

## New Faculty in Rice Biochemistry & Cell Biology



### Mary C. Farach-Carson

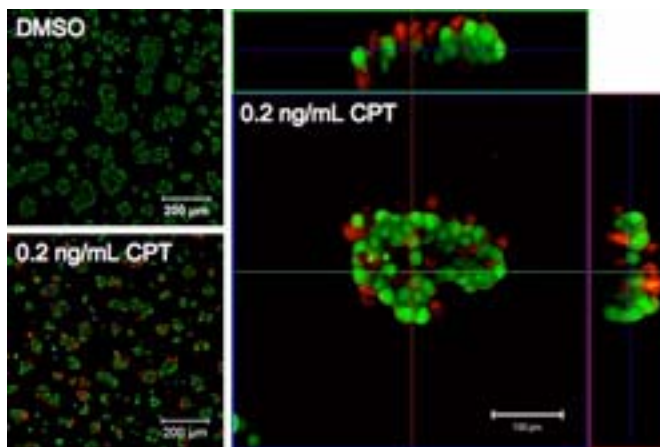
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B.S. Biology (1978) University of South  
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Ph.D. Biochemistry (1982) Medical College  
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Research in Dr. Farach-Carson's laboratory relates to the role of extracellular matrix in the progression of cancer following metastasis from primary sites, such as prostate or breast, to bone. In many cases,

primary tumors are fairly slow growing and do not become life-threatening until they form tumors in bone. The growth factors sequestered in bone matrix provide a very rich environment to promote the growth of cancer cells that invade there. Many of these growth factors are bound to a class of proteoglycans that contain heparan sulfate which regulate their bioactivity. Studies in the laboratory are aimed at identifying and isolating the growth factors responsible for cancer growth and progression with the long term aim of developing "molecular drugs" to combat cancer metastasis. Three dimensional models are used to study the behavior of cancer cells and to test their susceptibility to anti-cancer drugs that reduce cancer growth and progression. Industrial partnerships support the development of novel cancer diagnostics based on the principle that cancer biomarkers are created by cancer growth in bone.



A multidisciplinary project involves the use of proteoglycans, particularly those bearing heparan sulfate chains such as perlecan, in engineering of connective tissues such as bone, cartilage or salivary gland. Cell and molecular engineering strategies are being developed that facilitate controlled tissue growth and differentiation. Growth factor binding and delivery by engineered proteoglycans is being used in oral surgery and orthopaedic applications. Several engineering partnerships both within and outside the university exist to support these studies.

A trainee doing research in this laboratory would be exposed to a variety of techniques including cell culture, recombinant and natural protein purification and analysis, calcium imaging, cloning and molecular biology, microRNAs, immunodetection and immunohistochemistry, and various pre-clinical cancer models.

### **Recent Publications:**

Pradhan, S.S., Zhang, C., Jia, X., Carson, D.D., Witt, R.L., Farach-Carson, M.C., “Use of a novel perlecan-derived peptide for culture of human acinar cells useful for salivary tissue engineering.” *Tissue Engineering* (in revision).

Chung, S.-W., Miles, F.L., Sikes, R.A., Cooper, C.R., Farach-Carson, M.C. and Ogunnaike, B.A. “Quantitative modeling and analysis of the transforming growth factor  $\beta$  signaling pathway.” *Biophys. J.* (in press).

Farach-Carson M.C., Grindel B . HSPG2 (heparan sulfate proteoglycan 2). *Atlas Genet Cytogenet Oncol Haematol.* October 2008 .  
URL : <http://AtlasGeneticsOncology.org/Genes/HSPG2ID40890ch1p36.html>

Oristian D.S., Sloofman L.G., Zhou X., Wang L., Farach-Carson M.C., and Kirn-Safran C.B. “Ribosomal protein L29/HIP deficiency delays osteogenesis and increases fragility of adult bone in mice.” *J. Orthop. Res.* 27(1) 28-35, 2009.

D’Souza, S.S., Yang, W., Marchetti, D., Muir, C., Farach-Carson, M.C., and Carson, D.D. “HIP/RPL29 antagonizes VEGF and FGF2 stimulated angiogenesis by interfering with HS-dependent responses” *J Cell Biochem* 105(5):1183-93, 2008.

Brown, A.J., Alicknavitch, M., D’Souza, S.S., Daikoku, T., Kirn-Safran, C., Marchetti, D., Carson, D.D., and Farach-Carson, M.C. “Heparanase expression and activity influences chondrogenic and osteogenic processes during endochondral bone formation.” *Bone* 43(4):689-99, 2008.

Farach-Carson, M.C. and Carson, D.D. “Perlecan: A multifunctional extracellular proteoglycan scaffold in embryo implantation and placentation.” *Glycobiology* 17:897-905. 2007.

Farach-Carson, M.C., Brown, A.J., Lynam, M., Safran, J.B., and Carson, D.D. “A novel peptide sequence in perlecan domain IV supports cell adhesion and spreading” *Matrix Biology* 27:150-160, 2007.

Casper C. L., Yang, W, Farach-Carson, M.C., Rabolt, J.F. “Coating electrospun collagen and gelatin fibers with perlecan domain I for increased growth factor binding” *Biomacromolecules*, 8(4):1116-23. 2007.

O’Connor, J.C., Farach-Carson, M.C., Schneider, C.J., and Carson, D.D. “Co-culture of bone marrow stromal cells with prostate cancer cells alters endoglin expression and attenuates TGF- $\beta$  signaling in reactive bone stroma.” *Mol.Cancer Res.* 5(6):585-603, 2007.

Huang, W.C., Wu, D., Xie, Z., Zhau, H.E., Nomura, T., Zayzafoon, M., Pohl, J., Hsieh, C.L., Weitzmann, M.N., Farach-Carson, M.C., Chung, L.W. “ $\beta$ 2-microglobulin is a signaling and growth-promoting factor for human prostate cancer bone metastasis” *Cancer Res.* 66(18):9108-16. 2006.