeutics and Imaging: A Way to Overcome Drug Resistance.” Sept 14, 2016. (Dr. Jung Li).
154. Lifetime achievement award lecture: “From Cardiovascular to Oncology: the evolution of the role of antibodies in diagnosis and therapy from highly abundant to targets of low abundance.” June 2017. Denver, Co at the Annual meeting of the Society of Nuclear Medicine and Molecular Imaging by the Chinese American Society of Nuclear Medicine and Molecular Imaging.

Academic teaching:

1. Immunobiology, MLS 3338. Team taught (3 lectures) Spring Quarter Graduate Course. Northeastern University. April-June, 1992.
2. PMC 1322. Pharmaceutical Biotechnology. Team taught two lectures on Immunology. Fall Quarter, 1992. Bouve College of Pharmacy and Health Sciences, Northeastern University.
3. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Hematology and Immunology. Fall Quarter, 1992. Bouve College of Pharmacy and Health Sciences, Northeastern University.

4. PMC 1322. Pharmaceutical Biotechnology. Team taught two lectures on Immunology. Winter Quarter, 1993. Bouve College of Pharmacy and Health Sciences, Northeastern University.
5. PMC 1322. Pharmaceutical Biotechnology. Team taught two lectures on Immunology. Fall Quarter, 1993. Bouve College of Pharmacy and Health Sciences, Northeastern University.
6. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Immunology. Fall Quarter, 1993. Bouve College of Pharmacy and Health Sciences, Northeastern University.
7. PMC 1322. Pharmaceutical Biotechnology. Team taught two lectures on Immunology. Winter Quarter, 1994. Bouve College of Pharmacy and Health Sciences, Northeastern University.
8. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Immunology. Fall Quarter, 1994. Bouve College of Pharmacy and Health Sciences, Northeastern University.
9. PMC 1322. Pharmaceutical Biotechnology. Team taught three lectures on: 1) Monoclonal antibodies, 2) Applications of Monoclonal Antibodies, and 3) Immuno-toxins and Immunoliposomes... Fall Quarter, 1994. Bouve College of Pharmacy and Health Sciences, Northeastern University.
10. PHP 1615. Clinical Immunology. Course developed for PharmD program. Team taught 50% each, Khaw and Narula. Fall Quarter, 1994. Bouve College of Pharmacy and Health Sciences, Northeastern University.
11. MLS 3388. Immunobiology Graduate course, Khaw 80%, Narula 20%. Spring 1995. Bouve College of Pharmacy and Health Sciences, Northeastern University.
12. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Immunology. Fall Quarter, 1995. Bouve College of Pharmacy and Health Sciences, Northeastern University.
13. PMC 1322. Pharmaceutical Biotechnology. Team taught three lectures on: 1) Monoclonal antibodies, 2) Applications of Monoclonal Antibodies, and 3) Immuno-toxins and Immunoliposomes... Fall Quarter, 1995. Bouve College of Pharmacy and Health Sciences, Northeastern University.
14. PHP 1615. Clinical Immunology. Course developed for PharmD program. Team taught 60:40 %, Khaw and Narula. Fall Quarter, 1995. Bouve College of Pharmacy and Health Sciences, Northeastern University.
15. PMC 1322. Pharmaceutical Biotechnology. Team taught 4 lectures on: 1) Monoclonal antibodies, 2) In vitro Applications of Monoclonal Antibodies, 3) In vivo Applications of Monoclonal Antibodies and 4) Immuno-toxins and Immunoliposomes... Winter

- Quarter, 1996. Bouve College of Pharmacy and Health Sciences, Northeastern University.
16. MLS 3388. Immunobiology Graduate course, Khaw 80%, Narula 20%. Spring 1997. Bouve College of Pharmacy and Health Sciences, Northeastern University.
 17. PMC 1322. Pharmaceutical Biotechnology. Team taught 4 lectures on: 1) Monoclonal antibodies, 2) In vitro Applications of Monoclonal Antibodies, 3) In vivo Applications of Monoclonal Antibodies and 4) Immuno-toxins and Immunoliposomes... Fall Quarter, 1997. Bouve College of Pharmacy and Health Sciences, Northeastern University.
 18. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Immunology. Fall Quarter, 1997. Bouve College of Pharmacy and Health Sciences, Northeastern University.
 19. PMC 1322. Pharmaceutical Biotechnology. Course coordinator and primary lecturer. Bouve College of Pharmacy and Health Sciences, Northeastern University. Winter Quarter, 1998.
 20. PMC 1322. Pharmaceutical Biotechnology. Course coordinator and primary lecturer. Bouve College of Pharmacy and Health Sciences, Northeastern University. Fall Quarter, 1998
 21. PAH 3510, Concepts in Human Physiology. Team taught, one 3 hours lecture on Immunology. Winter Quarter, 1998. Bouve College of Pharmacy and Health Sciences, Northeastern University
 22. PMC 1322. Pharmaceutical Biotechnology. Course coordinator and primary lecturer. Bouve College of Health Sciences, Northeastern University. Winter Quarter, 1999.
 23. MLS 3388. Immunobiology Graduate course, Khaw 90%. Fall 1999.
 24. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Immunology. Fall Quarter, 1999.
 25. PMD 1310. Immunology for Pharm D students. 4 QH lecture course. Winter Quarter, 2000.
 26. PAH 3510, Concepts in Human Physiology. Team taught one 3 hours lecture on Immunology. Fall Quarter, 2000.
 27. PMD 1310. Immunology for Pharm D students. 4 QH lecture course. Winter Quarter, 2001.
 28. PMD 1310. Immunology for Pharm D students. 4 QH lecture course. Fall Quarter, 2001.

29. PMD 1310. Immunology for Pharm D students. 4 QH lecture course. Fall Quarter, 2002.
30. Pathophysiology. 10 lectures. Winter Quarter, 2003.
31. MLS3338 Immunobiology (Graduate, 15 students). Spring 2003.
32. Fall 2003.
33. Seminar in Pharmaceutics. Fall 2004.
34. Lectures in Pathophysiology. Spring, 2005
35. Immunology PSC U330. Spring, 2005
36. Human Physiology, PSCG216, Immunology lectures (2) Fall 2005.
37. Pathophysiology PMDU401 Spring 2006.
38. Immunology PSC U330, spring 2006.
39. Human Physiology, PSCG216, Immunology lectures (2). Fall 2006.
40. Pathophysiology PMDU401 Spring 2007.
41. Immunology PSC U330, spring 2007
42. BHSU100 Freshman Sem Fall 2007- present
43. Human Physiology, PSCG216, Immunology lectures (2). Fall 2005.
44. Imaging in Medicine and Drug Discovery. PCS G226. Spring 2008
45. Pathophysiology PMDU401 Spring 2008.
46. Advanced Drug Delivery. PSG Fall 2008.
47. BHSU100 Freshman Sem Fall 2008
48. Immunology PSG U330. Spring 2009
49. Immunology PSC G250 Spring 2009.
50. Imaging in Medicine and Drug Discovery. PCS G226. Spring 2009, 2010, 2011, 2012, 2013
51. Pathophysiology PMDU401 Spring 2009

52. Advanced Drug Delivery Systems. PSGG254 Fall 2009-2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017
Spring 2010, 2011,
53. Undergrad Research PSCU964 Spring 2009, 2013
54. Immunology PHSC 2330 Spring 2010 to present.
55. Human Physiology, PSCG216 ,Immunology lectures (2) Fall 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017.
56. Advanced Drug Delivery Systems: course coordinator 2016 Fall.
57. Pharmacology 2 lecture: Novel uses of antibodies for diagnosis and therapy. Spring 2018.

Invitation to Chair at International and National Meetings.

1. Chairman of the American Heart Association Cardiovascular Radiology/Clinical Cardiology Session, "Antimyosin Antibody and Fatty Acid Isotope Imaging." November 16, 1988.
2. Moderator at the 1991 Society of Nuclear Medicine 38th Annual Meeting, session on "Cardiovascular Clinical: Antibody Imaging in Cardiovascular Disease."
3. Moderator of the session "Communications II" of the Nuclear Cardiology Today - 1992 at Cesena Italy. May 28-30, 1992.
4. Co-moderator at the 1992 Society of Nuclear Medicine 39th Annual Meeting, session on "Cardiovascular Basic: MIBG & Antibody Imaging."
5. Chairman, Section on Medical Sciences; Pharmaceutical Sciences. "Targeting of Radioligands, Antibodies, and Immunotixins in Diagnosis and Therapy". At 1993 Annual Meeting of the American Association for the Advancement of Science. Boston, MA. February 15, 1993.
6. Chairman, Basic Science Section at the First International Congress of Nuclear Cardiology, Cannes, France, April 25 - 28, 1993.
7. Chairman: Closing Ceremony of the World Chinese Conference of Nuclear Medicine, Wuxi China, Aug 8-11, 1993.
8. Co-Chair: Session on Novel Targeting Approach in Cardiovascular Therapy II. Boscat '97, an International Symposium to Celebrate the Centennial of Northeastern

University, "Targeting the Cardiovascular System: Biologics, Genes and Pharmaceuticals in Diagnosis and Therapy." Boston, MA. September 19-21, 1997.

9. Co-Chair. Session on Newer Targeting Modalities II. Boscat '97, an International Symposium to Celebrate the Centennial of Northeastern University, "Targeting the Cardiovascular System: Biologics, Genes and Pharmaceuticals in Diagnosis and Therapy." Boston, MA. September 19-21, 1997.
10. Co-Chair. Session on Targeted Drug Delivery I, at the 26th International Symposium on Controlled Release of Bioactive Materials. June 22, 1999
11. Co-Chair. Session on Targeted Drug Delivery II, at the 26th International Symposium on Controlled Release of Bioactive Materials. June 23, 1999
12. Co-Chair. Session on Controlled Delivery of Diagnostics, at the 26th International Symposium on Controlled Release of Bioactive Materials. June 21, 1999.
13. Chair. 5th International Conference on Nuclear Cardiology. April 19-22, 1999. Athens Greece.
14. Invited expert panelist at the First "Center for Subsurface Sensing and Imaging Technology" seminar on "The Vulnerable Plaque and Triggering of Cardiovascular Disease Onset" by James Muller, M.D. at Northeastern University. Feb 4, 2000.
15. Co-Chair. Proffered abstracts oral presentation session. May 27, 2000. IV International Meeting: Nuclear Cardiology Today 2000 and Beyond. Cesena, Italy May 25-27, 2000.
16. Chair, the 5th International Conference of Nuclear Cardiology section on "Acute Coronary Syndromes" abstract oral presentation. Vienna, Austria. May 4, 2001.
17. Chair. The 2nd International Congress of Nanobiotechnology and Nanomedicine, the International Association of Nanotechnology. Advances in NanoBio Research, Track B. San Francisco, CA June 19-21, 2007.
18. Co-Chair. Nanomedicine and Drug Delivery Symposium. Section 5. Nanosystems for Imaging. Boston, MA Nov 2-3, 2007.

Inter-University Collaborations:

Lynne L. Johnson MD. Depart of Nuclear Cardiology, Rhode Island Hospital, Brown Medical School, and Providence, RI, 1997-present.

Michel Meignan, MD. Department of Nuclear Medicine, University of Paris, Creteil
Nov 3, 2000. Starting date.

Robert Cohen MD. Cardiovascular Institute, Boston University Medical Center, Boston.

Gary Heller, M.D. Ph.D. Hartford Hospital,

Stanley Majewski, Ph.D. Jefferson National Laboratories, Virginia
West Virginia University, WV.

Alexandra Varvarigou, Demokritos Institute, Athens, Greece.

Andrew Weisenberger. Jefferson National Laboratories, Virginia.

SUPERVISORY AND MANAGERIAL EXPERIENCES IN DIRECTING AND TRAINING OF:

Research Fellows

1. Carol Waksmonski, M.D.
2. Hugo A. Katus, M.D.
3. Peter Liu, M.D.
4. Yasuaki Kawamura, M.D.
5. Michito Kanke, M.D.
6. Barbara Nath, M.D.
7. Alexander Klibanov, Ph.D.
8. Tomiyashi Saito, M.D.
9. Misha Slinkin, Ph.D. (March, 1989)
10. Philip Nicol, M.D. (Sept. 1986-Sept. 1989)
11. Mitsuaki Isobe, M.D. (1987-1990)
12. Betina Beauthen-Baumann, M.D. (July 1988-Dec. 1989)
13. Jagat Narula, M.D. (July 89-June 1992)
14. Otis Yin (July-Dec. 1989)
15. Bela Fornet, M.D. (July 1988-June 1989)
16. Atiom Petrov, M.D. (July 1, 1992*).
17. Hun Lee, M.D. (Sept -Nov 1992).
18. Nazam Haider, Ph.D. (Dec. 1993) (Part time Oct. 1993).
(Jan. 1994 -).
19. Urich Smidth, M.D. (July 1995 June 30, 1996)
20. Adham Abu-Taha, Ph.D. Oct. 2003-2005

Surgical Technicians

1. Richard Moore
2. Edward Collard
3. Jack Irving (M.D.)
4. John Rosseel (D.V.M.)
5. Elizabeth Essington (D.V.M.)
6. John Cooney
7. James Powers (M.D.)
8. Sean O'Donnell (M.D.)

Immunochemical Technicians

1. Jessica Couteau
2. Elizabeth Locke
3. Eugene Mitsuzawa (Ph.D.)
4. Kathy Nichols (M.D.)
5. Edward Dean (M.D.)
6. Susan Cahill (M.D.)
7. Izak Bahar
8. Lorna Chen
9. Pamela Roy
10. Nancy Ciampi
11. Naseem Nossiff

12. Scott Little (Sept. 1991 -April 1992).
13. Dina Metilitsa (Sept 1992 - March 1993).
14. Ms. Linda SooHoo (Summer Job, 1993)

Ph.D. Candidates

1. Abd-El Rahman Sharaf M.D. (1988-1991)

Graduate Students (Ph.D. degree).

1. Maria Carles (1991-1992) switched to MS
Ph.D. Student, Sept. 1995.
NIH Minority Scholarship award recipient.
Ph.D. Candidate, Nov 4, 1996.
Ph.D. awarded September 1998.
2. Imran Vural (Sept. 1992-May 1993) Visiting Graduate Student
Ph.D. student, June 1993.
Ph.D. Candidate, June 30, 1996.
Ph.D. awarded September 1998
3. Xing Yu (Sept 1992-April 1993 withdrawn from program)
4. Lei Wu (Sept 1993-1997) (dropped out)
5. Ram Rammohan (Sept. 1994- June 2002).*
6. Katy Shahedirin (June, 1997)
Ph.D. awarded September 1999).
7. Jose DaSilva (June 1999-Dec 2002)*
8. Teresa Alvarez-Diaz, (Sept. 1999-June 2000, switched labs)
9. Shing-Ming Chen (Sept 2000-2001, switched labs)
10. Yared Takabi (Sept 2000-Jan 2005)
11. Vishwesh Patil (2008-May 2011)
12. Keyur Gada (Sept 2008-May 2011)
13. Rajiv Panwar (Sept 2008-2013)
14. Gauri Naik (Sept 2011- withdrawn)
15. *Prashant Bhattarai (0212-2018)

Inter College collaboration (Ph.D. Student from Biology):

- 1) Tala Khudairi (Sept 2000- Sept 2003)

Masters Research Report Students:

- 1) Maria Carles (April 1993-Sept 1995)
- 2) Shyamal Kamat (April 1993- October 1993)
- 3) Ram Rammohan (Sept. 1993-Sept 1995)
- 4) Atsuko Nagazawa (Jan. 1994-Nov. 1996)
- 5) Jose DaSilva (Dec. 1997- June 1999)

Master of Science (Thesis) Degree Students:

- 1) Atsuko Nagazawa (Jan. 1997)
- 2) Harsha (Sept 2000).
- 3) Mohammed Al Johi
- 4) Srinavassan Namala (Jan-2002-March 2002)
- 5) Prajna (Jan 2002-March 2002)
- 6) Kamal (Sept 2003-)
- 7) Mami Murakami (July 2004)
- 8) Jia Yin (Sept 2004- Nov 2004)
- 9) Vishal KuKreja (Sept 2004-Jan 2005)
- 10) Priyesh Surat (2004 – Jan 2005)

- 11) Aditee Dalvi (Dec 2005-June 2006)
- 12) Ajay Parashar (Dec. 2005—Dec 2005)
- 13) Jasneet Oberai (Jan 2006-Aug)
- 14) Gaauri Naik (Jan 2006-June 2007)
- 15) Omkar Vartaki (Jan 2006-Jan 2007)
- 16) Vishwesh Patil (Sept 2006 -)
- 17) Tushar Gupta (Sept 2006 –Dec 2006)
- 18) Kalpesh Gupta (Sept 2006 -)
- 19) Snehar Arckar (Sept 2006 –Dec 2006)
- 20) Chanchal Randhawa (Sept 2006 – Dec 2006)
- 21) Keyur Gada (Dec 2006-Aug 2008)
- 22) Vickrum (Jan 2007-
- 23) Sachin (Jan 2007)
- 24) *Savitri Mandapati (MS thesis 2010)
- 25) Parita Ghia (MS thesis 2010)
- 26) Abraham Abuzyef (Summer 2009) (Co-op fellow)
- 27) Jayant Arorah (Did not complete thesis 2010)
- 28) Dimple
- 29) Ankita Pandey (2014-2015)
- 30) Ram Rammohan
- 31) Pradhant Raj Bhattarai (Biotech 2010-2012)
- 32) Sahil Killare (MS thesis student Sept 2010-2011)
- 33) Amey Gaikwad (MS thesis student 2010-
- 34) Xiao Luo (MS thesis student 2010- switched to non thesis MS)_
- 35) Ugual
- 36) Namita Tapis (May 2012- Dec 2012)
- 37) XiaoDong Wang (MS thesis June 2012- 2013)
- 38) Wei Ting Chang
- 39) Sandeep (Dec 2015-\
- 40) Di Xu (Nov 2015-April 2016, dropped out trouble with course work).

International Visiting Graduate Student Fellow:

- 1) Jyoti Ballabh. Aug 2007-Jan 2008.
- 2) Selin Dogan 20015.

One week internship in lab:

Issoufuo Yacouba-Issa (Dec 2005)

Undergraduate students:

Tan Nguyen	Winter Quarter, 1996
Mamta Vora	Fall Quarter, 1997
Tanya John	Fall Quarter, 1997
Yolanda Burkett	Spring Quarter, 1998 -Spring Quarter 1999.
Rebecca Lee	Spring 1999-June 2000.
Larah Khaw	Summer 1999
Fayad	Jan-May 2009
Aakansha Bhalla	Sept. 2013
Dylan Vance	Sept 2014-May 2017
David Lu	Sept 2016-Dec 2017

Julie Na Yoon Kim May 2017-2019
 Catherine Platt May 2017 -2018

Undergraduate Co-op student:

Cheryl Cormier Jan 2000-June 2000.

Staff and Fellows of the Center for Drug Targeting and Analysis

Associate Director	Jagat Narula, M.D.	June 1992-June 1997.
Senior Fellow & Scientific Advisory Board Member	Robert Hanson, Ph.D.	Sept, 1993-1996.
Consultant, Senior Fellow & Scientific Advisory Board Members	Vladimir Torchilin, Ph.D.	July 1992.
Scientific Advisory Board Member	James Gozzo, Ph.D.	Sept, 1993.
Scientific Advisory Board Member	Mehdi Boroujerdi, Ph.D.	Sept, 1993.
Surgical Fellow	Artiom Petrov, Ph.D.	July 1992-June 1999
Molecular Biology Fellow	Nazam Haider, Ph.D.	Dec 1993-Dec 1996.
Research Fellow	Ulich Smidth, M.D.	July 1995-June 1996.
Research Associate	William Hartner, Ph.D.*	June, 1999-
Research Fellow	Adham Abu-Taha	Oct 2003-Jan 2006.
*Associate Research Scientist	Maria Carles	Jan 2009-

Summer Training and Fellowship Program.

High School minority Fellow	Ms. Linda SooHoo	July-Aug, 1992
High School Science Teacher Fellow	Ms. Mary Splaine	July-Aug. 1993.
High School minority Fellow	Ms. Ally Wong	July-Aug. 1994

* Present laboratory staff

() Degree pursued after leaving the laboratory.

BIBLIOGRAPHY

Original Reports

1. **Khaw BA**, Rule AH. Immunotherapy of the Dunning leukemia with thymic extracts. *Br. J. Cancer.* 1973; 28:288-292.
2. **Khaw BA**, Beller GA, Haber E, Smith TW. Localization of cardiac myosin-specific antibody in myocardial infarction. *J Clin Invest.* 1976; 58:439-446.
3. Beller GA, **Khaw BA**, Haber E, Smith TW. Localization of radiolabeled cardiac myosin-specific antibody in myocardial infarctions: comparison with technetium 99-m stannous pyrophosphate. *Circulation.* 1977; 55:74-78.
4. Haber E, **Khaw BA**, Beller GA, Gold H. Cardiac myosin-specific antibody in the localization of myocardial infarction. *Proceedings of the Third Joint US/USSR Symposium on Myocardial Metabolism.* 1977, DHEW Publication No. (NIH) 78-1457:453-470.
5. **Khaw BA**, Beller GA, Haber E. Experimental myocardial infarct imaging following intravenous administration of Iodine-131 labeled antibody (Fab')₂ fragments specific for cardiac myosin. *Circulation.* 1978; 57:743-750.
6. **Khaw BA**, Gold HK, Fallon JT, Haber E. Detection of serum cardiac myosin light chains in acute experimental myocardial infarction: radioimmunoassay of cardiac myosin light chains. *Circulation.* 1978; 58:1130-1136.
7. **Khaw BA**, Gold HK, Leinbach RC, Fallon JT, Strauss HW, Pohost GM, Haber E. Early imaging of experimental myocardial infarction by intracoronary administration of 131I-labeled anticardiac myosin (Fab')₂ fragments. *Circulation.* 1978; 58:1137-1142.
8. **Khaw BA**, Fallon JT, Beller GA, Haber E. Specificity of localization of myosin specific antibody fragments in experimental myocardial infarction: histologic, histochemical, autoradiographic and scintigraphic studies. *Circulation.* 1979; 60:1527-1531.
9. Torchilin VP, Berdichevskiy VR, **Khaw BA**, Zemkov VM, Haber E, Smirnov VN, Chazov YeI. Possibility of use of liposomes for directed transport of drugs during treatment of cardiovascular disease. *Proceedings of the Fourth Joint US/USSR Symposium on Myocardial Metabolism.* 1979; US DHHA Publication No. (NIH) 80-2017:403-414.
10. Torchilin VP, **Khaw BA**, Smirnov VN, Haber E. Preservation of antimyosin antibody activity after covalent coupling to liposomes. *Biochem Biophys Res Comm.* 1979; 89:1114-1119.
11. Torchilin VP, **Khaw BA**, Berdichevskiy VR, Locke ER, Smirnov VN, Haber E, Chazov YeI. Retention of specific binding capacity by antibodies covalently bonded to the surface of liposomes. *DAN USSR.* 1979; 246:746-749.

12. **Khaw BA**, Fallon JT, Strauss HW, Haber E. Myocardial infarct imaging with Indium-111-diethylene triamine pentaacetic acid-anticanine cardiac myosin antibodies. *Science*. 1980; 209:295-297.
13. Hurrell JG, Katus HA, **Khaw BA**, Haber E, Zurawski VR. Monoclonal antibodies directed against human myoglobin: characterization and application in a bideterminant radioimmunoassay. *J. Immunol Meth*. 1981; 45(3):249-256.
14. Katus HA, Hurrell JG, Matsueda GR, Ehrlich P, Zurawski VR, **Khaw BA**, Haber E. Increased specificity in human cardiac myosin radioimmunoassay utilizing two monoclonal antibodies in a double sandwich assay. *Molecular Immunol*. 1981; 19:451-455.
15. **Khaw BA**, Scott J, Fallon JT, Haber E, Homcy C. Myocardial injury: Quantitation by cell sorting initiated with anti-myosin fluorescent spheres. *Science*. 1982; 217:1050-1053.
16. **Khaw BA**, Strauss HW, Carvalho A, Locke E, Gold HK, Haber E. Technetium-99m labeling of antibodies to cardiac myosin Fab and to human fibrinogen. *J Nucl Med*. 1982; 23:1011-1019.
17. **Khaw BA**, Homcy CH, Fallon JT, Scott J, Cahill SL, Haber E. Irreversible ischemic injury in anoxic cultured myocytes: demonstration by cell sorting with antimyosin-fluorescent beads and scanning electron microscopy. *Proceedings of the IXth World Congress of Cardiology*. New York: Plenum Press. 1983; 1135-1147.
18. Haber E, Matsueda GR, **Khaw BA**. New directions in the use of radioactive antibodies and plasma proteins for in vivo diagnosis of cardiovascular disease. In: Nakamura RM, ed. *Clinical Laboratory Assays: New Technology and Future Directions*. New York: Masson Publishing. 1983; 205-222.
19. **Khaw BA**, Strauss HW, Pohost GM, Fallon JT, Katus HA Haber E. The relationship of immediate and delayed thallium-201 distribution to localization of I-125-antimyosin antibody in acute experimental myocardial infarction. *Am J Cardiol*. 1983; 51:1428-1432.
20. Frame LH, Lopez JA, **Khaw BA**, Fallon JT, Haber E, Powell J Jr. Early membrane damage during coronary reperfusion in dogs: Detection by radiolabeled anticardiac myosin (Fab')₂. *J Clin Invest*. 1983; 72:535-544.
21. Edgington TS, Soule HR, Linder E, Bacci C, **Khaw BA**, Haber E. The 126 kD phosphoprotein of human breast carcinoma cell surface. *Protides of the Biological Fluids*. 1983; 31:541-545.
22. Torchilin VP, **Khaw BA**, Berdichevskiy VR, Klibanov AL, Haber E, Smirnov VN. Complexes of liposomes with immunoglobulins and sialoglycoproteins. *Bull Expt Biol Med*. Moscow: Medicina Press. 1983; 95(6):51-53.

23. **Khaw BA**, Strauss HW, Carvalho AJ, Locke E, Gold HK, Haber E. Concerning the labeling of DTPA-coupled proteins with Tc-99m. *J Nucl Med (letter)*. 1983; 24(6):545.
24. **Khaw BA**, Torchilin VP, Berdichevskiy VR, Barsukov AA, Klibanov AL, Smirnov VN, Haber E. Enhancing specificity and stability of targeted liposomes by coinorporation of sialoglycoprotein and antibody on liposomes. *Bull Expt Biol Med*. (Translation from Russian). 1983; 95(6):776.
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26. **Khaw BA**, Mattis JA, Melincoff G, Strauss HW, Gold HK, Haber E. Monoclonal antibody to cardiac myosin; Scintigraphic imaging of experimental myocardial infarction. *Hybridoma*. 1984; 3:11-23.
27. Katus HA, Yasuda T, Gold HK, Leinbach RC, Strauss HW, Waksmonski C, Haber E, **Khaw BA**. Diagnosis of acute myocardial infarction: detection of circulating cardiac myosin light chains. *Am J Cardiol*. 1984; 54:964-970.
28. **Khaw BA**, Strauss HW, Cahill SL, Soule HR, Edgington TS, Cooney JM. Sequential imaging of Indium-111 labeled monoclonal antibody in human mammary tumors hosted in nude mice. *J Nucl Med*. 1984; 25:592-603.
29. **Khaw BA**. Concerning the imaging of Indium-111 labeled monoclonal antibody in human mammary tumors hosted in nude mice. *J Nucl Med*. 1984; 25:1395-1396.
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32. Scott JA, **Khaw BA**, Locke E, Haber E, Homcy C. The role of free radical-mediated processes in oxygen-related damage in cultured murine myocardial cells. *Circ Res*. 1985; 56:72-77.
33. Husby G, Arora R, Williams RC Jr, **Khaw BA**, Haber E, Butler C. Immunofluorescence studies of florid rheumatic aschoff lesions. *Arthritis and Rheumatism*. 1986; 29:207-211.

34. **Khaw BA**, Cooney J, Edgington T, Strauss HW. Differences in experimental tumor localization of dual-labeled monoclonal antibody. *J Nucl Med.* 1986; 27:1293-1299.
35. **Khaw BA**, Gold HK, Yasuda T, Leinbach RC, Kanke M, Fallon JT, Barlai-Kovach M, Strauss HW, Haber E. Scintigraphic quantification of myocardial necrosis in patients after intravenous injection of myosin specific antibody. *Circulation.* 1986; 74:501-508.
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40. **Khaw BA**, Strauss HW, Moore R, Fallon JT, Yasuda T, Gold HK, Haber E. Myocardial damage delineated by In-111 antimyosin Fab and Tc-99m-pyrophosphate. *J Nucl Med.* 1987; 28:76-82.
41. Scott JA, **Khaw BA**, Homcy CJ, Rabito CA. Oxygen radicals alter the cell membrane potential in a renal cell line (LLC-PK1) with differentiated characteristics of proximal tubular cells. *Biochim Biophys Acta.* 1987; 897:25-32.
42. Torchilin VP, Klibanov AL, Nossiff ND, Slinkin MA, Strauss HW, Haber E, Smirnov VN, **Khaw BA**. Monoclonal antibody modification with chelate-linked high-molecular-weight polymers; major increases in polyvalent cation binding without loss of antigen binding. *Hybridoma.* 1987; 6:229-240.
43. Timmis AD, Lopez JA, Fallon JT, **Khaw BA**, Haber E, Powell J Jr. Detection of early necrosis in canine model of low flow myocardial ischemia using 125I-antimyosin (Fab')₂. *J Appl Cardiol.* 1987; 2:185-211.
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45. **Khaw BA**, Yasuda T, Gold HK, Leinbach RC, Johns JA, Kanke M, Barlai-Kovach M, Strauss HW, Haber E. Acute myocardial infarct imaging with Indium-111-labeled monoclonal antimyosin Fab. *J Nucl Med.* 1987; 28:1671-1678.
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