

BIOGRAPHICAL SKETCH

NAME KHAN, MAHMOOD	POSITION TITLE RESEARCH SCIENTIST
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EDUCATION/TRAINING (Begin with baccalaureate or other professional education, such as nursing, and include postdoctoral training.)

INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
Gulbarga University, India	B. Pharm.	1998	Pharmacy
Rajiv Gandhi University of Health Sciences, India	M. Pharm.	2000	Pharmacology
Nizam's Institute of Medical Sciences, India	Ph. D.	2005	Clinical Pharmacology

RESEARCH AND PROFESSIONAL EXPERIENCE

- 2007- present Research Scientist, Davis Heart & Lung Research Institute, Ohio State University, Columbus, OH
- 2005 – 2007 Post-Doctoral Researcher, Davis Heart & Lung Research Institute, Ohio State University, Columbus, OH
- 2004 – 2005 Visiting Scholar, Davis Heart & Lung Research Institute, Ohio State University, Columbus, OH
- 2001 – 2004 Research Fellow, Nizam's Institute of Medical Sciences, Hyderabad, India

EXPERTISE

Stem-cell therapy for myocardial infarction. Stem cell (skeletal myoblast and mesenchymal stem cells) therapy in myocardial infarcted mice and rat models and monitoring of in-situ oxygenation in infarcted mouse heart using stem cells labeled LiNc-BuO oxygen sensing probe *in vivo*. Microsurgical techniques and development of myocardial infarction in rodents. Toxicity studies *in vitro* and *in vivo*. Development of models for drug-induced cardiotoxicity and cardiac hypertrophy in rats and mice. Ischemia-reperfusion injury model in isolated rat and mouse heart during ischemia-reperfusion injury *in vivo*. Measurement of cardiac function in rodents by echocardiography and catheter insertion into the heart *in vivo*. Hyperbaric oxygen therapy in rodents after stem cell transplantation in the heart. EPR oximetry studies using oxygen sensitive probes, LiPc and LiNc-BuO in *in vivo* rat and mice hearts. Isolation of cardiomyocytes, skeletal myoblast and bone marrow stem cells. Cell culture techniques, assessment of apoptosis; oxidative stress; immunohistochemical staining; confocal microscopy and Western blot analysis.

Ph.D DISSERTATION

Evaluation of C-phycoyanin, a component of *Spirulina*, a blue-green algae, a potent antioxidant on prevention against Doxorubicin-induced cardiotoxicity and ischemia-reperfusion induced injury in the heart.

AWARDS AND PROFESSIONAL HONORS

- **Poster Winner**, First Prize and travel award (competing for research scientists), Ohio State University, Davis Heart and Lung Research Institute, College of Medicine, 3rd Annual Research Retreat, October **2008**. Columbus, OH, USA
- **Excellence Award** (oral presentation), US-JSPS EPR Core-to-Core Symposium, June **2008**.
- **James Warren Award** for Outstanding Post-doctoral Fellow in department of Internal Medicine, College of Medicine, June, **2007**, OSU, USA
- **Poster Winner**, First Prize and travel award (competing for post doctoral researchers), Ohio State University, Davis Heart and Lung Research Institute, College of Medicine, 2nd Annual Research Retreat, April **2007**. Columbus, OH, USA
- **Finalist**, Stem Cells and Myocardial Regeneration Session, **American Heart Association** (AHA) scientific sessions **2006**, poster presentation, Chicago, USA
- **Young Investigator Award**, 8th International EPR Spin Trapping Meeting & 11th *in vivo* EPR Spectroscopy and Imaging. **2005**, Columbus, Ohio, USA

PROFESSIONAL AFFILIATIONS

- American Heart Association
- Free Radical Biology Medicine
- Indian Pharmacological Society
- Pharmaceutical Association of India

PUBLICATIONS

1. **Khan, M.** Patil, P. A. Shobha, J. C. "Influence of Bryophyllum pinnatum (Lam.) leaf extract on wound healing in albino rats". *Journal of natural remedies*, 14: 41-46, **2004**.
2. **Khan M,** Shobha, J.C., Mohan, I.C., Naidu, M.U.R., Sundaram, I.C., Shashi Singh, Kuppusamy, P., Kutala, V.K. Protective effect of Spirulina against Doxorubicin-induced cardiotoxicity in mice. *Phytotherapy Research*, 19, 1030-1037, **2005**.
3. **Khan M,** Saradhadevi Varadharaj, Jagdish C. Shobha, Maddireddi U. Naidu, Narasimham L. parinandi, Vijay K.Kutala, Periannan Kuppusamy. "C-phycocyanin ameliorates doxorubicin-induced oxidative stress and apoptosis in adult rat cardiomyocytes". *Journal of Cardiovascular Pharmacology*, Vol. 47, no.1, Jan **2006**.
4. **Khan M,** Varadharaj S, Latha P. Ganesan, Jagdish C. Shobha, Maddireddi U. Naidu, NarasimhamL. parinandi, Susheela Tridandapani, Vijay Kumar Kutala, Periannan Kuppusamy. "C-phycocyanin protects against ischemia – reperfusion injury of heart through involvement of p38 MARK and ERK signaling". *Am J physiol Heart Circ Physiol*, 290:H2136-H2145, **2006**.
5. Kumar KV, **Khan M,** Rajarsi Mandal, Latha P. Ganesan, Susheela Tridandapani, Tamas Kalai, Kalman Hideg, and Periannan Kuppusamy "Attenuation of Myocardial Ischemia-reperfusion Injury by Trimetazidine Derivatives Functionalized with Antioxidant Properties". *Journal of Pharmacology and Experimental Therapeutics*, 317:921-928, **2006**.
6. **Khan M,** Kutala VK, Wisel S, Chacko SM, Kuppusamy ML, Kwiatkowski P and Kuppusamy P. " Measurement of myocardial tissue pO₂ after stem cell therapy using oxygen sensing probe by EPR spectroscopy" *Advances in Experimental Biology and Medicine*, 614: 45-52, **2008**.
7. **Khan M,** Shobha, J C., Mohan IK, Naidu, M.U.R., Prayag A, Kutala, V K. "Spirulina attenuates cyclosporine-induced nephrotoxicity in rats. *Journal of Applied Toxicology*, 26: 444 – 451, **2006**.
8. Kumar KV, **Khan M,** Rajarsi Mandal, Vandana Potaraju, Giuseppe Colantuono, Damodar Kumbala, Kuppusamy P "Prevention of post-ischemic myocardial reperfusion injury by the combined treatment of NCX-4016 and Tempol" *J Cardiovascular Pharmacology*, 48; 3, **2006**.
9. Mohan I.C., Kutala, V.K. Naidu, M.U.R, **Khan M,** Sundaram, C., Shashi Singh. "Effect of Cardipro on Doxorubicin-induced cardiotoxicity in mice". *Phytomedicine*, 13:222-229 **2006**.
10. Kalai T, **Khan M,** Balog M, Kutala K V, Kuppusamy P and Hideg K. "Structure–activity studies on the protection of Trimetazidine derivatives modified with nitroxides and their precursors from myocardial ischemia–reperfusion injury". *Bioorganic & Medicinal Chemistry*, **2006** 14(16): 5510-5516
11. Mohan IK, **Khan M,** Shobha, J C., Mohan, I C, Naidu, M.U.R., Prayag A, Kutala, V K , Kuppusamy P. "Protection against cisplatin-induced nephrotoxicity by Spirulina in rats. *Cancer Chemother Pharmacol*, Dec;58(6):802-8, **2006**.
12. Wisel S, Chacko SM, Kuppusamy ML, Pandian RP, **Khan M,** Kuppusamy P et. al. "Labeling of skeletal myoblasts with nanoparticulate oxygen-sensing spin probes for long- term noninvasive monitoring of cell therapy and in situ oxygenation in the infarct myocardium" *Am J physiol Heart Circ Physiol*, 292: H1254-1261, **2007**.
13. **Khan M,** Kutala VK, Vikram D, Wisel S, Pawel Kwiatkowski, Simi M Chacko, Kuppusamy ML, Jay L Zweier and Kuppusamy P. "Non-invasive Tracking of Cells and Monitoring of In Situ pO₂ during Engraftment of Skeletal Myoblasts in Infarct Mouse Heart". *Circulation*, supplement II, Vol 114, No 18, **2006**.
14. Mark E Brauner, Micheal C Plewa, Kuppusamy P, **Khan M** "Effects of pulmonary-generated reactive oxygen species on left ventricular dysfunction associated with ischemia reperfusion in rats. *ACAD EMERG MED*, Vol 13, No.5, Suppl.1, may **2006**.

15. Kutala VK, **Khan M**, Mark G. Angelos, and Periannan Kuppusamy. "Role of Oxygen in Post-ischemic Myocardial Injury". **Antioxidants and Redox Signaling**, 9: number 8, **2007**.
16. Mandal R, Kutala KV, **Khan M**, Kuppusamy et. al. "A pro-nitroxyl modification of a verapamil exhibits antioxidant protection of heart against ischemia/reperfusion-induced cardiac dysfunction without compromising antagonistic activity", **Journal of Pharmacology and Experimental Therapeutics**. Oct; 323(1):119-27, 2007.
17. **Khan M**, Kutala VK, Kuppusamy P et al. "Skeletal myoblasts transplanted in the ischemic myocardium enhances in situ tissue oxygenation", **Am J physiol Heart Circ Physiol** **293**, **2007**.
18. **Khan M**, Mohan IK, Kutala VK, Kuppusamy P. "Cardioprotection by sulfaphenazole a cytochrome P450 inhibitor: Mitigation of ischemia-reperfusion injury by scavenging of reactive oxygen species". **JPET**, 323:1-9, **2007**.
19. **Khan M**, Mohan IK, Kutala VK, Kuppusamy P. "Sulfaphenazole, a cytochrome P450 inhibitor attenuates myocardial ischemia-reperfusion injury through involvement of NOS2, Akt and p38 MAPK *in vivo*". Communicated to **JMCC**, **2008**.
20. **Khan M**, Mohan IK, Sheik W, Kuppusamy et al. "Cardioprotection by a Pro-nitroxyl Modification of Verapamil, HO-4038: A Bifunctional Strategy Targeting both ischemia and Reperfusion in a Rat Model of Acute Myocardial Infarction. **AJP**, In press, **2008**.
21. Chacko M, **Khan M**, Kuppusamy et al. "Monitoring of tissue oxygenation and functional improvement in a rat model of acute myocardial infarction (AMI) treated with stem cells". Communicate **AJP**, In press **2009**.
22. Ryan Roberts, Eubank T, Jennifer Curry, **Khan M**, Periannan Kuppusamy, Clay Marsh. "GM-CSF inhibits breast cancer and metastases in mice and induces hypoxia in the tumor proper via stimulation of the soluble VEGF receptor", Communicated to **Cancer Research**, In Press, **2009**.
23. Sridhar A, Yoshinori Nishijima, Dmitry Terentyev, Terentyeva R, **Khan M**, Robert L Hamlin, Cynthia A Carnes. "Atrial Ionic Remodeling in Chronic Canine Heart Failure". Communicated to **Cardiovascular Research**, **2009**.
24. **Khan M**, Wisel S, Kuppusamy P et al Pharmacological preconditioning of mesenchymal stem cells with Trimetazidine protects hypoxic cells against oxidative stress and enhances recovery of myocardial function in infarcted heart through Bcl-2 expression. **Journal of Pharmacology and Experimental Therapeutics**. **2009**, Communicated.

BOOK CHAPTERS

1. Kutala KV, Parinandi NL, **Khan M**, Iyyapu KM, Kuppusamy P. " Medicinal properties of Spirulina a blue-green algae" **Indian Medicinal Plants**, 2006.
2. Kutala KV, Iyyapu KM, **Khan M**, Parinandi NL, Kuppusamy P. "Drug-induced nephrotoxicity by Spirulina" **The Basic and Clinical usage of Spirulina in Clinical Health**, 2007.

CONFERENCE PRESENTATIONS

1. **Khan M.**, Patil, P.A. "Influence of Bryophyllum Pinnatum Lam on wound healing in albino rats"34th Annual conference (Indian Pharmacological Society), Nagpur, India, Oral Presentation , **Ind J Pharmacol**, 10-12 (Jan), **2002**.
2. **Khan M.**, Shobha J C., K Vijay Kumar. "Antioxidant activity of Spirulina extract in-vitro." 35th Annual conference (Indian Pharmacological Society), Gwalior, India. Oral presentation, **Ind J Pharmacol.**, 26-29 (Nov), **2002**.
3. **Khan M**, Shobha, J. C., Kutala, V.K., Mohan, I.K., Prayag, A., Kutala, V.K. "Effect of spirulina on cyclosporine-induced nephrotoxicity in rats" **International Symposium on Recent Advances in Pharmacology**, New Delhi , India, poster presentation, 7-8 (Jan), **2004**.
4. **Khan M**, Varadharaj, S., Kutala, V.K., Shobha, J.C., Naidu, M.U.R., Parinandi, N.L., Kuppusamy, P. "C-phycocyanin ameliorates doxorubicin-induced oxidative stress and apoptosis in adult cardiomyocytes *in vitro*. **Free radical biology and medicine**, Austin, Texas, USA, November 16-20, **2005**, poster presentation.
5. **Khan M**, Kutala, V.K., Hideg, K., Kuppusamy, P. "Attenuation of ischemia-reperfusion injury. In hearts by trimetazidine derivatives functionalized with antioxidant properties". **Free radical biology and medicine**, Austin, Texas, USA, November 16-20, **2005**, poster presentation.
6. Kutala V.K., **Khan M**, Varadharaj, S., Ganesan P.L., Shobha J.C., Naidu M.U.R., Parinandi, N.L., Susheela, T., Kuppusamy, P. "C-phycocyanin improves cardiac dysfunction by attenuating oxidative stress and inhibition of p38

MAPK activity in isolated rat heart subjected to ischemia-reperfusion". **Free radical biology and medicine**, Austin, Texas, USA, November, **2005**, oral presentation.

7. **Khan M**, Kutala VK, Vikram D, Wisel S, et. Al. "Non-invasive Tracking of Cells and Monitoring of In Situ pO₂ during Engraftment of Skeletal Myoblasts in Infarct Mouse Heart". **American Heart association**, scientific session-**2006**, Chicago, poster presentation.
8. Ryan Roberts, Eubank T, Jennifer Curry, **Khan M**, Periannan Kuppusamy, Clay Marsh. "GM-CSF inhibits breast cancer and metastases in mice and induces hypoxia in the tumor proper via stimulation of the soluble VEGF receptor", **2nd Annual Research Retreat**, April **2007**, Davis Heart and Lung Research Institute, Ohio State University.
9. Kumbala D, **Khan M**, Vijay Kumar Kutala, Periannan Kuppusamy Sulfaphenazole, a CYP2C9 Inhibitor, Protects Against Ischemia-Reperfusion-Induced Injury in Isolated Rat Heart. **Circulation Res.** 2006, Volume 99 (5): 130A.
10. VK Kaushik Vedam, Yoshinori N, **Khan M**, Kuppusamy Zweier J, Ilangovan G. "Increased expression of heat shock protein 25 in doxorubicin treated failing hearts". **2nd Annual Research Retreat**, April **2007**, Davis Heart and Lung Research Institute, Ohio State University.
11. **Khan M**, Mohan IK, Kuppusamy P. "Mitigation of cardiac injury by sulfaphenazole, a cytochrome P450 inhibitor, through scavenging of reactive oxygen species and expression of iNOS in the post ischemic heart". **American Heart Association**, Scientific session-**2007**, Orlando, Poster presentation.

Ongoing Research Support

GRANT TITLE	Role of hyperbaric oxygen therapy on survival and engraftment of stem cells in the ischemic heart.
DESCRIPTION	The goal this study is to investigate the whether hyperbaric oxygen therapy can improve the survival of transplanted stem cells in the infarct rat heart.
FUNDING AGENCY	American Heart Association (AHA)
ROLE IN THE PROJECT	<u>Principal Investigator</u>
AWARD TYPE	Scientist Development Grant (SDG) , 0930181N
	PERIOD: 01/01/2009 –12/31/2012