

EARL BENJAMIN III

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Dear Sir or Madam:

I have 10 years in the scientific field with seven of those years focusing on research experimentation. My educational background includes the acquisition of dual Bachelor of Science degrees in both Biology and Chemistry. In addition, I pursued and received a Masters of Science in Chemistry in May of 1999. **Currently, I am a Ph.D. candidate in the Biochemistry field with a focus in microbiology and chemistry at Morgan State University.**

In addition to my educational qualifications, I also have an extensive research with several peer reviewed papers. My research background has spanned such diverse topics as Analytical Chemistry, Environmental Chemistry, Molecular Biology and Biochemistry. Along with these projects, I also had the honor to work with Dr. Donald Wilkinson chemist whose research has examined the effects of toxins both in the environment and in the body. My experience with Dr. Wilkinson focused on a Department of Defense grant funded project that examined methods for the remediation of chlorinated hydrocarbons. Complementary to this work I have also worked under Dr. Patricia Buckendahl an expert in the field of bone morphology and stress response. My work with Dr. Buckendahl focused on the bone gla protein, Osteocalcin, and its various roles in bone formation and stress response.

This work experience has allowed me to become familiar with a variety of scientific instrumentation that includes several types of Gas Chromatographs, UV-Visible Spectrometers, FT-Infrared Spectrometers, and Flame-Flammables Atomic Absorption Spectrometers. I have also performed techniques including radio-amino assays, metal analysis and quantification, EPA protocol for testing of organic pollutants, DNA replication and isolation, gas chromatographic separation and kinetic analysis. In addition, I am also familiar with several windows based programs that include Microsoft Excel, Microsoft Word, Microsoft PowerPoint and Microsoft Works.

I feel that my experiences can assist you in any endeavors it wishes to undertake. To better demonstrate my qualifications for your position I am enclosing my resume along with abstracts from some of my research project. I thank you for any help you may render me.

Sincerely,

Earl Benjamin III

CURRICULUM VITAE

EARL BENJAMIN III

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EDUCATION

2001– (2006)	PhD Candidate Bio-Environmental Studies	Morgan State University
1997- 1999	Masters of Science in Chemistry	Delaware State University
1991-1996	Bachelor of Science in Biology	Richard Stockton College
1991-1996	Bachelor of Science in Chemistry	Richard Stockton College

RESEARCH EXPERIENCE AND APPOINTMENTS

2004	<u>Research Intern</u> , Pittsburgh Supercomputing Center/Biomedical Division, Used basic bioinformatics principles such as hidden Markov models, advanced position-specific weight matrices, bayesian estimation, homology modeling, structural biology and molecular dynamics simulations to determine in computational research project.
1999 - 2000	<u>Research Technician</u> , UMDNJ-School of Osteopathic Medicine, Assisted in the analysis of key biological markers to determine lead exposure in pregnant women.
1997	<u>Research Technician</u> , The Richard Stockton College, Assisted in the preparation of several current bone and stress research projects.
1995 - 1997	<u>Student Research Assistant</u> , Molecular biology- bone morphology laboratory, The Richard Stockton College, Conducted several experiment in the field of stress and bone morphology.

TEACHING EXPERIENCE

2002-2003	<u>Teaching Assistant</u> , General Chemistry I and II Laboratory, Morgan State University, preparation and supervision of several chemical experiments including Acid/Base Titration and ideal Gas laws.
1997- 1999	<u>Teaching Assistant</u> , General Chemistry II Laboratory, Delaware State University Chemistry Department, Assisted in the preparation and supervision of several chemical experiments including Acid/Base Titration and ideal Gas laws.
1995 - 1996	<u>Teaching Assistant</u> , General Chemistry Laboratory, Richard Stockton College Chemistry Department, Assisted in the preparation and supervision of several chemical experiments including Acid/Base Titration and ideal Gas laws.

PROFESSIONAL ASSOCIATIONS AND SOCIETIES:

- 1999 – Current New Jersey Association of Osteopathic Physicians and Surgeons
- 1999- 2000 American Physiology Society
- 1999- 2000 The American Society for Cellular Biology
- 1998 Participate in the National Consortium for Graduate Degrees For Minorities in Engineering and Science (GEM Consortium) Faculty Bridge Seminar

COMMUNITY SERVICE

- 2004 Moderator for the Fifth Annual MBRS/RISE Science Career Workshop
- 1999 Judge at the UMBC 2nd Annual Undergraduate Research Symposium in the Chemical and Biological Sciences
- 1998 Judge at the South Jersey Regional Science Fair
- 1998 Volunteer for the Alpha Kappa Alpha Sorority Partnership in Mathematics and Science Career Conference
- 1998 Delaware's Department of Education Science in Motion Program
- 1997- 1999 Richard Stockton College's Summer Preparatory Program, Prepared and supervised several chemical experiments for middle and high school students.
- 1996 UMDNJ Mentor Scholars Program, Assisted high school students in development of research proposals.

AWARDS AND FELLOWSHIPS:

- 2006 2nd place Winner 13th Annual Morgan State University Undergraduate & Graduate Science Research Symposium Program (2006) Graduate Division
- 2001- Current Title III Scholar
- 1997-1999 Bridges to the Future Fellow
- 1996 Selected for the National Dean's List
- 1996 Awarded Program Distinction from the Richard Stockton College of New Jersey Biology Department for Academic and Research Excellence
- 1996 Honored by President Vera King Farris and The Unified Black Student Society of Richard Stockton College of New Jersey for Academic Excellence
- 1996 Dean's List:

RESEARCH

A. Posters and Publications

1. **Earl Benjamin III** *, Ellis Benjamin and Arthur Williams , “A Novel Method For The Deactivation of *Enterococcus faecalis*, *Staphylococcus aureus*, and *Escherichia coli*” Presented at the Morgan State University 13th Annual Undergraduate & Graduate Science Research Symposium Program (2006)
2. **Earl Benjamin III** *, Ellis Benjamin and Arthur Williams , “A Novel Method For The Deactivation of *Enterococcus faecalis*, *Staphylococcus aureus*, and *Escherichia coli*” Presented at the New England Science Symposium at Harvard Medical School (2006)
3. C. Reese*, T.V. Martin, **E. Benjamin III** and D.A. Hill , “Pretreatment With Silymarin Modifies The Level Of Endotoxin-Induced Neutrophil Migration And Liver Injury” Presented at the American Society of Cellular Biology 42nd Annual Meeting (2002)
4. Reese C*, **Benjamin. E.**, Martin T.V., Hijji Y., and Hill. D. “Pretreatment With Silymarin Modifies The Level Of Endotoxin-Induced Neutrophil Migration And Liver Injury.” Presented At The Morgan State University 9th Annual Undergraduate & Graduate Science Research Symposium Program (2002)
5. **Benjamin. E.***, Reese C., Martin T.V., Hijji Y., and Hill. D. “Post Treatment With Silymarin Reduces The Degree Of Alpha-Naphthylisothiocyanate-Induced Liver Injury.” Presented At The Morgan State University 9th Annual Undergraduate & Graduate Science Research Symposium Program (2002)
6. **Benjamin. E.**, A Kinetic Study Of The Degradation Of Trichloroethylene By Metal Ions Master’s Thesis, Delaware State University (1999)
7. Janangir. ZMS* , **Benjamin E.**., Hinchliffe D, and Patterson-Buckendahl P. “Probing Osteocalcin In Fish”. Presented at the 52nd Annual Fish and Northeastern Wildlife Conference (1996).
8. **Benjamin. E.** * , Patterson-Buckendahl. P, “Semi-Quantitative Analysis Of Rat Osteocalcin mRNA Expression Between Skeletal And Non Skeletal Cells As A Function Of Immobilization Stress”. Presented at the 1st Richard Stockton College Biannual NAMS Student Research Presentation. (1995)

SEMI-QUANTITATIVE ANALYSIS OF RAT OSTEOCALCIN mRNA EXPRESSION BETWEEN SKELETAL AND NON-SKELETAL CELLS AS A FUNCTION OF IMMOBILIZATION STRESS

Earl Benjamin III*, Patricia Patterson-Buckendahl, Division of Natural Science and Mathematics, Department of Biology, Richard Stockton College of New Jersey, Pomona, NJ Presented at the 1st Richard Stockton College Biannual NAMS Student Research Presentation. (1995)

Osteocalcin (OC) is a vitamin K and vitamin D dependent bone matrix protein, primarily serves to bind extracellular mineral in bone. OC, also known as bone Gla protein (BGP) accounts for 15-20% of the non-collagen proteins in the bone matrix. Small in size this protein contains approximately 49-50 amino acid residues (~5,900daltons). OC initial synthesis occurs osteoblasts (bone forming cells) after formation glutamic acid residues located at positions 17, 21, and 24 are then posttranslationally carboxylated at the gamma position. The gamma- carboxylation of these three glutamic acid residues gives OC unique properties that allows it to bind onto hydroxyapatite ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$) crystals in bone.

Although, OC is primarily produced in the osteoblasts (bone producing cells) it has also been shown to be transcribed in non-skeletal tissues such as adrenal, kidney, muscle, and leukocytes. Serum OC levels decrease in response to mild stressors and increase in response to acute immobilization. These results suggest a relationship between stress and the production of OC.

This study attempts to determine if transcription serves as a control point for changes in rat serum OC levels. Several tissues such as adrenal, kidney, muscle, bone and leukocytes were obtained from rats following two hours of immobilization. After tissue extraction RNA was then isolated and Polymerase Chain Reaction (PCR) was preformed using a OC protein specific primer. The PCR products were evaluated using visual methods to determine if changes in transcriptional concentrations of OC mRNA production in specific tissues in response to acute stressors.

PROBING OSTEOCALCIN IN FISH

ZMS Janangir, E. Benjamin*, D. Hinchliffe, and P. Patterson-Buckendahl, Division of Natural Science and Mathematics, Department of Biology, Richard Stockton College of New Jersey, Pomona, NJ. Presented at the 52nd Annual Fish and Northeastern Wildlife Conference (1996).

Osteocalcin (OC), an extra cellular mineral binding protein, has been identified in all vertebrates' classes except Agnatha and Chondrichthyes. The OC protein, 45-51 amino acid residue in length (depending on species) has been partially or completely sequenced from 20 species to date, including two Perciformes, swordfish (*Xiphias gladius*) and bluegill (*Lepomis macrochirus*). To learn more about the evolutionary relationship, origin, and function of this abundant bone protein, we have begun to probe for the gene in 18 species of fish representing several groups of Actinopterygians that will include Acipenseriformes, Anguilliformes, Clupeiformes, Cypriniformes, Salmoniformes, and Perciformes as well as Elasmobranchs. The fact that the latter have cartilaginous rather than fully mineralized bone found in Actinopterygians plus the fact that Osteocalcin inhibits hydroxy-apatite crystallization and crystal growth led us to examine if Osteocalcin originated with bone mineralization.

To identify this evolutionary relationship a small quantity of genomic DNA was extracted from several species of non-cartilaginous and cartilaginous fishes. This genomic DNA was then probed using a small segment of Mouse OC genomic DNA. Relative concentrations for each species of fish were then identified using colorimetric methods. The results suggested that the OC gene was present in cartilaginous fish species. The conservation of the OC gene in organism which do not need it for bone formation leads to a hypothesis that OC may have another unspecified function.

A KINETIC STUDY OF THE DEGRADATION OF TRICHLOROETHYLENE BY METAL IONS

Earl Benjamin III*, College of Mathematics, Natural Science and Technology, Department of Chemistry, Delaware State University, Dover, DE. Master's Thesis. (Advisor: Dr. Donald Wilkinson)

Heavy use of environmental contaminants over the past century has led to accumulation of large quantities of pollutants in soil and water supplies. Trichloroethylene, a non-flammable colorless industrial solvent, has been found to be among the most difficult to remove from the environment. It has been found in no less than 852 of 1430 National Priorities Sites identified in a report by the United States Environmental Protection Agency. Some data has suggested that TCE's half-life in soil can be as long as 8460 hours (approximately 1 year's time) or as long as 39,672 hours (4.5 year's time) if not treated.

Health professionals have long noticed the side effect of short-term inhalation of TCE includes dizziness, headaches, slowed reaction time, sleepiness and facial numbness. Along with these health concerns many current reports have suggested a relationship between the use of TCE and cancer formation. Several studies have suggested that metallic ion degrade chlorinated solvents by chemical oxidation, one such study was performed by Doong and Wu of National Taiwan University result showed an 84% drop in aqueous carbon tetrachloride content in 33 days. This project test four metals at several concentrations to determine which individual metals is most effective as a catalyst in the degradation of TCE. The metals used were Cr^{3+} , Zn^{3+} , Mn^{2+} and Fe^{3+} . The results suggested that Iron and Manganese were not effective catalyst in the degradation of TCE, however Chromium and Zinc did appear to be effective catalysts for degradation of TCE under the experimental parameters.

POST TREATMENT WITH SILYMARIN REDUCES THE DEGREE OF ALPHA-NAPHTHYLISOTHIOCYANATE-INDUCED LIVER INJURY.

Earl Benjamin III*, C. Reese, T.V. Martin, Y.Hijji and D. Hill, School of Computer, Mathematical and Natural Sciences, Department of Biology, Morgan State University, MD, USA. Presented At The Morgan State University 9th Annual Undergraduate & Graduate Science Research Symposium Program (2002)

Previous studies in our laboratory have demonstrated that pre-treatment with Silymarin (polyphenolic flavonoid derived from milk thistle seeds) is protective against the neutrophil-dependent hepatotoxicity of alpha-naphthylisothiocyanate (ANIT) in rodents. This hepatotoxicity is manifested as plasma elevations of hepato-specific enzymes, hepato-cellular necrosis, and a pronounced influx of neutrophils. Conversely, the effect of Silymarin post-treatment on ANIT-induced liver injury requires further elucidation. Thus, the present study was designed to test the hypothesis that post-treatment with Silymarin reduces the degree of ANIT-induced liver injury. Male Sprague Dawley rats received 120 mg/kg (oral) at either 0, 6, 12, 18, or 24 hours after ANIT administration. Twenty-four hours after the administration of ANIT, plasma samples were collected, processed and analyzed for markers of hepatic injury. Elevation in plasma levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and gamma-glutamyltranspeptidase (GGT) were used as the specific markers of ANIT-induced hepatotoxicity. Post-treatment with 50 mg/kg Silymarin afforded a modest degree of hepato-protection as indicated by plasma elevations of AST, ALT, and GGT. These data suggest that post-treatment with Silymarin affords a modest degree of protection against the hepatotoxicity of ANIT. (Supported by NIH Grant RR11606-5)

PRETREATMENT WITH SILYMARIN MODIFIES THE LEVEL OF ENDOTOXIN-INDUCED NEUTROPHIL MIGRATION AND LIVER INJURY

C. Reese*, T.V. Martin, E. Benjamin III and D.A. Hill, Morgan State University, School of Computer, Mathematical and Natural Sciences, Department of Biology, Morgan State University, MD, USA Presented at the American Society of Cellular Biology 42nd Annual Meeting (2002) and The Morgan State University 9th Annual Undergraduate & Graduate Science Research Symposium Program (2002)

Endotoxin, which is generated by gram-negative, microbial pathogens such as *Escherichia coli* (*E. coli*), is a persistent environmental contaminant that can cause lethality. Recent studies have indicated that urban communities demonstrate a higher occurrence of endotoxin-induced lethality compared to non-urban communities. The speculation is that exposure risk is higher in urban environments. Exposure can occur through microfloral translocation, environmental contact, ingestion of contaminated food products, and infection after invasive surgical procedures. In humans and animals, the liver is one of the primary targets of endotoxemic infection. The hepatotoxicity of endotoxin includes elevated plasma levels of hepato-specific enzymes such as gamma-glutamyltranspeptidase (GGT), aspartate aminotransferase (AST), and alanine aminotransferase (ALT). Also, exposure to endotoxin causes hepatic edema, peroxidation and cellular necrosis. In addition, this exposure to endotoxin causes hepatic edema, peroxidation and cellular endotoxemia is treated with antibiotic therapy. More recently, clinicians and research have become interested in the therapeutic effectiveness (e.g. hepato-protective) of natural products such as flavonoids. Silymarin, the natural polyphenolic flavonoid extract of the milk thistle, has been well documented for its anti-inflammatory, anti-oxidant and hepato-protective activity. Recent studies have suggested that Silymarin pretreatment protects against endotoxin-induced liver injury. Male Sprague Dawley rats were treated for 5 consecutive days with 25-50 mg/kg/day Silymarin (orally). On day 6, the Silymarin treated rats received 0.5-3.0 mg/kg of endotoxin (i.p.). After a 6 hour exposure period, liver samples were collected for histological analysis of liver injury and plasma samples were collected for analysis of enzymatic markers (AST, ALT and GGT) of hepatotoxicity. Pretreatment with Silymarin decreased hepato-cellular injury, prevented elevations of plasma enzyme markers, decreased hepato-cellular injury, prevent elevation so plasma enzymes markers, decreased neutrophil accumulation and expression of adhesion molecules. These data suggest that Silymarin pretreatment alters neutrophil activity and reduces the severity of endotoxin-induced liver injury. (NIH Grant RR11606-05)

A NOVEL METHOD FOR THE DEACTIVATION OF *ENTEROCOCCUS FAECALIS*, *STAPHYLOCOCCUS AUREUS*, AND *ESCHERICHIA COLI*

Earl Benjamin III*, Ellis Benjamin and Arthur Williams, Morgan State University, School of Computer, Mathematical and Natural Sciences, Department of Biology, Morgan State University, MD, USA Presented at the New England Science Symposium at Harvard Medical School (2006) and Morgan State University 13th Annual Undergraduate & Graduate Science Research Symposium Program (2006)

The development of new techniques for the reclamation of water is a long standing environmental and public health issue. It has been found that water related diseases account for a major part of the morbidity and mortality worldwide. The World Health Organization (WHO) reported that in 2000, 1.1 billion people still lacked access to safe water sources, of these 86% are located in rural areas. A pathogenic condition such as diarrhea accounts for about 4 billion cases per year and is responsible for approximately 2.2 million deaths, mostly among children under five years old. *E. faecalis*, *S. aureus* and *E. coli* has been closely linked to the development of pathogenic conditions such as meningitis, endocarditis, diarrhea, and several forms of nosocomial surgical infections. Costing in excess of \$500 million dollars in treatment options, bacterial resistant infections are becoming a major health concern. Additionally, these bacteria have well-characterized heat and drug resistant mechanisms. Previous studies have shown that *E. faecalis*, *S. aureus* and *E. coli* are now becoming resistant to several therapeutic agents. The aim of this project is to determine if the addition of low levels of metal ions such as, copper, zinc, manganese, aluminum, and silver, can enhance the deactivating effects of dielectric heating of *E. faecalis*, *S. aureus* and *E. coli* (Wards Natural Scientific, Rochester, NY). Previous research has suggested that thermal and chemical stressors work via similar but not the same stress mechanisms, therefore it is proposed that, the coupling of both thermal and chemical process will work synergistically to deactivation of *E. faecalis*, *S. aureus* and *E. coli*. To test this hypothesis *E. faecalis*, *S. aureus* and *E. coli* were placed in a solution containing various metal ions (copper, zinc, manganese, aluminum, and silver) for an hour period and then exposed to multimode microwave heating using a Panasonic Inverter Microwave (model #NN-S543BF) for a period of 3 minutes at 130 Watts. The results suggest that certain metal ions do can enhance the deactivation of *E. faecalis*, *S. aureus* and *E. coli* when coupled to dielectric heating using microwave radiation. Concentration of 1×10^{-6} M of metal ions such as aluminum, zinc and manganese were able to significant deactivate *E. faecalis* *S. aureus* and *E. coli* up to a concentration of 5×10^{-8} CFU. Copper and silver ions also appear to significantly deactivate *E. faecalis* without the need for microwave heating at 1×10^{-6} M concentration.