Patricia Rockwell, Professor of Biology

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Education:

- B.Sc., 1969, Gwynedd Mercy.
- M.Sc, 1972, Wright State University.
- Ph.D., 1986, Hunter College.
- Postdoc., 1986-1990, Columbia University School of Physicians and Surgeons.

Research Interest:

- **Signal Transduction Pathways**

Delineating signaling pathways that protect against neuronal cell loss mediated by harmful insults would be beneficial for developing strategies to delay or halt the

neurodegenerative process. The overall goal of our current research is to delineate the signaling pathways that the growth factor, vascular endothelial growth factor (VEGF), regulates to promote survival in neuronal cells subjected to harmful stimuli. VEGF is a well established angiogenic factor that also exhibits neuroprotective properties. Our research focuses specifically on identifying the signaling intermediates underlying the neuroprotection that VEGF mediates through activation of its cognate receptor VEGFR-2 in both in vitro and in vivo model systems of neuronal cell stress. We have identified signaling pathways that VEGF modulates to promote cell survival and those that VEGF suppresses to prevent cell death. The rationale for these studies is to determine whether VEGF would serve as a useful therapeutic to prevent the neuronal cell damage associated with neurodegenerative disorders.

My teaching responsibilities involve overseeing a BA/MA program in Biology with Specialization in Biotechnology. This program involves a Biotechnology Seminar and a Biotechnology Workshop that is designed to teach graduating seniors and Masters Students in the Biological Sciences state-of-the-art laboratory procedures in recombinant DNA techniques and the basic scientific principles underlying each technique. Students who successfully complete the Workshop are entitled to internships with local biotechnology or biomedical research laboratories. The curriculum for this program is based on my previous work in cancer therapeutics in industry. This work focused on the development of drugs that target signaling by specific tyrosine kinase receptors to prevent tumor growth or angiogenesis

Selected Publications:

- Tianfeng Hao, T. and Rockwell, P. Signaling through the vascular endothelial growth factor receptor VEGFR-2 protects hippocampal neurons from mitochondrial dysfunction and oxidative stress (Free Radical Biology & Medicine 2013, in press).
- Edelstein, J. and Rockwell, P. Okadaic acid induces Akt hyperphosphorylation and an oxidative stress-mediated cell death in serum starved SK-N-SH human neuroblastoma cells that are augmented by rapamycin Neuroscience Lett., 2012; 531:74-79.
- Edelstein, J., Hao, T., Cao, Q., Morales L., and Rockwell, P. Crosstalk between VEGFR2 and muscarinic receptors regulates the mTOR pathway in serum starved SK-N-SH human neuroblastoma cells (Cell. Signal., 2011; 23:239–248).
- Papa, L. and Rockwell P. The interrelationship between Reactive Oxygen Species (ROS) and proteasome inhibition as inducers of neuronal cell death (Book Chapter for “The Ubiquitin Proteasome System In Nervous System: From Physiology To Pathology - 2008 update”. Edited by Mario Di Napoli, M.D. and Cezary Wojcik, M.D., Ph.D., D.Sc. (2010).
- Gomes, E. and Rockwell P. Inhibition of p38 MAP Kinase exerts opposing effects on the survival and actin reorganization mediated by the vascular endothelial growth factor receptor2 (VEGFR2) signaling pathway in a neuronal model of serum deprivation Neuroscience Lett., 2008; 431:95-100
- Papa, L. and Rockwell P. Persistent mitochondrial dysfunction and oxidative stress

hinders neuronal cell recovery from reversible proteasome inhibition Apoptosis, 2008;13:588–599

- Gomes, E., Pap L., Hao T. and Rockwell P. The vascular endothelial growth factor receptor2 (VEGFR2) and Protein kinase A (PKA) act in concert to prevent a caspase-dependent cell death in serum deprived neuronal cells Molec. Cell Biochem. 2007;305:179-190.
- Papa, L., Gomes, E., and Rockwell P. Reactive oxygen species induced by proteasome inhibition in neuronal cells mediate mitochondrial dysfunction and a caspase-independent cell death Apoptosis 2007;12:1389-1405.
- Rockwell, P., Martinez, J., Papa, L., and Gomes, E. Redox regulates COX-2 upregulation and cell death in the neuronal response to cadmium Cell Signal. 2004;16:343-353.
- Figueiredo-Pereira, M., Li, Z., Jansen M. and Rockwell, P. N-acetyl-cysteine and celecoxib which is associated with cyclooxygense-2 upregulation and its accumulation as ubiquitin conjugates. J. Biol. Chem. 2002; 277:25283-25289
- Li, Z., Arnaud, L., Rockwell, P. and Figueiredo-Pereira, M. A single mutation triggers aggregation of ubiquitinated proteins in stressed neuronal cells J. Neurochem. 2004; 90:19-28.
- Methods for reducing tumor growth with VEGF receptor antibody combined with radiation and chemotherapy; United States Patent 6,811,779, Rockwell, et al. issued November 2, 2004 to ImClone Systems Inc.
- Figueiredo-Pereira, M., and Rockwell, P. “Eicosanoid Protocols” Book Review. Ed. Elias A. Lianos, Totowa, Humana. TME 2001;12:84-85
- Neuchrist, C Erovic, B.M., Handisurya, A., Steiner, G.E., Rockwell, P., Gedlicka, C. and Burian, M. VEGFR2 (Vascular Endothelial Growth Factor Receptor 2) expression in squamous cell carcinomas of the head and neck. J. Laryngoscope, 2001;111:1834-1841

- Figueiredo-Pereira, M.E. and Rockwell, P. (2000) "Eicosanoid Protocols" book review. Ed. Elias A. Lianos, Totowa, Humana. TME (December issue).
- Figueiredo-Pereira, M.E. and Rockwell, P. (2000) "The ubiquitin/proteasome pathway in neurological disorders" in: Proteolysis in the pathophysiology of neurodegenerative disease. Eds. Banik, Lajtha, and Smith. Kluwer Academic/Plenum Publishers (in press).
- Rockwell, P., Yuan, H., Magnusson, R., and Figueiredo-Pereira, M. (2000) “Proteasome inhibition induces up-regulation of cyclooxygenase-2, its accumulation as ubiquitin conjugates, and production of proinflammatory prostaglandin in neuronal cells” Arch. Biochem. Biophys. 374: 325-333.
- Rockwell, P., Yuan, H., Magnusson, R., and Figueiredo-Pereira, M. “Proteasome inhibition induces up-regulation of cyclooxygenase-2, its accumulation as ubiquitin conjugates, and production of proinflammatory prostaglandin in neuronal cells” Arch. Biochem. Biophys. 2000; 374: 325-333.

Patents:

- Methods of use of chimerized, humanized, and single chain antibodies specific to VEGF receptors; United States Patent 5,840,301, Rockwell et al., et al. issued November 24, 1998 to ImClone Systems Inc.
- Nucleic acid molecules encoding the variable or hypervariable region of a monoclonal antibody that binds to an extracellular domain; United States Patent 5,861,499, Rockwell, et al. issued January 19, 1999 to ImClone Systems Inc.
- Methods Of Affecting Intracellular Phosphorylation Of Tyrosine Using Phosphorothioate Oligonucleotides, And Antiangiogenic And Antiproliferative Uses Thereof. United States Patent 6,030,955, Stein, Cy and Rockwell, Patricia issued February 29, 2000 to The Trustees of Columbia University in The City of New York and ImClone Systems Inc.
- Single chain antibodies specific to VEGF receptors; United States Patent 5,874,542, Rockwell, et al. issued February 23, 1999 to ImClone Systems Inc.