Microbial Molecular Genetics, Cancer Biology & Phytonutriceuticals Research



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Education

1998 Ph.D. Microbiology (Cell & Molecular Biology) Michigan State University
1990 MS Biology (Molecular Biology) Jackson State University
1985 BS Biology Jackson State University

Research Highlight

Dr. Stephen I.N. Ekunwe has research interests in the areas of cancer biology and phyto-therapeutics, microbial molecular genetics related to bioremediation applications and isolation of potential degraders of high molecular weight polycyclic aromatic hydrocarbons (PAHs), and interaction between bacteriophage T4 and its host, Escherichia coli K-12. His current research focus is cancer biology and phyto-therapeutics. Leaf extract of the edible West African medicinal plant, Ocimum gratissimum (Og), is screened for its ability to inhibit the proliferation of selected model cancer cell lines in-vitro. Projects in his laboratory have involved the use of human colon cancer (HT-29) cells, human hepatocellular carcinoma (HepG2) cells, human prostate adenocarcinoma (PC3, PC3•AR, DU-145) cells and human non-small cell lung adenocarcinoma, A549 cells to evaluate the bioactivity of Og aqueous crude extract. Bioactivity-guided isolation, purification and characterization of the bioactive compound(s) in Og leaf extract are also being pursued in collaboration with our Chinese colleagues, who have expertise in Natural Products Chemistry research. Most potent fractions are currently being investigated in an attempt to elucidate the molecular mechanism(s) of their action. Results obtained in earlier and current projects indicate that Og leaf extract and its partially purified fractions inhibit proliferation of HT-29, HepG2, PC-3, PC3-AR and A549 cells. PC-3 cells are most sensitive to treatment with Og leaf extract. We are also showing that the extract increases levels of Hsp 70, induces DNA damage, increases levels of p21 protein in treated PC-3 and HT-29 cells, while having little or no effect on levels of Cyclin D1. Fraction P3-2 of Og leaf extract reduces levels of six different phospho-MAPKs in HT-29 cells. Assessing Og leaf extract modulation of androgen receptor (AR) and Survivin levels in PC3-AR cells is part of current work in our laboratory. Recent data from experiments with A549 cells indicate that fractionated Og leaf extracts induce apoptosis in these cells. While we continue work to obtain pure compounds from Og leaf extract and unravel their mechanism of action, some results obtained in current and earlier projects have either been published and/or presented at various meetings and conferences locally, nationally and internationally. The ultimate goal is to use the bioactive compound(s) from the most potent fractions and the aqueous crude whole extract to formulate novel low toxicity prophylactic and/or therapeutic cancer treatments, and also over-the-counter medication for treating hemorrhoids.

Recent Publications

- Stephen I.N. Ekunwe^{*d}, Sakeli M. Hall^m, Xuan Luo^d, Hengshan Wang^d, and Gregorio B. Begonia^d, 2013. Fractionated *Ocimum gratissimum* Leaf Extract Inhibit Prostate Cancer (PC3•AR) Cells Growth by Reducing Androgen Receptor and Survivin Levels. *J Health Care Poor Underserved*, 2013, 24(4): 61-69. PMID: 24241261.
- Xilin Ouyang^d, Liuxin Wei, Yingming Pan, Shiwen Huang, Hengshan Wang^{*d}, Gregorio B. Begonia^d and Stephen I.N. Ekunwe^{*d}. 2013. Antioxidant properties and chemical constituents of ethanolic extract and its fractions of *Ocimum gratissimum*. Med Chem Res 22(3):1124-1130.
- Wang Kai, Zhang Ye, Ekunwe S, Yi Xianghui, Liu Xianxian, Wang Hengshan and Pan Yingming. Antioxidant

activity and inhibition effect on the growth of human colon carcinoma (HT-29) cells of esculetin from Cortex Fraxini. Med Chem Res, 2011, 20(7): 968-974.

- Raphael D. Isokpehi*, Shaneka S. Simmons, Hari H.P. Cohly, Stephen I.N. Ekunwe, Gregorio B. Begonia and Wellington K. Ayensu. 2011. Identification of Drought-Responsive Universal Strees Proteins in *Viridiplantae*. *Bioinformatics and Biology Insights* 5: 1-18.
- Ekunwe S, Thomas MS, Luo X, Wang H, Chen Y, Zhang X, Begonia G. Potential cancer-fighting *Ocimum* gratissimum (Og) Extracts: Increased anti-proliferation activity of purification fractions and their spectral finger-prints. *Ethnicity & Disease*, 20,1, (S1), 12-16, 2010.
- Huang S, Pan Y, Gan D, Ouyang X, Ekunwe SIN, Wang H. Antioxidant activities and UV-protective properties of melanin from the berry of *Cinnamomum burmannii* and *Osmanthus fragrans*. *Med Chem Res, 2010.*
- Zhang Y, Hwang H-M, Ekunwe S. Comparing cytotoxicity and genotoxicity in HaCaT cells caused by 6aminochrysene and 5,6-chrysenequinone under UVA irradiation. *Environ Toxicol Chem 25(7): 1920-1925, 2006.*
- Ekunwe SIN, Hunter RD, Hwang H-M. Ultraviolet Radiation Increases the Toxicity of Pyrene, 1-Aminopyrene and 1-Hydroxypyrene to Human Keratinocytes. *Int. J. Environ. Res. Public Health 2(1): 58-62, 2005.*
- Hunter RD, Ekunwe SIN, Dodor DE, Hwang H-M, Ekunwe L. *Bacillus subtilis* is a Potential Degrader of Pyrene and Benzo[a]pyrene. *Int. J. Environ. Res. Public Health* 2(2): 267–271, 2005.
- Dodor DE, Hwang H-M, Ekunwe SIN. Oxidation of Anthracene and Benzo[a]pyrene by Immobilized Laccase from *Trametes versicolor. Enz Microb Technol* 35: 210-217, 2004.
- Zheng B, Hwang H-M, Yu H, Ekunwe S. DNA Damage Produced in HaCaT Cells by Combined Fluoranthene Exposure and Ultraviolet A Irradiation. *Environ Mol Mut 44: 151-155, 2004*.
- Izevbigie EB, Ekunwe SI, Jordan J, Howard CB. Ethanol Modulates the Growth of Human Breast Cancer Cells In Vitro. Exp Biol Med 227(4): 260 – 265, 2002.

Courses Taught

- BIO 515: Molecular Biology
- **BIO 509:** Genetics (Microbial Molecular Genetics)
- BIO 409: General Genetics (split level course with BIO 509)
- BIO 443 & BIOL 443: Biotechnology and Biotechnology Lab (for upper class juniors and seniors)
- BIO 318 & BIOL 318: Introductory Genetics and Introductory Genetics Lab
- BIO 111: General Biology
- BIO 101: Introduction to Biological Sciences (for Biology Non-majors)

Student Training Programs

I serve as faculty research mentor/advisor for students in the following programs:

- **Mississippi** Prostate Cancer HBCU Undergraduate Research Training Program
- JSU Environmental Science Ph.D. Program
- RISE: Research Initiative for Scientific Enhancement
- BRIDGE/Ph.D.: LSMAMP-Bridge to the Doctorate
- LSMAMP: Louise Stokes Mississippi Alliance for Minority Participation
- MARC: Minority Access to Research Careers
- STARGE Program/Undergraduate: Science & Technology Access to Research & Graduate Education