
Professional Biography

Michael Tweedle, PhD is the Stefanie Spielman Professor of Cancer Imaging and Professor of Radiology and Biophysics at The Ohio State University College of Medicine and James Comprehensive Cancer Center, adjunct Professor in the Chemistry and Biochemistry Department in the School of Arts and Sciences, and Director of the Wright Center Molecular Imaging Agent Laboratory. His education was at Knox College (BS Chemistry), Rice University (PhD Physical Chemistry) and Stanford University (NIH Research Service Fellow). His experience in diagnostic imaging began as a research scientist at New England Nuclear, Inc. In 1981 he invented the first catalyst for production of cationic Tc(III) radiopharmaceutical kits, and he worked on early targeted molecular imaging (MI) agents using monoclonal antibodies at NEN/DuPont Pharmaceuticals. In 1986, working with E.R. Squibb and Sons, he invented and developed the novel first generation macrocyclic Gd-based MRI agent, ProHanceTM (gadoteridol), that is used in over a million patients annually. As President and chief scientist at Bracco Research USA Inc, he and his team created two new Molecular Imaging agents: a first in class targeted theranostic for prostate and breast cancer (LuAMBA) and a first in class VEGF-R2 angiogenesis receptor targeted US agent now in Phase-II clinical trials (BR55). His current work includes targeted theranostics, molecular imaging agents and Optical Surgical Navigation agents. He sits on the editorial boards of Magnetic Resonance Imaging and Investigative Radiology, has served on Expert Councils at the US Pharmacopeia, the elected Boards of Directors and as Officer of four professional societies, academic Scientific Advisory Boards in molecular Imaging, on Scientific Advisory Boards of public and private pharmaceutical and chemical companies, and the Dean's Scientific Advisory Board of New York University's School of Science. He has authored over 150 publications, including 38 US patents, 25 pending patent applications, and 20 book chapters and reviews. In 2005 he was awarded The Harry Fischer Medal for Excellence in Contrast Media Research.



Curriculum Vitae

Dr. Michael F. Tweedle

<u>Office Address</u>	The Ohio State University 720 Biomedical Research Tower 460 W. 12th St., Office 720 Columbus, OH 43210 614 247-4427	<u>Home Address</u>	40 N Parkview Ave Bexley, OH 43209 609 937-0096 cell
------------------------------	---	----------------------------	--

Education 1969 - 1971 Joliet Junior College
 1971 – 1973 BA Knox College (Chemistry)
 1973 – 1977 PhD Rice University (Physical Chemistry)

Postgraduate Training and Fellowship Appointments

1977 – 1980 National Research Service Award Stanford University

Awards and Honors

1977	National Research Service Award (NIH), Stanford University, Palo Alto, CA
1988	Editor, Special Issue, Nuclear Medicine and Biology
1990 -	Editorial Board, Magnetic Resonance Imaging
1998 -	Editorial Board, Investigative Radiology
1998	Editor, Special Issue, Investigative Radiology (1998, 1999, 2000, 2005, 2009)
2003	Elected Board of Directors, Society of Noninvasive Imaging in Drug Development
2005	Awarded the Harry Fischer Medal For Excellence in Contrast Media Research (CMR – admin by RSNA)
2005, 2007	Spedding Award Committee, Rare Earth Research Conference
2006	Elected Vice Chairman of Society of Noninvasive Imaging in Drug Development
2007	Elected, Chairman of Society of Noninvasive Imaging in Drug Development
2007	Board of Directors of The Academy of Molecular Imaging
2007 - 2012	Science Dean's Advisory Board, New York University
2007, 2008	University of Arizona, ARIBI External Advisory Committee
2008	Elected, Secretary and Executive Committee, Academy of Molecular Imaging
2008-2011	Board of Trustees, Radiotracer Clearing House
2008	Most Notable person, RT-Image, Top 25 Most Influential in Radiology
2008 – 2011	Program Committee, World Molecular Imaging Congress
2009	Co-Organizer, Imaging in 2020 meeting, Jackson Hole, WY, USA

Awards and Honors (continued)

2009 –	Awarded Stefanie Spielman Chair in Cancer Imaging, Department of Radiology and The James Comprehensive Cancer Center at the Ohio State University
2009 – 2011	Centre for Probe Development and Commercialization, McMaster University, Canada
2010 - 2013	American Board of Science in Nuclear Medicine
2010	Mentor of the Year, Wright Center for Innovation
2011 - 2013	Chairman, Awards Selection Committee, Contrast Media Research Congress
2011 – 2013	Officer and Board Member, World Molecular Imaging Society
2012 -	Co-Chairman and founder, Optical Surgical Navigation Interest Group
2013	Distinguished Undergraduate Research Mentor, OSU
2011 - 2014	Board of Directors, Officer, World Molecular Imaging Society

Faculty Appointments

2009-	Professor, Department of Radiology (home), and Professor in Biophysics Program The Ohio State University College of Medicine Stefanie Spielman Chair in Cancer Imaging Radiology Department, The James Comprehensive Cancer Center Professor, Adjunct, Department of Chemistry and Biochemistry, College of Arts and Sciences, OSU
2013 – 2014	Entrepreneurial Scholar, Technology Transfer Department, OSU
2006 – 2009	Adjunct Associate Professor, Department of Radiology University of Pennsylvania Medical School

OSU Internal Faculty Committees

2012 –	Faculty Council OSUMC (Elected)
2013 -	College Assembly OSUMC (Elected)
2010 -	Pharmacy / formulary (OSU Wexner)
2010 -	Promotion and Tenure (OSU Radiology)
2014 -	Chairman, Promotion and Tenure Committee, Radiology
2010 - 2013	Contrast Agent use Guidelines (Radiology)
2010 – 2013	Safety & Risk Reduction Committee (Radiology)

Past Professional Appointments

1980-1983	Sr. Research Chemist, Radiopharmaceuticals New England Nuclear and E.I. DuPont de Nemours
1983 -1984	Section head, Contrast Agents The Squibb Institute for Medical Research
1984 - 1987	Assistant Director, Contrast Agents Research Department The Squibb Institute for Medical Research
1987 – 1989	Director, Contrast Media Research Department

1989 – 1992	The Squibb Institute for Medical Research Director, Contrast Media Research Department Bristol-Myers Squibb Pharmaceutical Research Institute
1992 – 1994	Director of Chemistry, Diagnostics Drug Discovery Division Bristol-Myers Squibb Pharmaceutical Research Institute
1992 – 1994	Promotion Review Board, Drug Discovery Bristol-Myers Squibb Pharmaceutical Research Institute
1994 - 2009	President and CEO, Bracco Research USA Inc

Memberships in Professional Societies

American Chemical Society
Society of Nuclear Medicine
International Society for Magnetic Resonance in Medicine
Radiological Society of North America
World Molecular Imaging Society

Consulting

2009 - 2014	Baker Sterchi Cowden and Rice, Attorneys at Law
2007- 2009	Gerhson Lehman

Scientific Advisory Boards

2009 - 2012	Marillion Pharmaceuticals
2009 – 2012	Macrocyclics Inc
2011 – 1012	Arroyo Biosciences Inc
2010 – 2014	Empirion
2015 -	Elyton, LLC (pending)

Corporate Boards of Directors

1994 - 2009	Bracco Research USA Inc (private)
2011 – 2014	Novelos Therapeutics (public) (now Cellectar Biosciences)

Honorary Positions

2012- 2014	OSU College of Medicine Technology Assessment Board (reviewer; twice selected for presentation)
2009 –2014	The Stefanie Spielman Chair in Cancer Imaging
2011 -2014	Gold Medal Awards Committee Chairman (CMR)

Conference Organizing Boards

1985 – 2014	Contrast Media Research biannual meeting
2002 -	Tc and other metals, Padua Italy
1988	Antibody and MRI agent Chemistry
2007, 2008	Rare Earth Research Society

Conference Organizing Boards (continued)

2009	co-Chairman Imaging in 2020
2008 – 2010	World Molecular Imaging Congress (Program Committee)
2008 – 2010	Therapy Emphasis Co-Chair,
2010 - 2011	Plenary Session Co-Moderator, WMIC
2011	Young Investigator Competition, WMIC

Academic Boards (elected:E; appointed:A)

2000 – 2005	USP Expert Committees on Radiopharmaceuticals and Medical Imaging Agents (A)
2003 – 2006	Board of Directors of Society of Noninvasive Imaging in Drug Development (E)
2005 - 2006	Newsletter Editor, SNIDD (A)
2006 – 2007	Vice-Chairman (Vice President) of SNIDD (E)
2007 – 2009	Chairman (President) of SNIDD (E)
2007 - 2011	Academy of Molecular Imaging (E)
2008 - 2011	Executive Committee & Secretary (E)
2010	Search Committee: Editor in Chief of Molecular Imaging in Biology Journal (A)
2006 – 2008	External Scientific Grant Advisor (Arizona Cancer Center) (A)
2007 - 2011	Science Dean's Board of Advisor's, New York University (A)
2008 – 2010	NYU Science Dean Board Chair, Technology Transfer and Intellectual property Committee (A)
2008 – 2010	Radiotracer Clearing House, Board of Trustees (A)
2009 – 2011	Centre for Probe Development and Commercialization, McMaster University, Canada 2010 (A)
2010 – 2013	Board of Directors of the American Board of Science in Nuclear Medicine (A)
2010 - 2011	Society for Molecular Imaging Council Member (A)
2011 - 2014	World Molecular Imaging Society, Board of Trustees (A) World
2011- 2014	World Molecular Imaging Society Officer (Secretary) (E)
2015 –	Board of Directors, International Society of Image Guided Surgery (ISIGS)

Editorial Positions

1990 –	Editorial Board of Magnetic Resonance Imaging
1998 –	Editorial Board of Investigative Radiology
1988	Editor, Special Issue, Nuclear Medicine and Biology
1998 - 2000	Editor Special Issue, Investigative Radiology, Contrast Agents
2005,	Editor Special Issue, Investigative Radiology, Contrast Agents
2010	Editor Special Issue Investigative Radiology Contrast Agents
1990 – 2013	J. of Magnetic Resonance in Medicine (reviewer)
1990 –	Inorganic Chemistry (reviewer)
2001 –	J. Am. Chem. Soc. (reviewer)
1991 –	Radiology (consultant and Reviewer)

1984 –	Nuclear Medicine and Biology (reviewer)
2013 -	Molecular Imaging and Biology (reviewer)
2011 –	reviewer: PLOS One, Bioconjugate Chemistry, Inorganic Chemistry, J. Am.Chem. Soc., Org. Med. Chem. Lett., Acta Radiologica, Radiology, Mol. Imag. Biol.
2009 –	Cancer and imaging research (abstract reviewer) Abstract Reviewer: American Association Cancer Research, International Society of Magnetic Resonance in Medicine, Society for Noninvasive Imaging in Drug Development, Academy of Molecular Imaging, World Molecular Imaging Society
2006 – 2007	Editor, Newsletter of the Society of Noninvasive Imaging and Drug Development (2006-7)

Expert Panels and Study Sections

1990, 2009	NIH ad hoc Study Section: Program Project Grants and site visit
1991	NIH ad hoc grant Study Section: Tissue Specific Contrast Agents
1993	Diagnostic Imaging Research Branch Strategic Planning Advisor
2002	Tc in Chemistry in Nuclear Medicine, Padua, Italy 2002
2003	ISMRM Conf. on MRI in Cancer
2004	NCI panel on (DCE) MRI in Cancer
2005	NCI Conference on Diagnostics in Pharmaceutical Development, Bethesda, MD
2005	Biochemical Imaging Agent Issues, International Society for Strategic Studies in Radiology
2005	Radiology: Creating strategies for the next decade
2008	Biomarkers Roundtable, by RSNA
2009	Imaging Biomarkers Workshop, AMI/SNIDD
2011	NIH NIBIB Ad Hoc Study Section S10 Grants
2012	NIH, NIBIB Ad Hoc Study Section P41 Grant and site visit
2011 – 2013	Denman Undergraduate Research Forum Faculty Judge
2012	OSU Molecular Life Sciences Interdisciplinary Graduate Programs Symposium Poster Judge
2014	“Why are there no Molecular MRI agents?” International Society of Magnetic Resonance Imaging, Milan, Italy
2015	NIH, Ad Hoc Study Section P41 Grant and Site visit
2015 -	DOD, CM Breast Cancer Research Program study section

Academic Funding

Drug Development Institute, James Cancer Center. Role: PI, Co-PI Josh Goldberger. “Molecular Magnetic Resonance Imaging Probes that Self-Assemble in Malignant Tumors”
The \$307,000 (\$185,000 year 1, with evaluations quarterly) bridges and augments an R21 being re-submitted July, 2015, that targets early breast cancer and many others. It’s aim is to generate the data required for a successful bid to venture capitalists from a start up company. It includes manufacturing drug product. Year 2 (funding ND)

Drug Development Institute, James Cancer Center. “Localized delivery of Peptide Receptor Radionuclide Therapy” (i.a.PRRT) for focal therapy of early prostate cancer without generating side effects, designed to work with Active Surveillance to avoid whole gland removal. \$186,000 (1 year, evaluations quarterly). It’s aim is to generate the data required for a successful bid to venture capitalists from a start up company.

Pelotonia Idea Grant, OSU. Role: co-PI with Charles Hitchcock, “Identification and development of new immunoagents for cancer diagnosis and therapy.” 10/15 – 10/17, \$100,000

Pelotonia Idea Grant, OSU. Co-PI with Ron Xu and A. Yilmaz “Wearable Navigation System for Image-guided Cancer Resection Surgery” \$100,000, 10/14 – 10/16

2-U44-CA176664-02. NIH SBIR Phase II Contract. Role: Co-I. PI: M. V. Knopp; “Improved Metallofullerene MRI Contrast Agent for Cancer Diagnosis.” –. \$382,206. 2013-12/15

Role: PI. Enlyton Pharmaceuticals An assessment of the tumor-targeting capability of Enlyton’s antibody technology for use in PET imaging of cancer” \$189,000. 10/12 – 6/15

TECH13-060 N043CO-2012-00059. Ohio Third Frontier Innovation Platform Grant. IPP-12-254. Role: Co-PI with M. V. Knopp and K. Kumar, “Next Generation Multi-Modal Molecular Imaging Technology Platform”. \$6,026,690. 2013 – 2018.

SBIR 2447-NIH-2S/OSU (sub) to 2 U44 CA176664-02 NIH SBIR Phase II Role: Co-I. “Improved metallofullerene MRI contrast agent for cancer diagnosis.” PI; M. Knopp.

Pending Submissions (\$16,021,679)

RO1 to NCI/NIBIB RFA 13-185, Image-guided drug delivery in cancer (\$1,980,000, 4 years), to be submitted June 16, 2015, Role: PI, Co-PI: Thomas Rosol, Michael Knopp. “Image-guided, transcatheter Peptide Receptor Radiotheranostic for Prostate Cancer”

RO1 Grant GRT00039093. NIH. Co-I with PI: Miryam Lustberg, “Affective consequences of chemotherapy in breast cancer survivors”

R21 Grant 11679996. NIH. Role: Co-PI with J. Goldberger. “Molecular Magnetic Resonance Imaging Probes that Self-Assemble in Malignant Tumors”

R21 Grant GRT00038741. NIH. Co-PI with Chadwick Wright. “Innovative dual-function agent for image-guided cancer therapy.”

SSTR Phase I. GRT00037702. NIH. PI: M. F. Tweedle. Sponsor Enlyton, LLC. “Creation and preclinical development of a real time, wide field Optical Surgical Navigation imaging agent specific for TAG-72+ adenocarcinomas.”

DOD Grant GRT00035750. DOD. Role: Co-PI with Ron Xu and A. Yilmaz. “Intraoperative integrated navigation for targeted breast-conserving surgery”

RO1 grant GRT00037727. NIH Role: Co-PI. PI: Ron Xu. “Multifunctional drug-loaded activatable microbubbles for ultrasound mediated combination therapy in ovarian cancer.”

RO1 grant. GRT00038811. NIH. Role: Co-I and PI on OSU subcontract. PI: James Basilion. “Theranostic gold nanoparticles for imaged-guided radical prostatectomy and PDT ablation.”

RO1 grant GRT00038338. NIH. Role: Co-I. PI: Dario Palmieri. “A novel class of anti-Nucleolin immunoagents for cancer therapy.”

RO1 grant GRT00038255. NIH. Role: Co-I. PI: Tonya Orchard. “Effect of omega 3 fatty acid supplementation and added sugars in the diet on chemotherapy-induced cognitive deficits.”

Enlyton Pharmaceuticals An assessment of the tumor-targeting capability of Enlyton's antibody technology for use in PET imaging of cancer” Role: PI. ~ \$300,000 – 400,000. For roll up to IND submittal

Completed Funding

9872-12: National Collegiate Inventors Association. PI: M. Tweedle with Undergraduates, K. Mitra and B. Geiger. “Bringing the Cancer Detection Kit Home” Phase II, \$25,000. 2014 - 2015

Bremmer CCTS, PI Chawick Wright. “¹²³Iodine-labeled HN1-800 dye agents for dual-modality intraoperative surgical guidance during resection of head & neck squamous cell carcinoma” \$70,000. 2013 - 2014

Wright Center Molecular Imaging Agents Laboratory (OSU, OSUMC, Radiology): “Create an IP protected Drug” OSU, OSUMC, WCI and Radiology, \$5,200,000 2009 – 2014

Enlyton Pharmaceuticals. Contract PI, SBIR Contract No. HHSN261201200059C: “A Tunable Tumor Targeting Agent for SPECT Imaging” \$66,366. 5/20/12 – 6/30/15.

N043CO-2012-00059: “A tunable agent for SPECT Imaging.” PI: M. Tweedle \$50,607. Enlyton Inc. SBIR Phase I Contract 2013 – 2014

Pelotonia Idea Grant, PI: M. Tweedle, J. Goldberger, “Pan-cancer MRI agents that self-assemble in malignant tumors” \$100,000. 2012 – 2014

1R21CA159077 – 01. NCI. Co-PI with R. Xu, T Huang, R Shen, Radiology, Bioengineering, Exp. Genetics. “Multifunctional microbubbles for image-guided epigenetic therapy in cancer”. 2012-2014. \$421,000

RISE Award. James Comprehensive Cancer Center. “Dosimetry modulated radiotherapy with ^{177}Lu AMBA, a new breast cancer theranostic.” Project V, Co-PI with J. White for a NCI Breast Cancer Spore Application. \$7,000.

CCTS Pilot Award. Co-PI with J. Kuret. Cancer Center Technical Services, “Tauopathic Imaging Agents.” \$25,000 2012

Lectures by Invitation (2008 – 2014)

Status of AMI’s Molecular Imaging projects; RSNA sponsored round table on Molecular Imaging, Chicago IL, April, 2008

Degenerative Diseases, a Challenge for Imaging Solutions
Italian Radiological Society Meeting; Rome, May 2008

Lu-AMBA, a ^{177}Lu -containing peptide conjugate for simultaneous imaging and radiotherapy
Rare Earth Research Conference; Tuscalusa, Alabama, June 2008

Lu-AMBA, a ^{177}Lu -containing peptide conjugate for simultaneous imaging and radiotherapy
International Macrocyclic Chemistry; Las Vegas, NV, July 2008

“Use of Multivalency in Drug Discovery in Molecular Imaging”
Metabolism in Cancer Lecture Series; University of Pennsylvania, October 2008

"Peptide Targeted Molecular Imaging Agents"
Molecular Imaging Seminar series; Stanford University, January 2009

“Matching the drugs to the patients”
A Christmas to Cure Cancer sponsored by the Stefanie Spielman Foundation
Columbus, OH, December 2009

“Cancer Discovery”
Spielman Cruise for Cancer, Columbus, OH, February, 2010.

“M-AMBA, a novel thernostic for breast and prostate cancer”
Imaging Research Seminar, Radiology Dept.; The Ohio State University, March, 2010

“The future of cancer detection and treatment through imaging technology”
Stefanie’s Champions Breast Cancer Research Symposium
Greater Columbus Convention Center, April 2010

"Comparative effectiveness of Contrast and Molecular Imaging agents"

Moffet Cancer Center; Tampa, Florida, May, 2010

"The future of cancer detection and treatment through imaging technology"
Stefanie's Champions Breast Cancer Research Symposium
The Ohio Union, Columbus, OH April 2011

"Cancer Imaging: Past, Present and Future"
Columbus Rotary Luncheon Meeting; Hyatt Regency Columbus, April 2011

"Molecular Imaging Agents: the Can, the Can't and the Won't"
Cooley Visiting Professor Lecture, Radiology Dept.; University of Texas Medical Branch,
November 2011

"Can MRI Agents Compete in the Biochemical Arena?"
National American Chemistry Society Meeting; Dallas Tx, March 2014

"Optical Surgical Navigation Probes"
Cardinal Health Inc.; April, 2014, Dublin, Ohio

"Molecular Imaging MRI Probes that Self-Assemble in Malignant Tumors"
Bracco Group; Milan, Italy, May 2014

**"Clinical Applications, Workflow and Regulatory Issues: Intraoperative Guided
Surgery with
Optical Probes" 9-14, at WMIC, Seoul, Korea.**

Internal OSU Teaching (2014)

"Molecular Imaging Agents 101". Department of Radiology Residents' Seminar OSU
presented annually.

"The Basic Principles and History of X ray and MRI Contrast Agents."
Department of Radiology Residents' Seminar, OSU Presented annually.
"Recent Research"

"Molecular Imaging Research" Department of Radiology Residents' Seminar, OSU
presented bi-annually.

Individual Studies. The Ohio State University. 2014 GRA Christian Beutner (Chemistry and
Biochemistry) Primary Instructor

"Preclinical Analysis of infrared fluorescence labeled Probe to target bombesin receptors"
(poster at James CCC annual Event)

Research in Biophysics. The Ohio State University. Primary Instructor:

PhD Candidacy Examination. Xiaoli Liu, Biophysics. 11-24-14

PhD Oral Examination. Sara Lim. Biophysics.11-6-14.

Biophysics Rotation, Keyton Clayson. Biophysics. Nov. - Dec, 2014.

Xu Zhang. NSF I-Corps support. Bioengineering, 11-14

PhD. Pre-Oral. Maria Isabella Menendez. 12-17-14.

PhD. Oral Examination. Maria Isabella Menendez. June 16, 2015

Bibliography

Patents (only US Patent and published Applications listed)

1. M. F. Tweedle. Accelerators for Forming Cationic Tc Complexes Useful in Kits for Radiodiagnostic Heart and Hepatobiliary Tissue Imaging.
US Patent Number 4,455,291, 1984
2. M.F. Tweedle, G.T. Gaughan, J.H. Hagan. Substituted Triscarboxymethyl-tetraazacyclododecane and Analogs
US Patent Number 4,885,363, 1989
3. M.F. Tweedle, L.D. Bradshaw, L. J. Wilson. Paramagnetic Metalloporphyrins as Contrast Agents for Magnetic Resonance Imaging
US Patent Number 5,262,532, 1993
4. J.F. Desreux, M.F. Tweedle, P.C. Ratsep, T.R. Wagler, E.R. Marinelli. Hepatobiliary Tetraazamacrocyclic Magnetic Resonance Contrast Agents
US Patent Number 5,358,704, 1994
5. M.F. Tweedle, H.W. Strauss, A.D. Nunn. Methods for the In Vivo Measurement of the Concentration of non-Imaging NMR-Detectable Xenobiotic Compounds
US Patent Number 5,468,467, 1995
6. M.F. Tweedle, G.T. Gaughan, J.J. Hagan. Method for Imaging Mammalian Tissue using 1-Substituted-1,4,7-Tricarboxy-Methyl-1,4,7,10-Tetraazacyclo-Dodecane and Analogs
US Patent Number 5,474,756, 1995
7. R.S. Ranganathan, E. Marrinelli, R. Pilli, M. F. Tweedle. Aromatic Amide Compounds and Metal Chelates Thereof for Diagnostic Imaging
US Patent Number 5,573,752, 1996
8. M.F. Tweedle, H.W. Strauss, A.D. Nunn
Methods for the In Vivo Measurement of the Concentration of NMR-Detectable Xenobiotic Compounds
US Patent Number 5,603,917, 1997

9. M.F. Tweedle, G.T. Gaughan, J.J. Hagan
Method for Imaging Mammalian Tissue using 1-Substituted-1,4,7-Tricarboxy-Methyl-1,4,7,10-Tetraazacyclo-Dodecane and Analogs
US Patent Number 5,674,470, 1997
10. M.F. Tweedle, G.T. Gaughan, J.J. Hagan
Method for Imaging Mammalian Tissue using 1-Substituted-1,4,7-Tricarboxy-Methyl-1,4,7,10-Tetraazacyclo-Dodecane and Analogs
US Patent Number 5,846,519, 1998
11. R. Ranganathan, M.F. Tweedle, P. Wedeking. Methods and Compositions for Using Non-ionic Contrast Agents to Reduce the Risk of Clot Formation in Diagnostic Procedures
US Patent Number 5,869,024, 1999
12. R. Ranganathan, T. Arunachalam, M.F. Tweedle. N, N-Dimethyldiatrizoic Acid and its conjugates as Hepatobiliary agents for X ray CT Imaging
US Patent Number 6,051,210, 2000
13. J. Desreux, P. Jaques, P. Humblet, P. Herman, P. Comblin, P. Tholet, M. F. Tweedle. Self Assembling Heteropolymetallic Chelates As Imaging Agents and Radiopharmaceuticals
US Patent Number 6,056,939, 2000
14. P. Wedeking, T R. Wager, T. Arunachalam, R. Ramalingam, K. Linder, R. Ranganathan, A. Nunn, K. Raju, M.F. Tweedle. Metal Complexes Derivatized with Folate for use Diagnostic and Therapeutic Applications
US Patent Number 6,093,382, 2000
15. M. Tweedle, G. Gaughan, J. Hagan. Method for Imaging and Radiopharmaceutical Therapy using 1-substituted-4,7,10-tricarboxymethyl-1,4,7,10-tetraazacyclododecane and analogs
US Patent Number 6,143,274, 2000
16. P. Wedeking, T R. Wager, T. Arunachalam, R. Ramalingam, K. Linder, R. Ranganathan, A. Nunn, K. Raju, M.F. Tweedle. Metal Complexes Derivatized with Folate for use Diagnostic and Therapeutic Applications
US Patent Number 6,221,334, 2001
17. R. Ranganathan, T. Arunachalam, M.F. Tweedle. N, N-Dimethyldiatrizoic Acid and its conjugates as Hepatobiliary agents for X ray CT Imaging
US Patent Number 6,264,916, 2001
18. R. Ranganathan, X. Zhang, R. Shukla, M.F. Tweedle. Enhanced Relaxivity Monomeric and Multimeric Compounds
US Patent Number 6,693,190, 2004

19. R. Pillai, S. I. Kang, E. Marinelli, R. Ranganathan, M.F. Tweedle. Aminocarboxylate ligands having substituted aromatic amide moieties”
US Patent Number 6,875,864, 2005

20. M. A. Von Wronski, E.R. Marinelli, A. D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K. Linder, P. Nanjappan, N. Raju. Compounds for targeting endothelial cells, compositions for the same and methods for their use
US Patent Number 7,109,167, 2006

21. R. Ranganathan, H. Fan, M.F. Tweedle. Conjugates of antioxidants with metal chelating ligands for use in diagnostic and therapeutic applications
US Patent Number 7,160,535, 2007

22. P. Wedeking, T R. Wager, T. Arunachalam, R. Ramalingam, K. Linder, R. Ranganathan, A. Nunn, K. Raju, M.F. Tweedle. Metal Complexes Derivatized with Folate for use Diagnostic and Therapeutic Applications
US Patent Number 7,186,397, 2007

23. E. Cappelletti, L. Lattuada, K.E. Linder, E. Marinelli, P. Nanjappan, N. Raju, R. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Number 7, 226,577, 2007

24. R. Pillai, S. I. Kang, E. Marinelli, R. Ranganathan, M.F. Tweedle. Aromatic Amide Compounds and Metal Chelates Thereof
US Patent Number 7,351,389, 2008

25. C. A. Chang; K. Kumar, M.F. Tweedle. Dual functioning excipient for metal chelate contrast agents.
US Patent Number 7,385,041, 2008

26. P. Wedeking, T R. Wager, T. Arunachalan, R. Ramalingam, K. Linder, R. Ranganathan, A. Nunn, K. Raju, M.F. Tweedle. Metal Complexes Derivatized with Folate for use Diagnostic and Therapeutic Applications
US Patent Number 7,399,460, 2008

27. R. Ranganathan, H. Fan, M.F. Tweedle. Conjugates of Antioxidants with Metal Chelating Ligands for use in Diagnostic and Therapeutic Applications
US Patent Number 7,407,644, 2008

28. R. Ranganathan, H. Fan, M.F. Tweedle, R.E. Swenson. Conjugates of Antioxidants with Metal Chelating Ligands for use in Diagnostic and Therapeutic Applications.
US Patent Number 7,582,280, 2009

29. E. Cappelletti, L. Lattuada, K.E. Linder, E. Marinelli, P. Nanjappan, N. Raju, K. Ramalingam, R. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Number 7,611,692, 2009

30. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R.K. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju, F. Yan, M. Schneider. Compounds for targeting endothelial cells, compositions containing the same and methods for their use
US Patent Number 7,820,621, 2010

31. E. Cappelletti, L. Lattuada, K.E. Linder, E. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. Gastrin releasing peptide compounds
US Patent Number 7,850,947, 2010

32. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju. Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use
US Patent Number 7,884,183, 2011

33. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Number 7,922,998, 2011

34. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju. Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use
US Patent 8,263,739, 2012

35. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent 8,420,050 2013, 2013

36. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent 8,420,864, 2013

37. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent 8,420,053, 2013

38. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent 8,444,954, 2013

39. P.W. Wedeking, R.E. Wager, T. Arunachalam, K. Ramalingam, K.E. Linder, R.S. Ranganathan, A.D. Nunn, N. Raju, M.F. Tweedle. Metal Complexes Derivatized with Folate for use in Diagnostic and Therapeutic Applications
US Application 20010004454

39. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju. Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use
US Application 20020147136

40. R.K. Pillai, S.I. Kang, E.R. Marinelli, R.S. Ranganathan, M.F. Tweedle. *Aminocarboxylate Ligands having Substituted Aromatic Amide Moieties*
US Application 20030171561
41. R.S. Ranganathan, H. Fan, M.F. Tweedle. *Conjugates of Antioxidants with Metal Chelating Ligands for use in Diagnostic and Therapeutic Applications*
US Application 20040082767
42. R.S. Ranganathan, R. Pillai, P.C. Ratsep, R. Shukla, M.F. Tweedle, X. Zhang. *Enhanced Relaxivity Monomeric and Multimeric Compounds*
US Application 20040131551
43. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, R.E. Swenson, M.F. Tweedle. *Gastrin Releasing Peptide Compounds*
US Application 20040136906
44. C.A. Chang, K. Kumar, M.F. Tweedle. *Dual Functioning Excipient for Metal Chelate Contrast Agents*
US Application 20040170566
45. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. *Gastrin Releasing Peptide Compounds*
US Application 20040253225
46. R.K. Pillai, S.I. Kang, E.R. Marinelli, R.S. Ranganathan, M.F. Tweedle. *Aminocarboxylate Ligands having Substituted Aromatic Amide Moieties*
US Application 20050090689
47. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. *Gastrin Releasing Peptide Compounds*
US Application 20060018830
48. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju. *Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use.*
US Application 20060153775
49. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. *Gastrin Releasing Peptide Compounds*
US Application 20060239914
50. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju. *Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use.*
US Application 20060258566

51. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju. Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use.
US Application 20060263303
52. P.W. Wedeking, R.E. Wager, T. Arunachalam, K. Ramalingam, K.E. Linder, R.S. Ranganathan, A.D. Nunn, N. Raju, M.F. Tweedle. Metal Complexes Derivatized with Folate for use in Diagnostic and Therapeutic Applications
US Application 20070077197
53. R.S. Ranganathan, H. Fan, M.F. Tweedle, R.E. Swenson. Conjugates of Antioxidants with Metal Chelating Ligands for use in Diagnostic and Therapeutic Applications
US Patent Application 20070086944
54. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Application 20070231257
55. J. Chen, K.E. Linder, E.R. Marinelli, E. Metcalfe, A.D. Nunn, R.E. Swenson, M.F. Tweedle. Stable Radiopharmaceutical Compositions and Methods for Preparation
US Patent Application 20070269375
56. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Application 20080008649
57. M.F. Tweedle, H. Fan, L. Lattuada, K. Ramalingam, R.E. Swenson. Compounds Useful as Metal Chelators
US Patent Application 20080124270
58. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Application 20080247946
59. R. S. Ranganathan, H. Fan, M.F. Tweedle, R. E. Swenson. Conjugates of Antioxidants with Metal Chelating Ligands for use in Diagnostic and Therapeutic Applications
US Patent Application 20080274048
60. E. Cappelletti, L. Lattuada, K.E. Linder, E.R. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle, Gastrin Releasing Peptide Compounds
US Patent Application 20090175786
61. E. Cappelletti, L. Lattuada, K.E. Linder, E. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. Gastrin Releasing Peptide Compounds
US Patent Application 20110052491
62. J. Chen, K.E. Linder, E.R. Marinelli, E. Metcalfe, A.D. Nunn, R.E. Swenson, M.F. Tweedle. Stable Radiopharmaceutical Compositions and Methods for Preparation

US Patent Application 20110206606

63. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R.K. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju, F. Yan, M. Schneider. *Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use*
US Patent Application 20110262366

64. E. Cappelletti, L. Lattuada, K.E. Linder, E. Marinelli, P. Nanjappan, A.D. Nunn, N. Raju, K. Ramalingam, R.E. Swenson, M.F. Tweedle. *Gastrin Releasing Peptide Compounds*
US Patent Application 20120009122

65. J. Chen, K.E. Linder, E.R. Marinelli, E. Metcalfe, A.D. Nunn, R.E. Swenson, M.F. Tweedle. *Stable Radiopharmaceutical Compositions and Methods for Their Preparation*
US Patent Application 20120065365

66. M.A. Von Wronski, E.R. Marinelli, A.D. Nunn, R.K. Pillai, K. Ramalingam, M.F. Tweedle, K.E. Linder, P. Nanjappan, N. Raju, F. Yan, M. Schneider. *Compounds for Targeting Endothelial Cells, Compositions Containing the Same and Methods for Their Use*
US Patent Application 20120315220

67. J. Goldberger, M. Tweedle. Self-assembling molecules that accumulate in acidic tumor microenvironments
US Patent Application 20140363378 (Dec. 2014)

Book Chapters

1. M.F. Tweedle, H.G. Brittain, W.C. Eckelman, G.T. Gaughan, J.J. Hagan, P.W. Wedeking, V.R. Runge. "Principles of Contrast Enhancement with Paramagnetic Metal Complexes" pp. 793-809 in Magnetic Resonance (MR) Imaging second edition, Edited by C. Leon Partain, Ronald R. Rice, James A. Patton, Madan V. Kulkarni, A. Everette James, Jr. published by W. B. Saunders, Philadelphia, 1988

2. M.F. Tweedle. "Relaxation Agents in Nuclear Magnetic Resonance" pp. 127-173 in Lanthanide Probes in Life, Medical and Environmental Sciences, edited by J.-C.G. Bunzli and G.R. Choppin, Elsevier, 1989

3. M.F. Tweedle. "Work In Progress toward Nonionic Macrocyclic Gd(III) Complexes" pp. 65-73 in Contrast and Contrast Agents in Magnetic Resonance Imaging, Edited by P.A. Rink, European Workshop on Magnetic Resonance in Medicine, European Magnetic Resonance Forum Foundation, Univ. Mons, Belgium, 1989.

4. C.A. Chang, M.F. Tweedle. "Preclinical Studies with Gd(HP-DO3A)" Pp.75-82 in New Developments in Contrast Agent Research, Proceedings of the 2nd Special topics Seminar, Bordeaux, France, Sept. 26-28, 1990. Edited by P.A. Rink and R.N. Muller, European Magnetic Resonance Forum Foundation, Blonay, Switzerland, CH 1807, 1991.

5. M.F. Tweedle, S. Kang, P. Ratsep, J. Emswiler, K. Kumar, R.K. Pillai, R. Ranganathan, R. Shukla, X. Zhang. "New Nonionic Macrocyclic Gd Chelates" pp. 50-65 in New Developments in Contrast Media Research, Proceedings of the 3rd Special Topics Seminar of the European Magnetic Resonance Forum, Hamburg, Germany, Sept. 23-25, 1992. Edited by P.A. Rink and R.N. Muller, European Magnetic Resonance Forum Foundation, P.O. Box 1235, CH-6648, Minusio-Locarno, Switzerland, 1993.
6. R.S. Ranganathan, S.I. Kang, P.C. Ratsep, K.M.R. Pillai, R. Shukla, X. Zhang, M.F. Tweedle. "New Multimeric MRI Contrast Agents" pp. 17-28 in New Developments in Contrast Agent Research, Proceedings of the 4th Special Topic Seminar of the European Magnetic Resonance Forum (September 1994) Edited by P.A. Rink and R.N. Muller, European Magnetic Resonance Forum Foundation, C/O Univ. Mons, Belgium, 1995
7. M.F. Tweedle and K. Kumar. "Magnetic resonance Imaging Contrast Agents" Edited by Michael Clarke. Springer Verlag, London, 1999
8. M. F. Tweedle. "Can MRI Agents Compete in the Biochemical World?" pp. 723-7 in "Technetium, Rhenium, and Other Metals in Chemistry and Nuclear Medicine" Edited by M. Nicolini and U. Mazzi, SGE Editorial SNC, Padua, Italy, 2002
9. A. Shrivastava, M. vonWronski, M. F. Tweedle and A. D. Nunn. "Identification of ideal peptides for heterovalent ligands" Chapter in "Therapeutic Peptides" 2009, Volume 00 Methods in Molecular Biology, Humana Press, USA (Springer)
10. R.X. Xu, J.S. Xu, J. Huang, M. F. Tweedle, C. Schmidt, S. P. Povoski, E. W. Martin "Targeted delivery of cancer-specific multimodal contrast agents for intraoperative detection of tumor boundaries and therapeutic margins" in Design and Quality for Biomedical Technologies III, eds. R. Raghavachari, R. Liang, Proc. of SPIE. 2010
11. K. Kumar, M.F. Tweedle. "Nanoparticulate Gadolinium-based Magnetic Resonance Imaging Contrast Agents.", Volume 3 Edited by Y.V Pathak, G.K. Pillai, H. Tran. Centera of Sullivan University, Lexington, KY, 2011
12. H. Thomsen, P. Dawson, M. F. Tweedle. "MR and CT Contrast Agents for Perfusion Imaging and Regulatory Issues" Chapter 11, in **MR & CT Perfusion Imaging: Clinical Applications and Theoretical Principles**. Edited by Roland Bammer, MD. Wolters Kluwer Health, Inc., Chapter Accepted.
13. M. F. Tweedle, K. Kumar, M. V. Knopp. Chapter 20. X ray, MRI and Ultrasound Agents: Basic Principles. Handbook of Small Animal Imaging, Preclinical Imaging, Therapy, and Applications Edited by G. C. Kagadis, Nancy L. Ford, George K. Loudos, Dimitrios Karnabatidis. Taylor and Francis, CRC Press. In Press.

Reviews

1. M.F. Tweedle. "Gd Chelates as Relaxation Agents in Magnetic Resonance Imaging" *Journal of Alloys and Compounds* **180**, 317-323, 1992
2. M.F. Tweedle "Physicochemical Properties of ProHance and Other MR Contrast Agents" *Invest. Radol.* **27**, S2-6, 1992
3. M.F. Tweedle, V.M. Runge "Gadoteridol" *Drugs of the Future* **17** (3), 187-190, 1992
4. M.F. Tweedle. "The ProHance Story: The Making of a Novel MRI Contrast Agent" *Eur. Radiol.* **7**, S225-30, 1997.
5. M. F. Tweedle. "Using Radiotracers to Characterize MRI Contrast Agents" *Invest. Radiol.* **37**, 107-113, 2002.
6. M. F. Tweedle. "The Chemistry of Contrast Agents in Medical Magnetic Resonance Imaging" edited by E. Merbach and E. Toth." Book Review: *J. Am. Chem. Soc.* 2002, **124**: 888.
7. M. F. Tweedle. "Adventures in Multivalency – The Harry Fischer Memorial Lecture" *Contrast Media & Molecular Imaging* 2006, **1**: 2-9.
8. A. Shrivastava, A. Nunn, M.F. Tweedle. "Designer Peptides: Learning from Nature" In *Exploiting Multivalency in Drug Design. Current Pharmaceutical Design*, 2009, **15**:657-81.
9. M. F. Tweedle. "Peptide - targeted diagnostics and radiotherapeutics" *Accounts of Chemical Research*, 2009, **42**: 958-68.
10. D. Hao, T. Ai, F. Goerner, X. Hu, V. M. Runge, M.F. Tweedle. "MRI Contrast Agents: Basic Chemistry and Safety" *J. Magn. Reson. Imag.* 2012, **36**: 1060-1071.
11. C. L. Wright, J. Zhang, M. F. Tweedle, M. V. Knopp, N. C. Hall. "Theranostic Imaging of Yttrium-90" *Biomed Res Int* 2015 in press. "Theranostic Imaging of Yttrium-90," *BioMed Research International* 2015, 2015: Article ID 481279, 11 pages. doi:10.1155/2015/481279. PMID : 26106608
12. Eben L Rosenthal, Jason M Warram, Esther de Boer, James P Basilion, Merrill A Biel, Matthew Boggyo, Michael Bouvet, Brian E Brigman, Yolonda L Colson, Steven R DeMeester, Geoffrey C Gurtner, Takeaki Ishizawa, Paula M Jacobs, Stijn Keereweer, Joseph C Liao, Quyen T Nguyen, James M Olson, Keith D Paulsen, Dwaine Rieves, Baran D Sumer, Michael F Tweedle, Alexander L Vahrmeijer, Jamey P Weichert, Brian C Wilson, Michael R Zenn, Kurt R Zinn, Gooitzen M van Dam. "Successful Translation of Fluorescence Navigation During Oncologic Surgery: A Consensus Report" *J Nucl Med* 2015 e pub ahead of print : <http://jnm.snmjournals.org/content/early/2015/10/07/jnumed.115.158915.long>
- 13.

Editorials

1. M.F. Tweedle. "Nonionic or Neutral?" Radiology 178, 891, 1991
2. S. Eaton, H.M. Tsay, F.J. Yost, M.F. Tweedle. "Complement Activation by Radiographic Contrast Media" Investigative Radiology 26, 918-919, 1991
3. Brasch, R. C., Tweedle, M. F. et al. Magnetic-Resonance for Liver Imaging - Discussion, Invest. Radiol. 1991, 26, S150-S155.
4. Golman, C., Tweedle, M.F., et al Magnetic Resonance Imaging and the Kidney – Discussion, Invest. Radiol. 1991, 26, S137-S138.
5. Norman, A. Tweedle, M. F. et. al. Iodinated Agents - Adverse-Effects and Reaction-Mechanisms – Discussion, Invest. Radiol. 1991, 25, S40-S41.
6. Vexler, V. S. Tweedle, M. F. et. al. Blood Pool Agents – Discussion, Invest. Radiol. 1991, 26, S60-S64.
7. M.F. Tweedle. "No More Edsel Mechanics Needed in Nuclear Medicine" J. Nucl. Med., 34, 1826, 1993
8. M.F. Tweedle "Can biochemically targeted MRI agents improve drug development?" Newsletter of the Academy of Molecular Imaging and Website of the Society for Noninvasive Imaging in Drug Development Page 1, Spring, 2004
9. M.F. Tweedle. "Introduction to the Special Issue" Investigative Radiology, Special Issue on Contrast Agents 2006 (March)
10. Michael F. Tweedle. "Multivalency in Targeted Imaging Agents" Newsletter of the Academy of Molecular Imaging and Website of the Society for Noninvasive Imaging in Drug Development. Page 14, Spring, 2006
11. M.A von Wronksi, M.F. Tweedle, A.D. Nunn. "Binding of the C-terminal amino acids of VEGF 121 directly with neuropilin-1 should be considered" FASEB Journal, 21, 1292, 2007
12. M.F. Tweedle. "Stability" of gadolinium chelates" British Journal of Radiology (letter to editor) 80, 583-4, 2007.
13. Michael F. Tweedle. "Message from the Chair" Newsletter of the Academy of Molecular Imaging. Winter, 2008
14. Emanuel Kanal, Michael F. Tweedle, "Residual/Retained Gadolinium: Practical Implications for Radiologists and our Patients" Radiology, 2015, ahead of print at <http://pubs.rsna.org/doi/10.1148/radiol.2015150805>
<https://www.youtube.com/watch?v=gmgv6EvGw0o>
<http://pubs.rsna.org/doi/10.1148/radiol> Radiology Podcast
Response to editorial

Peer Reviewed Journals

1. M.F. Tweedle, L.J. Wilson. "Variable Spin Iron(III) Chelates with Hexadentate Ligands Derived from Triethylenetetraamine and Various Salicylaldehydes. Synthesis, Characterization, and Solution State Studies of a New $^2T \leftrightarrow ^6A$ Spin Equilibrium System" J. Am. Chem. Soc. 98, 4824-4834, 1976
2. E.V. Dose, M.F. Tweedle, L.J. Wilson. "A Direct Measurement of Dynamic Spin-Interconversion Rates in the Spin-Equilibrium Protein Ferric Myoglobin Hydroxide" J. Am. Chem. Soc. 99, 3886-3888, 1977
3. M.F. Tweedle, L.J. Wilson. "Faraday Magnetic Balance Capable of High Resolution Measurements on Metalloproteins in Solution from 6.5 to 300 K" Rev. Sci. Instrum. 49, 1001-1004, 1978
4. R.A. Binstead, J.K. Beattie, E.V. Dose, M.F. Tweedle, L.J. Wilson. "Intersystem Crossing Observed by Ultrasonic Relaxation of the $^2T \leftrightarrow ^6A$ Spin Equilibrium of Hexadentate Iron(III) Complexes in Solution" J. Am. Chem. Soc. 100, 5609-5614, 1978
5. G. Palmer, T. Antalia, G.T. Babcock, L. Gardia-Iniguez, M.F. Tweedle, L. J. Wilson, L. Vickery. "Electronic States of Heme in Cytochrome Oxidase" Mechanisms of Oxidizing Enzymes, Dev. Biochem. 1, 221-238, 1978
6. E.V. Dose, M. A. Hoselton, N. Sutin, M.F. Tweedle, L.J. Wilson. "Dynamics of Intersystem Crossing Processes in Solution for Six-Coordinate d^5 , d^6 , and d^7 Spin-Equilibrium Metal Complexes of Iron(III), Iron(II), and Cobalt(II)" J. Am. Chem. Soc. 100, 1141-1147, 1978
7. E. Sinn, G. Sim, E.V. Dose, M.F. Tweedle, L.J. Wilson. "Electronic and Molecular Structure of Variable-Spin Iron(III) Chelates with Hexadentate Ligands Derived from Triethylenetetraamine and b-Diketones or Salicylaldehyde. J. Am. Chem. Soc. 100, 3375-3390, 1978
8. R.H. Petty, E.V. Dose, M.F. Tweedle, L.J. Wilson. "Bis(N-methylethylene-diaminesalicylaldiminato)iron(III) Complexes. Magnetic, Mossbauer, and Intersystem Crossing Rate Studies in the Solid and Solution States for a New ($S=1/2$) $\leftrightarrow$ ($S=5/2$) Spin-Equilibrium Case" Inorg. Chem. 17, 1064-1071, 1978
9. M.F. Tweedle, L.J. Wilson, L. Garcia-Iniguez, G.T. Babcock, G. Palmer. "Electronic state of heme in cytochrome oxidase III. The magnetic susceptibility of beef heart cytochrome oxidase and some of its derivatives from 7-200 K. Direct evidence for an antiferromagnetically coupled iron(III)/-copper(II) pair" J. Biol. Chem. 253 (22), 8065-71, 1978
10. M.F. Tweedle. "Spin interconversion studies of $3d^5$, $3d^6$, and $3d^7$ spin equilibrium iron and cobalt complexes. Magnetic susceptibility studies (7-200 K) of beef heart cytochrome

oxidase and some of its derivatives: Evidence for a heme spin state dependent antiferromagnetically coupled iron-(III)/copper(II) pair" (Ph.D. Thesis from Rice University, 1978, 200 pp.) Diss Abstr. Int. B 1978, 39 (3), 1279-80

11. M.F. Tweedle, H. Taube. "Reactivity of Imidazoliumruthenium Ammine Complexes: Nitrogen- to Carbon-Bound Rearrangement, Trans Labilization, and Redox Behavior" Inorg. Chem. 21, 3361-3371, 1982

12. V.M. Runge, A.C. Price, C.J. Wehr, J.B. Atkinson, M.F. Tweedle. "Contrast Enhanced MRI. Evaluation of a Canine Model of Osmotic Blood-Brain Barrier Disruption" Invest. Radiol. 20, 830-844, 1985

13. H.G. Brittain, S. Mantha, M.F. Tweedle "Effect of Oligomerization on the Solvent Water Proton Longitudinal Relaxation Rates of Lanthanide EDTA Complexes" J. Less Comm. Met. 126, 339-342, 1986

14. S.M. Eaton, H-M. Tsay, F.J. Yost, M. F. Tweedle "Effect of Iodinated Contrast Media on Radioimmunoassay of C_{3a}" Clin. Chem. 33, 1470, 1987

15. W.C. Eckelman, M.F. Tweedle, M.J. Welch. "NMR Enhancement with Gd-Labeled Antibodies" Proc. NATO Conf. Antibodies, 571-579, 1988

16. M. Tweedle, G. Gaughan, J. Hagan, P. Wedeking, L. Wilson, D. Lee "Considerations Involving Paramagnetic Coordination Compounds as Useful NMR Contrast Agents" Int. J. Nucl. Med. Biol. 14, 31-36, 1988

17. S.M. Eaton, J.J. Hagan, H-M. Tsay, F.J. Yost, E.L. Nickoloff, M.D. Loberg, M.F. Tweedle "A Predictive Test for Adverse Reactions to Contrast Media: Preliminary Results" Invest. Radiol. 23, S206-S208, 1988

18. P.W. Wedeking, M.F. Tweedle. "Comparison of the Biodistribution of ¹⁵³Gd(DTPA)²⁻, Gd(DOTA)⁻, and Gd(acetate)_n in Mice" Nuc. Med. Biol. 15, 395-402, 1988

19. M.F. Tweedle, S.M. Eaton, W.C. Eckelman, G.T. Gaughan, J.J. Hagan, P.W. Wedeking, F.J. Yost. "Comparative Chemical Structure and Pharmacokinetics of MRI Contrast Agents" Invest. Radiol. 23, S236-S239, 1988

20. J.J. Hagan, S. Cicero, M.F. Tweedle "Fluorescence Detection of Gadolinium Chelates Separated by Reversed-Phase High-Performance Liquid Chromatography" Anal. Chem. 60 514, 1988

21. S.M. Eaton, H.M. Tsay, F.J. Yost, M.F. Tweedle, H-M. Tsay. "Assays for Plasma Complement Activation by X-ray Contrast Media" Invest. Radiol. 25, 789-792, 1990

22. G. Hernandez, H.G. Brittain, M.F. Tweedle, R.G. Bryant. "Nuclear Magnetic Relaxation in Aqueous Solutions of Gd(HEDTA) Complex" *Inorg. Chem.* 29, 985-988, 1990
23. C.A. Chang, H.G. Brittain, J. Telser, M.F. Tweedle. "pH Dependence of Relaxivities and Hydration Numbers of Gd(III) Complexes of Linear Amino Carboxylates" *Inorg. Chem.* 29, 4468-4473, 1990
24. G. Hernandez, M.F. Tweedle, R.G. Bryant. "Proton Magnetic Relaxation Dispersion in Aqueous Glycerol Solutions of Gd(DTPA)²⁻ and Gd(DOTA)" *Inorg. Chem.* 29, 5109-5113, 1990
25. P. Wedeking, S. Eaton, D.G. Covell, S. Nair, M.F. Tweedle, W. C. Eckelman "Pharmacokinetic Analysis of Blood Distribution of Intravenously Administered ¹⁵³Gd-Labeled Gd(DTPA)²⁻ and ^{99m}Tc(DTPA) in Rats" *Magn. Reson. Imag.* 8, 567-575, 1990
26. M.F. Tweedle, J.J. Hagan, K. Kumar, S. Mantha, C.A. Chang "Reaction of Gadolinium Chelates With Endogenously Available Ions" *Magn. Reson. Imag.* 9, 409-415, 1991
27. D.D. Dischino, J.E. Delaney, J.E. Emswiler, G.T. Gaughan, J.I. Moniot, J.S. Prasad, S.K. Srivastava, M.F. Tweedle. "Synthesis of Non-Ionic Gadolinium Chelates Useful as Contrast Agents for Magnetic Resonance Imaging" *Inorg. Chem.* 30, 1265-1269, 1991
28. M.F. Tweedle, P. Wedeking, J. Telser, C.H. Sotak, C.A. Chang, K. Kumar, X. Wan, S.M. Eaton. "Dependence of MR Signal Intensity on Gd Tissue Concentration over a Broad Dose Range" *Magn. Reson. Med.* 22, 191-194, 1991
29. R. Shukla, X. Zhang, M.F. Tweedle. "Probes of Relaxivity: In Vitro Determination of Correlation Times Independent of NMRD" *Investigative Radiology* 26, S224-S225, 1991
30. R. Ranganathan, T. Arunachalam, G. Diamantidis, L. Duncan, J. Emswiler, E. marinelli, R. Neubeck, R. Pillai, P. Wedeking, M.F. Tweedle. "New X ray Contrast Agents. The Chemical, biological, and physical properties of 5-heterocycle substituted 2, 4, 6-triiodo-1, 3-benzenedicarboxamide derivatives" *Invest. Radiol.* 26, S156-8, 1991
31. P.W. Wedeking, C.H. Sotak, J. Telser, K. Kumar, C.A. Chang, M.F. Tweedle "Quantitative Dependence of MR Signal Intensity on Tissue Concentration of Gd(HP-DO3A)" *Magn. Reson. Imag.* 10, 97-108, 1992
32. L.S. Szczepaniak, A. Sargeson, M.F. Tweedle, R. Bryant. "Nuclear Magnetic Spin-Lattice Relaxation of Water Protons Caused by Metal Cage Compounds" *Bioconjugate Chem.* 3, 27-31, 1992
33. P.W. Wedeking, L. Kumar, M.F. Tweedle. "Dissociation of Gadolinium-Chelates in Mice: Relationship to Chemical Characteristics" *Magn. Reson. Imag.* 10, p. 641-648, 1992

34. X. Zhang, C.A. Chang, H.G. Brittain, J.M. Garrison, J. Telser, M.F. Tweedle "pH Dependence of Relaxivities and Hydration Numbers of Gadolinium(III) Complexes of Macrocyclic Aminocarboxylates" *Inorg. Chem.* 31, 5597-5600, 1992
35. K. Kumar, C.A. Chang, M.F. Tweedle "Equilibrium and Kinetic Studies of Lanthanide Complexes of Macrocyclic Polyamino Carboxylates" *Inorg. Chem.* 32, 587-593, 1993
36. K. Kumar, K. Sukumaran, C.A. Chang, M.F. Tweedle. "True Tracer Radiolabeling of Gadolinium Complex of 10-(2-Hydroxypropyl)-1,4,7,10-tetraazacyclododecane-1,4,7 - DO3A)" . *Labelled Compds.Radiopharm.* 33, 473-482, 1993
37. S. Eaton, P.W. Wedeking, M.F. Tweedle, W.C. Eckelman "A Multi-organ Axially Distributed Model of Capillary Permeability for an MRI Contrast Agent" *J. Pharm. Sci.* 82, 531-536, 1993
38. P. Wedeking, K. Kumar, M.F. Tweedle. "Dose Dependent Biodistribution of $^{153}\text{Gd}(\text{acetate})_n$ in Mice" *Nucl. Med. Biol.* 20, 679-691, 1993
39. S. Kang, R. Ranganathan, J. Emswiler, K. Kumar, J. Gougoutas, M. Malley, M.F. Tweedle. "Synthesis, Characterization, and Crystal Structure of Gadolinium (III) Chelate of (1R,4R,7R)-Trimethyl-1, 4,7,10-Tetraazacyclododecane-1,4,7-Triacetic Acid (DO3MA)" *Inorg. Chem.* 32, 2912, 1993
40. C.A. Chang, L.C. Francesconi, M.F. Malley, J.Z. Gougoutas, M.F. Tweedle "Synthesis, Characterization, and Crystal Structures of $\text{M}(\text{DO3A})$ $\{\text{M}=\text{Fe}, \text{Gd}\}$ and $\text{Na}[\text{M}(\text{DOTA})]$ $\{\text{M}=\text{Fe}, \text{Y}, \text{Gd}\}$ " *Inorg. Chem.* 32, 3501-3508, 1993
41. K. Kumar, M.F. Tweedle. "Ligand Basicity and Rigidity Control Formation of Macrocyclic Polyaminocarboxylate Complexes of $\text{Gd}(\text{III})$ " *Inorg. Chem.* 32, 4193-4199, 1993
42. K. Kumar, M.F. Tweedle "Macrocyclic Polyamioncarboxylate Complexes of Lanthanides as Magnetic Resonance Imaging Contrast Agents" *Pure and Applied Chemistry* 65, 515-520, 1993
43. K. Kumar, K.V. Sukumaran, M.F. Tweedle. "Determination of Free Gd^{3+} as a CDTA Complex by Reversed Phase HPLC" *Anal. Chem.* 66, 295-299, 1994
44. K. Kumar, T. Z. Jin, X. Wang, J.F. Desreux, M.F. Tweedle. "Effect of Ligand Basicity on the Formation and Dissociation Equilibria and Kinetics of Gd^{3+} Complexes of Macrocyclic Polyamino Carboxylates" *Inorg. Chem.* 33, 3823-3829, 1994
45. K. Kumar, C.A. Chang, C. Francisconi, D. Dischino, M.F. Malley, J.Z. Gougoutas, M.F. Tweedle. "Synthesis, Stability and Structure of Some Gadolinium(III) and Yttrium(III) Macrocyclic Poly (amino carboxylates)" *Inorg. Chem.* 33, 3567-3575, 1994

46. K. Kumar, K. Sukumaran, K. Taylor, C.A. Chang, A.D. Nunn, M.F. Tweedle. "Partition Coefficients (logP) and Some HPLC Capacity Factors (k') of Some Gd(III) complexes of Linear and Macrocyclic Polyamino Carboxylates" *J. of Liq. Chrom.* 17, 3735-3746, 1994
47. X. Zhang, R. Pillai, R. Shukla, R. Ranganathan, M.F. Tweedle. "New Aromatic Macrocyclic Gd-Chelates with Enhanced Relaxivity" *Invest. Radiol.* 29, S69-S71, 1994
48. S. Eaton, M.F. Tweedle, R.S. Ranganathan. "A Study of the Anticoagulation of X-Ray Contrast Media" *Invest. Radiol.* 29, S201-S202, 1994
49. X. Wan, P. Wedeking, M.F. Tweedle. "Sources of Heterogeneous Contrast Enhancement in the Gastrointestinal Tract" *Mag. Reson. Imag.* 12, 1009-1012, 1994
50. X. Wan, P. Wedeking, M.F. Tweedle. "MRI Evaluation of Potential Gastrointestinal Contrast Media" *Magn. Reson. Imag.* 13, 215-218, 1995
51. M.F. Tweedle, P. Wedeking, K. Kumar. "Biodistributions of Radiolabeled, Formulated Gadopentetate, Gadoteridol, Gadoterate and Gadodiamide in Mice and Rats" *Invest. Radiol.* 30, 372-380, 1995
52. K. Kumar, M.F. Tweedle, M.F. Malley, J.Z. Gougoutas. "Synthesis, Stability, and Crystal Structure Studies of Some Ca^{2+} , Cu^{2+} , and Zn^{2+} Complexes of Macrocyclic Polyamino Carboxylates" *Inorg. Chem.* 34, 6472-6480, 1995
53. R. Shukla, M. Fernandez, R. K. Pillai, R. Ranganathan, P.C. Ratsep, X. Zhang, M.F. Tweedle. "Design of Conformationally Rigid Dimeric MRI Agents" *Mag. Reson. in Med.* 35, 928, 1996
54. R.B. Shukla, K. Kumar, R. Weber, X. Zhang, M.F. Tweedle. "Alteration of Electronic Relaxation in MR Contrast Agents through De-Novo Ligand Design" *Acta Radiologica* 38, Suppl. 412; 121-123, 1996
55. K. Kumar, M.F. Tweedle, H.G. Brittain "Gadoteridol" *Analytical Profiles of Drug Substances*, 24, 209-241, 1996
56. A.D. Nunn, P. Wedeking, E. Marinelli, R. Ranganathan, R. Pillai, M.F. Tweedle. "Toxicity of Gadolinium Chelates in Rodents" *Acad. Radiol.*, S333-335, 1996
57. A.D. Nunn, K. Linder, M.F. Tweedle. "Can Receptors be imaged with MRI agents" *Quart. J. Nucl. Med.* 2, 1997
58. M.F. Tweedle, X. Zhang, M. Fernandez, P. Wedeking, H.W. Strauss. "A Noninvasive Method for Monitoring Renal Status at Bedside" *Invest. Radiol.* 32, No. 12: 802-805, 1997

59. J.E. Bradshaw, K.A. Gillogly, L.J. Wilson, X. Wan, K. Kumar, M.F. Tweedle, G. Hernandez, R.G. Bryant. "New Non-Ionic Water-Soluble Porphyrins: Evaluation of Manganese (III) Polyhydroxylamide Porphyrins as MRI Contrast Agents" *Inorganica Chimica Acta*, 275-276, 106-116 1998
60. R.S. Ranganathan, T. Arunachalam, B. Song, S. Mantha, P. Wedeking, F. Yost, E. Jagoda, M.F. Tweedle. "Evaluation of N, N'-bis-dimethyldiatrizeic Acid Analogs as Liver Imaging Agents" *Acad. Radiol.*, 5, S1, S23-30, 1998
61. R. Ranganathan, M.E. Fernandez, S.I. Kang, A.D. Nunn, P.C. Ratsep, K.M. Pillai, X. Zhang, M.F. Tweedle. "New Multimeric Magnetic resonance Imaging Agents" *Invest. Radiol.*, 33, 779-97. 1998
62. P. Wedeking, R. Shukla, A.D. Nunn, M.F. Tweedle. "Utilization of the Nephrectomized Mouse for Determining Threshold Effects of MRI Contrast Agents" *Magn. Reson. Imag.* 17: 569-75, 1999
63. E. Marinelli, R. Neubeck, B. Song, T. Wagler, R. Ranganathan, K. Sukumaron, P. Wedeking, A.D. Nunn, V.R. Runge, M.F. Tweedle "Synthesis, characterization and imaging performance of a new class of macrocyclic hepatobiliary MR contrast agent" *Invest. Radiol.* 25, 8-24, 2000.
64. P. L. Williams, G.L. Anderson, J.L. Johnstone, A. D. Nunn, M. F. Tweedle, P. Wedeking "Caenorhabditis elegans as an alternative animal species" *J. Toxicol. Environ. Health Part A*, 61: 641-7, 2000.
65. E. Marinelli, R. Neubeck, B. Song, T. Wagler, R. Ranganathan, K. Sukumaron, P. Wedeking, A.D. Nunn, V.R. Runge, M.F. Tweedle. "Synthesis and Evaluation of Macrocyclic Gadolinium Chelates as hepatospecific MRI Agents" *Acad. Radiol.* 2002 S251-4.
66. R.S. Ranganathan; R.K. Pillai; N. Raju; H. Fan; H. Nguyen; M.F. Tweedle; J.F. Desreux; J. Vincent. "Polymethylated DOTA ligands. 1. Synthesis of rigidified ligands and studies on the effects of alkyl substitution on acid-base properties and conformational mobility" *Inorg. Chem.* 2002, 41: 6846-55.
67. R.S. Ranganathan; N. Raju; H. Fan; X. Zhang; M.F. Tweedle; J.F. Desreux; J. Vincent. "Polymethylated DOTA ligands. 2. Synthesis of Rigidified Lanthanide Chelates and Studies on the Effect of Alkyl Substitution on Conformational Mobility and Relaxivity." *Inorg. Chem.* 2002, 41: 6856-6866.
68. N. Raju, R.S. Ranganathan, M.F. Tweedle, R.E. Swenson. "A new dendrimer scaffold for preparing dimers or tetramers of biologically active molecules" *Tetrahedron Letters* 46:1463-1465, 2005
69. Shrivastava, A; von Wronski, M; Sato, AK; Dransfield, DT; Sexton, D; Bogdan, N; Pillai, R; Nanjappan, P; Song, B; Marinelli, M; DeOliveira, D; Luneau, C; Devlin, M; Muruganandam, M; Abujoub, A; Connelly, G; Wu, Q; Conley, G; Chang, Q; Tweedle, MF; Ladner, RC; Swenson, R; Nunn, AD "A distinct strategy to generate high affinity peptide

binders to receptor tyrosine kinases” *Protein Engineering, Design and Selection* 2005, 18: 417-424.

70. M. Von Wronski, N. Raju R. Pillai; N.J. Bogdan; E.R. Marinelli; P. Nanjappan; K. Ramalingam; K. Arunachalam; S. Eaton; K. Linder; F. Yan; S. Pochon; A.D. Nunn; M.F. Tweedle. “Tuftsin binds neuropilin-1 through a sequence similar to that encoded by exon 8 of VEGF” *J. Biol. Chem* 2006, 281: 5702-5710.

71. G. W. White, W. A. Gibby; M. F. Tweedle. “Comparison of Gd(DTPA-BMA) (Omniscan) Versus Gd(HP-DO3A) (ProHance) Relative to Gadolinium Retention in Human Bone Tissue by Inductively Coupled Plasma Mass Spectrometry” *Invest. Radiol.* 2006, 41: 272-278.

72. L. E. Lantry; E. Cappeletti; M. Maddalena; J. S. Fox; W. Feng; J. Chen; R. Thomas; S. M. Eaton; N. J. Bogdan; T. Arunachalam; J. C. Reubi; N. Raju; L. Kattuada; K. E. Linder; R. E. Swenson; M. F. Tweedle; A. D. Nunn “LuAMBA: Synthesis and Characterization of a Selective ¹⁷⁷Lu-Labeled GRP-R Agonist for Systemic Radiotherapy of Prostate Cancer” *J. Nucl. Med.* 2006, 47:1144 – 1152.

73. J. Chen; K. E. Linder; A. Cagnolini; E. Metcalfe; N. Raju; M. F. Tweedle; R. E. Swenson. “Synthesis, Stabilization and Formulation of [¹⁷⁷Lu]Lu-AMBA, a Systemic Radiotherapeutic Agent for Gastrin Releasing Peptide Receptor Positive Tumors” *J. Applied Radiation Isotopes* 2008, 66: 497-505.

74. B. J. Wintersperger; V. M. Runge, M.F. Tweedle; C. B. Jackson; M.F. Reiser. “Brain Tumor Enhancement in Magnetic Resonance Imaging; Dependency on the Level of Protein Binding of Applied Contrast Agents” *Invest. Radiol.* 2009, 44: 89-94.

75. M. E. Maddalena, J. Fox, J. Chen, W. Feng, A. Cagnolini, K. E. Linder, M. F. Tweedle, A. D. Nunn, Laura E. Lantry “¹⁷⁷Lu-AMBA Biodistribution, Radiotherapeutic Efficacy, Imaging and Autoradiography in Prostate Cancer Models with Low GRP-R Expression” *J. Nucl. Med.* 2009, 50:2017-2024.

76. J.N. Morelli, V.M. Runge, J.M. Williams, R.S. Beissner, M. Tweedle. “Evaluation of a fibrin-binding gadolinium chelate peptide tetramer in a brain glioma model” *Invest. Radiol.* 2011, 46:169-177.

77. K.E. Linder, E. Metcalfe, P. Nanjappan, T. Arunachalam, K. Ramos, T.M. Skedzielewski, M.F. Tweedle, A.D. Nunn, R.E. Swenson. “Synthesis, In Vitro Evaluation and In Vivo Metabolism of Fluor/Quencher Compounds Containing IRDye 800CW and Black Hole Quencher-3 (BHQ-e)” *Bioconj. Chem.* 2011, 22: 1287-1297.

78. RX Xu, J Xu, T Zuo, R Shen, TH Huang, MF Tweedle. Drug-loaded biodegradable microspheres for image-guided combinatory epigenetic therapy in cells. *J Biomed Optics* 2011, 16:205071-3.

79. Ghosh A, Haverick M, Stump K, Yang X, Tweedle MF, Goldberger JE. “Fine-Tuning the pH Trigger of Self-Assembly” *J Am Chem Soc.* 2012, 134(8):3647-50.

80. A. Shrivastava, S-H Wang, N. Raju, I. Gierach, H. Ding, M.F. Tweedle, "Heterobivalent dual-target probe for targeting GRP and Y1 receptors on tumor cells." 2012. Bioorganic & Medicinal Chemistry Letters, Bioorganic & Medicinal Chemistry Letters, 2013, 23: 687-692.
81. Haiming Ding, Adlina Mohd Yusof, PhD,^a Shankaran Kothandaraman, PhD,^b Xiaoli Zhang, PhD,^c Motoyasu Saji, MD, PhD,^d Matthew D. Ringel, MD,^d Michael F. Tweedle, PhD,^b John E. Phay, MD, "Specific Localization of CaSR Antagonists in CaSR-expressing Medullary Thyroid Cancer." The Journal of Clinical Endocrinology and Metabolism, 2013. PMCID: 24030941
82. Haiming Ding, Michelle M. Carlton, Stephen P. Povoski, Keisha Milum, Krishan Kumar, Shankaran Kothandaraman, George H. Hinkle, David Colcher, Rich Brody, Paul D. Davis, Alex Pokora, Mitchell Phelps, Edward W. Martin, Jr, Michael F. Tweedle "Site specific discrete PEGylation of 124I-labeled mCC49 Fab' fragments improves tumor microPET/CT imaging in mice." 2013 Bioconj. Chem, 24(11):1945-54. PMID: 24175669.
83. Adlina Mohd Yusof, Shankaran Kothandaraman, Xiaoli Zhang, Motoyasu Saji, Matthew D. Ringel, Michael F. Tweedle, John E. Phay, "Development of a calcium-sensing receptor molecular imaging agent" J. Surgery, 2013, 154(6):1378-84. PMCID: 24238055
84. Qing Ma, Meghan Jebb, Michael F Tweedle, Lon J Wilson. The Gadonanotubes: Structural Origin of their High-Performance MRI Contrast Agent Behavior. J. Mater. Chem. B, 2013, 1 (42), 5791 – 5797.
85. Ajay Shrivastava, M von Wronski, Michael F. Tweedle, Adrian D. Nunn, "Identification of ideal peptides for heterovalent ligands" Methods Mol Biol, 2014, 1088:97-15.
86. Ajay Shrivastava, Haiming Ding, Shankaran Kothandaraman, Wang Shu-Huei, Li Gong, Michelle Williams, Kisha Milum, Song Zhang, Michael F. Tweedle, "A High-Affinity Near-Infrared Fluorescent Probe to Target Bombesin Receptors. Mol Imaging Biol, 2014, 16: 661-669. PMID: 24604209
87. Ghosh A, Buettner CJ, Manos AA, Wallace AJ, Tweedle MF, Goldberger JE. Probing peptide amphiphile self-assembly in blood serum. Biomacromolecules. 2014 Dec 8;15(12):4488-94. doi: 10.1021/bm501311g. Epub 2014 Nov 12. PubMed PMID: 25347387.

Recent Abstracts (2009 – 2014) 3 new in 2013/14 (Only External Abstracts included)

- 1.. K.E. Linder, E. Metcalfe, P. Nanjappan, T. Arunachalam, T. Skedzielewski, K. Ramos, A.D. Nunn, M.F. Tweedle, R.E. Swenson "Black Hole Quencher 3 (BHQ-3) quenches fluorescence from IRDye800 but is unstable in vivo - a tale of two compounds." World Molecular Imaging Congress, Montreal, Canada, September 2009
- 2.. K.E. Linder, E. Metcalfe, P. Nanjappan, T. Arunachalam, T. Skedzielewski, K. Ramos, A.D. Nunn, M.F. Tweedle, R.E. Swenson. "Light imaging agents containing IRDye800 are contact quenched by Black Hole Quencher 3" Contrast Media Research 2009. Copenhagen, Denmark, October 2009

- 3.. R. Xu, J.S. Xu, J. Huang, M.F. Tweedle, C.Schmidt, S.P. Povoski, E.W. Martin
“Targeted delivery of cancer-specific multimodal contrast agents for intraoperative detection of tumor boundaries and therapeutic margins” Design and Quality for Biomedical Technologies III. San Francisco, California, January 2010
4. R. Layman, N.C. Hall, J. Zhang, D. Barker, M. Natwa, M.F. Tweedle, M.V. Knopp.
“Overview of current technology in clinical hybrid SPECT/CT” Society of Nuclear Medicine 57th Annual Meeting 2010. Scientific Poster Session: Educational Exhibit. Salt Lake City, Utah, June 2010
5. J. D. Clifton, N. Beardsley, K.E. Linder, P. Nanjappan, T. Mawn, E. Metcalfe, R. Eisenberg, M.F. Tweedle, J. Delikatny. “Non invasive in-vivo optical imaging of matrix metalloproteinase activity in a KRN serum transfer model of Arthritic mice with novel near infra-red probes.” University of Pennsylvania 9th Annual Biomedical Postdoctoral Research Symposium. Philadelphia, Pennsylvania, October 2010
6. Jeff Xu, Jiwei Huang, Ruogu Qin, Michael Tweedle, Ronald Xu. 2010. “Gold Nanoparticle Assisted Light Activation of Microbubbles for Photothermal Therapy Photonics West” 2010: 7551-32.
7. Xu RX, Xu JS, Huang JW, Tweedle MF, Schmidt C, Povoski SP, Martin EW. “Targeted delivery of cancer-specific multimodal contrast agents for intraoperative detection of tumor boundaries and therapeutic margins” Conference on design and Quality for Biomedical technologies, San Francisco, Jan 25-6, 2010
8. K. Kumar, M. Matson, L.J. Wilson, M.F. Tweedle. “Loading and Human Plasma Stability of Gadonanotubes” World Molecular Imaging Congress, San Diego, California, September 2011
9. S.H. Wang, N. Raju, H. Ding, M.F. Tweedle. “Evaluation of biotinylated Bombesin analogs as tumor targeting probes” World Molecular Imaging Congress, San Diego, California, September 2011
- 10 K. Kumar, M. Matson, L.J. Wilson, M.F. Tweedle. “On the Stability of Gadonanotubes” Contrast Media Research Conference” Galveston, Texas, October 2011
11. Q. Ma, M.F. Tweedle. “X-ray Absorption Spectroscopy Study of Gd³⁺ loaded ultra short carbon nanotubes” 15th International Conference on X-ray Absorption Fine Structure (XAFS-XV), Beijing, China July 2012
12. Shrivastava A, Wang S-H, Natarajan, R, Gierach I, Tweedle M, “Heterobivalent chelating ligand for targeting GRP and NPY-1 receptors on tumor cells” World Molecular Imaging Society, Dublin Ireland, September, 2012
13. Mohd Yusof A, Kothandaraman S, Ding H, Tweedle M, Phay J. “DEVELOPMENT OF A CALCIUM-SENSING RECEPTOR MOLECULAR IMAGING AGENT”.Annual AAES Meeting

Chicago, April 14 –16, 2013

14. A. Shrivastava, H. Ding, S. Kothandaraman, S. Wang, R. Natarajan, M. Williams, N. Raju, L. Gong, S. Zheng, K. Milum, M. F. Tweedle. "Near infrared fluorescent (NIRF) probes targeting bombesin receptors on breast and prostate cancers" Contrast Media Research 2013, November 2013. Beijing, China
15. C. Wright, R. Layman, M. F. Tweedle. "Optical Imaging of positron-emitting radionuclides using Cerenkov luminescence and its potential applications in radioguided surgery. Nafki , 2013
16. A. Ghosh, C. Beutner, M. Williams, H. Ding, A. Bratasz, K. Kumar, M. Tweedle, J. Goldberger. "Developing Pan Cancer Targeted MRI Contrast Agents that Self-Assemble in Malignant Tumors" ISMRM, Milan Italy, May, 2014
17. K. A. Collier, J. Zhang, K. Binzel, N. C. Hall, K. Kumar, M. F. Tweedle, P. Monroe, M. V. Knopp. "Neuroimaging PET tracers: An atlas based approach for comparison in NHP PET/CT" SNM 2014, St. Louis, Mo.
18. Haiming Ding, Shankaran Kothandaraman , Li Gong, Michelle M. Williams, Wessel P. Dirksen, Thomas J. Rosol, Michael F. Tweedle. "NIRF Peptides Targeted to HuGRPr-transfected Canine ACE-1 Prostate Cancer Tumors." 2014 World Molecular Imaging Congress, Soel, Korea.
19. **Haiming Ding, william T. Drost, Li Gong, Shankaran Kothandaraman, Maria Menendez, Huyen nguyen, mitch phelps, Joshua Dowell, Robert R. Bahnson, Michael V. Knopp, Thomas J. Rosol, Michael F. Tweedle, "Orthotopic canine prostate cancer model for imaging agents to human cancer receptors" 2015 World Molecular Imaging Congress, Honolulu, Hawaii.**
20. **Chadwick L. Wright, Ricky R. Layman, Shankaran Kothandaraman, Nathan C. Hall, Michael V. Knopp, Michael F. Tweedle, "Buckeye-Boost: Cerenkov luminescence amplification by the wavelength-shifting Ohio Buckeye extract, esculin." ACNM, 2015**
21. **Ashley Braddom, Timothy Richmond, Tyler Sheetz, Erika Reese, Anna Tessari, Kathleen Tober, Christin E. Burd, Claudia De Lorenzo, Edward W. Martin, Jr., Vincenzo Coppola, Charles Hitchcock, Michael F. Tweedle, Tatiana Oberyshyn, Carlo M. Croce and Dario Palmieri. "Anti-NCL scFv as a new tool for skin cancer diagnosis and therapy." James CCC Translational Therapeutics retreat. Oct 31, 2015, Columbus, Ohio**
22. **Tweedle, M.F. Dowell, J.; Bahnson, R.R.; Wright, C.L.; Ding, H.; Gong, L.; Kothandaraman, S.; Drost, T.; Dirksen, Wessel; Menendez, M.; Nguyen, H.; Phelps, M.; Knopp, M.V.; Rosol, T. J. "A versatile canine prostate cancer model that expresses human receptors" James CCC Translational Therapeutics retreat. Oct 31, 2015, Columbus, Ohio.**

23. **Tweedle, M.F., C Beuttner, A Wallace, M Williams, K Kumar, JE Goldberger**
Gd chelates that self-assemble in a low pH biological microenvironment. Contrast
Media Research 2015, Berlin , Germany

24. **John Phay, Steven Justiano, Haiming Ding, Kara Rossfeld, Shankaran**
Kothandaraman, Chadwick Wright, Matthew Ringel, Michael Tweedle. A novel
imaging agent for medullary thyroid carcinoma in an orthotopic mouse model.

External lectures

1. **2015 Case Comprehensive Cancer Center. “A versatile Canine Prostate Cancer Model” at Cancer Imaging Mini-Retreat, Friday October 16, 2015.**
2. **Case Comprehensive Cancer Center. “Targeting Peptide Diagnostic Pharmaceuticals with Commercial Intent. November, 2013.**
3. **Media Contrast Research 2015, Berlin, Germany “Gd chelates that self-assemble in a low pH biological microenvironment. Contrast”**

Internal Lectures

1. **Engineering 4891. Creativity and Innovation. “Entrepreneurial Attitudes.” November, 2015.**
2. **James CCC Grand Rounds. “Pan-Cancer Targeting MRI Contrast Agents that Self-assemble in Malignant Tumors.” May, 2015.**
3. **Residents Seminar. “History and Pharmacology of X ray and MRI Contrast Agents.” July, 2015.**
4. **Radiology Safety Committee talk. “GBCA and Residual Gd.” September, 2015.**
5. **Drug Development Institute. “Gd PA molecules as pan cancer imaging agents.” December 2015.**

6. **Residenmts Seminar**

Educational Video

1. "ProHance, new Imaging Pharmaceutical for MRI." Bristol-Myers Squibb training VHS tape, 1989 (est.)
2. Prescription New Jersey, hosted by Sara Lee Kessler. "New Jersey Network Television documentary" Last aired July 28, 2005
3. 2011 Stefanie's Champions Awards Ceremony – "Continue to Fight"
<http://www.youtube.com/watch?v=NLDu94y3g6M>
4. 2010 Stefanie's Champions Awards Ceremony – Opening Video
<http://www.youtube.com/watch?v=-XoN9GA-mGU&feature=plcp>
5. **Radiological Society of North America. Interview and discussion. June 2015. Release.**

Recent Press Reports (2009 – 2015 only) (Two new in 2013/14)

1. Columbus Post dispatch Article on Stefanie Spielman
http://www.dispatch.com/live/content/local_news/stories/2009/11/24/Spielman_Funds.ART_ART_11-24-09_A1_FGFPJEU.html
2. WBNS-10/TV (Komen Race for the Cure special)
As part of a 30-minute "behind-the-scenes" look at the upcoming Race for the Cure special, OSUCCC cancer researcher **Dr. Michael Tweedle** discusses his on-going research to develop a drug that would allow surgeons to know in real-time during surgery if they had removed all of the cancerous cells. "The drug would be like a bloodhound seeking out cancerous cells," said Tweedle, "and would glow when illuminated by a special light, thus allowing surgeons to see if they had clear margins before finishing the surgery."
WBNS: <http://bit.ly/ITCXAT>
3. SNM Smart Brief with Jeff Kurate and Michael F. Tweedle
Fall 2013 Re; Tauopathic Imaging Agents
"Researchers create "designer" tracer for earlier diagnosis and better treatments of Alzheimer's" "Unlike beta amyloid, tau appears in specific [brain](#) regions in Alzheimer's," said Tweedle. "With a better view of how tau is distinct from amyloid, we'll be able to create a much more accurate view of disease staging, and do a much better job getting the right therapeutics into the right populations at the right time."
<http://www.news-medical.net/news/20130426/Researchers-create-designer-tracer-for-earlier-diagnosis-and-better-treatments-of-Alzheimers.aspx>
4. **Internal CCTS Interview Online with Chad Wright and Michael Tweedle, Spring 2014 Re: Bremer Grant ¹²³Iodine-labeled HN1-800dye agents for dual-modality intraoperative surgical guidance during resection of head & neck squamous cell carcinoma.** "Before a surgeon does any cutting, they will do imaging, like PET/CT, MRI or CT scans, to try to locate the cancer," Tweedle said. Wright and Tweedle's efforts have been strengthened by an outstanding team of multidisciplinary collaborators, including Nathan Hall, MD, PhD, Quintin Pan, PhD,

Ted Teknos, MD, and Michael Knopp, MD, PhD. Their novel, real-time imaging detection and treatment paradigm is critical to improving and personalizing cancer detection and care at Ohio State.<https://ccts.osu.edu/node/4171>

Optical Surgical Navigation workshop at the World Molecular Imaging Congress, co- organized <http://www.wmis.org/optical-surgical-navigation-workshop-at-the-wmic-2014/>

Synopsis. <http://www.wmis.org/wp-content/uploads/2014/10/WMIC-2014-OSN-Workshop-RIs-Final.pdf>