

NAME Kannan Rangaramanujam, Ph.D. I use Rangaramanujam. M. Kannan in publications Email: krangar1@jhmi.edu	POSITION TITLE Professor [PAR], Ophthalmology, Johns Hopkins School of Medicine
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EDUCATION/TRAINING			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
Birla Institute of Technology and Science, India	B.E.	1987	Chemical Engg.
Penn State University, Penn., USA	M.S.	1989	Chemical Engg.
California Institute of Technology, USA	M.S.	1991	Chemical Engg.
California Institute of Technology, USA	Ph.D.	1994	Chemical Engg.

Positions and Honors

Positions and Employment months

1994-1995	Postdoctoral: Research Associate, Chemical Engineering, University of Minnesota
1995-1997	Senior Research Engineer, 3M Corporate Research Laboratories
1997-2003	Assistant Professor, Department of Chem. Engg. & Mat Sci., Wayne State University
2002-present	Joint Appointment, Department of Biomedical Engg., Wayne State University
2003-5/2009	Associate Professor, Department of Chem. Engg. & Mat Sci., Wayne State University
2003-present	Full Member, Barbara Ann Karmanos Cancer Institute, Detroit, Michigan
2004-2005	Co-founder & Research Director, nanoScience Engineering Corporation
2006-2011	Vice President & Chief Technical Officer, nanoScience Engineering Corporation
2009-7/2012	Professor, Department of Chem. Engg. & Mat Sci., Wayne State University
2007-7/2011	Co-director, NICHD Perinatology Research Branch-Nanotechnology Lab, Detroit, MI
8/2011-present	Professor (Pending academic review, re-appointment at JHU), Department of Ophthalmology, Johns Hopkins School of Medicine
1/2012-present	Co-director, Center for Nanomedicine, Wilmer Eye Institute, Johns Hopkins Medicine

Honors

Du Pont (1989-1990) and Charles Powell Foundation Graduate Fellowships (1992-1994) at Caltech
 American Chemical Society Honor symposium for Unilever award (1995)
 Unilever Award for outstanding Ph.D. thesis in polymer Science by ACS (1995)
 Wayne State University Faculty Research Award (1997-1998, 1998-1999)
 3M Non-tenured Faculty Award (1998-2000, 2001-2002)
 NSF CAREER Award (1999)
 Director, Nanotechnology Lab, NICHD Perinatology Research Branch, 2008-2011
 NIH Study section membership (NCI Special Emphasis Panels, and IMST W53 SBIR)
 Editorial Board, Nanomedicine: Nanotechnology, Biology and Medicine

Publications

A. Selected peer-reviewed publications {from more than 80 publications, * denotes principal author}

1. MK. Mishra, CA Beaty, WG Lesniak, SP Kambhampati, F Zhang, MA Wilson, ME Blue, JC Troncoso, S Kannan, MV Johnston, WA Baumgartner*, RM Kannan* (2014). 'Dendrimer Brain uptake and targeted therapy for brain injury in a large animal model of hypothermic circulatory arrest'. ACS Nano, published online, 10.1021/nn40487e.
2. B Balakrishnan, E Nance, MV Johnston, RM Kannan, S Kannan* (2013). 'Nanomedicine in cerebral palsy'. *International Journal of Nanomedicine*, Invited Review, 2013:8 4183–4195.

3. U Sk, SP Kambhampati, M Mishra, W Lesniak, F Zhang, RM Kannan* (2013), 'Enhancing efficacy of Ara-C by conjugation with PAMAM dendrimer and linear PEG: A Comparative Study', *Biomacromolecules*, 14 (3), 801–810.
4. SP Kambhampati and RM Kannan* (2013), 'Dendrimer nanoparticles for ocular drug delivery', *J. of Ocular Pharmaceutics and Therapeutics, Invited Review*, 29(2): 151-165.
5. Q Xu, SP Kambhampati, RM Kannan* (2013). Nanotechnology approaches for ocular drug delivery. *Middle East Afr J Ophthalmol., Invited Review*, 20:26-37.
6. A Kim, NJ Boylan, M Hwangbo, JS Suk, T Yu, L Cebotaru, WG. Lesniak, JS Oh, P Adstamongkonkul, AY. Choi, RM Kannan, and JS Hanes*(2013), ' Use of single-site functionalized PEG-dendrons to prepare gene vectors that penetrate human mucus barriers', *Angew. Chemie Int. Ed.*, 52(14), 3985-3988.
7. WG Lesniak, A Jyoti, M. Mishra, N Louissaint, R. Romero, D. Chugani, S. Kannan, RM. Kannan*(2013), 'Concurrent quantification of tryptophan and its major metabolites', *Anal. Biochem.* In press, Sep, <http://dx.doi.org/10.1016/j.ab.2013.09.001>.
8. RM Kannan, HC Gerard, M Mishra, S Wang, G Mao, M Hali, J Whittum-Hudson, A Hudson*(2013), Dendrimer-enabled transformation of *Chlamydia trachomatis*, *Microbial Pathogenesis*, In press, Sep.
9. HC Gerard, M Mishra, S Wang, G Mao, J Whittum-Hudson, RM Kannan*, A Hudson* (2013), 'Dendrimer-enabled DNA delivery and transformation of *Chlamydia pneumoniae*', *Nanomedicine (NBM)*, 9(7), 996-1008.
10. S Kannan*, H Dai, RS Navath, B Balakrishnan, A Jyoti, J Janisse, R Romero, RM Kannan* (2012). 'Dendrimer-based postnatal therapy for neuroinflammation and cerebral palsy in a rabbit model'. *Science Translational Medicine*, 4(130), p. 130ra46. Highlighted in *Nature*, *Science*, *Nature Review Drug Discovery*, *C & EN. Faculty of 1000 selection*.
11. R Iezzi, B Raja Guru, I Glybina, M Mishra, A Kennedy, RM Kannan* (2012). 'Dendrimer-based targeted intravitreal therapy for sustained attenuation of neuroinflammation in retinal degeneration'. *Biomaterials*, 33(3), 979-988. *Faculty of 1000 selection*.
12. H Dai, RS Navath, B Balakrishnan, BR Guru, M Mishra, R Romero, RM Kannan*, S Kannan* (2010). 'Intrinsic targeting of inflammatory cells in the brain by polyamidoamine dendrimers upon subarachnoid administration'. *Future Medicine: Nanomedicine*, 5(9), 1317-1329.
13. AR Menjoge, A Rinderknecht, R Navath, M Faridnia, R Romero, R Miller, RM Kannan* (2011). 'Transfer of PAMAM dendrimers across the human placenta: prospects for use as drug carrier during pregnancy'. *Journal of Controlled Release*, 150(3), 326-338.
14. YK Emre, RS Navath, B Wang, R Romero, S Kannan, RM Kannan* (2009). 'Drug release mechanisms and kinetics from dendrimer-drug conjugates with glutathione sensitive linkers'. *Biomaterials*, 30, 2112-2121.
15. M Mishra, K Kotta, M Hali, S Wykes, I Benchaala, H Gerard, A Hudson, J Whittum-Hudson, RM Kannan* (2011). 'PAMAM dendrimer-azithromycin conjugate nanodevices for the treatment of *Chlamydia trachomatis* Infections'. *Nanomedicine (NBM)*, 7(6), 935-944.
16. A Bosnjakovic, M Mishra, W Ren, YE Kurtoglu, RM Kannan* (2010). 'Poly(amidoamine) dendrimer-erythromycin conjugates for drug delivery to macrophages involved in periprosthetic inflammation'. *Nanomedicine (NBM)*, 7(3), 284-294.
17. RS Navath, AR Menjoge, B Wang, R Romero, S Kannan, RM Kannan* (2010). 'Amino acid functionalized dendrimers with hetero-bifunctional chemoselective peripheral groups for drug delivery'. *Biomacromolecules*, 11(6), 1544-1563.
18. J. Khandare, P. Kolhe, O. Pillai, S. Kannan, M. Lieh-Lai, R.M. Kannan* (2005). Synthesis, cellular transport and activity of PAMAM dendrimer-methylprednisolone conjugates. *Bioconjugate Chemistry*, 16(2), 330-337.
19. P Kolhe, J Khandare, O Pillai, S Kannan, M Lieh-Lai, RM Kannan* (2006). 'Preparation, cellular transport, and activity of polyamidoamine-based dendritic nanodevices with a high drug payload'. *Biomaterials*, 27(4), 660-669.
20. R Navath, YE Turkoglu, B Wang, S Kannan, R Romero, RM Kannan* (2008). 'Dendrimer-drugconjugates for tailored intracellular drug release based on glutathione levels'. *Bioconjugate Chemistry*, 19(12), 2446-2455.

21. H Yu, R Bellair, RM Kannan, SL Brock* (2008). 'Engineering Strength, Porosity, and Emission Intensity of Nanostructured CdSe Networks by Altering the Building Block Shape'. *Journal of American Chemical Society*, 130(15), 5054-5055.
22. OP Perumal, R Inapagolla, S Kannan*, RM Kannan (2008). 'The effect of surface functionality on cellular trafficking of dendrimers'. *Biomaterials*, 29(24-25), 3469-3476.
23. YE Kurtoglu, M Mishra, S Kannan, RM Kannan* (2009). 'Drug release characteristics of PAMAM dendrimer-drug conjugates with different linkers'. *International Journal of Pharmaceutics*, 377(1-2), 159-168.
24. B Wang, R Navath, R Romero, S Kannan, RM Kannan* (2009). 'Enhanced delivery of N-acetyl cysteine to activated microglial cells using dendrimer-based nanodevices'. *International Journal of Pharmaceutics*, 377(1-2), 159-168.
25. R Inapagolla, BR Guru, YE Kurtoglu, X Gao, M Lieh-Lai, D Bassett, RM Kannan (2010). 'In vivo efficacy of dendrimer-methylprednisolone conjugate formulation for the treatment of lung inflammation'. *International Journal of Pharmaceutics*, 399(1-2), 140-147.
26. B Wang, R Navath, AR Menjoge, B Balakrishnan, R Bellair, H Dai, R Romero, S Kannan, RM Kannan* (2010). 'Inhibition of bacterial growth and intramniotic infection in a guinea pig model of chorioamnionitis using PAMAM dendrimers'. *International Journal of Pharmaceutics*, 395(1-2), 298-308.
27. H Han, RM Kannan*, S Wang, GZ Mao, JP Kusanovic, R Romero (2009). 'Multifunctional dendrimer-templated antibody presentation on biosensor surfaces for improved biomarker detection'. *Advanced Functional Materials*, 20(3), 409-421.
28. O Perumal, J Khandare, P Kolhe, M Lieh-Lai, S Kannan, RM Kannan* (2009), 'Effects of branching architecture and linker on the activity of hyperbranched polymer-drug conjugates'. *Bioconjugate Chemistry*, 20(5), 842-846. *Faculty of 1000 selection*.
29. R Navath, B Wang, R Romero, S Kannan, RM Kannan* (2010). 'Stimuli-responsive star polyethylene glycol conjugates for improved intracellular delivery of N-acetyl cysteine in neuroinflammation'. *Journal of Controlled Release*, 142(3), 447-456.
30. AR Menjoge, RM Kannan*, DA Tomalia* (2010), 'Dendrimer-Based Drug and Imaging Conjugates: Design Considerations for Nanomedical Applications, Invited Foundation review'. *Drug Discovery Today*, 15(5), 171-185.
31. AR Menjoge, R Navath, A Asad, S Kannan, CJ Kim, R Romero, RM Kannan* (2010). 'Transport and biodistribution of dendrimers across human fetal membranes: implications for intravaginal administration of dendrimer-drug conjugates'. *Biomaterials*, 31(8), 5007-5021.
32. R Navath, A Menjoge, H Dai, R Romero, S Kannan, RM Kannan* (2011). 'Injectible PAMAM dendrimer-PEG hydrogels: Formulation, in vitro and in vivo evaluation'. *Molecular Pharmaceutics*, 8(4), 1209-1223.
33. M Mishra, H Gerard, J Whittum-Hudson, A Hudson*, RM Kannan* (2012). 'Dendrimer-Enabled Modulation of Gene Expression in Chlamydia trachomatis'. *Molecular Pharmaceutics*, 9(4), 413-421.
34. A Bosnjakovic, M Mishra, H Han, R Romero, RM Kannan* (2012). 'A Dendrimer-based Immunosensor for Improved Capture and Detection of Tumor Necrosis Factor- α Cytokine'. *Analytica Chimica Acta*, 720, 118-125.

B. Patents

1. Dendrimer-containing particles for sustained release of compounds, R Kannan, R Iezzi, S Kannan, US provisional patent filed 10/5/07 (Application #60/997987)/International patent filed Oct 2008 (application #, PCT/US2008/078988). Regular patents filed in US (#12/681,516), Canada (#2,701,291), European Union (#08835693.6), Japan (#2010-528216) and India (1247/ELNP/2010) (Apr. 2010). *Describes inventions on ocular and neuroinflammation applications of dendrimer-based delivery systems.*
2. Dendrimer-based therapeutic nanodevices for therapeutic and imaging applications, R Kannan, S Kannan, R Romero, R Navath, H Dai, Y Kurtoglu, B Wang, A Menjoge, Provisional patent filed # 61/187263, 5/09, and additional provisional patent filed, #61/319285, 3/10, US patent (#12/797,657) and international PCT (PCT/US10/38068), filed 6/10. *Describes inventions on dendrimer-based formulations for cerebral palsy and other neurodegenerative diseases, and for maternal-fetal infections and inflammation.*

3. Injectable dendrimer hydrogel nanoparticles, RM Kannan, S Kannan, R Romero, R Navath, A Menjoge, provisional patent filed, 61/319289, 3/10; International PCT filed (4/11)
4. Supercritical Carbon-Dioxide Processed Biodegradable Polymer Nanocomposites, **R.M.Kannan**, K.Baker, M.Manitiu, R.Bellair, provisional patent filed, 1/10, *Regular US patent filed (Jan 2011, application # 1301052)*
Describes biodegradable, supercritical CO₂-processed polylactic acid-clay nanocomposite foams for bone graft and tissue engineering constructs.
5. Supercritical Carbon-Dioxide Processed Biodegradable Polymer Nanocomposites, **R.M.Kannan**, K.Baker, M.Manitiu, R.Bellair, provisional patent filed, 1/10, *Regular US patent filed (Jan 2011, application # 13010513)*.
Describes biodegradable, supercritical CO₂-processed nanocomposite materials for packaging film application.
6. Injectable dendrimer hydrogel nanoparticles, **R.M. Kannan**, S.Kannan, R.Romero, R. Navath, A.Menjoge, provisional patent filed, 61/319289, 3/10, PCT application under preparation.
Describes injectible, biodegradable, hybrid nanoparticles containing dendrimer nanodevices for targeted therapy.
7. Supercritical Fluid based process for preparing highly exfoliated nanocomposites', E. Gulari, G.K. Serhatkulu, R. M. Kannan, US patent, 7,387,749, 2007 (spinoff company, RM Kannan-CTO)
8. Method for aligning side-group liquid-crystalline polymers", J. A. Kornfield, R. M. Kannan, N. Schwenk, US patent, 5,313,320 (1994)

C. Book Chapters

- (1) Kannan, RM., Pillai, O., Kannan, S. Cellular interactions of nano drug delivery systems. In: Force microscopy in biology and medicine, Edited by B.P. Jena, Wiley & Co., June 2007
- (2) Kannan, RM., Pillai, O., Kannan, S. Dendrimers and hyperbranched polymers for drug delivery. In: Biomedical applications of nanotechnology, Edited by V. Labhasetwar, D.L. Leslie-Pelecky John Wiley & Co., August 2007.
- (3) Y.E. Kurtoglu, Kannan RM. Cellular trafficking of dendrimers. In: Organelle-specific pharmaceutical nanotechnology, edited by V.Weissig and G.G.GM. D'Souza, Wiley & Co., 2010

Mentoring

Graduate Student Advised: 13 PhDs and 3 MS

Semen Kharchenko (**Ph.D.** in ChE - October 2001) (at Masco R & D)
 Vivek Maheshwari (**M. S.** ChE (Thesis) – September 2001)(Assistant Professor, U Waterloo)
 Gautam Parthasarthy (**M. S.** MSE (Thesis) – August 2001)(R & D industry, India)
 Ekta Misra (**M. S.** MSE (Thesis) – July 2001)(Intel R & D)
 Parag Kolhe (**Ph.D.** MSE – April 2004) (Pfizer R & D)
 Michael Sevegney (**Ph.D.** ChE – April 2004)(Pall Corp. R & D)
 Sezen Gurdag (**Ph.D.** – May 2005)(R & D, Turkey)
 Ajay Kulkarni (**Ph.D.** – May 2006) (Packaging R & D)
 Rajyalakshmi Inapagolla (**Ph.D.** – December 2006)
 Steve Horsch (**Ph.D.**- June 2006 (with E. Gulari))(Dow Chemical R & D)
 Bharath Raja Guru (**Ph.D.**, December 2008)(Postdoctoral Researcher, U Minnesota)
 Yunus Emre Kurtoglu (**Ph.D.** August 2009)(BASF R & D)
 Robert Bellair (**Ph.D.** November 2009)(Dow Chemical R & D)
 Mihai Manitiu (**Ph.D.** May 2010)(BASF R & D)
 Admira Bosnjakovic (**Ph.D.** June 2012)(U Detroit)
 Kevin Baker (**Ph.D.** July 2012)(Associate Professor, Oakland U/Beaumont Hospital)

Postdoctoral Researchers Advised:

Gerald Hoffman (1999-2000) (currently at 3M R & D)
Omathanu Perumal (2005-2007) (jointly with S.Kannan)(currently tenured faculty at SD State)
Jayanth Khandare (2005-2006)(currently at Nicholas Piramal R & D, Mumbai, India)
Hrushikesh Agashe (2007-2008)(currently at OK State, Pharmaceutical Sciences)
Raghavendra Navath (2008-2010)(currently at Johnson and Johnson R & D)
Hye Jung Han (2008-2010)(currently at Kettering Cancer Center, NY)
Anupa Menjoge (2009-2010)(currently at Allergen R & D)
Bing Wang, MDPHd (10/2007-12/2009)(joint with S.Kannan)
Hui Dai, MDPHd (10/2007-5/2012)(joint with S. Kannan)
Amar Jyoti (2010- 1/2013)(jointly with S.Kannan)
Ugir Hussain Sk (1/2011-5/2012)

Graduate Students - Current

Siva Kambhampati (Ph.D – biomedical engineering – 4th year)
Fengyuan Yang (Ph.D. student - Materials Science - 4th year)
Fan Zhang (Ph.D. student-Materials Science - 3rd year)

Current Post-doctoral Associates:

Manoj Mishra (10/2007-current)
Wojciech Lesniak (8/10-current)

Selected Invited Talks

1. Nanofrontiers Symposium, University of Missouri, Columbia, June 2013
2. ARVO Drug Delivery Symposium, U Colorado, Boulder, June 2012
3. Saudi Ophthalmology Society, Riyadh, March (2012)
4. Nanomedicine Conference, Riyadh Saudi Arabia, October (2012)
5. Children's Hospital at Saint Justine/ U Montreal, Quebec, Canada, November (2012)
6. University of Illinois, Chicago, Department of Pharmaceutical Science, March (2012)
7. Miami Project for Cure of Paralysis, U Miami Medical School, September, 2012
8. University of Texas (Austin), Chemical Engineering (November, 2012)
9. Northwestern University - Biotechnology/ChemE - July 2010
10. Nanobusiness Alliance conference, Chicago, IL, September 2010
11. Stanford University – Chemical Engineering, April 2010
12. Bristol Myers Squibb - NJ, May 2010
13. Clemson University-Bioengineering, Joint Page Morton Hunter Bioengineering Distinguished Seminar Series & NIH COBRE SCBiomat Lecture Series, Feb, 2010
14. University of Akron (Polymer Science), December, 2009-Dendrimer nanotherapeutics & neuroinflammation; Austen Bioinnovation Institute of Akron, May 2010
15. 'Dendrimer-based nanotherapeutics', Plenary Speaker, Symposium on 'Nanotechnology in Health Sciences', American Association of Dental Research, Ann Arbor, MI , 12/08
16. 'Dendrimer-based nanodevice platforms', Invited talks in the following departments at Wayne State University: Obstetrics and Gynecology (11/08), Perinatology Research Branch (9/08), Immunology and Microbiology (4/08), Institute of Environmental Health Sciences (3/07, 4/10); Anatomy and Cell Biology (1/07), Pediatric Critical care(12/05), Children's Hospital of Michigan-PET Center (3/08); pharmaceutical sciences (2006); Karmanos Cancer Institute (2003, 2007, 2009).

17. 'Designing dendrimer-based nanodevices for intracellular delivery through mechanistic understanding', American Physical Society, April 2007.
18. 'Emerging nanotechnologies for therapeutic applications', AIChE Nanotechnology forum, November, 2006
19. 'nanoSEC: experiences from a start-up company', University-Technology Commercialization conference, Dearborn, MI, 9/2006
20. 'Dendrimer-based bioconjugates as multifunctional targeted drug delivery systems', Invited Plenary lecture, International Polymer Conjugates Conference, Jerusalem, Israel, 12/05
21. International particle technology conference, San Diego, 11/2006

Research Support

External Research Support (current)

ACTIVE

KKESHJHU 02-09 (Rangaramanujam K.) 7/1/13 – 6/30/15 1.2 calendar months

King Khalid Eye Specialist Hospital (Saudi Arabia) \$54,013

Preparation and characterization of dendrimer-hyaluroic acid nanoglues for sutureless corneal surgeries

Project Goal: Development and characterization of dendrimer-hyaluronic acid nanogels for replacing sutures, following corneal surgeries.

Role: PI

KKESHJHU 02-25 (Rangaramanujam K.) 7/1/13 – 6/30/15 0.6 calendar months

King Khalid Eye Specialist Hospital (Saudi Arabia) \$51,305

In vivo evaluation of dendrimer-hyaluroic acid nanoglues for sutureless corneal surgeries

Project Goal: Assessment of the in vivo effectiveness of the dendrimer nanoglue in appropriate animal models in (a) sealing a corneal laceration; (b) replacing sutures; (c) preventing corneal transplant failures.

Role: PI

1 R01 HD069562-01A1 (Kannan S.) 5/1/12-4/30/17 1.3 calendar months

NIH/NICHD \$42,214 (Rangaramanujam allocation)

Mechanisms and therapy in maternal intrauterine inflammation induced brain injury.

Project Goal: The primary objective of this application is to define the role of intrauterine inflammation induced alterations in tryptophan metabolism and serotonin depletion, due to activation of the kynurenine pathway in the placenta and fetal/newborn brain resulting in brain injury in the fetus and neonate.

Maternal therapy with Ro-61-8048, an inhibitor of kynurenine mono-oxygenase, will be evaluated to determine the effects of inhibiting the kynurenine pathway in the placenta on fetal and newborn brain injury. Inhibition of the kynurenine pathway in the neonatal brain will be evaluated by postnatal treatment with Ro-61-8048, and nanoparticle conjugated Ro-61-8048. Rangaramanujam's group will measure tryptophan metabolites with and without therapy, and prepare nanoparticle-Ro-61-8048 conjugate.

Role: co-investigator

AstraZeneca116601 (Rangaramanujam K.) 12/1/13 – 11/30/14 1.2 calendar months

Astra Zeneca Corporation \$65,500

Dendrimer-based therapies targeted to Tumor-associated macrophages in Glioma

Project Goal: The goal of this project is to develop dendrimer-PD98059 drug conjugates to target tumor associated macrophages, and evaluate the efficacy of these compounds in reducing brain tumor growth, in a 9L rat glioma model.

Role: PI

PENDING

1R01HD076901-01A1 (Rangaramanujam K.) 4/1/14-3/30/19 2.4 calendar months
NIH/NICHD \$250,000

Postnatal combination therapy in cerebral palsy

Project Goal: The objective of this application is to develop pediatric formulations for combination therapy in cerebral palsy. Two therapeutics minocycline and n-acetyl cysteine, will be formulated alone and with dendrimers, and evaluated for their combined ability to attenuate brain injury in a rabbit model. Specific aims focus on dose-related toxicity in healthy animals, pharmacokinetics of the formulations, and efficacy of the combination therapy.

Role: PI

14CSA20600010 (Rangaramanujam, K - co-PI and Koehler, R - co-PI) 7/1/14-6/30/17 1.4 calendar mo.
American Heart Association \$227,272

Systemic nanotherapies for stroke

Project Goal: The objective of this collaborative science project application, aimed at adult stroke therapy, is to develop dendrimer-based systemic combination therapies for the treatment of brain injury and inflammation following stroke, in a mouse model. Two drugs, conjugated to dendrimers will be explored 14,15 EET and n-acetyl cysteine.

Role: co-PI

2R01HL091541-20 (Baumgartner W) 4/1/14-3/30/18 1.8 calendar months
NIH/NHLBI \$172,090 (Rangaramanujam Allocation)

Excitotoxicity in circulatory arrest-brain injury

Project Goal: The objective of this application is to develop dendrimer-based systemic combination therapy for the treatment brain injury associated with excitotoxicity and neuroinflammation in a canine model of hypothermic circulatory arrest. Free valproic acid and n-acetyl cysteine and dendrimer-conjugated valproic acid and n-acetyl cysteine will be explored. Therapy at 1 hr and 2hr after HCA will be assessed, based on neurobehavioral, histological, and hemodynamic support, and inflammatory response.

Role: Co-investigator

CDMRP (Demar) 9/30/14-9/29/17 1.2 calendar months
The Geneva Foundation/CDMRP \$50,346 (Rangaramanujam portion)

Evaluation of Dendrimer-Based Nanoparticle Delivered Therapeutics to Ameliorate Neuronal Cell Damage to Retina and Brain Visual Centers, in a Rat Model of Blast Over Pressure Wave Exposure

Project Goal: The objective of this application is to evaluate immune cells involved in inflammation processes in rats exposed to blast as a target for DHA-based drugs as delivered by nanoparticles, which can enter the retina and brain and are rapidly scavenged by these cells.

Role: Co-Principal Investigator

Research supported completed in the last three years

(RM Kannan)

09/2010-09/2013

Coca-Cola R & D

Supercritical CO₂-processed PET-clay nanocomposite barrier materials

Project goal: Development of dispersed poly(ethylene terephthalate)-clay nanocomposites with improved barrier properties for plastic bottle applications.

(RM Kannan-PI, S.Kannan-co-I)

7/2012 - 12/2012

WSU-Perinatology Research Branch (PRB) Subcontract *Services in support of the PRB*

Project Goal: The objective of this short term subcontract is to (1) evaluate the neuronal injury and oligodendrocyte injury in the rabbit model of cerebral palsy; (2) assess the difference in the

biodistribution of the PAMAM dendrimer in the brain and other major organs in newborn rabbit kits with and without CP; (3) Scale-up synthesis of dendrimer-Cy5 imaging agent conjugates for imaging studies in large animal models.

(RM Kannan-PI & S Kannan)

09/2007-09/2011

NICHD-Perinatology Research Branch (sub contract)

Dendrimer-based functionally-optimized nanodevices for diagnosis and treatment of chorioamnionitis

Project goal: Dendrimer-based nanotherapeutics for maternal-fetal applications. Specific aims include: (1) development and characterization of an animal model of maternal intrauterine inflammation-induced cerebral palsy in the neonate; (2) development and *in vitro* and *in vivo* evaluation of glutathione-sensitive dendrimer-drug nanodevices; (3) development of topical dendrimer-hydrogel formulations with antibiotics for the treatment and prevention of intrauterine infection in pregnant guinea pig models; and (4) characterization of transport and biodistribution of dendrimers in the human placenta and the rabbit placenta.

(RM Kannan-PI, S. Kannan-co-I, R. Iezzi-co-I)

01/2008 - 05/2010

Ralph C. Wilson Foundation for Biomedical Engineering

In vivo evaluation of dendrimer nanodevices for the treatment of neuroinflammation

Project goal: Develop dendrimer-minocycline nanodevices for *in vivo* testing in rat model of retinal degeneration and rabbit model of cerebral palsy

(RM Kannan-PI, R. Iezzi-co-I)

01/2009 - 12/2009

Dryer Foundation

Dendrimer-based ocular nanotherapeutics

Project goal: Develop and evaluate dendrimer-fluocinolone acetonide nanodevices for intravitreal therapy in animal models of retinitis pigmentosa.