FRONT COVER

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TITLE:
Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program

PRINCIPAL INVESTIGATOR:
Marvella E. Ford, PhD

CONTRACTING ORGANIZATION:
The Medical University of South Carolina
Charleston, South Carolina 29425

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PREPARED FOR:  U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland  21702-5012

DISTRIBUTION STATEMENT:

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**Title:** Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program

**Authors:** Marvella E. Ford, PhD

**Performing Organization:** The Medical University of South Carolina
Charleston, South Carolina 29425

**Sponsoring Agency:** U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

**Abstract:**
See Next Page

**Subject Terms:**
Prostate Cancer Research Training Program Summer Undergraduate Research Program (SURP) Student Fellows from Historically Black Colleges and Universities (HBCUs)

**Distribution Statement:**
Approved for Public Release; Distribution Unlimited

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Standard Form 298 (Rev. 8-98) Prescribed by ANSI Std. Z39.18
14. ABSTRACT

**Background:** There is a critical need to increase the number of racially and ethnically diverse prostate cancer researchers. The purpose of this 3-year project is to develop a prostate cancer research training program at the Medical University of South Carolina (MUSC) with 12 students from the following three Historically Black Colleges and Universities (HBCUs) in South Carolina: Claflin University, South Carolina State University (SCSU), and Voorhees College. Students from the 3 HBCUs (defined as “Student Fellows”) will participate in research internships in the laboratories/research units of senior prostate cancer research scientists at MUSC. **Specific Aims:**

- **Aim 1.** To provide training in the basics of research design and methods to 4 Student Fellows each year through participation in the MUSC Summer Undergraduate Research Program (SURP);
- **Aim 2.** To immerse 4 Student Fellows each year in a prostate cancer research training curriculum.

**Results:** During the current reporting period, 4 Student Fellows were identified, recruited to participate in the program, and admitted to the DOD Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program. The Student Fellows were matched with Research Mentors at MUSC, with whom they conducted research in the summer of 2010. Each Student Fellow prepared scientific papers, presented scientific presentations at the end of the summer program, and completed an 8-week Kaplan Graduate Record Examination Test Preparation Course at a local Kaplan Center. **Conclusions:** In the summer of 2010, we provided state-of-the-art comprehensive prostate cancer research education and training opportunities for 4 Student Fellows from HBCUs in South Carolina. Each Student Fellow prepared a scientific paper and gave at least 1 scientific presentation. In addition, 1 Student Fellow was selected to give an oral presentation of her summer research project during MUSC’s Annual Perry V. Halushka MUSC Student Research Day on November 5, 2010. Importantly, all 4 Student Fellows from 2010 plus an additional 2 Student Fellows from 2009 had abstracts accepted for poster presentation at the DOD-sponsored national Innovative Minds in Prostate Cancer Today (IMPaCT) Conference. An abstract describing the overall program was also accepted for poster presentation at the conference. We are developing a cadre of scientists who are well-prepared to conduct research spanning the continuum from basic science to clinical science to population-based research. The 2011 application process is ongoing, and four Student Fellows will be selected to participate in the Training Program during the Summer of 2011.

15. SUBJECT TERMS

- Prostate Cancer Research Training Program
- Summer Undergraduate Research Program (SURP)
- Student Fellows from Historically Black Colleges and Universities (HBCUs)
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INTRODUCTION

The Scientific Context of the Training Program
The overarching goal of the Training Program is to recruit the next generation of prostate cancer researchers by exposing undergraduate students (“Student Fellows”) from Claflin University (CU), South Carolina State University (SCSU), and Voorhees College (VC) to prostate cancer research at the Medical University of South Carolina (MUSC), and training them to meaningfully participate in such research activities. Basic science and clinical researchers are needed to aggressively pursue and test better methods to decode the prostate cancer fingerprints, which hold the key to understanding the relationship between gene expression and future prognosis. Population science researchers are needed who will identify barriers and facilitators of prostate cancer early detection and treatment, and develop strategies to overcome them. The Training Program will provide a pipeline for future generations of these prostate cancer researchers.

The two Specific Aims are to:
Aim 1: Provide training in the basics of research design and methods to 4 Student Fellows each year through participation in the MUSC Summer Undergraduate Research Program (SURP).

Aim 2: Immerse 4 Student Fellows each year in a prostate cancer research training curriculum.

Program Director and Training Team
Dr. Marvella E. Ford is the Program Director. Drs. Rebecca Bullard-Dillard (CU), Judith Salley (SCSU), and Leroy Davis (VC) are Associate Directors. This four-person leadership team collaborates closely in the management and administration of the award, as well as the continued development and enhancement of the Training Program. The Program Director and Associate Directors share scientific interests in health disparities, serve in other leadership roles within their institutions, and meet frequently, both formally and informally. These individuals form the Executive Committee for the Training Program. Each institution has appointed Faculty Advisors consisting of Dr. Kamal Chowdhury (CU), Dr. James B. Stukes (SCSU), and Ms. Gayle Tyler Stukes (VC).
BODY

Statement of Work

Task 1. Identify and Recruit the Student Fellows
(a) Identify the pool of potential Student Fellows (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)
(b) Interview the potential Student Fellows (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)
(c) Select the top Student Fellows (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)
(d) Match the Student Fellows with Their Research Mentors at MUSC (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)
(e) Hold the Kickoff Intensive and Luncheon (Year 1, months 4-6; Year 2, months 4-6; Year 3, months 4-6)

Task 2. Provide Training in Biomedical and Prostate Cancer Research
(a) Conduct Aim 1: Training in the Basics of Research Design and Methods through participation in the MUSC Summer Undergraduate Research Program (Year 1, months 6-8; Year 2, months 6-8; Year 3, months 6-8)
(b) Conduct Aim 2: Prostate Cancer Research Training (Year 1, months 6-8; Year 2, months 6-8; Year 3, months 6-8)
(c) Sponsor the Student Fellows’ Participation in a Graduate Record Examination (GRE) course (Year 1, months 6-8; Year 2, months 6-8; Year 3, months 6-8)

Task 3. Prepare Tangible Scientific Products
(a) Prepare and present scientific abstracts based on the Student Fellows’ prostate cancer research (Year 1, months 10-12, Year 2, months 1-12, Year 3, months 1-12)
(b) Prepare manuscripts that will be submitted to peer-reviewed journals (Year 1, months 10-12, Year 2, months 1-12, Year 3, months 1-12)

Task 4. Evaluate the Training Program
(a) Assess the number of applicants to the Training Program (Year 1, months 1-4, Year 2, months 1-4, Year 3, months 1-4)
(b) Assess the number of Student Fellows who apply to graduate school (Year 2, months 1-12, Year 3, months 1-12)
(c) Assess the number of Student Fellows who are admitted to graduate school (Year 2, months 1-12, Year 3, months 1-12)
(d) Assess the number of graduate schools to which Student Fellows are admitted (Year 2, months 1-12, Year 3, months 1-12)
(e) Identify the number of scientific abstracts presented and peer-reviewed publications that result (Year 1, months 10-12, Year 2, months 1-12, Year 3, months 1-12)
KEY RESEARCH ACCOMPLISHMENTS

Task 1. Identify and Recruit the Student Fellows

(a) Identify the pool of potential Student Fellows (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)

(b) Interview the potential Student Fellows (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)

(c) Select the top Student Fellows (Year 1, months 1-3; Year 2, months 1-3; Year 3, months 1-3)

To accomplish Tasks 1(a) – 1(c), Dr. Ford, the Program Director worked with Associate Directors Dr. Rebecca Bullard-Dillard (Claflin University), Dr. Judith Salley (SC State University), and Dr. Leroy Davis (Voorhees College) as well as Faculty Advisors Dr. Kamal Chowdhury (Claflin University), Dr. James Stukes (SC State University), and Ms. Gayle Stukes (Voorhees College) to identify potential Student Fellows. The Associate Directors and Faculty Advisors issued a call for applicants to their student bodies and personally approached students whom they felt would be outstanding applicants for the summer research program.

Drs. Ford (Principal Investigator), Bullard Dillard (Associate Director), Salley (Associate Director), and Davis (Associate Director) communicated via electronic mail to discuss the 2011 SURP application process and deadlines. Each Associate Director is in the process of identifying students to participate in the DOD-funded summer research training program in 2011. The students are submitting their applications to the SURP for consideration.

To broaden the pool of potential applicants, each Associate Director invited faculty and students from his/her institution to participate in the Ernest Just Symposium held on February 25, 2011 at MUSC. A total of 51 students from the three HBCUs attended the symposium (Table 1.). A description of the symposium is included in Appendix A. The students who participated in the symposium also received a tour of the MUSC campus and met with MUSC faculty members who could become their future summer research mentors. The DOD grant funds covered travel expenses for two faculty members from Voorhees College who requested travel assistance. All other individuals listed paid for their own travel.

<table>
<thead>
<tr>
<th>Table 1. Ernest Just Symposium Student Attendees</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courtney Anderson</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Keaira Berry</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Camille Brown</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Dorneisha Brown</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Maurissa Charles</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Jasmine Elliot</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Kayla Felix</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Jessica Fuller</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Kendrick Henderson</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Khirston Howard</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Name</td>
<td>University</td>
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<tr>
<td>Candice Jenkins</td>
<td>Claflin University</td>
</tr>
<tr>
<td>Marleah Johnson</td>
<td>Claflin University</td>
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<tr>
<td>Lakia Mansell</td>
<td>Claflin University</td>
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<tr>
<td>Ezinne Mong</td>
<td>Claflin University</td>
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<tr>
<td>Torez Moody</td>
<td>Claflin University</td>
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<tr>
<td>Britanny Orange</td>
<td>Claflin University</td>
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<tr>
<td>Lynelle Pompey</td>
<td>Claflin University</td>
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<tr>
<td>Donna Sellers</td>
<td>Claflin University</td>
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<td>Muhammad Sheraz</td>
<td>Claflin University</td>
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<td>Faith Simmons</td>
<td>Claflin University</td>
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<td>Minakchhi K. Singh</td>
<td>Claflin University</td>
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<tr>
<td>Ericka Smith</td>
<td>Claflin University</td>
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<td>Destynei Tiller</td>
<td>Claflin University</td>
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<td>Tamara Wilks</td>
<td>Claflin University</td>
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<td>Brook Williams</td>
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<td>Rachael Woods</td>
<td>Claflin University</td>
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<td><strong>Total Students From Claflin University</strong></td>
<td><strong>26</strong></td>
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<td>Jasmine Addison</td>
<td>Voorhees College</td>
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<td>Brittany Allen</td>
<td>Voorhees College</td>
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<td>Tandria Allen</td>
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<td>Kalin Bright</td>
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<td>Latgera Brunson</td>
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<td>Derickeo Cooper</td>
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<td>Jeshia Cooper</td>
<td>Voorhees College</td>
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<td>Jessica Dingle</td>
<td>Voorhees College</td>
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<td>Katrina Dunn</td>
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<td>Jamie Eaddy</td>
<td>Voorhees College</td>
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<td>Hollie Garnett</td>
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<td>Willette Hudson</td>
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<td>John Jackson</td>
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<td>Monica Johnson</td>
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<td>Antavius Jones</td>
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<td>David Maloney</td>
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<td>Edward McMorris</td>
<td>Voorhees College</td>
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<td>Tyquan Parker</td>
<td>Voorhees College</td>
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</table>
The Student Fellows were matched with their Research Mentors at MUSC based on the expressed interests of the Student Fellows. For example, Ms. Scharan Clarke expressed an interest in clinical research in her application, so she was matched with Dr. Harry Clarke (no relation) a urologist who conducts prostate cancer clinical research at MUSC. Ms. Clarke had an opportunity to shadow Dr. Clarke as he conducted his clinical research. Table 2. shows the names of the students who participated in the 2009 DOD Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program, their Research Mentors at MUSC, and their research topics.

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Academic Institution</th>
<th>Research Program</th>
<th>Mentor</th>
<th>Title of Research Project</th>
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<td>Mr. DeAngelo Dinkins</td>
<td>SC State University</td>
<td>Department of Defense</td>
<td>Dr. Christina Voelkel-Johnson</td>
<td>Redox protein expression and susceptibility to therapeutic intervention in ARCaP prostate cancer cells</td>
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<td>Ms. Ebonie Fuller</td>
<td>SC State University</td>
<td>Department of Defense</td>
<td>Dr. Marvella E. Ford</td>
<td>Evaluating an Intervention to Improve Perceptions of Cancer Clinical Trials among Racially Diverse Communities in South Carolina</td>
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<td>Mr. Jonathan Brown</td>
<td>Claflin University</td>
<td>Department of Defense</td>
<td>Dr. Danyelle Townsend</td>
<td>NOV-002 Induces S-Glutathionylation of Serpin A1 and A3 in Human Plasma</td>
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<td>Ms. Scharan Clarke</td>
<td>Claflin University</td>
<td>Department of Defense</td>
<td>Dr. Harry Clarke</td>
<td>What Factors Can Predict the Success of Sacroneuromodulation When Used in Patients with Urinary Retention</td>
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(e) Hold the Kickoff Intensive and Luncheon (Year 1, months 4-6; Year 2, months 4-6; Year 3, months 4-6)

The Kickoff Intensive and Luncheon took place during the first meeting of the didactic training program in prostate cancer research, on Thursday, June 8, 2010. Dr. Ford gave an overview of the DOD Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program. On June 17, 2010, the Associate Directors from the partnering institutions gave presentations to the students. Their presentations highlighted their cancer disparities research.

**Task 1 Deliverables:** Four Student Fellows were identified, recruited to participate in the program, and admitted to the DOD Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program. The Student Fellows were matched with Research Mentors at MUSC, with whom they conducted research in the summer of 2010.

**Task 2. Provide Training in Biomedical and Prostate Cancer Research**

(a) Conduct Aim 1: Training in the Basics of Research Design and Methods through participation in the MUSC Summer Undergraduate Research Program (Year 1, months 6-8; Year 2, months 6-8; Year 3, months 6-8)

The Student Fellows participated in an intensive training program in the Basics of Research Design and Methods through participation in the MUSC Summer Undergraduate Research Program. The 2010 SURP curriculum is included in Appendix B.

(b) Conduct Aim 2: Prostate Cancer Research Training (Year 1, months 6-8; Year 2, months 6-8; Year 3, months 6-8)

The Student Fellows participated in an intensive training 10-week program in Prostate Cancer Research. Four lectures focused on population science, one lecture focused on statistical methods in prostate cancer research, four lectures highlighted prostate cancer clinical research, and four lectures emphasized prostate cancer basic science research. Other lectures described funding opportunities available to the students, career development opportunities, qualitative research methods, perspectives of prostate cancer among community members, and tips for preparing graduate school applications. Disparities research was a cross-cutting theme in all of the lectures. Table 3 below illustrates the curriculum. The presentations given by the lecturers are included in Appendix C. Please note that not all lecturers utilized PowerPoint presentations. Some lectures were conducted via roundtable discussion with no slide presentations.
### Table 3. Prostate Cancer Research Training Course – Summer of 2010

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Instructor and Organizational Affiliation</th>
<th>Location and Time</th>
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<tbody>
<tr>
<td>Week 1</td>
<td>Welcome and Overview</td>
<td>Marvella E. Ford, Ph.D., Associate Director, Cancer Disparities Program, Associate Professor, Department of Medicine, Division of Biostatistics &amp; Epidemiology</td>
<td>Room 124 1:00-2:00pm</td>
</tr>
<tr>
<td>Tuesday, June 8, 2010</td>
<td></td>
<td>Melanie S. Jefferson, MPH, Program Coordinator, Cancer Disparities Program, HCC</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Week 1 (Basic Science Research Lecture)</td>
<td>Overview of the Hollings Cancer Center</td>
<td>Andrew S. Kraft, M.D., HCC Director, MUSC</td>
<td>Room 121 1:00-2:00pm</td>
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<tr>
<td>Wednesday, June 9, 2010</td>
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<tr>
<td>Week 2</td>
<td>Introduction to Health Disparities Research</td>
<td>Rebecca Bullard-Dillard, Ph.D., CU; Judith Salley, Ph.D., SCSU; Leroy Davis, Ph.D., VC</td>
<td>Room 121 1:00-2:00pm</td>
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<tr>
<td>Thursday, June 17, 2010</td>
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<tr>
<td>Week 3 (Clinical Research Lecture)</td>
<td>Anatomy and the Function of the Prostate</td>
<td>Harry S. Clarke, M.D., Ph.D., Associate Dean for Graduate Medical Education and Professor, Urology Services, MUSC</td>
<td>Room 121 3:00-4:00pm</td>
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<tr>
<td>Monday, June 21, 2010</td>
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<tr>
<td>Week 3 (Population Science/Epidemiologic Research Lecture)</td>
<td>Vitamin D and Prostate Cancer</td>
<td>Sebastiano Gattoni-Celli, M.D., Professor Radiation Oncology</td>
<td>Room 121 1:00-2:00pm</td>
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<tr>
<td>Tuesday, June 22, 2010</td>
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<tr>
<td>Week 4 (Basic Science)</td>
<td>Apoptosis of Prostate Cancer Cells</td>
<td>Christina Voelkel-Johnson, Ph.D., Assistant Professor, Microbiology &amp; Immunology MUSC</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Tuesday, June 29, 2010</td>
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</tr>
<tr>
<td>Week 4 (Biostatistical Methods Lecture)</td>
<td>Biostatistical Issues in Prostate Cancer Research</td>
<td>Elizabeth Garrett-Mayer, Ph.D., Director, HCC Biostatistical Core, Department of Medicine, Division of Biostatistics &amp; Epidemiology</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Thursday, July 1, 2010</td>
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<tr>
<td>Week 5 (Population Science/Epidemiologic Research Lecture)</td>
<td>Epidemiologic Issues in Prostate Cancer Research</td>
<td>Anthony Alberg, Ph.D., HCC Associate Director, Prevention and Control Program, Associate Professor, Department of Medicine Division of Biostatistics &amp; Epidemiology</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Tuesday, July 6, 2010</td>
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<tr>
<td>Week 5 (Population Science)</td>
<td>Prostate Cancer Research: Perspectives of Community Members</td>
<td>Debbie Bryant, RN Cancer Disparities Outreach Efforts, Outreach Coordinator, HCC Cancer Disparities Program, MUSC</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Thursday, July 8, 2010</td>
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<tr>
<td>Week 6 (Biostatistical Methods Lecture)</td>
<td>Statistical Genetics</td>
<td>Emily Kistner-Griffin, Ph.D., Assistant Professor, Department of Medicine, Division of Biostatistics &amp; Epidemiology</td>
<td>Room 124 1:00-2:00pm</td>
</tr>
<tr>
<td>Tuesday, July 13, 2010</td>
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<tr>
<td>Week 6 (Basic Science Lecture)</td>
<td>Developmental Transcription Factors in Prostate Cancer</td>
<td>Demetri Spyropoulos, Ph.D., Associate Professor, Pathology &amp; Laboratory Medicine</td>
<td>Room 121 1:00-2:00pm</td>
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<tr>
<td>Thursday, July 15, 2010</td>
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<tr>
<td>Week 7 (Population Science Lecture)</td>
<td>Qualitative Research Methods</td>
<td>Charlene Pope, Ph.D., Associate Professor, College of Nursing, MUSC</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Tuesday, July 20, 2010</td>
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<tr>
<td>Week 8 (Population Science Research Lecture)</td>
<td>Lunch and Lecture</td>
<td>Dr. Marvella E. Ford, Cancer Disparities Program</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Tuesday, July 27, 2010</td>
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<tr>
<td>Week 8 (Population Science Lecture)</td>
<td>Project Sugar: Community-based genetic research project among the Sea Islanders (Gullahs) in South Carolina</td>
<td>Ida J. Spruill, Ph.D., Assistant Professor, College of Nursing, MUSC</td>
<td>Room 121 12:30-1:30pm</td>
</tr>
<tr>
<td>Thursday, July 29, 2010</td>
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<tr>
<td>Week 9 (Tips for Preparing Graduate School Applications)</td>
<td>Improving Graduate School Admission Rates</td>
<td>Cynthia F. Wright, Ph.D., Assistant Dean for Admissions and Associate Professor, College of Graduate Studies, MUSC</td>
<td>Room 121 1:00-2:00pm</td>
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<tr>
<td>Tuesday, August 3, 2010</td>
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<tr>
<td>Week 9 (Rehearsals)</td>
<td>Research Presentation Rehearsals and Evaluations</td>
<td>All Research Students Dr. Marvella Ford, HCC Ms. Melanie Sweat, Program Coordinator</td>
<td>Room 121 1:00-2:00pm</td>
</tr>
<tr>
<td>Thursday, August 5, 2010</td>
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<tr>
<td>Week 10 (Rehearsals and Evaluations)</td>
<td>Research Presentation Rehearsals and Evaluations</td>
<td>All Research Students Marvella Ford, Ph.D Melanie S. Jefferson</td>
<td>TBD</td>
</tr>
</tbody>
</table>
(c) **Sponsor the Student Fellows’ Participation in a Graduate Record Examination (GRE) course**

(Year 1, months 6-8; Year 2, months 6-8; Year 3, months 6-8)

All four Student Fellows took the 8-week Kaplan GRE Test Preparation Course. The 2010 course schedule description is detailed below in Table 4.

<table>
<thead>
<tr>
<th>Table 4. 2010 KAPLAN COURSE SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SESSION</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Session 1: Diagnostic Exam &amp; Orientation</td>
</tr>
<tr>
<td>Session 2: Intro to Math Strategies</td>
</tr>
<tr>
<td>Session 3: Strategic Short Verbal</td>
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<tr>
<td>Session 4: Arithmetic &amp; Number Properties</td>
</tr>
<tr>
<td>Session 5: Reading I &amp; Issue Essays</td>
</tr>
<tr>
<td>Session 6: Algebra &amp; Data Interpretation</td>
</tr>
<tr>
<td>Session 7: Vocab &amp; Short Verbal</td>
</tr>
<tr>
<td>Session 8: Proportions &amp; Geometry</td>
</tr>
<tr>
<td>Session 9: Reading II &amp; Argument Essays</td>
</tr>
</tbody>
</table>

**Task 2 Deliverables:** In the summer of 2010, we provided state-of-the-art comprehensive prostate cancer research education and training opportunities for four students from two of South Carolina’s HBCUs. We will develop a cadre of scientists who are well-prepared to play a significant role in discovering and testing new prostate cancer biomarkers. These investigators will conduct research spanning the continuum from basic science to clinical science to population-based research.

**Task 3. Prepare Tangible Scientific Products**

(a) **Prepare and present scientific abstracts based on the Student Fellows’ prostate cancer research**

(Year 1, months 10-12, Year 2, months 1-12, Year 3, months 1-12)

(b) **Prepare manuscripts that will be submitted to peer-reviewed journals** (Year 1, months 10-12, Year 2, months 1-12, Year 3, months 1-12)

Each Student Fellow prepared a scientific research paper that will form the basis of a peer-reviewed publication. Their papers are included in Appendix D. Each Student Fellows’ PowerPoint presentations are included in Appendix E. The Student Fellows are completing manuscripts with their research mentors. Currently, Ms. Co-Danielle Green, a 2009 Student Fellow, has a recent 2011 peer-reviewed publication stemming from her summer research project, and another manuscript has been submitted for peer-review that includes two additional Student Fellows as co-authors. Ms. Green’s publication citation is featured below.

Each Student Fellow gave a scientific presentation based on the results of his or her work. In addition, one Student Fellow, Ebonie Fuller, was selected to give an oral presentation of her summer research project during MUSC’s Annual Perry V. Halushka MUSC Student Research Day on November 5, 2010. All four Student Fellows had abstracts accepted for poster presentation at the DOD-sponsored Innovative Minds in Prostate Cancer Today (IMPaCT) Conference (plus an additional two Student Fellows from the Summer of 2009). An abstract describing the overall program was also accepted for poster presentation at the conference. Appendix F includes the posters that were presented by the Student Fellows and the Program Director and Associate Directors during the IMPaCT Conference. Appendix G describes the scientific accomplishments of the Student Fellows to date.
Deliverables: Four scientific papers were prepared by the Student Fellows. A cumulative total of nine scientific presentations were given by the four Student Fellows.

REFERENCE


Task 4. Evaluate the Training Program

(a) Assess the number of applicants to the Training Program (Year 1, months 1-4, year 2, months 1-4, Year 3, months 1-4)

As planned, four Student Fellows enrolled in the Training Program in the summer of 2010.

(b) Assess the number of Student Fellows who apply to graduate school (Year 2, months 1-12, Year 3, months 1-12)

All four Student Fellows are currently juniors at their perspective institutions, and reported that they have not yet taken the GRE, but plan to take it in their senior year of college.

(c) Assess the number of Student Fellows who are admitted to graduate school (Year 2, months 1-12, Year 3, months 1-12) and (d) Assess the number of graduate schools to which Student Fellows are admitted (Year 2, months 1-12, Year 3, months 1-12)

The Student Fellows have not yet applied to graduate schools. They report that they anticipate applying to graduate programs in their senior year of college.

(e) Identify the number of scientific abstracts presented and peer-reviewed publications that result (Year 1, months 10-12, Year 2, months 1-12, Year 3, months 1-12)

Each Student Fellow gave a scientific presentation during the SURP. In addition, the Student Fellows were invited for poster presentation based on their submitted abstracts to the Innovative Minds in Prostate Cancer Research Today (IMPaCT) conference that took place in Orlando, FL on March 9-12, 2011.

Deliverables: The four Student Fellows who participated in the Training Program in the summer of 2010, all of whom are juniors in college, have stated that they have not applied to or been accepted in a graduate program thus far. All of the Student Fellows reported that they will apply to graduate programs in their senior year of college. Each Student Fellow gave a scientific presentation and submitted a scientific paper as part of the SURP. All of the Student Fellows gave poster presentations at the IMPaCT conference in March 2011.

We also asked the Student Fellows to evaluate the Training Program. The results are presented in Table 5. It is important to note that all of the Student Fellows rated the program favorably. A summary of the analyses is bulleted below.

- 100% (n=4) Agreed/Strongly Agreed that the summer program was a good research experience
- 100% (n=4) Strongly Agreed that the summer program helped them learn the fundamentals of prostate cancer and research
- 100% (n=4) Agreed/Strongly Agreed that the prostate cancer curriculum was interesting and convenient for learning
- 100% (n=4) Strongly Agreed that they would recommend this program to other students at their college/university

<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Overall, the summer program was a good research experience.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2. The summer program helped me learn the fundamentals of prostate cancer and research.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3. The KAPLAN Graduate Record Examination (GRE) Course was effective in helping me to learn GRE test preparation strategies.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4. The seminar schedule was convenient.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>5. The seminar topics were of interest to me.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>6. Participating in the program helped to strengthen my desire for a career in cancer research.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>7. The Program Director (Dr. Ford) was accessible and assisted me when needed.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>8. The Program Coordinator (Ms. Sweat) was accessible and assisted me when needed.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>9. My research mentor was accessible and assisted me when needed.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>10. I would recommend this program to other students at my college/university.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
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</table>
REPORTABLE OUTCOMES

Student Summer Research Summaries
Each Student Fellow prepared a research paper and gave a scientific presentation to their peers, mentors and other faculty on August 6, 2010 at MUSC. The manuscripts developed by the Student Fellows are included in Appendix D and the scientific presentations are included in Appendix E.

<table>
<thead>
<tr>
<th>Student’s Name</th>
<th>Institution</th>
<th>Research Title</th>
<th>Research Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jonathan Brown</td>
<td>Claflin University</td>
<td>NOV-002 Induces S-Glutathionylation of Serpin A1 and A3 in Human Plasma</td>
<td>The objective of the experiment was to identify the S-glutathionylation patterns of serpins in plasma from cancer patients via Western blot analysis. The results concluded that cancer patients have different Serpin A1 and A3 glutathionylation amounts after receiving the NOV-002 treatment. Therefore proving that S-glutathionylation of serpins occur after receiving the chemotherapeutic or drug, NOV-002.</td>
</tr>
<tr>
<td>Scharan Clarke</td>
<td>Claflin University</td>
<td>What Factors Can Predict the Success of Sacroneuromodulation When Used in Patients with Urinary Retention</td>
<td>The objective of this study was to determine if any preoperative factors could help predict better clinical outcomes in the setting of urinary retention. Performed a retrospective chart review from 2000 to 2010 of procedures performed by three dedicated voiding dysfunction specialist. The preoperative and intraoperative factors evaluated do not appear to give us significant prognostic data.</td>
</tr>
<tr>
<td>DeAngelo Dinkins</td>
<td>SC State University</td>
<td>Redox Protein Expression and Susceptibility to Therapeutic Intervention in Arcap Prostate Cancer Cells</td>
<td>Thioredoxin is a redox-regulating protein that plays a central role in regulating cellular redox and preventing cell death. It was hypothesized that increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype.</td>
</tr>
<tr>
<td>Ebonie Fuller</td>
<td>SC State University</td>
<td>Evaluating an Intervention to Improve Perceptions of Cancer Clinical Trials among Racially Diverse Communities in South Carolina</td>
<td>The objective of the study was to conduct a cancer clinical trials education intervention with racially diverse groups in South Carolina. The intervention consisted of a 30-minute cancer clinical trial educational presentation. Providing cancer clinical trials information to racial and ethnic minorities led to more positive perceptions of cancer clinical trials. It was concluded that ARCaPm cells do have an increased expression of redox proteins. Therefore they are more resistant to cancer treatments.</td>
</tr>
</tbody>
</table>
Student Summer Research Manuscript Abstracts
Importantly, as noted, all 4 Student Fellows from 2010 plus an additional 2 Student Fellows from the Summer of 2009 submitted abstracts for presentation consideration during DOD-sponsored Innovative Minds in Prostate Cancer Today (IMPaCT) Conference in March 2011. All of the abstracts were accepted for poster presentation. An abstract describing the overall research training program was also accepted for poster presentation at the IMPaCT Conference. Each abstract is listed below. Communications between all institutional directors, faculty advisors, and research mentors took place to assist the students with the development of their poster presentations. All institutional directors (Drs. Ford, Bullard-Dillard Salley, and Davis) participated in the IMPaCT Conference.

Jonathan Brown
Claflin University

ABSTRACT

NOV-002 Induces S-Glutathionylation of Serpin A1 and A3 in Human Plasma

Introduction: Serine protease inhibitors (serpins) make up about 2% of the total protein in human serum. Serpins have been found to undergo post-translational modification, S-glutathionylation, in patients treated with redox chemotherapeutics. S-glutathionylation is the specific posttranslational modification of protein cysteine residues by the addition of glutathione. S-glutathionylation alters the functionality of enzymes, receptors, structural proteins, transcription factors, and transport proteins.

Methods: The methods evaluated the effects of the redox chemotherapeutics on the S-glutathionylation of serpins. NOV-002, is the redox chemotherapeutics utilized to cause serpin A1 and A3 to glutathionylate in treated serum. After receiving the redox chemotherapeutics, glutathionylated Serpin A1 and A3 were used to analyze myeloproliferative events. Protein electrophoresis and Western blot analysis were utilized to test glutathionylation. Glutathionylation of serpin A1 and A3 proteins was measured before and after the addition of the drug NOV-002 to serum samples of cancer patients.

Results: According to the Western blot analyses, the glutathionylation patterns in both blots illustrated that glutathionylation was increased in the plasma samples that were treated with NOV-002. On the contrary, the plasma samples that were not treated with NOV-002 had less glutathionylation patterns compared to those that were treated with the drug. This Western blot that was done on the serpin group, Serpin A1 illustrated that Serpin A1 were found in all of the eight plasma samples taken from cancer patients and were S-glutathionylated.

Conclusion: The results revealed that cancer patients have different Serpin A1 and A3 glutathionylation amounts after receiving the NOV-002 treatment. This supports our hypothesis that S-glutathionylation of serpins occur after receiving the chemotherapeutic or drug, NOV-002.

Impact: The results of this study could lead to improved hematopoietic cell mobilization in bone marrow cells, which could lead to significant increases in white blood cell counts in cancer patients. Currently, many cancer patients experience low white blood cell counts following receipt of chemotherapy.
ABSTRACT

What Factors Can Predict the Success of Sacroneuromodulation When Used in Patients with Urinary Retention?

Introduction: Urinary retention issues are a side effect of some types of prostate cancer treatment. Sacroneuromodulation has been used for both detrusor over-activity and urinary retention. The exact mechanism of action is not known for this therapy. We sought to determine pre-operative factors that could predict good clinical outcomes in the setting of urinary retention.

Methods: We performed a retrospective chart review of procedures performed by three dedicated voiding dysfunction specialists from years 2000-2010. Characteristics evaluated included patient’s age, previous surgeries, neurologic diagnosis, length of retention, invasive and noninvasive urodynamic data. Operative data collected included presence of bellows response, sacral foramen used, number of leads, number of electrodes generating a response, side of lead, and complications. Postoperative data included subjective and objective improvement, progression to IPG implantation, wound infection, complications and need for revision.

Results: We identified 54 patients who underwent 73 sacroneuromodulation lead placements as treatment for urinary retention. Seventeen of the 54 patients were males and 35 were females. Their mean age was 50 years. Twenty-seven patients had data on length of retention with a mean of 34 months. Twenty-four patients had undergone previous surgery and 18 were on medical management. All patients underwent urodynamic testing and demonstrated little or no detrusor contraction low flows and elevated post void residuals (PVR). Mean detrusor pressure was 12.5 cm H2O, mean flow rate was 4 cc/sec and mean PVR was 593 cc. Only 3 patients presented with a neurologic diagnosis. All 73 lead placements demonstrated a good bellows response. Thirty-six leads were placed in the left and 36 on the right; one was not recorded. Bilateral stimulation was tested in 67 patients. A mean of 2.4 electrodes generated a response after lead implantation. Subjective improvement was noted after 48 lead placements and 47 went on to implantable pulse generators (IPG). Twenty six lead placement procedures did not go on to IPG. When comparing the procedures that failed to go on to IPG versus those that did we found few differences. The mean age was higher in the failure group 55 vs. 43 years. Mean PVR was also found be higher in the failure group 613 cc versus 570 cc. No difference was noted in mean flow rate, max detrusor pressure, or number of stimulating electrodes.

Conclusions: The pre-operative and intra-operative factors we evaluated do not appear to give us significant prognostic data. The mechanism of action of sacroneuromodulation lead placements and the factors that may portend its success have yet to be fully defined.

Impact: This study described a potential solution to treating urinary voiding dysfunction, which is a side effect of prostate cancer treatment that has a significant negative impact on quality of life. Electrical impulses through neuromodulation have been theorized to help patients with urinary retention and urinary incontinence by restoring control of the detrusor and sphincter muscles. The findings from this study show that further clinical investigation into the mechanism of sacroneuromodulation lead placements is warranted.
DeAngelo Dinkins  
SC State University

ABSTRACT

Redox Protein Expression and Susceptibility to Therapeutic Intervention in ARCaP Prostate Cancer Cells

Background: Prostate cancer is the 2nd leading cancer in men after lung cancer. Thioredoxin is a redox-regulating protein that plays a central role in regulating cellular redox and preventing cell death in prostate cancer. There is a high expression of thioredoxin in prostate cancer cells because the tumor environment is usually under either oxidative or hypoxic stress and both stresses are known to be up-regulators of thioredoxin expression. Indolent disease can be treated fairly well and progresses slowly. However, the more aggressive form of prostate cancer spreads throughout the body and there are no curative treatments.

Hypothesis: We tested the hypothesis that increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype.

Methods: In our project we looked at the expression of redox proteins and susceptibility to chemotherapy in ARCaPe and ARCaPm cells. Using western blot methods and Image J we were able to quantify the expression of thioredoxins. Susceptibility to chemotherapy was tested in a viability assay.

Results: Western blot analysis indicated increased expression of the redox proteins such thioredoxin 1 and thioredoxin 2 in ARCaPm cells when compared to ARCaPe cells. Our results conclusively showed that Taxol killed both cell types, while Depsipeptide proved effective on ARCaPe cells and ineffective on the ARCaPm cells. We are currently determining the effect of combination therapies.

Conclusions: In conclusion we found that ARCaPm cells do have an increased expression of redox proteins. Therefore they are more resistant to cancer treatments, such as depsipeptide.

Impact: The results lend evidence for possible combination therapies to effectively treat aggressive prostate cancer phenotypes. Thus, the study results could potentially lead to improved clinical treatment for aggressive prostate cancer, which currently has extremely poor prognostic outcomes.
ABSTRACT

Evaluating an Intervention to Improve Perceptions of Cancer Clinical Trials among Racially Diverse Communities in South Carolina

Objective: To conduct a cancer clinical trials education intervention with racially diverse groups in South Carolina.

Methods: The study was conducted at ten different sites in eight counties in South Carolina. The intervention consisted of a 30-minute cancer clinical trial educational presentation. Participants were recruited primarily by community partners. Pre- and post-intervention surveys were administered. The survey instrument included seven items. Sample items included the following: “Do you think that patients should be asked to take part in medical research?” and “Would you be prepared to take part in a study where treatment was chosen at random?” Analyses were completed using SPSS 16.0, SAS 9.1.3, and R v2.6.1.

Results: The study sample consisted of 195 predominantly African American participants (n=195). One hundred and ninety participants reported their age and most were 50+ years (57.4%). Among those who reported income (n=182), 66.6% had an annual household income < $60,000. For each of the seven survey items assessing perceptions of cancer clinical trials, respectively, 9%, 24%, 38%, 20%, 18%, 14% and 13% of the participants changed to more favorable responses on the post-test vs. pre-test (p<0.001).

Conclusions: Providing cancer clinical trials information to racial and ethnic minorities led to more positive perceptions of cancer clinical trials. Future research studies could incorporate a longer follow-up period to assess the behavioral impact of the intervention and whether short-term gains are sustained over time.

Impact: Despite their higher incidence and mortality of cancer relative to their European American counterparts, African Americans are not well represented in cancer clinical trials. The intervention that we tested led to more favorable perceptions of clinical trials in a predominantly underrepresented population. Future studies could evaluate whether the significant and positive changes in perceptions of clinical trials translate into higher rates of clinical trials enrollment.
ABSTRACT

Enhancing Gene Delivery to Cancer Cells

Background: Adenoviral delivery to cancerous cells has potential as a new therapy but is also problematic. Many cancer cells lack coxsackie and adenovirus receptor (CAR) which serves as the transduction factor for an adenovirus to enter a cell. HDACi and polymers have been proven to enhance the transduction of an adenovirus.

Objective: This study involved the investigation of a cell line of prostate cancer cells that infects poorly and to test if HDACi or the polymer EGDE-3,3’ will increase the infectivity of the cell line.

Methods: Infectivity and transgene expression was measured by using flow cytometry following exposure to an adenovirus that expresses green fluorescent proteins. From this, the percentage of cells that were GFP positive were calculated. GFP intensity was determined from this as well.

Results: The results indicated that HDACi increased infectivity in the prostate cancer cells more than 5-fold at MOI’s below 10. However EDGE-3, 3’ did not increase infectivity.

Conclusions: EDGE-3, 3’ did not work as well as it did in a previous study using bladder cancer cells. However, there was an increase when HDACi were used along with AdGFP. There was also a notable increase of infectivity in the cells that were treated with AdGFP and depsipeptide. Therefore, HDACi may have been more suitable for enhancing adenoviral transgene expression in prostate cancer cells.

Impact: Adenoviruses have the potential to be genetically modified and used in gene therapy to treat diseases such as prostate cancer. Favorable outcomes were seen when HDACi were in conjunction with AdGFP. Further studies are needed to test the effectiveness of this treatment.
ABSTRACT

Role of ABCA2 in Prostate Tumor Progression

Background: Prostate cancer is responsible for an estimated 33% of all newly diagnosed cancers in men. Unfortunately, prostate cancer tumors do not always respond to chemotherapy treatment. Therefore, determining what causes the tumors to become resistant is important to efficiently treat the cancer.

Objective: This study involved determining the role of ABCA2 expression and its association with resistance to chemotherapy and multi-drugs. Therefore the study aimed to determine whether ABCA2 is correlated with tumor progression and to determine whether ABCA2 has an effect on the grade of prostate tumors and instances of metastasis.

Methods: To examine the objectives, a knockout line was created using the Transgenic Adenocarcinoma of Mouse Prostate (TRAMP) model and compared to wild types by various methods including: Western Blotting Analysis, PCR, MRI imaging, Vimentin and Desmin analyses, Scratch Assays, and Transient Transfections.

Results: The ABCA2 expression of Vimentin was found to be elevated in TRAMP prostatic epithelia when viewing the sample slides. In the dorsal prostate, ABCA2 expression in dorsal prostate was also elevated in TRAMP compared to WT mice; expression increases over time/progression. Increased oxidative stress markers were in KO TRAMP tissue. Proliferation of prostatic & SV lesions was similar in WT and KO TRAMP tissues. There was a slight elevation of ROS/RNS-induced DNA damage in KO TRAMP prostate epithelia and elevated ROS/RNS-induced 4-hydroxynonenal modified proteins. Seminal vesicle volume was greater in KO TRAMP mice at 20 weeks. Furthermore, normal stroma of KO TRAMP mice had elevated vimentin expression. No change occurred in the expression of desmin, a myocytic marker of stromal cells.

Conclusions: Although prostate tumor progression was similar in both lines, the instances of metastasis were elevated in the knock out mice.

Impact: The study results related to the role of ABCA2 in prostate cancer tumor or progression could potentially lead to clinical improvements in treatment to overcome multi-drug resistance and tumor relapse. Future studies could expand this investigation.
Marvella E. Ford, Ph.D. (Medical University of South Carolina)
Rebecca Bullard-Dillard, Ph.D. (Claflin University)
Judith D. Salley, Ph.D. (SC State University)
Leroy Davis, Ph.D. (Voorhees College)

ABSTRACT

Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program

Background: There is a critical need to increase the number of racially and ethnically diverse prostate cancer researchers. The purpose of this 3-year project is to develop a prostate cancer research training program at the Medical University of South Carolina (MUSC) with 12 students from the following three Historically Black Colleges and Universities (HBCUs) in South Carolina: Claflin University, South Carolina State University (SCSU), and Voorhees College. Students from the three HBCUs (defined as “Student Fellows”) will participate in research internships in the laboratories/research units of senior prostate cancer research scientists at MUSC.

Specific Aims: Aim 1.) To provide training in the basics of research design and methods to four Student Fellows each year through participation in the MUSC Summer Undergraduate Research Program (SURP); Aim 2.) To immerse four Student Fellows each year in a prostate cancer research training curriculum.

Results: In 2009-2010, eight Student Fellows were identified, recruited to participate and admitted to the DOD Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program. The Student Fellows were matched with Research Mentors at MUSC, with whom they conducted research in the summers of 2009 and 2010. Each Student Fellow prepared a scientific paper and gave a scientific presentation at the end of the Training Program. Each Student Fellow also completed an 8-week Graduate Record Examination Test Preparation Course at a local Kaplan Center. In addition, a total of 73 students from the three HBCUs attended the Ernest E. Just Symposium at MUSC in February of 2010. The symposium is used as a platform to recruit racially and ethnically diverse students to MUSC.

Conclusions: In the summers of 2009-2010, we provided state-of-the art comprehensive prostate cancer research education and training opportunities for eight Student Fellows from HBCUs in South Carolina. Each Student Fellow prepared a scientific paper and gave a scientific presentation.

Impact Statement: Through this funding mechanism, we are developing a cadre of scientists who are well-prepared to conduct research spanning the continuum from basic science to clinical science to population-based research.
CONCLUSIONS

During the second year of the DOD Collaborative Undergraduate HBCU Summer Prostate Cancer Training Program, the tasks outlined in the Statement of Work were met successfully. Two Student Fellows were recruited from Claflin University and two Student Fellows were recruited from SC State University. Each Student Fellow conducted research and prepared a research paper that was presented at the conclusion of the program. The Student Fellows also presented their work at the national Department of Defense-sponsored IMPaCT meeting. The recruitment process for the 2011 Student Fellows is ongoing.

Two additional students from Voorhees College participated in the DOD Collaborative Undergraduate HBCU Summer Prostate Cancer Training Program using funds leveraged from another DOD grant that was funded in 2010 (DOD Grant Number W81XWH-10-2-0057, Southeastern Virtual Institute for Health Equity and Wellness). The DOD SE VIEW grant will provide funding for only two additional students per year. The following table lists each student’s name, college, and research summary.

<table>
<thead>
<tr>
<th>Student’s Name</th>
<th>MUSC Research Mentor</th>
<th>Research Title</th>
<th>Research Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edward McMorris</td>
<td>Dr. James Norris</td>
<td>Acid Ceramidase Overexpression Causes Activation of and Addiction to AKT Signaling in Prostate Cancer</td>
<td>Previous studies have demonstrated the role of the ceramide metabolizing enzyme acid ceramidase in promoting an aggressive cancer phenotype in prostate cancer cell lines. In addition, it has been found that greater than 80% of prostate tumors overexpress acid ceramidase, suggesting that acid ceramidase may be an important mediator of development and progression of prostate cancer. In this study, we demonstrate that the increased rate of proliferation in acid ceramidase overexpressing cells is dependent on signaling through the oncogenic PI3K/Akt pathway. In addition, we found that acid ceramidase overexpressing cells are more sensitive to Akt inhibition than control cells, suggesting that acid ceramidase overexpressing tumors are addicted to Akt signaling. These findings highlight the importance of investigating the Akt pathway as a potential therapeutic target in acid ceramidase overexpressing tumors.</td>
</tr>
<tr>
<td>Student’s Name</td>
<td>MUSC Research Mentor</td>
<td>Research Title</td>
<td>Research Summary</td>
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<tr>
<td>Janielle Samuel</td>
<td>Dr. Danyelle Townsend</td>
<td>Protein Glutathionylation Levels In MCF7 Breast Cancer Cells Expressing Glutathione S-transferase Pi Isoforms</td>
<td>S-Glutathionylation is a redox-regulated posttranslational modification of protein cysteine residues by the addition of the tripeptide glutathione. It is promoted by oxidative and nitrosative stress. The disulfide bond between glutathione and a protein is reversible. S-Glutathionylation is similar to phosphorylation because it alters protein structure and function such as activation of protein enzyme activity. S-glutathionylation alters the function of enzymes, receptors and structural proteins. S-glutathionylation if proteins are critical to cellular stress response but the characteristics of the forward reaction are not completely known. However, results have shown that GSTpi potentiates S-glutathionylation reactions. Glutathione S-transferase pi is a subgroup of GST family. The GSTpi gene is polymorphic gene encoding active, functionally different GSTpi proteins which provides cellular protection against free radical and carcinogenic compounds. The first reported example of kinase regulation by a GST was in the inhibition of c-Jun aminoterminal kinase (JNK) by a pi class. JNK a stress activated kinase, has been implicated in pro-apoptotic signaling and my mediate the cytotoxicity of a variety of chemotherapeutic agents. We discovered that MCF7 breast cancer cells expressing GST pi isoforms exhibit different glutathionylation levels in response to nitrosative stress. Future research is needed to further elucidate these relationships.</td>
</tr>
</tbody>
</table>
APPENDICES
8:00-9:00 am  Registration and Breakfast-BSB 100 entrance to Auditorium

9:00-9:10 am  Opening: Mark S. Sothmann, Ph.D., Interim Vice President for Academic Affairs and Provost MUSC
Steven Lanier, Ph.D., Associate Provost for Research; Professor of Pharmacology, MUSC
Greetings: Dr. Sabra Slaughter; Chief of Staff, Office of the President MUSC

9:10-9:40 am  History
    Title: "Ernest Everett Just/ History and Retrospective, Philosophical Analysis of the birth of Omega Psi Phi Fraternity, Inc."
    Charles A. Christopher, MD
    Surgeon General for Omega Psi Phi Fraternity, Inc.
    Retired Contract physician
    Austin, Texas

9:40-10:10 am  Title: None Shall Perish
    Kelly M. Mack, Ph.D.
    Program Director, ADVANCE
    National Science Foundation
    Arlington, Virginia

10:10-10:30 am  Break

10:30-11:15 am  Just Symposium Key Note
    Title: Human Defibrillation: History & Evolution
    Dr. Levi Watkins, MD
    Professor of Cardiac Surgery, Associate Dean, School of Medicine
    The Johns Hopkins Hospital
    Baltimore MD
11:20-11:35 am  Title: TBA
Student Presenters

BREAKOUT SESSIONS (middle and high school students from Baltimore, MD-room 402)

Dr. Clifton Poodry, Ph.D; Director, Division of Minorities in Research; National Institute of General Medical Sciences; National Institutes of Health
Campus tour for visiting students, Undergraduate Advisors meet with MUSC College Admissions Officers

11:35 - 12:20 pm  BREAKOUT SESSIONS (middle and high school students from Baltimore, MD-room 402)

12:25-12:55 pm LUNCH

1:05-2:00 pm  Title: Epithelial plasticity and the origin of fibroblasts
Eric Neilson, MD
Thomas Fearn Frist, Sr Professor in Medicine
Professor of Cell and Developmental Biology
Vanderbilt University School of Medicine
Nashville, TN

2:05-3:00 pm  Title: Respecification of cell type using transcription factors
Jonathan Slack, Ph.D.
Professor and Director Stem Cell Institute
University of Minnesota
St. Paul Minnesota

3:05-4:00 pm  Title: Periostin in fibrillogenesis for tissue regeneration
Akira Kudo, Ph.D.
Professor
Department of Biological Information
Tokyo Institute of Technology
Yokohama Japan
**APPENDIX B**  
**MUSC SURP SCHEDULE FOR 2010**

Summer Undergraduate Research Program Lecture Series

**Summer 2010**  
**Location: BSB 302, 8:30-9:30 AM**

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Lecturer</th>
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<tbody>
<tr>
<td>June 8</td>
<td>What is Translational Research?</td>
<td>Dr. Kathleen T. Brady</td>
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<td>M.D., Ph.D.</td>
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<tr>
<td>June 9</td>
<td>The Development of a New Treatment and Diagnostic Test for Bladder Cancer: From Bench to Bedside</td>
<td>Dr. Perry Halushka, PhD, MD</td>
</tr>
<tr>
<td>June 10</td>
<td>Human Subject Research / Examples of Translational Research</td>
<td>Dr. Susan C. Sonne, PharmD./ Royce Sampson, MSN, RN</td>
</tr>
<tr>
<td>June 11</td>
<td>Treatment of Cocaine Addiction: From Bench to Bedside</td>
<td>Khaled Moussawi, MD/PhD Student</td>
</tr>
<tr>
<td>June 14</td>
<td>Hepatic Steatosis in a Growing World: The Impact on Transplantation</td>
<td>Dr. Kenneth Chavin, MD, PhD</td>
</tr>
<tr>
<td>June 15</td>
<td>MANDATORY: Public Perceptions of Scientific Research — Questionable Research Practices (“And the Band Played On” video and discussion)</td>
<td>Dr. Ed Krug, PhD</td>
</tr>
<tr>
<td>June 16</td>
<td>MANDATORY: Moral Reasoning in Ethical Dilemmas (lecture and case study discussion)</td>
<td>Dr. Ed Krug, PhD</td>
</tr>
<tr>
<td>June 16</td>
<td>Responsible Lab Citizenship</td>
<td>Dr. Ed Krug, PhD</td>
</tr>
<tr>
<td>June 16</td>
<td>(C) Cancer Cell Cycle (lunch meeting location TBA)</td>
<td>Dr. Cynthia Wright, PhD</td>
</tr>
<tr>
<td>June 17</td>
<td>MANDATORY: Data Management/Data Manipulation (lecture and case study discussion)</td>
<td>Dr. Ed Krug, PhD</td>
</tr>
<tr>
<td>June 17</td>
<td>Authorship and Plagiarism (lecture and case study discussion)</td>
<td>Dr. Ed Krug, PhD</td>
</tr>
<tr>
<td>June 18</td>
<td>MANDATORY: Animal Use in Research (lecture &amp; discussion)</td>
<td>Dr. Alison Smith, PhD</td>
</tr>
<tr>
<td>June 18</td>
<td>Research Misconduct/Whistleblower Protections (lecture and literature discussion)</td>
<td>Dr. Ed Krug, PhD</td>
</tr>
<tr>
<td>June 18</td>
<td>Closing Comments/Exit Evaluation</td>
<td></td>
</tr>
</tbody>
</table>

Outside Assignment: Complete the University of Montana On-Line RCR training (link below) by June 14th - you must score a minimum of 70% on all quizzes. Bring paper copies of quiz completion with you to the RCR Lectures starting on June 15th.

(http://ori.dhhs.gov/education/products/montana_round1/research_ethics.html)

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Lecturer</th>
</tr>
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<tbody>
<tr>
<td>June 21</td>
<td>Lipidomics</td>
<td>Dr. Maurizio Del Poeta, MD</td>
</tr>
<tr>
<td>June 22</td>
<td>Stem Cells</td>
<td>Dr. Amanda LaRue, PhD</td>
</tr>
<tr>
<td>June 23</td>
<td>Cell Biology – Tissue Ultrastructure</td>
<td>Dr. Debra Hazen-Martin, PhD</td>
</tr>
<tr>
<td>June 23</td>
<td>(M) Introduction to Oceans and Human Health (8:30-9:30) Climate Change Game – Mitigation Strategies (9:30-10:30)</td>
<td>Jillian Lynch, Dr. Kristin Hardy, PhD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Mackenzie Zippay, PhD</td>
</tr>
</tbody>
</table>
June 24  Developmental Biology  Dr. Michael Kern, PhD
June 24  Harmful Algal Blooms (HABs) and Their Impact on Human Health (8:30-9:30am)  Peter Feltman
Discussion  (9:30-10:30am)  Dr. Fran Van Dolah, PhD
June 25  Proteomics Technology  Dr. Lauren Ball, PhD
June 28  The Heart  Dr. Perry Halushka, PhD, MD
June 29  Confocal/Multiphoton Microscopy of Living Cells and Tissues  Dr. John Lemasters, MD, PhD
June 30  Microarray Analysis  Dr. Jeremy Barth, PhD
June 30  Algal Biofuels (9:30-10:30am)  David Kurtz, PhD
Discussion  (10:30-11:30am)  Steven Kubalak, PhD
July 1  Recombinant DNA  Dr. Rupak Mukherjee, PhD
July 2  Transcription  Dr. Roger Newman, PhD
July 5  Epidemiology and Human Health (8:30-9:30am)  Ramsey Unal, PhD
July 6  Pre-term Birth and the Environmental Connection Part I (12:00-1:30pm)  Dr. Mark Kindy, PhD
July 7  Cytogenetics  Dr. Masahiro Kono, PhD
July 7  Links Between Alzheimer’s Disease and the Marine Environment (8:30-9:30am)  Dr. Daynna Wolff, PhD
July 8  Retinoids & Vision  Dr. Mark Kindy, PhD
July 8  Marine Mammal Surfactants and Their Role in Pre-Term Birth Defects (8:30-9:30am)  Dr. John Baatz, PhD
Visit Premature Infant Clinic (9:30-11:30am)
July 9  G Proteins  Dr. John Hildebrandt, PhD
July 9  Causes and Consequences of Disease in Marine Species (MSS) (8:30-9:30am)  Leslie Burdett
Discussion  (9:30-10:30am)  Dr. Mackenzie Zippay, PhD
July 12  Arterial Pressure Control & High Blood Pressure  Dr. Perry Halushka, PhD, MD
July 12  Oceans and Human Health Part II (8:30-9:30am)  Jillian Lynch
Discussion  (9:30-10:30am)  Dr. Kris Hardy
How to make a poster (12:00-1:00pm)  Dr. Mackenzie Zippay, PhD
July 13  Dementia  Dr. Mark Kindy, PhD
July 13  Ecotoxicology: A Survey of Marine Contaminants and the Consequences (8:30-9:30am)  Dr. Geoff Scott, PhD
Discussion: Contaminants of Emerging Concern (9:30-10:30am)  Krystal Ludwig
July 14  ADD/ADHD  Dr. Tom Hulse, PhD
July 14  Marine Natural Pharmaceutical Products (8:30-9:30am)  Dr. Peter Moeller, PhD
Discussion  (9:30-10:30am)  Matt Bertin
July 15  Kinds of Cancer  Dr. Robert Gemmill, PhD
July 15  Natural Products in the Clinic (8:30-9:30am)  Dr. Mike Wargovich
Discussion  (9:30-10:30am)  Dina Brown
July 16  The Global Context of OHH (8:30-9:30am)  Dr. Juli Trtanj
NOAA Structure & Opportunities (9:30-10:30am) MBES Student Research Day (12:00-4:00pm)
<table>
<thead>
<tr>
<th>Date</th>
<th>Session</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 19</td>
<td>(N) Addiction &amp; Alcohol</td>
<td>Dr. Scott Stewart, MD</td>
</tr>
<tr>
<td>July 20</td>
<td>Receptors</td>
<td>Dr. Steven Rosenzweig, PhD</td>
</tr>
<tr>
<td>July 20</td>
<td>(M) Powerpoint Presentation Workshop</td>
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<tr>
<td>July 20</td>
<td>(M) Alternative Careers in Science (12-1pm)</td>
<td>Dr. Craig Plante, PhD</td>
</tr>
<tr>
<td>July 21</td>
<td>(C) Herbals &amp; Cancer</td>
<td>Dr. Michael Wargovich, PhD,FACN</td>
</tr>
<tr>
<td>July 22</td>
<td>(N) Neuroimaging lab demonstration</td>
<td>Dr. Mark George, MD</td>
</tr>
<tr>
<td>July 23</td>
<td>(C) Epidemiology of Cancer</td>
<td>Dr. Kristin Wallace, PhD</td>
</tr>
<tr>
<td>July 26</td>
<td>(M) Ecology of Human Pathogens in Coastal and Other Natural Waters (8:30-9:30am)</td>
<td>Dr. Erin Lipp, PhD</td>
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<td></td>
<td>Discussion: Pathogens in the Marine Environment – A Public Health Perspective (9:30-10:30am)</td>
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<tr>
<td>July 26</td>
<td>(H) Atherosclerosis</td>
<td>Dr. Samar Hammad, PhD</td>
</tr>
<tr>
<td>July 27</td>
<td>(C) Cancer Chemotherapy</td>
<td>Dr. David Kurtz, PhD</td>
</tr>
<tr>
<td>July 27</td>
<td>(M) Marine Science Media and Communication (12-1pm)</td>
<td>Dr. Carolyn Sotka, PhD</td>
</tr>
<tr>
<td>July 28</td>
<td>(N) Neuroimaging</td>
<td>Dr. Mark George, MD</td>
</tr>
<tr>
<td>July 29</td>
<td>(H) Kidney</td>
<td>Dr. Ed Soltis, PhD</td>
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<tr>
<td>July 30</td>
<td>(H) Imaging the Heart</td>
<td>Dr. Joseph Schoepf, MD</td>
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<tr>
<td>Aug 2</td>
<td>(N) Spinal Cord Injury</td>
<td>Dr. Narendra Banik, PhD</td>
</tr>
<tr>
<td>Aug 3</td>
<td>(N) Schizophrenia</td>
<td>Dr. Antonieta Lavin, PhD</td>
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<tr>
<td>Aug 4</td>
<td>(C) Pathology Museum</td>
<td>TBA</td>
</tr>
<tr>
<td>Aug 5</td>
<td>H) Aspirin &amp; NSAIDS</td>
<td>Dr. Perry Halushka, PhD, MD</td>
</tr>
<tr>
<td>Aug 6</td>
<td>(N) Addiction &amp; Drugs</td>
<td>Dr. Kimber Price, PhD</td>
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<tr>
<td>Aug 9</td>
<td>Presentations (all day)</td>
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<tr>
<td>Aug 10</td>
<td>Presentations (all day)</td>
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<tr>
<td>Aug 11</td>
<td>Presentations (all day)</td>
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<tr>
<td>Aug 12</td>
<td>Presentations (if another day is needed)</td>
<td>students will finish up with mentors and the dean’s office</td>
</tr>
<tr>
<td>Aug 13</td>
<td>Final checks disbursed, all paperwork turned in, labs cleared out</td>
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</tbody>
</table>

**Note:** Lectures in Black are for all students.  
Lectures in Blue are for Cardiovascular track students. (7 lectures)  
Lectures in Red are for Cancer track students. (7 lectures)  
Lectures in Green are for Neuroscience track students. (9 lectures)  
Lectures in Orange are for Marine Biomedicine (Ocean & Human Health) track students. Location: The White House at Fort Johnson  
CTSA – (5 lectures)
APPENDIX C
Chronological Listing of PowerPoint Presentations by Lecturers

NOTE: Not all lecturers utilized a PowerPoint presentation. Instead, some lectures were conducted through roundtable discussion. Therefore, all lectures may not be presented in this appendix.
WELCOME!
DOD and RBC HBCU Collaborative Undergraduate Research Students

Principal Investigator:
MUSC: Marvella E. Ford, PhD

Co-Investigators:
SC State University: Judith D. Salley, PhD
Claflin University: Rebecca Bullard-Dillard, PhD
Voorhees College: Leroy Davis, PhD

Program Coordinator:
Melanie Sweat Jefferson, MPH

Hollings Cancer Center (HCC) Cancer Disparities Program, 5-Point Action Plan Objectives

1. Conduct cancer disparities activities with partners in South Carolina (SC)
2. Develop specific, targeted research interventions to reduce cancer disparities
3. Increase the number of investigators in SC who conduct cancer disparities research
4. Increase use of products and/or services provided by minority-owned businesses in SC
5. Provide training in cultural competence

Increasing the Number of Investigators in SC who Conduct Cancer Disparities Research

RBC Research Scholars Program
- Five year grant established by the Royal Bank of Canada (RBC) Insurance Company in 2007
- In partnership with Voorhees College
- Two RBC Research Scholars per year participate in MUSC’s 8-week Summer Undergraduate Research Program (SURP)

Increasing the Number of Investigators in SC who Conduct Cancer Disparities Research (continued)

Department of Defense HBCU Collaborative Undergraduate Student Summer Training Program
- Three-year grant focusing on prostate cancer disparities research
- In partnership with Historically Black Colleges/Universities (HBCUs)
  - Claflin University
  - SC State University
  - Voorhees College
- Scholarships are awarded to four students per year
- Students participate in the SURP and in a prostate cancer research curriculum

Research Outcomes

Each DOD Student Fellow developed a research paper and gave a scientific presentation for their summer research experience on August 6, 2010 at MUSC

Scharan Clarke, Claflin University
Title: Does the Preoperative Evaluation of Men with Bladder Obstruction Affect the Outcomes of Outlet Reduction Procedures?
Summary: Evaluate whether preoperative workup affects surgical outcomes in patients with symptomatic urinary obstruction. We retrospectively reviewed our series of 119 patients extracted randomly from 2004 to 2009. In our series more invasive preoperative evaluation did not lead to better clinical outcomes

CoDanielle Green, SC State University
Title: Role of ABCA2 in Prostate Tumor Progression
Summary: To determine if ABCA2 has a role in prostate tumor progression and metastatic phenotype in mouse (TRAMP/ABCA2 knockout) and cell (D8P2T and PC3 knockout) models. This was achieved by performing specific assays and analyses relating to the ABCA2 knockout models
Research Outcomes

Andrea Gibson, Claflin University

**Title:** Enhancing Gene Delivery To Cancer Cells

**Summary:** Testing HDACi and polymers to see if they will increase infectivity in prostate cancer cells with an adenovirus. The HDACi used are MS275 and depsipeptide and the polymer used is EDGE-3.3'. AdGFP is the adenovirus used in the treatment of cells

Research Outcomes

Samantha Jones, SC State University

**Title:** Isolation and *ex vivo* expansion of antigen-specific CD8+ T cells

**Summary:** T cell immunotherapy is a new approach for using the cells of the immune system to treat prostate cancer. The hypothesis was that CD8+ T cells that are specific for prostate antigens could easily be isolated and expanded from the blood of a female donor. We were successfully able to isolate CD8+ T cells and expand them after making them specific for prostate cancer

Research Outcomes

Celina Ridgeway, Voorhees College

**Title:** Evaluating A Cancer Education Program with Minority Populations in South Carolina

**Summary:** Lack of knowledge about cancer screening, prevention, early detection, and treatment likely contributes to the cancer disparities. A Train the Trainer educational intervention was used to enhance cancer knowledge in minority populations in South Carolina

Research Outcomes

Rashell Blake, Voorhees College

**Title:** Improving Perceptions of Cancer Clinical Trials among Minority Populations in South Carolina

**Summary:** Despite the higher incidence and mortality of cancer in African American population compared to the Caucasian population, African Americans are less likely than Caucasians to participate in cancer clinical trials. A Train the Trainer educational intervention was used to educate minority communities about cancer clinical trials, and increase positive perceptions of cancer clinical trials

Students Are Co-Authors on Peer-Reviewed Publications


Summer Activities

- Prostate Cancer Research Training Curriculum
- KAPLAN GRE Prep Course
- SURP Activities
- Final Research Project
QUESTIONS?
Vitamin D, Selenium and Chemoprevention of Prostate Cancer

Sebastiano Gattoni-Celli, M.D.
Department of Radiation Oncology
Medical University of South Carolina
Charleston VA Medical Center

UVB (290-315 nm)
Major Source: Sun
Minor Source: Dietary
Vitamin D3: Plants/supplements
Vitamin D2: Fish (cod liver oil), meat, fortified milk, egg yolk, butter
Parathyroid hormone
Calcium absorption (small intestine)
Urinary calcium reabsorption (kidney)
Bone mineralization

Vitamin D3 pathway in SKIN

Vitamin D3
- Formed by irradiation of ergocalciferol, found in plants
- Formed by some dietary sources and multivitamins
- Biologically inert
- Conversion (OH) in liver and kidneys produces active form
- D3 is less potent than D2

Types of Vitamin D

Vitamin D2
- Formed by action of ultraviolet light on vitamin D precursors in skin
- Present in certain nutrients
- Biologically inert
- Conversion (OH) in liver and kidneys produces active form

Metabolism of Vitamin D Under Conditions of Adequate Vitamin D Supply

Metabolism of Vitamin D Under Conditions of Low Vitamin D Supply

When vitamin D supplies are adequate, flow of 25(OH)D through other potential pathways, including its utilization by peripheral tissues for paracrine regulation, is no longer compromised.

The vessels represent metabolic compartments, stages in the metabolism of vitamin D. The height of the shaded portion of each vessel represents the relative concentration of each metabolite indicated in the figure.
A single initial MED dose of UVB radiation to a light-skinned individual will release approximately 20,000 IU vitamin D₃ into the circulation within 24 hrs.

However, if an individual has very dark skin the exposure time for a MED could increase by 10-fold.

**Vitamin D and Melanin**
- SLC24A5 is a gene that controls melanin production
- This gene underwent a mutation around 6000 years ago, apparently at the time that hunter-gatherers, fishers, and herders became farmers
- Until then, their diet supplied enough vitamin D
- When farming spread in the last 6000 years, Europeans lost their ability to make melanin because they needed more vitamin D
- Heavier clothing might have also played a role

**Childhood lack of vitamin D causes rickets**
- Normal childbirth would be impossible
- Contracted pelvis, in a case of osteomalacia (adult rickets)

**Vitamin D Status in Primates and Early Humans**
- Normal levels of vitamin D in early humans were due to full skin exposure to sunshine’s UV rays
- Today’s people take 1000 IU/day
- Should NEVER have been defined by Gaussian distribution.
- This is similar to defining “normal” estrogen levels by sampling a population of women whom are primarily postmenopausal.
Circulating 25(OH)D as a Function of Oral Vitamin D3 Intake

How toxic is vitamin D?

- The U.S. Nutrition Guidelines state that the lowest observed adverse effect level (LOAEL) for humans is 2,000 IU vitamin D/day.
- This statement is grossly in error and is an impediment to the health of humans.

However

- 1-hydroxylated vitamin D metabolites and analogues are extreme hypercalcemic agents!!!
- DO NOT CALL EVERYTHING VITAMIN D. 1,25(OH)2D IS A HORMONE!!!!!!!
- 1,25(OH)2D can be a deadly hypercalcemic agent.

"Vitamin D controls T cell antigen receptor signaling and activation of human T cells."
Rode von Essen et al. Nature Immunology 11:344-349, 2010
**RCT for Vitamin D3 Supplementation and Cancer**
- 1179 healthy women
- aged 66.7 ± 7.3
- four year trial
- 1032 finished (87.5%)
- baseline 25(OH)D: 71.8 nmol/L ± 20.3
- three treatment groups:
  - control
  - Ca (1400–1500 mg/d)
  - Ca plus D3 (1100 IU/d)

*Lappe et al. AJCN 2007

**Conclusions**
- Based on biomarkers of nutritional vitamin D status (PTH, BMD, intestinal calcium absorption, insulin sensitivity, beta cell function, and innate immune function), circulating levels of 25(OH)D <32 nmol/L should be considered deficient.
- A 400 IU DRI for vitamin D is irrelevant with respect to the adult population in general.
- Guidelines stating that the lowest observed adverse effect level for humans is 2,000 IU vitamin D/day are incorrect. In actuality, the AI for adults may be 2,000 IU/day and in some cases, such as pregnancy and lactation, higher.
- It is not unlikely that chronic nutritional vitamin D deficiency puts populations at risk for developing debilitating, long latency chronic diseases such as cancer and autoimmune disease.
- Vitamin D probably plays a crucial role in cancer prevention.
- The physician will have to become familiar with vitamin D, not simply as a dietary supplement. Active management of nutritional vitamin D status will become indispensable.

**Mechanisms of Action of Vitamin D**
- Vitamin D induces the expression of insulin growth factor binding protein-3 (IGFBP-3), which increases the levels of the cell-cycle inhibitor p21.
- Vitamin D represses the expression of COX-2, the key enzyme for the synthesis of prostaglandins, mediators of inflammation and thought to be important for cancer progression.
- Vitamin D decreases matrix metalloproteinases and cathepsin activities, while increasing the activities of their counterparts, tissue inhibitors of metalloproteinase-1 and cathepsin inhibitors.
- Vitamin D can do a lot of other things because it can affect the expression of 2000 human genes.

**Vitamin D and Prostate**
- Human prostate cells express the vitamin D receptor (VDR) and the androgen receptor (AR).
- Normal prostate cells also synthesize 1,25(OH)2 D3 (calcitriol), which remains sequestered in the gland.
- 1,25(OH)2 D3 can inhibit the proliferation of prostate cancer cells both in vitro and in vivo, through AR-dependent and AR-independent mechanisms.
- 1,25(OH)2 D3 enhances AR expression and there is clear evidence of cross-talk between VDR and AR.
- VDRs are present in regulatory regions of up to 10% of the human genome.

**Serum 25(OH)D3 & Prostate Cancer**
- 13 yr longitudinal study
- 19,000 men
- 149 cases prostate CA

*Ahonen et al., Cancer Causes & Control 11, 847-852 (2000)*
Design of Prospective Study

- Enroll 80 male subjects diagnosed with early-stage, low-risk PCa, a serum PSA value of ≤10.0 ng/ml, and a Gleason score of 6 or less (FDA IND 77,839)
- All subjects will have decided to be monitored through active surveillance for at least one year, before deciding whether or not to undergo definitive treatment (surgery and/or radiation therapy)
- Primary Objective: To test the hypothesis that a daily dose of vitamin D3 (4,000 IU) taken for 12 months will result in a decrease serum PSA levels in a significant number of enrolled subjects
- Secondary Objective: To compare prostate biopsy specimens (% positive cores) pre- and post-treatment

Current Status

- Forty-five subjects have been enrolled thus far
- One subject was terminated because he was diagnosed with colorectal cancer shortly after enrollment; a second subject was taken off study because his PSA rose to >10 ng/mL serum; and a third subject was non-compliant
- No toxicity was observed or recorded with any of the subjects enrolled and treated thus far

Diagnostic Work-Up

Pre-Study Results

<table>
<thead>
<tr>
<th>Subject</th>
<th>25(OH)D</th>
<th>PSA</th>
<th>Bx: + cores (Total 12 cores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-18</td>
<td>17.2</td>
<td>3.36</td>
<td>1</td>
</tr>
<tr>
<td>1-19</td>
<td>17.2</td>
<td>3.36</td>
<td>1</td>
</tr>
<tr>
<td>1-20</td>
<td>17.2</td>
<td>3.36</td>
<td>1</td>
</tr>
<tr>
<td>1-21</td>
<td>17.2</td>
<td>3.36</td>
<td>1</td>
</tr>
<tr>
<td>1-22</td>
<td>17.2</td>
<td>3.36</td>
<td>1</td>
</tr>
<tr>
<td>1-23</td>
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<tr>
<td>1-24</td>
<td>17.2</td>
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<tr>
<td>1-25</td>
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<td>3.36</td>
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<td>1-26</td>
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<tr>
<td>1-30</td>
<td>17.2</td>
<td>3.36</td>
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</table>

Post-Study Results

<table>
<thead>
<tr>
<th>Subject</th>
<th>25(OH)D</th>
<th>PSA</th>
<th>Bx: + cores (Total 12 cores)</th>
</tr>
</thead>
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<tr>
<td>1-31</td>
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<td>3.46</td>
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</tr>
<tr>
<td>1-32</td>
<td>45.1</td>
<td>3.83</td>
<td>1</td>
</tr>
<tr>
<td>1-33</td>
<td>12.6</td>
<td>3.98</td>
<td>1</td>
</tr>
<tr>
<td>1-34</td>
<td>45.1</td>
<td>3.83</td>
<td>1</td>
</tr>
<tr>
<td>1-35</td>
<td>32.3</td>
<td>3.33</td>
<td>1</td>
</tr>
<tr>
<td>1-36</td>
<td>37.2</td>
<td>3.33</td>
<td>1</td>
</tr>
<tr>
<td>1-37</td>
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<td>1</td>
</tr>
<tr>
<td>1-38</td>
<td>37.2</td>
<td>3.33</td>
<td>1</td>
</tr>
<tr>
<td>1-39</td>
<td>37.2</td>
<td>3.33</td>
<td>1</td>
</tr>
<tr>
<td>1-40</td>
<td>37.2</td>
<td>3.33</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes:

- Bx: biopsy
- PIN: Prostatic Intraepithelial Neoplasia
- Progression to Gleason 4+4 in one core
- Progression to Gleason 3+4 in four cores
- 50% positive core decreases to <5%
Vitamin D is beneficial for:

- CANCER (chemo-preventive)
- DIABETES (anti-inflammatory)
- HYPERTENSION (anti-inflammatory)
- ALZHEIMER'S DISEASE (?)

THESE CONDITIONS ARE MORE PREVALENT IN THE AFRICAN-AMERICAN POPULATION
Adequate Intake of Vitamin D

- The current recommended daily intake (RDI) is 400IU.
- Vitamin D RDI is way too little for good health.
- Melanin protects African-Americans from skin cancer; however, it prevents vitamin D production in the skin.
- This can be remedied by supplementation.
- **The desirable level of vitamin D in blood is at least 40ng/mL.**
- This can be easily achieved by taking 4000IU/day.

Circulating Levels of Vitamin D₃

<table>
<thead>
<tr>
<th>Serum levels of 25(OH)D₃, in ng/mL</th>
<th>0-20</th>
<th>21-22</th>
<th>≥23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient's Status</td>
<td>Deficient</td>
<td>Insufficient</td>
<td>Suboptimal</td>
</tr>
<tr>
<td>Most African-Americans</td>
<td>1000-2000 IU/d</td>
<td>4000 IU/d</td>
<td></td>
</tr>
</tbody>
</table>

SELENIUM and PROSTATE CANCER

- This randomized study was mostly conducted in Arizona and other sun-rich states, and was restricted to patients with a diagnosis of skin cancer (basal or squamous cell carcinoma).
- However, the Selenium and Vitamin E Cancer Prevention Trial – SELECT failed to confirm previous indications.
- We investigated the interaction between vitamin D and selenium in LNCaP cells.
**Preliminary Conclusions**

- These preliminary observations support the use of 4,000 IU of vitamin D3 as a chemopreventive/therapeutic agent, especially in men with early-stage, low-risk prostate cancer.
- The results of our *in vitro* studies suggest that combining vitamin D3 and selenium supplementation may provide even more effective chemoprevention.

**Acknowledgments**

- David T. Marshall
- Stephen J. Savage
- Thomas E. Keane
- Bruce W. Hollis
- Elizabeth Garrett-Mayer
- Linda H. Ambrose
- Blake C. Ellis-Hays
- Jin Yu
- Mark S. Kindy
- Supported by Gateway for Cancer Research and VA Merit Award
The (long, but fulfilling) Journey to a Dual-Degree

Gabrielle F. Cannick, DMD, PhD
June 23, 2010

Gabrielle’s Timeline 2001-2009

Or:
What I did for 8 years at MUSC

2001-2002
First Year of Dental School

2002-2003
Got Married
Started Grad School

2003-2004
NIDCR/NIH

Oral Cancer Knowledge Among South Carolina Dental Students

Gabrielle F. Cannick, DMD, Annette M. Bower, DDS, Thomas F. Brown, DDS, MS

Results:
- Although positive associations were found for some variables, results were inconsistent across analyses.
- Limited data on tobacco and alcohol use.
- Selection bias due to unknown confounders related to non-response.
- Previous studies indicate inadequate education and training in dental school for applied knowledge.

Conclusions:
- Need greater emphasis on oral cancer prevention and early detection.
- Explore association between oral cancer and tobacco use.
- Implications for future oral and dental health education.

Acknowledgements:
- NIDCR, NIH, DHHS
- South Carolina Central Cancer Registry, Office of Public Health
- Medical University of South Carolina IRB for Human Research: #
2004-2006
Dissertation/Life

2006-2007
Returned to Dental School

2007-2009
Family/Dental School

2009
Finally done!

Drs. Sparkle Pompey and Gabrielle Cannick

So glad to be finished!
And the newest addition....

Awards, Presentations, and Publications

Quintessence Award for Clinical Achievement in Dental Research, Quintessence Award for Clinical Achievement in Dental Research, Medical University of South Carolina College of Dental Medicine, Medical University of South Carolina, May 14, 2009.

The Charleston Dental Society Scholar Award, Charleston Dental Society, May 14, 2009.


APHA Anthony Westwater Jong Memorial Community Dental Public Health Preliminary Award (2006).


Introduction to Radiation Oncology
Leander Cannick

What is Radiation Oncology?
- Treatment of various conditions with X-Ray therapy
- Part of the usual triad of cancer treatments: surgery, chemotherapy, and radiation

Intro to the Lingo
Units of Radiation
- Gray (Gy)
  - SI unit absorbed dose
  - Old unit was the rad
  - 1cGy = 1rad

External Beam Radiation Therapy (EBRT)
- X-ray or photon treatments are delivered by linear accelerators
- Mega-voltage x-rays can penetrate deeper to treat the tumor
- For curative cancers, once daily treatments are usually given in an outpatient setting for about 6-8 weeks
- Radiation can be given palliatively for 2-3 weeks

Why Do We Fractionate Radiation Dose?
- Cannot treat tumor in isolation without treating some surrounding normal tissue
- Therapeutic benefit
  - When radiotherapy is given in small doses daily, normal tissue has a greater capacity to repair than to tumor cells
Locally Advanced HNC

2-D Radiation

RT Fields

Lateral Field

Supradivascular Field
3-D Radiation

3-D RT Treatment for Right Base of Tongue Lesion
IMRT (Intensity Modulated Radiation Therapy)

IMRT Treatment for Tonsillar Cancer
Toxicities of HNC Treatments

- Fatigue
- Edema of soft tissues
- Oral Mucositis
  - Radiation-induced
  - Chemotherapy induced
- Skin erythema and desquamation
- Xerostomia

Oral Mucositis (OM)

- OM generally develops within 2 weeks after the beginning of radiation but may start earlier if chemotherapy is given concurrently.
  - Turnover rate of the epithelial cells of the oral mucosa is 2 weeks, and that is the approximate time that it takes for OM to manifest.
- Any of the oral mucosas can be the site of OM but preferentially those that do not keratinize such as lips, buccal, soft palate, ventral tongue, and pharyngeal mucosas.

Oral Mucositis

- Different stages of OM
  - Grade I: Erythema
  - Grade II: Erythema with patchy ulceration
  - Grade III: Erythema with confluent ulceration

Grade II OM

Grade III chemotherapy-induced OM
### Skin Toxicity

- **RTOG acute morbidity scoring scale**
  - **Grade 0**: No changes
  - **Grade 1**: Follicular, faint or dull erythema/epilation/dry desquamation/decreased sweating
  - **Grade 2**: Tender or bright erythema, patchy moist desquamation/moderate edema
  - **Grade 3**: Confluent, moist desquamation other than skin folds, pitting edema
  - **Grade 4**: Ulceration, hemorrhage, necrosis

### Xerostomia

- **Grade I**
  - Mild mouth dryness with some altered taste and slightly thickened saliva
  - No alteration in eating behavior
- **Grade II**
  - Moderate to severe dryness with markedly altered taste
  - Diet is altered
- **Grade IV**
  - Necrosis of salivary gland

---

**Xerostomia**

This 60 year-old woman had undergone radiation for an adenocarcinoma of the parotid gland. Note the rampant caries and the dryness of the gingiva as a consequence to xerostomia.

---

**Pros and Cons of RT as a career**

1. Part of a team that helps to care for cancer patients
2. Exciting and changing technology
3. Able to work with surgeons and medical oncologists
4. Good lifestyle

---

1. Many treatments are palliative
2. Competitive to obtain a residency position
3. Must keep abreast with the changing technology and treatment options.
Experimental Therapies for Prostate Cancer

Christina Voelkel-Johnson, Ph.D.
Department of Microbiology & Immunology
Cancer Immunology & Immunotherapy

Prostate Cancer
- 192,280 new cases (2009)
- 27,360 deaths (2009)
- ~85% localized at diagnosis
- Slow growing, 5yr survival > 90%
- AA>caucasian>hispanic>asian>NA
- Mortality in AA=75%
- 1/6 males affected
- Standard Treatment
  • Localized: radiation, surgery, watchful waiting
  • Advanced: hormone ablation (cancer becomes castration resistant)
  • Metastatic: chemotherapy (not curative, mostly palliative)
- Experimental Therapies
  • Gene Therapy
  • Immunotherapy

(Suicide) Gene Therapy
- Gene therapy is a technique for correcting defective genes responsible for disease development
- Suicide gene therapy involves a gene that when expressed leads to death of the infected cell
- The most common vector is a virus, since viruses have naturally evolved to infect human cells and deliver their genetic material
- Scientists manipulate the virus and insert a gene of interest to correct disease

Infectious Viruses: A Genetic “Syringe”
Viruses are composed of genetic material encapsulated in a protein coat.
Viruses inject their genetic material into target cells.
The viral DNA can be altered to contain a gene of interest (rDNA) to infect that gene into the target cell.

Adenovirus
- dsDNA genome
- Non-Lipid Enveloped
- Upon infection, the viral DNA forms an episome
- Episome rarely integrates into host genome
- Fixed host range affecting Rodents, humans and other animals
- Known receptors: Coxsackie & Adenovirus Receptor (CAR)
  HLA / MHC I

Obstacles
- Entry of adenovirus
  - via receptor
- Tropism of adenovirus
  - Liver and lungs
- Neutralization by the immune system
  - Pre-existing antibodies
Nanoparticle Shielding

- Coating the virus to hide it from pre-existing immunity
  - Polymer-Adenovirus Hybrids (PICs)
- Targeting the virus to cancer cells to overcome tropism
  - Conjugating an antibody to the PICs

Obstacles

- Entry of adenovirus
  - via receptor
- Tropism of adenovirus
  - Liver and lungs
- Neutralization by the immune system
  - Pre-existing antibodies

Adenoviral Entry

Entry of adenovirus via receptor

CAR - originally discovered as a viral receptor but later found to be an adhesion molecule

Do cancer cells adhere?

Question

Do prostate cancer cells adhere?

Downregulation of adhesion proteins is a prerequisite for the ability to metastasize

CAR decreases in prostate cancer with increasing tumor stage and grade

Research Questions

1. Is there a model that simulates this decrease in CAR?
2. Can we use this model to test how CAR expression affects adenoviral entry?
3. What can be done to increase adenoviral entry?

The LNCaP progression model of PC

Flow cytometry

- Expression of proteins on the cell surface
  - Here: How much CAR is on LNCaP vs. C4-2b?
- Expression of reporter proteins
  - Here: we used GFP as a reporter to determine how many cells are infected by the adenovirus and how much of the transgene is expressed

http://probes.invitrogen.com/resources/education/tutorials/4Intro_Flow/player.html

Questions

Is there a model that simulates this decrease in CAR? **YES**
Can we use this model to test how CAR expression affects adenoviral entry?
What can be done to increase adenoviral entry?

Adenoviral entry and CAR

CAR and HDACi

- a novel class of chemotherapeutic drugs called histone deacetylase inhibitors (HDACi)
  - In clinical trials for prostate cancer
  - Increase CAR expression in bladder cancer
  - Can HDACi increase CAR expression in prostate cancer cells?
Selectivity

- The goal of any cancer therapy is to selectively kill tumor cells
- HDACi can be safely administered to cancer patients with lower side effects than other drugs
- Can HDACi increase adenoviral infection selectively in tumor cells?

Conclusions-part 1

- Decreased expression of the adenoviral receptor CAR impairs adenoviral gene delivery
- HDACi restore CAR expression, increase adenoviral infectivity and gene expression
- HDACi exhibit selectivity for cancer cells

Research Question

- What therapeutic gene should be inserted into the adenovirus?
  - Gene should be able to kill cancer cells
  - Gene should NOT kill normal cells
Death Ligands as Cancer Therapeutics

**TRAIL**
(TNF Related Apoptosis Inducing Ligand /Apo2L)
- discovered by 2 groups (Genentech/Immunex) 1995/1996
- member of the TNF superfamily (highest homology to FasL)
- Induces apoptosis in a variety of cancer cell lines
- Does not induce apoptosis in normal cells
- Preclinical studies confirmed safety of single agent therapy
- Clinical trials with rTRAIL and agonistic Ab against receptors ongoing

TRAIL is expressed on a variety of activated immune cells
- TRAIL knockout mice are more susceptible to carcinogen-induced tumors
- Aging TRAIL knockout mice develop tumors of hematopoietic origin more frequently than controls
- BCG immunotherapy induces TRAIL release from neutrophils—correlates with treatment response

**TRAIL Receptors**

- TRAIL-R1/DR-4
- TRAIL-R2/DR-5
- TRAIL-R3 / DcR-1
- TRAIL-R4/  DcR-2

Cleavage of Death Substrates

- DEATH DOMAIN
- TRUNCATED DEATH DOMAIN
- PI LINKED

**Status of TRAIL therapy**
- Preclinical studies
  - Human tumor xenografts in mice (efficacy)
  - Non-human primates (safety)
- Clinical trials
  - Phase 1A: 39 patients, no response, no adverse effects
  - Phase 1A: 31 patients, 1 PR, 5 SD, no adverse effects
  - Phase 1: 51 patients, 1 PR, 13 SD, adverse effects included fatigue, headache, fever, vomiting, nausea, anemia, weight loss
  - Pharmacokinetic assessment in 37 patients with 0.5–15 mg/kg rTRAIL revealed that serum concentration similar to xenograft studies can be safely achieved in humans.

Issue: short half-life of rTRAIL in circulation
Gene Therapy using TRAIL

- Full-length TRAIL (membrane bound form)
- IRES allows translation of two proteins from one mRNA
- GFP as marker for infected cells

AdTRAIL can kill cells resistant to rTRAIL

HDACi increases efficacy of AdTRAIL
AdTRAIL trial

- Clinical trial has been conducted
- Patients - scheduled for prostatectomy
- Route - intra-prostatic injection
- Outcome measures - apoptosis

Conclusions

- AdTRAIL is more effective than rTRAIL
- Decreased expression of the adenoviral receptor CAR impairs adenoviral gene delivery
- HDACi SELECTIVELY restore CAR expression, increase adenoviral infectivity and gene expression, and improve efficacy in vitro

Immunotherapy
Adoptive T cell transfer and AICD

Solution: Gene modify and/or treat T cells to make them more robust and increase resistance to cell death

Thank you!
Biostatistics in Prostate Cancer Research

Elizabeth Garrett-Mayer, PhD
Associate Professor of Biostatistics and Epidemiology
Director of Biostatistics, Hollings Cancer Center

July 1, 2010

Statistics
- Statistics is the art/science of summarizing data and quantifying evidence
- Better yet...summarizing data so that non-statisticians can understand it
- Scientific investigations usually involve collecting a lot of data.
- But, at the end of your study, what you really want is a “punch-line:”
  - Did the new treatment work?
  - Are the two groups being compared the same or different?
  - Is the new method more precise than the old method?
- Statistical inference is the answer!

How do statisticians help research?
- Statistics should be a part of the study from the very beginning
- Statistical issues arise in:
  - Study Design
  - Analysis
  - Interpretation of results
  - Conclusions

What we do
- We plan
  - we help to plan clinical trials and other kinds of studies
  - we help figure out how many people to study
- We estimate
  - we determine what the “response rate” was
  - we estimate how much better treatment A is than treatment B
- We test
  - we determine which treatment is better
  - we quantify how much better using a test.

Clinical Research in Prostate Cancer
- Research requires a plan
- A DETAILED plan called a “clinical trial protocol”
  - could also be an intervention
  - could also be an observational study
  - but, for simplicity, we focus on a “treatment trial”
  - Example: Velcade for treatment of men with relapsed prostate cancer
Clinical Trial Protocol

- Variety of templates
- Some key elements
  - Specific Aims: you must state what your goals are in terms of measurable objectives
  - Background/Rationale: explanation of why this study is important, what preliminary data exists and justification of the dose.
  - Experimental Design: Describes how the study will proceed, no detail can be spared, someone else should be able to implement the study with no questions.
  - Analysis Plan: how will the data will handled and Objectives answered.

Endpoint selection

- What measures should we take to determine if our treatment (e.g. Velcade) has worked?
- Example: for each patient, determine if his disease has
  - regressed (i.e., responded)?
  - stayed the same? (‘stable disease’)
  - progressed?
- Common endpoints in prostate cancer clinical trials
  - PSA (prostate specific antigen), a biomarker
  - tumor size/volume
  - pain
  - quality of life
- It is important to use endpoints that everyone else uses.

Example: prostate cancer clinical trial

- TAX327: Aventis study
- Patient Population: hormone refractory metastatic prostate cancer
- Large randomized clinical trial
  - docetaxel, schedule 1
  - docetaxel, schedule 2
  - mitoxantrone
- Primary endpoint: overall survival
- Additional Aim: how is PSA related to overall survival?
  - prostate specific antigen
  - well-known ‘surrogate’ for prostate cancer presence
  - well-known ‘test’ for prostate cancer progression
- Additional Aim: compare quality of life in the three treatment arms

Statistical Design Issues

- Choose most efficient design
- Consider all aims of the study
- Particular designs that might be useful
  - Cross-over
  - Pre-post
  - Factorial
- Sample size considerations
- Interim monitoring plan

Study design

- Patients are randomized to one of three arms
- Equal chance of assignment to each arm
- Overall survival:
  - Time from randomization until death
  - Patients are followed until death
  - For patients who do not die by study end, we say that their outcomes are 'censored' at the last known time they were still alive (more on that later)
- Statistician worked with the clinicians to determine how many patients were needed
  - depends on how certain we want to be about our conclusion
  - the expected survival in each group
- how long patients are followed
- how long it takes to enroll patients
Analysis Plan: Part of the Design!
- Statistical method for EACH aim
- Account for type I and type II errors
  - These quantify how certain we want to be about making mistakes
  - Type I: the probability of concluding that there is a difference in treatments when there truly is no difference
  - Type II: the probability of concluding that there is no difference when there truly is a difference
- Stratifications or adjustments are included if necessary
- Simpler is often better
- Loss to follow-up: plan for missing data

Estimation
- At the end of the study, you need to be able to “measure” how things went
- Some examples:
  - What proportion of patients responded to the treatment?
  - How many patients are still alive at 5 years?
  - What is the difference in the response rate between the two treatment groups?
  - How much improvement was seen in quality of life from the beginning of the study to the end?
- Estimation depends on the endpoint selection

Estimation in TAX 327
- Outcome of interest is overall survival
- We can estimate
  - Median survival: the time at which 50% of patients are still alive
  - 5 year survival: the proportion of patients that are still alive at 5 years
- These are called “point estimates”
- Other aims?
  - The mean change in quality of life from baseline to follow-up
  - The proportion of men with increased PSA at end of treatment

Survival Curves of Treatment Groups
- Median survival
  - Docetaxel every 3 wks: Median survival = 19.4 months
  - Docetaxel weekly: Median survival = 18.7 months
  - Mitoxantrone: Median survival = 16.6 months
- Which looks to be the best?

Another key part of estimation
- Precision: how certain are we of our point estimates?
- Variance or standard errors are important!
- We often use “Confidence intervals” to describe our certainty in our estimates
- A 95% confidence interval: provides an interval that we are 95% certain contains the true parameter estimate
- 95% is most common, but we also see 90% and 99%.
Confidence intervals for Median survival in TAX327

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>median</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doce Q3</td>
<td>241</td>
<td>19.4</td>
<td>(17.6, 21.6)</td>
</tr>
<tr>
<td>Doce wk</td>
<td>217</td>
<td>18.7</td>
<td>(16.3, 21.2)</td>
</tr>
<tr>
<td>Mitox</td>
<td>228</td>
<td>16.6</td>
<td>(14.3, 18.6)</td>
</tr>
</tbody>
</table>

How to interpret these?

Testing

- Critical for these types of comparative studies!
- The drug company (and everyone else) wants to know if its drug is better than the old drug
- We test hypotheses:
  - hypothesis 0: survival is the same in the three groups
  - hypothesis 1: survival is different in the three groups.
- Depending on the type of outcome, we use different tests
  - hypothesis 0 is called the "null"
  - hypothesis 1 is called the "alternative"

Outcome of test: p-value

- The most common measure of whether or not the treatments are different is the 'p-value'
- The p-value is the probability of observing the difference we did (or larger) if the null hypothesis is true.
- If the p-value is small, it means that the observed data is unlikely if there is really no difference
- If the p-value is large, it means that the observed difference is too small to provide evidence of a "real" difference
- Standard threshold for "significant" p-value?

Additional biostatistical issues in prostate cancer research

- Measure of 'response'
- Measuring time to progression or time to death

Prostate Specific Antigen

- Prostate specific antigen (PSA) is a protein produced by the cells of the prostate gland.
- PSA is present in small quantities in the serum of normal men, and is often elevated in the presence of prostate cancer and in other prostate disorders.
- A blood test to measure PSA is considered the most effective test currently available for the early detection of prostate cancer, but this effectiveness has also been questioned.
- Rising levels of PSA over time are associated with both localized and metastatic prostate cancer.
Prostate Specific Antigen (PSA)

Tricky issues with PSA
- Change in PSA from baseline to post-treatment
- Potential problems
  - There is variability due to things other than cancer
    - day to day fluctuations
    - assay sensitivity
    - other prostate disorders
  - When you sample may give you different answers
  - Some question whether or not PSA is a good "surrogate measure"

Surrogate measure
- What is the gold-standard measure in cancer treatment?
- Multiple choice:
  A. time from treatment until disease goes into remission
  B. time from diagnosis until disease progresses
  C. time from treatment until death
  D. time from diagnosis until death
  E. time from treatment until disease progresses
  F. time from diagnosis until disease goes into remission

Surrogate measures in cancer research
- We generally assume the following:
  - if we can shrink the tumor, we can extend life
  - if we can delay tumor progression, we can extend life
- Are these valid assumptions?
  - sometimes yes, sometimes no
- Tumor shrinkage ("clinical response")
  - tumor response is often considered a poor surrogate
- Time to progression
  - tumor progression is often valid surrogate
  - however, it is hard to measure

RECIST criteria
- RECIST criteria offer a simplified, conservative, extraction of imaging data for wide application in clinical trials. They presume that linear measures are an adequate substitute for 2-D methods and registers four response categories:
  - CR (complete response) = disappearance of all target lesions
  - PR (partial response) = 30% decrease in the sum of the longest diameter of target lesions
  - PD (progressive disease) = 20% increase in the sum of the longest diameter of target lesions
  - SD (stable disease) = small changes that do not meet above criteria

Potential Problems with RECIST
- Stable disease includes both improvements and worsening
- Tumors are 3-D. RECIST only allows for 1-D.
- Implicitly makes the assumption that all lesions are spherical
- Measures are hence fraught with measurement error.
- Tumors with minor differences (e.g., 32% decrease and 28% decrease) are categorized differently.

http://imaging.cancer.gov/clinicaltrials/imaging/
Time to event outcomes

- In cancer research, we are usually interested in measuring time until an event occurs.
- The event is *usually* bad so we are trying to prevent the event from occurring.
- Inevitably, at the end of the study, many patients will not have had the outcome.
- These events that are not observed is called 'censored'.
- More specifically, "right censored".

Simple example:

Introduce "administrative" censoring

More realistic: clinical trial
Additional issues
- Patient drop-out
- Loss to follow-up

Drop-out or LTFU

How do we ‘treat’ the data?
- Shift everything so each patient time represents time on study

Set of tools for time-to-event outcomes
- "Survival analysis"
- Kaplan-Meier curves: graphical representation
- Kaplan-Meier estimation: provides point estimates and confidence intervals
- Logrank test: tests for differences across groups

Summary
- Biostatisticians have a lot of tools for helping with prostate cancer research
- Critical areas of assistance:
  - study design
  - sample size estimation
  - data analysis
- Prostate cancer has some specific areas that make it challenging
  - measurement issues with standard outcomes
  - time to event outcomes require special methods
Epidemiology of Prostate Cancer

Summer Undergraduate Research Program
July 7, 2010
Anthony J. Alberg

Cancer Control:

• “Cancer control research is the conduct of basic and applied research in the behavioral, social and population sciences that, independently or in combination with biomedical approaches, reduces cancer risk.”

1997 NCI Report

Ultimate goal is to reduce burden of prostate cancer:

• Prevention
• Early detection
• Prolong Survival

To develop strategies to prevent prostate cancer, we need to understand its distribution in populations

2008 Estimated US Cancer Cases*

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>745,180</td>
<td>692,000</td>
</tr>
<tr>
<td>Lung &amp; bronchus</td>
<td>15%</td>
<td>14%</td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Melanoma of skin</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>Kidney &amp; renal pelvis</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Oral cavity</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>All Other Sites</td>
<td>20%</td>
<td>23%</td>
</tr>
</tbody>
</table>

*Excludes nonmelanoma skin cancer and in situ carcinomas except urinary bladder.

Source: American Cancer Society, 2008.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All sites</td>
<td>50</td>
<td>54</td>
<td>66</td>
</tr>
<tr>
<td>Breast (female)</td>
<td>75</td>
<td>79</td>
<td>89</td>
</tr>
<tr>
<td>Colon</td>
<td>51</td>
<td>59</td>
<td>65</td>
</tr>
<tr>
<td>Leukemia</td>
<td>35</td>
<td>42</td>
<td>50</td>
</tr>
<tr>
<td>Lung and bronchus</td>
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<td>16</td>
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<td>Melanoma</td>
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<td>Non-Hodgkin lymphoma</td>
<td>48</td>
<td>53</td>
<td>64</td>
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<tr>
<td>Ovary</td>
<td>37</td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Prostate</td>
<td>69</td>
<td>76</td>
<td>99</td>
</tr>
<tr>
<td>Rectum</td>
<td>49</td>
<td>57</td>
<td>66</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>74</td>
<td>78</td>
<td>81</td>
</tr>
</tbody>
</table>

*5-year relative survival rates based on follow up of patients through 2004.

Stage distribution for AA (red) and EA (gray), US 1996-2004

Geographic distribution of prostate cancer mortality rates by state, US 2002-2006

To develop strategies to prevent prostate cancer, we need to understand its causes

The single strongest individual risk factor for prostate cancer is older age.
The results of migrant studies suggest that environmental risk factors are important to the etiology of prostate cancer, but the specific factors have proven difficult to identify.

A significant challenge to epidemiologic studies of prostate cancer is uncertainty about the “disease-free” controls or comparison group.

Cigarette Smoking and Prostate Cancer

- Evidence of association with prostate cancer mortality, but not incidence
- Association stronger during 1st 10 years of follow-up
- Hypothesis: Smoking associated with more aggressive disease

Cigarette Smoking and Prostate Cancer

RRs (95% CLs), Washington County, MD 1963-1973 (1st 10 yrs of follow-up)

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>Incidence</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Former</td>
<td>1.5</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>(0.9, 2.4)</td>
<td>(1.3, 8.3)</td>
</tr>
<tr>
<td>Current &gt;20 cigs/d</td>
<td>1.5</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>(0.8, 2.9)</td>
<td>(1.0, 12.4)</td>
</tr>
</tbody>
</table>

Source: Rohrmann S, Platz EA. J Urology 2007

Summary of Evidence on Dietary Factors and Prostate Cancer

<table>
<thead>
<tr>
<th>Protects</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selenium</td>
<td>Calcium/Dairy Fat</td>
</tr>
<tr>
<td>Vit. E</td>
<td></td>
</tr>
<tr>
<td>Lycopene</td>
<td></td>
</tr>
<tr>
<td>Vit. D</td>
<td></td>
</tr>
<tr>
<td>Fish intake</td>
<td></td>
</tr>
</tbody>
</table>

Source: Adami HO et al
Major inherited susceptibility

- Genetic testing for mutations that confer major inherited susceptibility cannot provide a “cure”, but can provide clinically useful information.
- Examples:
  - Enhanced surveillance for colorectal polyps (FAP) or breast cancer (BRCA1/BRCA2)
  - Organ removal (e.g., prophylactic mastectomy for BRCA1/BRCA2).
  - For prostate cancer, currently none

Common genetic variants associated with small increases in risk

- Ongoing research is attempting to characterize how common genetic variation affects inter-individual susceptibility to prostate cancer (and prostate cancer risk factors)
- A promising lead: 8q24

What steps can we take for the primary prevention of cancer?

Can we take a pill to prevent cancer?

CHEMOPREVENTION
The use of natural (e.g., selenium, vitamin E) or synthetic (e.g., aspirin) to reduce the risk of developing cancer

Examples of chemoprevention: Prostate Cancer

- SELECT Trial
  - Bad news: no evidence that either selenium or vitamin E supplements protects against the development of prostate cancer
  - ~35,000 men followed for ave. 5.5 yrs

Age-adjusted prostate cancer incidence rate by racial/ethnic group, SEER 2002-2006

<table>
<thead>
<tr>
<th>Group</th>
<th>RR (99% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placebo</td>
<td>1.0 (referred)</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>1.13 (0.95-1.35)</td>
</tr>
<tr>
<td>Selenium</td>
<td>1.04 (0.87-1.24)</td>
</tr>
<tr>
<td>Both</td>
<td>1.05 (0.88-1.25)</td>
</tr>
</tbody>
</table>

Source: Lippman SM, et al JAMA 2009; 301: 39-
What steps can we take for the secondary prevention of cancer?

Cancer is a fearsome disease, but it is much less fearsome if detected early rather than late.

A strong determinant of a cancer patient’s survival is stage of disease.

A strong determinant of a cancer patient’s survival is stage of disease.

So, a screening test that can shift the population distribution of stage of disease should be embraced, right?

Cancer screening: all that glitters is not gold

- How accurate is the screening test?
- Does the test achieve the intended benefit of reduced mortality? (Is there an effective available treatment that will reduce mortality when cancer is treated earlier?)
- Is the test acceptable to the public?
PSA Testing for Prostate Cancer: Results of RCTs

- 2 randomized controlled trials published earlier this year in New England Journal of Medicine
- Neither study showed significant benefit in reducing prostate cancer mortality
- Strong evidence that PSA testing is not efficacious

PSA Testing for Prostate Cancer: PLCO Trial

- ~77,000 men randomized to PSA testing vs “usual care”
- Intervention: annual PSA testing for 6 years and DRE for 4 years
- 7 years of follow-up
- Mortality rate (intervention vs control): 1.13 (0.75-1.70)

Source: Andriole GL et al NEJM 2009; 360: 1310--

Screening Guidelines for the Early Detection of Prostate Cancer. American Cancer Society

For men at average risk and high risk, information should be provided about what is known and what is uncertain about the benefits and limitations of early detection and treatment of prostate cancer so that they can make an informed decision about testing.

Applied Cancer Screening

- Given a screening test of proven efficacy, research will be needed to identify and overcome barriers to screening

Epidemiology of Prostate Cancer

Summer Program
July 22, 2009
Anthony J. Alberg
Genetic Epidemiology of Prostate Cancer

Overview
1. Genetic Epidemiology
2. The Human Genome
3. Genetic Variation
4. Types of Genetic Studies: Design and Analysis
5. Genetic Susceptibility to Prostate Cancer
6. Resources

Basics of Genetic Epidemiology

What is genetic epidemiology?
- The study of why some families are more susceptible to developing certain diseases
- Also why some populations are more susceptible to certain diseases
- Example: individuals of eastern European Jewish descent have higher rates of breast and ovarian cancer

Implications
- Study of families (or populations) to discover inherited genes that increase risk of disease
- Discovery of these genes helps biologists understand mechanisms of disease and may lead to the development of therapies for prevention or treatment

How do we study genetic risk?
- Understand the basics of the human genome
- Understand what parts of the human genome are more common in families or populations at higher risk of disease
- Start with DNA
Describing the Human Genome

DNA (Deoxyribonucleic Acid)
- Double Stranded
- Linked at base pairs (A-T; C-G)

DNA (cont.)
- Certain regions of DNA, called genes, code for amino acids and thus proteins
- A lot of DNA between genes (intergenic regions)
- Complete DNA sequence known as the human genome: approximately 25,000 protein-coding genes
- 3 billion base pairs across 23 chromosomes

Human Chromosomes
- 23 chromosome pairs: 22 autosomal and XX or XY

Genes
- Consist of coding and non-coding regions
- Non-coding regions are removed from mRNA
- Approximately 2% of genome consists of protein coding sequences

Studying DNA
- Most of the human genome is the same across individuals but some variations occur
- Goal is to discover regions of DNA that DIFFER between individuals with and without disease
- Isolate genetic risk factors
- Understand more about biology of disease and possible treatments
Sources of Genetic Variation

Variation in the Human Genome
- 99.9% of genome of any two unrelated individuals is identical
- Genetic mutations result from changes in base pair sequence (causes include copying error, radiation, viruses, or chemical mutagens; germ-line mutations inherited)
- Sequence variations that result in altered protein function may have health consequences
- Common type of variation: single nucleotide polymorphism (SNP)

SNP
- Single Nucleotide Polymorphism
- Nucleotides are bases (A, T, G, C)
- Common SNP: variation in at least 1% of population
- Occur every 100 to 300 base pairs (at least 10 million SNPs in genome)
- At least two "alleles" (e.g. A or G) possible at given locus

SNP (cont)
- Many SNPs are in non-coding regions
- Non-coding SNPs could alter transcription (the process of creating RNA from DNA)
- Non-synonymous SNP – alters amino acid coding proteins
- Synonymous SNP – in coding region but does not alter protein structure

ALLELE
- Version of SNP (e.g. G or T)
- "Minor allele" is the less common version
- MAF – minor allele frequency – describes how common the SNP is in the population
- Refers to any type of genetic variation (not just SNPs)

Linkage Disequilibrium (LD)
- Because of recombination, sequences of DNA that are closer together on a chromosome, are more likely to be inherited together.
- Leads to strong association between two distinct loci (e.g. a & b but not c in Figure)
### Tag SNPs
- Tag SNPs are SNPs that identify most of the variation in a given gene or region.
- Tag SNPs are in high LD with neighboring SNPs.
- Most genetic variation in a region can be genotyped without typing all SNPs.

### Types of Genetic Studies: Design and Analysis

#### Linkage Analysis
- Linkage mapping conducted in families in hopes of discovering regions conserved across multiple affected generations.
- Genes for monogenic (caused by 1 gene) conditions have been located.
- Not finely-mapped, thus multiple genes may fall under a linkage "peak".

#### Association Studies
- Determine whether genetic markers are associated with traits in a broader population.
- Generally more finely-mapped than linkage studies.
- Approaches include family-based association studies (trios/tetrads) and population-based association studies (case/control).

### Genome Wide Association Studies
- High density SNP arrays now available (up to 1 million SNPs can be genotyped giving genome-wide coverage).
- Generally 1,000s of subjects genotyped (most cost-effective to collect cases and controls).
- Need statistical power necessary to detect associations after correcting for multiple comparisons (testing thousands of SNPs).

### Candidate Genes & SNPs
- Custom arrays designed to interrogate candidate genes (up to 1,500 SNPs).
- Candidate genes may be in known disease pathways or discovered in genome-wide studies or linkage analysis.
- Fine-mapping may be explored with candidate gene interrogation.
- Resequencing of candidates (all base pairs).
**Family-based Association Studies**
- Families genotyped (parents and affected offspring plus possibly unaffected siblings)
- Trio/tetrad designs
- Twin and sib-pair designs

**Phenotypes: Binary Traits**
- Testing for differences in MAF (minor allele frequencies) between cases and controls
- Testing for differences in transmission of alleles from parents to affected offspring
- Testing for genotype differences between sib-pairs

**Phenotypes: Quantitative Traits**
- Testing for different means across genotype groups (AA/AT/TT) using linear regression
- Testing for correlation between inherited alleles and phenotypes in families
- Heritability: estimate of phenotypic variance attributable to genetic effects

**Genetic Susceptibility to Prostate Cancer: what have we learned?**

**Family Studies**
- Relative risk of prostate cancer in individuals who have first-degree relatives (brothers, fathers) with prostate cancer has been reported to be greater than 2
- Greater if family members diagnosed at a young age or multiple affected family members
- Twin studies show that monozygotic (identical) twins have higher relative risk than dizygotic (same genetic similarity as siblings) twins
- Evidence that the breast cancer susceptibility gene BRCA2 increases risk of prostate cancer as well (only explains 10% of familial prostate cancer though!)

**Family Studies: Linkage**
- Linkage studies in families with multiple affected individuals have not found reproducible genetic loci
- Suggests that there isn’t a prostate cancer gene (or even a few)
- Genetic predisposition comes from many common risk variants (true of many common diseases)
- Common disease-common variant theory
Genome-wide Association Studies

- Testing common SNPs without any prior assumptions
- Common SNPs on chromosomes 8 (8q24) and 17 (17q12 and 17q24) have been replicated as being risk variants in multiple populations (caucasian American, African American, Icelandic)
- The SNP on 8q24 is relatively uncommon in individuals of European descent (MAF of 4%) and common in individuals of African descent (MAF of 42%)
- Higher incidence in AA may be partially attributed to this loci

8q24

- Genetic variants in this region also associated with earlier age at diagnosis
- Biologic implications?
- What gene is in this region – doesn’t map to a known gene!
- Doesn’t mean that the genetic region isn’t important BUT interpretation is MUCH harder
- Could be a genomic instability mechanism (prone to deletions and duplications)

Other regions implicated

- Region on chromosome 11 (11q13) – no known gene
- TCF2 gene on chromosome 17 (17q2) which is also implicated in type II diabetes (higher risk of diabetes is associated with lower risk of prostate cancer)
- KLK2 and KLK3 genes on chromosome 19 (19q13) which are involved in PSA production
- More work needs to be done!

HAPMAP

- International HapMap Project: goal to develop a map of the human genome
- Identified over 3 million SNPs in the most recent “build” released in 2009
- Genotyping 270 individuals from four populations (30 US families of European descent, 30 Yoruban families from Nigeria, 45 unrelated subjects from Beijing and 45 from Tokyo)
- Other populations have been added: Indians, Kenyans, Mexican Americans, Italians
- LD patterns and allele frequencies described in populations useful for determining tagSNPs

Resources
To Learn More:

- HapMap: [www.hapmap.org](http://www.hapmap.org)
- UCSC genome browser: [www.genome.ucsc.edu](http://www.genome.ucsc.edu)

To Learn More:

## Recruitment, Retention, Surgical and Medication Adherence Studies with African Americans: Lessons Learned

Marvella E. Ford, Ph.D.  
Medical University of South Carolina  
Associate Director, Cancer Disparities  
Associate Professor, Department of Medicine

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### Topic Areas to be Discussed

Four topic areas will be discussed today:
- Recruitment intervention testing
- Retention intervention testing
- Cancer screening adherence assessment
- Medication adherence assessment

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### Presentation Outline

- Statement of the Problem
- Conceptual Framework
- Study 1: AAMEN Project
- Study 2: Case Management/ Patient Navigation Study
- Study 3: Comorbidities Study
- Studies 4-5: Surgical Adherence Studies
- Study 6: Medication Utilization Study
- Overall Conclusions

---

### Statement of the Problem

- Despite their higher incidence and mortality of cancer compared to their Caucasian counterparts, African American men are not well-represented in cancer screening trials
- There is a lack of randomized trials testing the effectiveness of different recruitment and retention strategies in this population

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### Conceptual Framework


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### The AAMEN Project

Recruiting African American Men to the Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial

#### Study 1
Peer-Reviewed Publications Related to the AAMEN Project


AAMEN Project Overview

AAMEN Project Design
- A randomized trial
- Designed to test the efficacy of three increasingly intensive recruitment strategies
- Conducted in the context of the Prostate, Lung, Colorectal, and Ovarian (PLCO) Cancer Screening Trial

Overview of the PLCO Cancer Screening Trial

Primary Objective:
- To determine whether screening for the 4 cancers decreases mortality due to these cancers in adult study participants aged 55-74 years
- 22-year multi-site randomized cancer screening trial
- Funded by the National Cancer Institute

PLCO Cancer Screening Trial Procedures

<table>
<thead>
<tr>
<th>Test</th>
<th>Prostate Cancer</th>
<th>Lung Cancer “Ever-smokers”</th>
<th>Lung Cancer “Never-smokers”</th>
<th>Colorectal Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>PSA, DRE</td>
<td>Chest x-ray</td>
<td>Chest x-ray</td>
<td>Flexible sigmoidoscopy</td>
</tr>
<tr>
<td>Year 1</td>
<td>PSA, DRE</td>
<td>Chest x-ray</td>
<td>Chest x-ray</td>
<td></td>
</tr>
<tr>
<td>Year 2</td>
<td>PSA, DRE</td>
<td>Chest x-ray</td>
<td>Chest x-ray</td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>PSA, DRE</td>
<td>Chest x-ray</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4</td>
<td>PSA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 5</td>
<td>PSA</td>
<td></td>
<td></td>
<td>Flexible sigmoidoscopy</td>
</tr>
</tbody>
</table>

AAMEN Project Study Sample

- African American males aged 55-74 years
- Community residents of southeastern Michigan (and northern Ohio)

Sample Identification and Selection
Summary of AAMEN Project Study Processes (H₀ = C>B>A>D)

<table>
<thead>
<tr>
<th>Processes</th>
<th>Arm A</th>
<th>Arm B</th>
<th>Arm C</th>
<th>Arm D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro. Mailing</td>
<td>Enhanced</td>
<td>Enhanced</td>
<td>Enhanced</td>
<td>Standard</td>
</tr>
<tr>
<td>Telephone Interview</td>
<td>African</td>
<td>African</td>
<td>African</td>
<td>African</td>
</tr>
<tr>
<td>Eligibility Screener</td>
<td>American</td>
<td>American</td>
<td>American</td>
<td>or Caucasian</td>
</tr>
<tr>
<td>Mailing Confirmation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone Reminder Call</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline Questionnaire</td>
<td>Mailed BQ</td>
<td>Telephone</td>
<td>Project</td>
<td>Mailed BQ</td>
</tr>
<tr>
<td>(BQ) Information and Consent Form</td>
<td>Packet</td>
<td>Interview</td>
<td>Session</td>
<td>Packet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for BQ &amp;</td>
<td>at Church</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mailed CF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone Reminder Call</td>
<td>Completed</td>
<td>Signed CF</td>
<td>Completed</td>
<td>BQ Packet</td>
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<tr>
<td></td>
<td>BQ Packet</td>
<td></td>
<td>BQ Packet</td>
<td></td>
</tr>
</tbody>
</table>

AAMEN Study Recruitment using the Conceptual Framework

Addressing Economic Barriers
- Provided transportation to project meetings

Addressing an Individual Barrier: Denial
- Worked with key community leaders (Arm A-C)
- Emphasized the importance of the participants to their families and communities (Arm A-C)

Addressing Barriers Inherent in Study Design
- Gathered baseline information via a telephone interview (Arm B)
- Gathered baseline information at a community-based project session (Arm C)
- Participants never see each other face to face

Addressing Sociocultural Barriers: Fear and Mistrust
- Tailored recruitment strategies to the characteristics of the individuals to be enrolled
- Used population-based strategies (Arms A-D)
- Formed partnerships with community organizations (Arm C)
- Included research team members with racial backgrounds similar to those potential participants (Arms A-D)
- Conducted follow-up telephone calls (Arms A-D)

Mean Age, Age Range, and Income Level of African American Men in the AAMEN Project, by Contact Status

<table>
<thead>
<tr>
<th>Contacted n (column %)</th>
<th>Not Contacted n (column %)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62.0 (5.7)</td>
<td>65.0 (6.0)</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Age range (in years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-59</td>
<td>3,954 (25.3)</td>
<td>8,230 (44.0)</td>
</tr>
<tr>
<td>60-64</td>
<td>3,694 (23.6)</td>
<td>5,307 (28.3)</td>
</tr>
<tr>
<td>65-69</td>
<td>4,033 (25.8)</td>
<td>2,807 (15.0)</td>
</tr>
<tr>
<td>70-74</td>
<td>3,962 (25.3)</td>
<td>2,380 (12.7)</td>
</tr>
<tr>
<td>Income level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>6,222 (35.0)</td>
<td>8,765 (40.5)</td>
</tr>
<tr>
<td>Mod-to-High</td>
<td>11,548 (65.0)</td>
<td>12,897 (59.5)</td>
</tr>
</tbody>
</table>

Randomization of AAMEN Project participants to the PLCO Cancer Screening Trial by Study Arm

<table>
<thead>
<tr>
<th>Study Arm</th>
<th>Yield (n/number contacted and found eligible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm A</td>
<td>2.5%</td>
</tr>
<tr>
<td>Arm B</td>
<td>2.8%</td>
</tr>
<tr>
<td>Arm C</td>
<td>3.9%</td>
</tr>
<tr>
<td>Arm D</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

* Arm C had a significantly higher yield than arm D (control arm), P=0.022

Summary

- Arm C, with the highest amount of face-to-face contact, had the highest recruitment yield
- The screenings offered through the PLCO Cancer Screening Trial may have been an incentive for study participation for men from lower SES groups

Enhancing Cancer Screening Trial Retention among Older African American Men: Randomized Trial Design Using a Case Management/Patient Navigation Approach

Study 2
Peer-Reviewed Publications Related to the Case Management Study


Rationale for the Case Management Approach

Our previous recruitment study showed that participants reported having a variety of human service needs that may have hindered their study participation.

Study Methods

Sample
- Enrollees in the intervention arm of the PLCO Trial at the Henry Ford Health System site in Detroit, MI
- 703 African American men aged 55+ years living in the Detroit metropolitan area and in northern Ohio
- The participants were then randomly assigned to the case management intervention group (n=352) or to the control group (n=351)

Study Methods

African American men in the intervention (screening arm) of the PLCO Trial
Randomized by participant identification number
- Control Group: Regular PLCO Trial screening Procedures (n=351)
- Intervention Group: PLCO Trial screening procedures plus proactive comprehensive case management (n=352)

Outcomes

Analytic Approach

- Logistic regression was used to test for an interaction between income and randomization group for each of the four types of screening tests (PSA, chest x-ray, DRE, and FSG)
- All overall comparisons were determined to be significant at the p<0.05 level
- All within-income level comparisons were considered to be significant at the p<0.025 level

The Case Management Intervention

- The case managers spoke with each participant in the intervention group at least once per month by telephone, and often much more frequently
Demographic Characteristics of the Study Sample

<table>
<thead>
<tr>
<th>INTERVENTION (n=352)</th>
<th>CONTROL (n=351)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: 63.1 (5.5%)</td>
<td>Age: 63.3 (5.4%)</td>
</tr>
<tr>
<td>Education: Some college or &gt; (47%)</td>
<td>Education: Some college or &gt; (41%)</td>
</tr>
<tr>
<td>Income: Moderate to high (68.5%)</td>
<td>Income: Moderate to high (70.0%)</td>
</tr>
<tr>
<td>Marital Status: Married (67.8%)</td>
<td>Marital Status: Married (67.3%)</td>
</tr>
<tr>
<td>Work Status: Retired (59.7%)</td>
<td>Work Status: Retired (51.6%)</td>
</tr>
</tbody>
</table>

Post-Intervention Adherence Outcomes by Income Group

<table>
<thead>
<tr>
<th>Type of Screening Test</th>
<th>Adhere (Yes/No)</th>
<th>Intervention (n=106) n (%)</th>
<th>Control (n=105) n (%)</th>
<th>p-value</th>
<th>Intervention (n=231) n (%)</th>
<th>Control (n=236) n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA</td>
<td>Yes</td>
<td>78 (74.3)</td>
<td>53 (51.0)</td>
<td>0.001</td>
<td>155 (68.6)</td>
<td>158 (68.1)</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>27 (25.7)</td>
<td>47 (47.0)</td>
<td></td>
<td>73 (32.0)</td>
<td>74 (31.9)</td>
<td></td>
</tr>
<tr>
<td>DRE</td>
<td>Yes</td>
<td>53 (66.2)</td>
<td>35 (44.1)</td>
<td>0.011</td>
<td>95 (63.3)</td>
<td>109 (66.5)</td>
<td>0.56</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>27 (33.8)</td>
<td>45 (55.9)</td>
<td></td>
<td>55 (36.7)</td>
<td>55 (33.5)</td>
<td></td>
</tr>
<tr>
<td>Chest</td>
<td>Yes</td>
<td>39 (37.8)</td>
<td>37 (44.9)</td>
<td>0.012</td>
<td>77 (64.0)</td>
<td>113 (95.5)</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>21 (20.1)</td>
<td>20 (24.0)</td>
<td></td>
<td>54 (38.6)</td>
<td>56 (40.7)</td>
<td></td>
</tr>
<tr>
<td>PSA</td>
<td>Yes</td>
<td>31 (68.9)</td>
<td>20 (51.3)</td>
<td>0.010</td>
<td>50 (53.8)</td>
<td>62 (62.5)</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>14 (31.1)</td>
<td>19 (48.7)</td>
<td></td>
<td>43 (46.2)</td>
<td>25 (37.5)</td>
<td></td>
</tr>
</tbody>
</table>

Summary

- The case management intervention was most effective in retaining African American men with low income levels
- Greater attrition is typically seen in study participants with lower income levels

Summary (cont.)

- Men with lower income requested more services than other men (p=0.02)
- Elements of successful case management interventions require a sufficient planning phase to:
  - Select and hire case managers
  - Identify and contact local service agencies
  - Develop an information and referral file

The Comorbidities Study

Effects of Baseline Chronic Conditions on Adherence in the Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial (PLCO Trial)

Study 3

Peer-Reviewed Publication Related to the Comorbidities Study

### Purpose of the Adherence Study

- To examine the effects of baseline health factors on screening adherence in a sample of older African American men enrolled in the PLCO Trial (aged 55+ years)

### Adherence Study Methods

- A longitudinal design was used
- 703 African American men aged 55 years and older in the previously described case management, patient navigation study
  - 352 men were assigned to a case management intervention group
  - 351 men were assigned to the case management control group
  - A case manager called each intervention group participant at least once per month

### Adherence to PSA Screen by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Disease Status</th>
<th>N</th>
<th>Adhere to PSA Screen? n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Current smoker Yes</td>
<td>83</td>
<td>51 (61.4%)</td>
<td>96 (62.5%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>162</td>
<td>47 (56.0%)</td>
<td>122 (72.2%)</td>
</tr>
<tr>
<td>Intervention</td>
<td>Current smoker Yes</td>
<td>84</td>
<td>47 (56.0%)</td>
<td>122 (72.2%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>169</td>
<td>47 (56.0%)</td>
<td>122 (72.2%)</td>
</tr>
</tbody>
</table>

### Adherence to the DRE Screening Test by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Disease Status</th>
<th>N</th>
<th>Adhere to DRE Screen? n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Chronic bronchitis Yes</td>
<td>11</td>
<td>7 (63.6%)</td>
<td>137 (66.8%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>194</td>
<td>120 (61.9%)</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>Chronic bronchitis Yes</td>
<td>14</td>
<td>4 (28.6%)</td>
<td>124 (65.3%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>190</td>
<td>73 (61.9%)</td>
<td></td>
</tr>
</tbody>
</table>

### Adherence to Chest X-Ray Screening Test by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Disease Status</th>
<th>N</th>
<th>Adhere to Chest Screen? n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Chronic bronchitis Yes</td>
<td>11</td>
<td>7 (63.6%)</td>
<td>137 (66.8%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>193</td>
<td>40 (67.1%)</td>
<td>190 (66.3%)</td>
</tr>
<tr>
<td>Intervention</td>
<td>Chronic bronchitis Yes</td>
<td>14</td>
<td>4 (28.6%)</td>
<td>190 (66.3%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>190</td>
<td>67 (66.4%)</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Current smoker Yes</td>
<td>70</td>
<td>40 (57.1%)</td>
<td>154 (64.4%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>124</td>
<td>85 (68.6%)</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>Current smoker Yes</td>
<td>68</td>
<td>35 (51.5%)</td>
<td>124 (68.6%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>124</td>
<td>85 (68.6%)</td>
<td></td>
</tr>
</tbody>
</table>

### Adherence to FSG Screen by Group

<table>
<thead>
<tr>
<th>Group</th>
<th>Disease Status</th>
<th>N</th>
<th>Adhere to FSG Screen? n (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Arthritis Yes</td>
<td>42</td>
<td>17 (40.5%)</td>
<td>73 (69.9%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>73</td>
<td>51 (69.9%)</td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>Arthritis Yes</td>
<td>45</td>
<td>28 (62.2%)</td>
<td>74 (60.8%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>74</td>
<td>45 (60.8%)</td>
<td></td>
</tr>
</tbody>
</table>
Summary

- Focus on African American men
- Results show that, in general, once participants are recruited, those with baseline co-morbidities are no less likely than those without baseline co-morbidities to adhere to the trial screenings
- Smokers had lower rates of screening adherence than non-smokers

Studies 4-5: Underuse of Surgical Resection among Whites and African Americans in South Carolina

Study 4: Independent Predictors of Surgical Resection in Patients with Localized, Non-Small Cell Lung Cancer (Funded by an NIH/NIA Pilot Grant, PI: Esnaola, Mentor: Ford)

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 70-79</td>
<td>0.48 (0.28-0.82)</td>
<td>0.0078</td>
</tr>
<tr>
<td>Age &gt; 85</td>
<td>0.18 (0.10-0.32)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>African American race</td>
<td>0.43 (0.34-0.55)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Separated or divorced</td>
<td>0.71 (0.52-0.97)</td>
<td>0.029</td>
</tr>
<tr>
<td>Widowed</td>
<td>0.60 (0.48-0.76)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>0.69 (0.62-0.78)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Living in poverty</td>
<td>0.67 (0.51-0.88)</td>
<td>0.005</td>
</tr>
<tr>
<td>HMO</td>
<td>0.47 (0.26-0.85)</td>
<td>0.013</td>
</tr>
<tr>
<td>Medicare</td>
<td>0.53 (0.39-0.72)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Medicaid</td>
<td>0.37 (0.22-0.64)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Self-pay</td>
<td>0.41 (0.25-0.67)</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

Study 5: Colon Cancer: Independent Effect of Black Race on Surgical Resection (Funded by an NIH/NIA Pilot Grant, PI: Esnaola, Mentor: Ford)

<table>
<thead>
<tr>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Model 1: Race</td>
</tr>
<tr>
<td>2. Model 1 + demographics</td>
</tr>
<tr>
<td>3. Model 2 + comorbidity</td>
</tr>
<tr>
<td>4. Model 3 + SES</td>
</tr>
<tr>
<td>5. Model 4 + tumor factors</td>
</tr>
</tbody>
</table>

Study 6: Racial/Ethnic Disparities in Medication Use among Veterans with Hypertension and Dementia: A National Cohort Study

Peer-Reviewed Publications Related to the Medication Use Study

Study Design and Sample

- Data were obtained from two national databases of the Veterans Health Administration (2000-2005)
- A total of 56,561 patients (70.5% Caucasian, 15.6% African American, and 6.6% Hispanic) aged 65 years and older had diagnoses of hypertension and dementia

Definition of Medication Adherence

- Adherence = a medication possession ratio (MPR) of 0.8 or greater
- The adherence variable was dichotomous, defined as either adherent or nonadherent

Analytic Approach

- Data were analyzed using SAS software
- Sociodemographic data were generated using descriptive statistics
- The independent sample t-test was used to make comparisons for the MPR
- All tests were 2-sided and a p value of < 0.05 was considered to be statistically significant

Analytic Approach (continued)

- Multivariate logistic regression analyses were adjusted for age, gender, marital status, and geographic location to assess the association between adherence and racial/ethnic group

Results

- The mean age was 78.9 years ± 6 years
- 97.0% of participants were male

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>African American vs White</th>
<th>Hispanic vs White</th>
<th>OR</th>
<th>95% CI</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors</td>
<td>0.76 (0.69 to 0.84)</td>
<td>0.78 (0.52 to 1.19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARBs</td>
<td>0.68 (0.38 to 1.24)</td>
<td>0.68 (0.38 to 1.24)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium-channel blockers</td>
<td>0.60 (0.54 to 0.67)</td>
<td>0.60 (0.54 to 0.67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diuretics</td>
<td>0.65 (0.59 to 0.72)</td>
<td>0.65 (0.59 to 0.72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losartans</td>
<td>0.64 (0.44 to 1.29)</td>
<td>0.64 (0.44 to 1.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probenecid</td>
<td>0.73 (0.44 to 1.29)</td>
<td>0.73 (0.44 to 1.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thiazide diuretics</td>
<td>0.68 (0.48 to 0.96)</td>
<td>0.68 (0.48 to 0.96)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candesartan</td>
<td>0.65 (0.50 to 0.77)</td>
<td>0.65 (0.50 to 0.77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dihydrochloride</td>
<td>0.60 (0.54 to 0.67)</td>
<td>0.60 (0.54 to 0.67)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losartans</td>
<td>0.68 (0.59 to 0.72)</td>
<td>0.68 (0.59 to 0.72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moxalide</td>
<td>0.70 (0.59 to 0.82)</td>
<td>0.70 (0.59 to 0.82)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Panthelurin</td>
<td>0.65 (0.50 to 0.77)</td>
<td>0.65 (0.50 to 0.77)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valsartans</td>
<td>0.60 (0.41 to 0.90)</td>
<td>0.60 (0.41 to 0.90)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Summary**

- African American patients with dementia received less acetyl cholinesterase inhibitors and the NMDA antagonist memantine compared with Caucasians
- Hispanics were less likely to be adherent to dihydropyridine calcium-channel blockers and acetyl cholinesterase inhibitors compared to Caucasians

**Overall Conclusions of All Six Studies**

- Caveat - Tremendous diversity among African Americans
- Wide range of socioeconomic status (2/3 of African Americans are not poor)
- Recognize gender and age/cohort differences

**Overall Conclusions (continued)**

- Older African American men will participate in cancer clinical trials with intensive recruitment methods employed
- A case management/patient navigation intervention can be successful in retaining men once recruited
- African American men with baseline comorbidities will adhere to trial methods

**Overall Conclusions (continued)**

- Targeted recruitment strategies for African American men may help to reach this population
- The wives of the men in the AAMEN Project play a significant gatekeeper role
- A high level of commitment to the inclusion of African American men in clinical trials is needed:
  - Making study sites more accessible
  - Funding and supporting African American investigators conducting these studies

**Overall Conclusions (continued)**

- The case management intervention was most effective among men with lower incomes
- Men with lower income requested more services than other men (p=0.02)
- Elements of successful case management interventions require a sufficient planning phase to
  - Select and hire case managers
  - Identify and contact local service agencies
  - Develop an information and referral file

**Overall Conclusions (continued)**

- African American men with baseline comorbidities are very good candidates for participation in longitudinal cancer screening trials
- Smoking status is a major barrier to adherence
Overall Conclusions (continued)

- African Americans underuse surgical resection
- African Americans and Hispanics with hypertension and dementia are less adherent than Caucasians to medication use for these diseases
- A case management/patient navigation intervention could be tested in this population as a means of increasing medication adherence rates

Acknowledgements

This research was supported by:
- CDC NCI Contract No. N01-CN-25512
- NIH/NCMHD EXPORT Grant No. P60 MD000267
- NIH/NIA/NINR Resource Center for Minority Aging Research (RCMAR) Grant No. 1 P30 AG 21677
- DoD Grant No. DAMD17-99-1-9005
- NIH/NCI 1 P30 CA138313-01 (Cancer Center Support Grant)
The Basics:
What’s a Ph.D.?

Ph.D.: Doctor of Philosophy degree
• Highest academic degree earned
• Terminal degree
• ~1% of the population is awarded
• Requires:
  – Extensive study
  – Intense intellectual effort
  – Scientific expertise

Drs. Brandon, Dansby, Freeman, Hagos, Handy, Owen, and Peprah
Emory University Fellowships in Research and Science Teaching (FIRST)

Benefits of a graduate school degree
• Rewarding career opportunities
  • Make contributions to cutting edge science
  • MS and Ph.D required for many positions
• Increased salaries in many biomedical careers
• Flexibility and independence
• Publishing in scientific journals

Who Should Do This?
People who:
• Have curiosity
• Enjoy solving problems
• Like to work independently
• Want to help others
• Are flexible about their careers

Dr. Cynthia Wright, Assistant Dean for Admissions
wrightcf@musc.edu

Choosing your graduate school

- Make sure that the graduate program fits your interests and goals
- Talk to faculty at your undergraduate institution
- Participate in Summer Undergraduate Research Programs
- Visit the institution
- Discover where graduates have gone

Writing an Effective Personal Statement

What are you trying to tell the reader?

1. The reason why you are applying
2. Your short- and long-term career goals
3. Your academic background
4. Past experiences - research and others
5. How (3) and (4) support (2), which then collectively justify (1).

Application Process

- Completed Application (including personal statement and CV)
- Transcripts from all colleges/universities attended
- Letters of recommendation - research mentors
- GRE general test - PREPARE! PREPARE! PREPARE!
- An interview (should) be required - know your research project - goals, aims, outcomes, future directions

What can I do with my degree?

- Academic Research
- Teaching
- Industry Research
- Patent Law
- Consulting
- Entrepreneur
- Medical Writing
- Public Policy

• be coherent, organized, and succinct
• use an active, straight-forward voice
• be specific - get to the point!
• proof, revise, and then proof
• be honest - demonstrate confidence

• don’t write a biography or catalog achievements
• don’t use clichés, elaborate constructs, etc
• don’t quote dead people
• don’t lecture!
• don’t start out with: I’ve always wanted to be...
• don’t use vague qualifiers: challenging, rewarding, etc
• check your grammar and spelling! NO MISTAKES!!!
Tips on Preparing a Curriculum Vitae (CV)

“Course of Life” is the Latin translation of Curriculum Vitae.

What goes into a CV?

Contact information
Who are you? Where are you from? Here, include your name, address, phone, fax, and e-mail for home and office, if applicable.

Education
Indicate your major, type of degree, and the date each degree was awarded for each postsecondary school attended.

Teaching Experience
List any courses that you assisted with as a TA, co-taught, or taught.

Research Experience (Very important)
List assistantships, summer undergraduate programs, and other research experience. Include the institution, nature of the position, duties, dates, and supervisor.

Grants Awarded
Include title of agency, projects for which funds were awarded, and dollar amounts.

Publications
Put the full reference.

References
Get permission ahead of time. Make sure they will speak highly of you.

Conference Presentations
Similar to the section on publications, separate this category into sections for posters and papers. Use the appropriate documentation style for your discipline.

Professional Activities
List service activities, committee memberships, administrative work, lectures you’ve been invited to deliver, professional workshops you’ve delivered or attended, editorial activities, and any other professional activities in which you’ve engaged.

Professional Affiliations
List any professional societies with which you’re affiliated, Honor or Scientific Societies, Student affiliate.

Research Interests
Briefly summarize your research interests with four to six key descriptors. This is best added during graduate school than before.

What Not to Put In

Don’t overly personalize.

Pretty Cool People Club
Doughnut Appreciation Club

Fernando

Padding

Don’t list lots of projects underway
Don’t have more form than substance

No Padding!

Don’t Exaggerate

OR
Other considerations when preparing a CV:

QUALITIES OF AN EFFECTIVE CV
- Easy to read
- Clear and concise
- Comprehensive but concise
- Correct
- Be Honest

CURRICULUM VITAE DISASTER AREAS
- Poor appearance or format
- Confusing or illogical organization
- Incorrect grammar or word usage, misspellings, typographical errors
- Poor photocopy
- Lack of name, address or phone number
- Unexplained time periods
- Exaggerations or "padding"
- Insufficient or contradictory information

MD/PhD Pathway:
- First 2 years of medical school (lab rotations in the summers)
  - Step 1 USMLE
  - 3-4 years research
- Final 2 years of medical school

MD/PhD Application Process
- Apply through AMCAS
- Apply online to MUSC MSTP program
- MCAT scores (32)
- GPA (3.5)
- Letters of recommendation
- Interview

Research experience is critical

PhD Application Process
- Completed Online Application (including personal statement and CV)
- Transcripts from all colleges/universities attended (3.0 GPA or greater) (3.4)
- Letters of recommendation (3)
- GRE general test (guideline is 1100 V+Q) (1220)
- Interview
- TOEFL test if international

Research experience is critical
PhD Pathway:

- First year core (interdisciplinary) curriculum
- Choose a program and a mentor/laboratory
- Advanced course work (12 hours)
- Written and oral qualifying exams
- Dissertation research
- Defend your dissertation

Financial considerations

Stipend $23,000-25,000/year
Paid health insurance
Dean’s scholarship for tuition
APPENDIX D
Student Fellows’ Research Papers
Serine protease inhibitors (serpins) make up about 2% of the total protein in human serum. Serpins have been found to undergo post-translational modification, $S$-glutathionylation, in patients treated with redox chemotherapeutics. $S$-glutathionylation is the specific posttranslational modification of protein cysteine residues by the addition of glutathione. $S$-glutathionylation alters the functionality of enzymes, receptors, structural proteins, transcription factors, and transport proteins. The drug, NOV-002, is the redox chemotherapeutics utilized in this experiment to cause serpin A1 and A3 to glutathionylate in treated serum. After receiving the redox chemotherapeutics, glutathionylated Serpin A1 and A3 may affect myeloproliferative events. Using protein electrophoresis and Western blot analysis, glutathionylation of serpin A1 and A3 proteins was measured before and after the addition of the drug NOV-002 to serum samples of cancer patients. The results will evaluate the effects of the redox chemotherapeutics on the $S$-glutathionylation of serpins.

**Introduction**

The objective of this experiment is to identify the $S$-glutathionylation patterns of serpins in plasma from cancer patients via Western blot analysis. There is evidence that the Serpin protein family influences myeloproliferation and hematopoietic progenitor cell mobilization. The goal is to determine the $S$-glutathionylated serpin patterns in relation to a cancer patient’s myeloproliferative status. Hence, after chemotherapy, the myeloproliferative status is low and in the future, this information will help to increase this condition. Evidence shows that the down-regulation of serpins A1 and A3 in bone marrow occurs during progenitor cell mobilization. These two serpin groups are responsible for inhibiting serine proteases in addition to lesser roles as hormone transporters, molecular chaperones, or even tumor suppressors. Glutathionylation of serpins may inhibit their activity, which may affect their role in key signaling pathways. Serpin A1 and Serpin A3 are $S$-glutathionylated in redox chemotherapeutic treated serum.

**Materials**

The following materials were utilized in this experiment in order to carry out experimental procedures:

- Eight plasma samples (taken from cancer patients)
- NOV-002
- Reduced GSH
- $KH_2PO_4$, Potassium Phosphate
- Deionized, Distilled $H_2O$
- Eppendorf tubes (1.5mL)
- IGG (Immunoglobulins)
- 4XSD
- TBST (Tris-Buffered Saline Tween-20)
- Anti-PSSG (protein glutathione)
- Anti-Mouse
- Anti – Albumin
- Anti-Rabbit
• Serpin A1 and Serpin A3

**Method/Procedure**

1. Calculate concentrations from stock solutions and use dilutions, calculate protein concentrations, and calculate all reagents.
2. Thaw serum samples on ice- 1 hour to thaw – label samples 1-8 (representing the 8 plasma samples)
3. Preheat water bath at 37°C
4. Once samples are completely thawed, mix gently by inverting and calculate protein concentration using the Bradford Assay.
5. Prepare 18 1.5mL eppendorf tubes (8 for treated samples, 8 for untreated samples, 1 extra treated, 1 extra untreated)
6. Add Potassium Phosphate, protein samples, add GSH(only in 9 samples), and then drug (only in 9 samples)-respectively
7. Put samples at 37°C water bath- 1 hour
8. add 7uL of 4XSD immediately after removing from water bath
9. Centrifuge samples
10. Boil sample for 5 mins
11. Centrifuge samples again
12. Load two 7.5% gels (10 wells)
13. Run at 100V – 2hr
14. Transfer gel to membrane at 25-30V(over night)
15. Block in 5% Milk (2.5g milk/50mL TBST)
16. Probe in primary antibody (anti-PSSG) -two hours
17. Rinse 4X for 5 mins in TBST
18. Probe in secondary antibody (anti-mouse) -one hour
19. Image the membrane
20. Strip the membrane with stripping buffer
21. Repeat step 15
22. Probe in primary antibody (anti-albumin)- 2 hours
23. Repeat step 17
24. Probe in secondary antibody (anti-rabbit)- loading control -1 hour
25. Repeat Step 19
26. Repeat step 20 and 15 (respectively)
27. Probe in primary antibody (Serpin A1)- 2 hours
28. Repeat step 17
29. Probe in secondary antibody (anti-goat)- 1hour
30. Repeat step 19
31. Repeat step 20 and 15 (respectively)
32. Probe in primary antibody (Serpin A3) – 2 hours
33. Repeat step 17
34. Repeat step 29
35. Repeat step 19
Results

Western Blot Analysis of P-SSG

This western blot analysis was done on glutathionylation. The blot on the left indicates that the first four samples (1, 2, 3, and 4) were the untreated samples (no NOV-02). The last four samples indicates the samples that were treated (NOV-002 treated). The blot on the right shows the other plasma samples that were glutathionylated. The first five samples (1, 5, 6, 7, 8) are the untreated samples (no NOV-002) and the other five samples (1, 5T, 6T, 7T, 8T) are the treated samples. The glutathionylation patterns in both blots illustrates that glutathionylation is increased in the plasma samples that were treated with NOV-002. On the contrary, the plasma samples that were not treated with NOV-002 has less glutathionylation patterns compared to those that were treated with the drug.

Western Blot Analysis of Serpin A1

KDA

This western blot analysis was done on Serpin A1. The blot shows the molecular weight markers and the protein bands for Serpin A1. The first two samples (1, 2) are the untreated samples (no NOV-02), and the last two samples (5, 6) are the treated samples (NOV-002 treated). The blot illustrates that the Serpin A1 levels are increased in the plasma samples that were treated with NOV-002. On the contrary, the plasma samples that were not treated with NOV-002 has less Serpin A1 levels compared to those that were treated with the drug.
This western blot was done on the serpin group, Serpin A1. This blot illustrates that Serpin A1 are found in all of the eight plasma samples taken from cancer patients and are S-glutathionylated. The blot that is absent is Serpin A3. The glutathionylation performed on the Serpin A3 blot was too light to illustrate. Although the Serpin A3 blot is too light to show, Serpin A3 is present in all of the eight plasma samples as well.

**Conclusion**

In conclusion, referring to the results that were gathered from this experiment, cancer patients have different Serpin A1 and A3 glutathionylation amounts after receiving the NOV-002 treatment. This proves that S-glutathionylation of serpins occur after receiving the chemotherapeutic or drug, NOV-002. This evidence may help with hematopoietic cell mobilization in bone marrow cells. This is significant to increase the low blood count of white blood counts in cancer patients after receiving chemotherapy. In essence, later studies can be conducted to better assist cancer patients and increasing their myeloproliferative status.

**References**

2. Serine protease inhibitors serpina1 and serpina3 are down-regulated in bone marrow during hematopoietic progenitor mobilization - Ingrid G. Winkler (2005)
5. Sulfiredoxin - Robert R. Bowers
6. [www.wikipedia.com](http://www.wikipedia.com)
7. [www.pubmed.com](http://www.pubmed.com)
Introduction: Sacroneuromodulation has been used for both detrusor overactivity and urinary retention. The exact mechanism of action is not known for this therapy. We sought to determine if any preoperative factors could help predict better clinical outcomes in the setting of urinary retention.

Methods: We performed a retrospective chart review from 2000 to 2010 of procedures performed by three dedicated voiding dysfunction specialist. Characteristics evaluated included age, previous surgeries, neurologic diagnosis, length of retention, invasive and noninvasive urodynamic data. Operative data collected included presence of bellows response, sacral foramen used, number of leads, number of electrodes generating a response, side of lead, and complications. Postoperative data included subjective and objective improvement, progression to IPG implantation, wound infection, complications and need for revision.

Results: We identified 54 patients that had undergone 73 sacroneuromodulation lead placements as treatment for urinary retention, 17 male, and 35 female. Mean age was 50 years. Twenty-seven patients had data on length of retention with a mean of 34 months. Twenty-four patients had undergone previous surgery and 18 were on medical management. All patients underwent urodynamic testing and demonstrated little or no detrusor contractile activity, low flows, and elevated postvoid residuals (PVR). Mean detrusor pressure was 12.5 cm H2O, mean flow rate was 4 cc/sec, and mean PVR was 593 cc. Only 3 patients presented with a neurologic diagnosis. All 73 lead placements demonstrated a good bellows response. Thirty-six leads were placed in the left and 36 on the right, one was not recorded. Bilateral stimulation was tested in 67 patients. A mean of 2.4 electrodes generated a response after lead implantation. Subjective improvement was noted after 48 lead placements and 47 went on to implantable pulse generators (IPG). Twenty-six lead placement procedures did not go on to IPG. When comparing the procedures that failed to go on to IPG versus those that did, we found few differences. The mean age was higher in the failure group, 55 vs. 43 years. Mean PVR was also found to be higher in the failure group, 613 cc versus 570 cc. No difference was noted in mean flow rate, max detrusor pressure, or number of stimulating electrodes.

Conclusions: The preoperative and intraoperative factors we evaluated do not appear to give us significant prognostic data. Just as we do not fully understand the mechanism of action of this treatment, the factors that may portend its success or failure have yet to be fully defined.
Introduction

The bladder is an important organ that stores and expels urine. It is composed of two muscles: the detrusor muscle and sphincter muscles. The detrusor is the muscle that lines the wall of the bladder and acts like a sac that stores and empties urine. The muscle relaxes to allow your bladder to fill and contracts when it is time to expel the urine. The sphincter muscle has two parts: an internal and external muscle. The internal sphincter is a ring of muscles that open and close the neck of the bladder involuntarily. The external sphincter or distal sphincter is the “cap” that keeps the urine in the bladder. This muscle is under voluntary control via the pudendal nerve and is voluntary. When these muscles become damaged, voiding dysfunction can occur and affect quality of life. Lower urinary tract dysfunction can manifest as incontinence or urinary retention. Urinary incontinence is the involuntary leakage of urine and urinary retention is the inability to void. To define the specific cause of a patient’s voiding dysfunction a physician will perform video urodynamics. This is administered to gather objective data that can be used to counsel patients about possible treatment options. Urodynamics “involves the electronic recording of the urinary flow rate throughout the course of micturition and is commonly used in patients who present with symptoms of” or urinary retention or incontinence (Urology, 9th ed., Ch. 87). In urodynamics study a “tiny catheter is inserted into the bladder as well as a tiny catheter inserted into the rectum. This measures the pressure within the bladder and the "abdominal cavity." Fluid is slowly instilled into the bladder to diagnose the pressure as the bladder fills as well as the pressure when urinating. This "bladder pressure" determination can be very helpful in accurately diagnosing the severity of neurogenic bladder and voiding dysfunction. In addition, urodynamics may be used to provide a risk assessment of a patient's potential for kidney damage and worsening symptoms over the ensuing years” (Uroassociates). This test also produces a post void residual number (PVR), which is the volume of fluid remaining in the bladder immediately after the completion of micturition. Very high PVR volumes are an indication of retention or incomplete bladder emptying. A neurogenic bladder is the result of damage to the neuronal control or efferent or afferent innervations of the bladder. This may result in retention of detrusor overactivity. In the case of urinary retention catheter is often required to adequately empty the bladder. There are several treatment options, but we will explore electrical stimulation and specifically sacral neuromodulation.

Electrical stimulation of the bladder is not a new treatment option. Unfortunately there is not substantial information about it because there is limited understanding of the complex coordination required for detrusor function. Brindley was the first to experiment with sacral root stimulation as a treatment option for incontinence in paraplegic patients. Brindley sacral anterior root stimulator uses electrical stimulation to empty the bladder, and bladder overactivity is abolished by transection of sacral dorsal roots. “Evolving data showed that for optimal bladder emptying to be achieved, sacral anterior root stimulation with posterior rhizotomies of S2, S3, and S4 would be required. The posterior rhizotomy would decrease the reflex activity of the detrusor and improve bladder compliance” (Campbell 2148). From the work of Brindley sacral neuromodulation was developed. Knowledge of this type of electrical stimulation is still evolving, but two theories exist to explain its method of action: “1) direct activation of efferent fibers to the striated urethral sphincter reflexively causes detrusor relaxation and 2) selective activation of afferent fibers causes inhibition at spinal and supraspinal levels” (Campbell 2149). Sacral neuromodulation involves the implantation of a pacemaker like device in the pelvic region to deliver low amplitude electrical impulses to S3 or S4 roots via multi electrode lead. These electrical impulses help patients with urinary retention, and urinary incontinence by restoring control of the detrusor and sphincter muscles. The constant current helps relax an overactive detrusor or influence an inactive detrusor which in turn helps improves quality of life.

Due to the limited information on the mechanism of action of electrical stimulation, there is currently no significant indicator or specific test that delineates which patients will have better clinical outcomes in the setting of urinary retention. We evaluated our series to see if we could identify any factors that portended a better or worse outcome with sacral neuromodulation.
**Materials/Procedure:**
We performed a retrospective chart review from 2000 to 2010 of procedures performed by three voiding dysfunction specialist. Characteristics evaluated included age, previous surgeries, neurologic diagnosis, length of retention, invasive and noninvasive urodynamic data. Operative data collected included presence of bellows response, sacral foramen used, number of leads, number of electrodes generating a response, side of lead, and complications. Postoperative data included subjective and objective improvement, progression to IPG implantation, wound infection, complications and need for revision.

**Data/Results:**
We identified 54 patients that had undergone 73 sacroneuromodulation lead placements as treatment for urinary retention 17 male, and 35 female. Mean age was 50 years. Twenty seven patients had data on length of retention with a mean of 34 months. Twenty four patients had undergone previous surgery and 18 were on medical management. All patients underwent urodynamic testing and demonstrated little or no detrusor contraction low flows and elevated post void residuals (PVR). Mean detrusor pressure was 12.5cm/H2O, mean flow rate was 4cc/sec and mean PVR was 593cc. Only 3 patients presented with a neurologic diagnosis. All 73 lead placements demonstrated a good bellows response. Thirty six leads were placed in the left and 36 on the right one was not recorded. Bilateral stimulation was tested in 67 patients. A mean of 2.4 electrodes generated a response after lead implantation. Subjective improvement was noted after 48 lead placements and 47 went on to implantable pulse generators (IPG). Twenty six lead placement procedures did not go on to IPG.

<table>
<thead>
<tr>
<th>Preoperative Mean for All Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of Retention</strong></td>
</tr>
<tr>
<td><strong>UDS PVR</strong></td>
</tr>
<tr>
<td><strong>Max Flow</strong></td>
</tr>
<tr>
<td><strong>Pressure at Max Flow</strong></td>
</tr>
<tr>
<td><strong>Evidence of Obstruction on X-Ray</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preoperative Mean</th>
<th>Failure</th>
<th>Went on to InterStim Implantation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of Retention</strong></td>
<td>24.5 months</td>
<td>39 months</td>
</tr>
<tr>
<td><strong>UDS PVR</strong></td>
<td>613.4 cc</td>
<td>570.2cc</td>
</tr>
<tr>
<td><strong>Max Flow</strong></td>
<td>4.2 cc/sec</td>
<td>4.1 cc/sec</td>
</tr>
<tr>
<td><strong>Pressure at Max Flow</strong></td>
<td>12.2 cm/H2O</td>
<td>12.8 cm/H2O</td>
</tr>
<tr>
<td><strong>Evidence of Obstruction on X-Ray</strong></td>
<td>14 (70%)</td>
<td>29 (83%)</td>
</tr>
</tbody>
</table>

**Postoperative Statistics for All Patients**

<p>| Subjective Improvement | 49 (67%) |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Bladder Diary</td>
<td>47 (64%)</td>
<td></td>
</tr>
<tr>
<td>Improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implantation</td>
<td>47 (64%)</td>
<td></td>
</tr>
<tr>
<td>Wound Infection</td>
<td>6 (8%)</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>9 (12%)</td>
<td></td>
</tr>
<tr>
<td>IPG Revision</td>
<td>20 (27%)</td>
<td></td>
</tr>
<tr>
<td>Mean Follow Up</td>
<td>26.11 months</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Postoperative Statistics</th>
<th>Failure</th>
<th>Went on to InterStim Implantation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Improvement</td>
<td>3 (11%)</td>
<td>46 (98%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bladder Diary Improvement</td>
<td>3 (11%)</td>
<td>44 (94%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implantation</td>
<td>0 (0%)</td>
<td>47 (100%)</td>
</tr>
<tr>
<td>Wound Infection</td>
<td>1 (4%)</td>
<td>5 (11%)</td>
</tr>
<tr>
<td>Complications</td>
<td>5 (19%)</td>
<td>4 (9%)</td>
</tr>
<tr>
<td>IPG Revision</td>
<td>0 (0%)</td>
<td>18 (38%)</td>
</tr>
<tr>
<td>Mean Follow Up</td>
<td>3.67 months</td>
<td>28.5 months</td>
</tr>
</tbody>
</table>

When comparing the procedures that failed to go on to IPG verses those that did we found few differences. The mean age was higher in the failure group 55 vs. 43 years. Mean PVR was also found be higher in the failure group 613 cc verses 570 cc. No difference was noted in mean flow rate, max detrusor pressure, or number of stimulating electrodes.

**Conclusion:**
Failure was more common in patients that had an increase in PVR. Failure was more common in patient that had shorter operation times. We did not find a significant difference in sacral foramen or laterality for the number of lead responses. Despite these findings, the preoperative and intraoperative factors we evaluated do not appear to give us significant prognostic data. Just as we do not fully understand the mechanism of action of this treatment the factors that may portend its success or failure have yet to be fully defined. It is important to note that further statistical analysis and study will need to be completed on the patients in this series.

**Reference**
Redox protein expression and susceptibility to therapeutic intervention in ARCaP prostate cancer cells

Abstract

Introduction: Thioredoxin is a redox-regulating protein that plays a central role in regulating cellular redox and preventing cell death. There is a high expression of thioredoxin in cancer cells because the tumor environment is usually under either oxidative or hypoxic stress and both stresses are known to be up-regulators of thioredoxin expression. Prostate cancer is the 2nd leading cancer in men after lung cancer. Indolent disease can be treated fairly well and progresses slowly. However, the more aggressive form of prostate cancer spreads throughout the body and there are no curative treatments.

Hypothesis: We tested the hypothesis that increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype.

Methods: In our project we looked at the expression of redox proteins and susceptibility to chemotherapy in ARCaPe and ARCaPm cells. Using western blot methods and Image J we were able to quantify the expression of thioredoxins. Susceptibility to chemotherapy was tested in a viability assay.

Results: Western blot analysis indicated increased expression of the redox proteins such thioredoxin 1 and thioredoxin 2 in ARCaPm cells when compared to ARCaPe cells. Our results conclusively showed that Taxol killed both cell types, while Depsipeptide proved effective on ARCaPe cells and ineffective on the ARCaPm cells. We are currently determining the effect of combination therapies.

Conclusion: In conclusion we found that ARCaPm cells do have an increased expression of redox proteins. Therefore they are more resistant to cancer treatments, such as depsipeptide.

INTRODUCTION

Prostate cancer is a form of cancer that develops in the prostate. Prostate cancer tends to develop in men over the age of fifty and although it is one of the most prevalent types of cancer in men, many never have symptoms, undergo no therapy, and eventually die of other causes. Most prostate cancers are slow growing; however, there are cases of aggressive prostate cancers. The cancer cells may metastasize from the prostate to other parts of the body, particularly the bones and lymph nodes. Prostate cancer may cause pain, difficulty in urinating, problems during sexual intercourse, or erectile dysfunction. Other symptoms can potentially develop during later stages of the disease. Many factors, including genetics and diet, have been implicated in the development of prostate cancer. If there is a history of people in a family with prostate cancer there is an increased risk of prostate cancer for males in that family. Prostate cancer is also more common in African American males and less common in south an eastern Asia. The presence of prostate cancer may be indicated by symptoms, physical examination, prostate specific antigen (PSA), or biopsy. Suspected prostate cancer is typically confirmed by taking a biopsy of the prostate and examining it under a microscope. Further tests, such as CT scans and bone scans, may be performed to determine whether prostate cancer has spread. Treatment options for prostate cancer with intent to cure are primarily surgery, radiation therapy, and proton therapy. Other treatments, such as hormonal therapy, chemotherapy, cryosurgery, and high intensity focused ultrasound (HIFU) also exist, depending on the clinical scenario and desired outcome.

Apoptosis signal-regulating kinase 1 (ASK1) activates the c-Jun N-terminal Kinase (JNK) in a Raf independent fashion in response to an array of stresses. It has been found to be involved in cancer. Thioredoxin is a redox
protein. Thioredoxins facilitate the reduction of other proteins by cysteine thiol-disulfide exchange. Thioredoxins are found in nearly all known organisms and are essential for life in mammals. When thioredoxin levels are up regulated cell growth and resistance to the normal mechanism of programmed cell death are increased. Increased Thioredoxin in primary cancers compared to normal tissue contributes to increased cell growth and resistance to chemotherapy. Thioredoxin offers a target for the development of drugs to treat and prevent cancer. ASK1 mediates cytokines and oxidative stress (ROS)-induced apoptosis in a mitochondria dependent pathway. ASK1 in mitochondria is JNK independent and ASK1 in cytoplasm is JNK dependent. Mutation of ASK1 at C250 enhanced ASK2 induced JNK activation and apoptosis. Trx 1 blocks ASK1 signal to JNK in cytoplasm and Trx2 inhibits ASK1 in mitochondria. ASK1 in the mitochondria is c-Jun N-terminal Kinase (JNK) dependent.

The purpose of our study was to test if increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype. In our project we looked at the expression of redox proteins and susceptibility to chemotherapy in ARCaPe and ARCaPm cells. With this information we can find effective treatments for aggressive prostate cancer phenotype.

**METHODS AND MATERIALS**

We isolated the protein from the cells. To do this we added RIPA buffer and Mammalian Protease cocktail (MPC) 5ul of Mammalian Protease cocktail for each 500ul of RIPA buffer (1:100 dilution). The tube containing cell pellet was vortex then the mixture (RIPA and MPC) was added to the cell. We stored the cell on ice for 15 minutes then vortex again. It is spun at 4C in microfuge for 20 min and then transferred into a new tube for protein assay.

**NuPage gels**

Heat block is turned on to 70C. Then the samples were prepared each sample was given 6ul of sample buffer and 1.5ul DTT. For marker tube 4ul of rainbow marker was prepared no more than 30ul volume or 50ug protein was added to each tube. Tubes were then put in vortex to bring all liquid to the bottom. Tubes were then set in heat block for 10 min at 70C. Spun again then kept at room temperature.

While samples were heating running buffer (760ml ddH2O and 40ml 20x MES running buffer) was prepared. 600ml of running buffer was poured into outer chamber of gel box. 500ul of antioxidant was then added to remaining 200ml of buffer and poured into inner chamber gels were rinsed and samples were loaded into gel. We ran the gels for 40-50 min at 200v (4-12% Nupage). After gel is ran 400 ml of transfer buffer was prepared. This consisted of 300 ml of ddH2O, 20 ml of 20x transfer buffer 80 ml of MeOH and 400 ul of antioxidant.

Next we assembled a transfer unit to assemble the transfer unit pads were soaked in transfer buffer and we wet nitrocellulose paper with ddH2O placed two pads into deep side of transfer unit disassembled the gel placed one piece of 3MM paper onto the gel pushed gel out and placed it 3MM side down onto pads in transfer unit. Next nitrocellulose was put onto the gel and topped with another piece of 3MM paper. Then the rest of the transfer unit was filled with pads until 5mm over edge of transfer unit. Transfer unit was closed and placed in gel box. Buffer was added to the inner chamber and water was added to the outer chamber. Gel was transferred at 30v for 1.5 hr.

When transfer is completed the blot was blocked by placing nitrocellulose into 5% milk in TBS-Tween(TBS with 0.1% Tween) in a 50 ml conical tube and was allowed to rotate for at least 30 min at room temperature. The blot is then put in primary antibody (Trx1, Trx2, Catalase, DJ-1, or GAPDH) overnight at 4C. Blot is then washed 3 times for 10 min with TBS-Tween. Then they were put in secondary antibody for 1-2 hours at room temperature. Washed 3 times for 10 min in TBS-Tween. The blot is then put in 750 ul of each supersignal DuraWest (pierce) reagent for 5 min. The blot was then placed into a film cassette and exposed in a darkroom.
NIH Image
This was used to quantify the western blot signals. Blot was taken to an imager and image was converted to jpg. Then we opened NIH (Image J) we drew boxes around all of the lanes 1 box per lane. Then we analyzed the gels which made plots of the bands. Then we sectioned off each peak and quantified the results. The results were in turn pasted into excel were we generated graphs of our results.

MTS Assay
Cells were plated in triplet with 96-well plate and 2 hours later infected with the cells with the proper titer of virus. 24 hours after infection, medium is replaced with 100ul fresh medium, and 20ul of Cell Titer 96 AQueous One Solution (Promega, Cat.#: G3582) added. A triplet “no-cell” control containing 50ul of culture medium and 25ul of each Solution at the same time. Return the plate to incubator for 48 to 72 hours. Empty each well of a 96-well plate, and record fluorescence with a 96-well plate reader. Subtract the average fluorescence from the “no-cell” control from all other fluorescence values yields the corrected fluorescence.

RESULTS
Increased expression of redox protein in ARCaPm cells
We used western blot and compared ARCaPe cells next to ARCaPm cells. After the blots were quantified using Image J we could see an increase expression of our redox proteins in the ARCaPm cells. This confirms that redox proteins are more prevalent in the more aggressive prostate cancer phenotype.

Effects of Taxol and Depsipeptide on cancer cells independently
To investigate the possible effect of Taxol a chemotherapy drug on prostate cancer cells. We did a MTS assay and plated ARCaPe and ARCaPm cells on a 96 well plate and cells were treated with increasing concentrations of Taxol and Depsipeptide. Plates were let in incubator for 48 hr. The fluorescence readings show that Taxol was effective on both ARCaPe and ARCaPm cells but in very high concentrations the readings also show that Depsipeptide is effective in ARCaPe but not effective in ARCaPm.
Effects of Taxol and Depsipeptide on cancer cells in combination

To examine the effects of Taxol and Depsipeptide on ARCaP cells. A MTS assay was run. One plate ARCaPe cells and another plate ARCaPm cells. Cells were treated with increasing concentrations of taxol from left to right and increasing concentrations of Depsipeptide top to bottom. After 48 hrs reading were taken for fluorescence readings show that the two drugs can work together to kill prostate cancer cells.

The two drugs are shown here working together to kill ARCaPm cells.

CONCLUSION

So both cell lines are sensitive to taxol (at very high and probably not clinically relevant concentrations). ARCaPe displays some sensitivity to Depsipeptide and ARCaPm do not. This shows a correlation between increased thioredoxins and Depsipeptide not working. This gave a reason to test for synergy and possible combination therapy when the two works together they work very well together to kill the prostate cancer cells.

REFERENCES

Evaluating an Intervention to Improve Perceptions of Cancer Clinical Trials among Racially Diverse Communities in South Carolina

Abstract

Objective. To conduct a cancer clinical trials education intervention with racially diverse groups in South Carolina.

Methods. The study was conducted at ten different sites in eight counties in South Carolina. The intervention consisted of a 30-minute cancer clinical trial educational presentation. Participants were recruited primarily by community partners. Pre- and post-intervention surveys were administered. The survey instrument included seven items. Sample items included the following: “Do you think that patients should be asked to take part in medical research?” and “Would you be prepared to take part in a study where treatment was chosen at random?” Analyses were completed using SPSS 16.0, SAS 9.1.3, and R v2.6.1.

Results. The study sample consisted of 195 predominantly African American participants (n=195). The majority of the 190 participants who reported age were 50+ years (57.4%). Among those who reported income (n=182), 66.6% had an annual household income < $60,000. For each of the seven survey items assessing perceptions of cancer clinical trials, respectively, 9%, 24%, 38%, 20%, 18%, 14% and 13% of the participants changed to more favorable responses on the post-test vs. pre-test (p<0.001).

Conclusions. Providing cancer clinical trials information to racial and ethnic minorities led to more positive perceptions of cancer clinical trials. Future research studies could incorporate a longer follow-up period to assess the behavioral impact of the intervention and whether short-term gains are sustained over time.
Introduction
South Carolina (SC) ranks among the top 20 states in the U.S. with the highest number of cancer deaths, and one of five South Carolina residents will be diagnosed with cancer during their lifetime. African Americans in South Carolina have significantly higher cancer rates than European Americans in the state. Breast cancer mortality rates are 1.4 times higher for African Americans than European Americans (31.5 compared to 21.9); cervical cancer rates are 2.2 times higher (4.4 compared to 2.0); colorectal cancer rates are 2.1 times higher (35.8 compared to 17.4); and prostate cancer rates are 2.3 times higher (52.4 compared to 22.7).

Underrepresentation of African Americans in Clinical Trials
Despite their higher incidence and mortality of cancer relative to their European American counterparts, African Americans are not well represented in cancer clinical trials. These trials provide opportunities to test new screening techniques, therapies, and biomarkers that could reduce cancer disparities. While trial participation is of major importance for all people with cancer, it is of particular importance for African Americans. Proper sampling of a heterogeneous population to ensure sample representativeness is a key component of valid epidemiologic and clinical research. Without adequate numbers of African Americans in clinical trials, the generalizability of study results to members of this population is in question.

Enhancing Knowledge of Clinical Trials in Diverse Communities
The need to expand the knowledge base of clinical trials among diverse community members is underscored by Ford et al. These investigators reviewed 65 studies focusing on recruitment of minorities to cancer clinical trials. They found that lack of education about cancer clinical trials was the most frequently reported barrier to participation. Other barriers included lack of culturally appropriate information about cancer clinical trials and lack of cancer knowledge. Similarly, Giuliano et al. report that lack of knowledge about clinical trials, and negative perceptions of them, are formidable barriers to the participation of minorities in clinical trials. McCaskill-Stevens et al. recommend the use of culturally appropriate educational materials to increase minority clinical trial participation.

Along the same lines of reasoning, Fallowfield et al. note that recruitment difficulties often arise from potential participants’ concerns about ethical issues in research, as well as concern about whether the best available treatment would be given. Additionally, lack of understanding of the value of clinical trials and the randomization procedure could lead to suspicion of trials and low rates of trial participation.

Methods
We hypothesized that increased knowledge about cancer clinical trials would lead to more positive perceptions of trials among the study participants; therefore, we conducted a cancer clinical trials education intervention with diverse populations in South Carolina.

Study Sample
Our study included a convenience sample of community participants in communities with high racial disparities in cancer mortality rates. Although most of the community leaders who took responsibility for recruiting participants to the intervention were African American, we did not exclude other participants. For example, while we focused on African Americans, the racial group with the largest cancer mortality disparities in the state, we also included Native Americans and Caucasians. We did not exclude members of groups other than African Americans from taking part in the intervention.

Study participants were recruited via community partners in each locale where the training sessions were conducted. Each locale had a self-identified “champion”, a community leader who took the responsibility for recruiting participants to the session. In addition, we gave presentations to patients and community members at sites during events hosted by the community partners, such as men’s fellowship meetings or health ministry
meetings. We also posted flyers in community venues such as health care centers, churches, libraries, and community centers and we posted information about the sessions in local barbershops and beauty salons. Additionally, we made presentations about the sessions at meetings of fraternities, sororities and civic groups. Public service announcements on local radio stations to advertise the upcoming sessions were also made.

To enhance the representativeness of our statewide study sample, we conducted the intervention in eight different counties representing several different geographic regions of the state. These eight counties include: Berkeley Georgetown, Charleston, Greenville, Orangeburg, Richland, Bamberg and Florence counties. The Ridgeville site is in Berkeley County, the Georgetown site is in Georgetown County, the Charleston and Johns Island sites are in Charleston County, the Greenville site is in Greenville County, the Orangeburg sites are in Orangeburg County, the Columbia site is in Richland County, the Denmark site is in Bamberg County, and the Florence site is in Florence County. Three sessions were held at historically black colleges/universities (HBCUs) in Orangeburg and Bamberg Counties (Figure 1).

The sites consisted of a community cancer center (Charleston), a community center of a church (Georgetown), community health systems (Greenville, Columbia and Florence), HBCUs (two Orangeburg sites and one Denmark site), and community centers (Johns Island and Ridgeville).

<table>
<thead>
<tr>
<th>Race</th>
<th>Berkeley</th>
<th>Charleston</th>
<th>Georgetown</th>
<th>Greenville</th>
<th>Orangeburg</th>
<th>Richland</th>
<th>Bamberg</th>
<th>Florence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>197.83</td>
<td>176.89</td>
<td>179.93</td>
<td>171.77</td>
<td>180.38</td>
<td>190.19</td>
<td>#</td>
<td>180.6</td>
</tr>
<tr>
<td>African</td>
<td>206.16</td>
<td>222.10</td>
<td>187.23</td>
<td>244.71</td>
<td>261.08</td>
<td>237.20</td>
<td>291.4</td>
<td>226.7</td>
</tr>
</tbody>
</table>

*South Carolina Department of Environmental Control website (http://www.scdhec); accessed 7/10/09
#: Cells with 15 or fewer cases do not have rates due to the instability of small numbers when calculating rates.

The counties were selected based on their high rates of cancer disparities. Table 1 illustrates age adjusted cancer mortality rates in South Carolina for African Americans and European Americans for the counties in which we conducted the intervention.

**Institutional Review Board Approval**

The Institutional Review Board (IRB) at the Medical University of South Carolina approved the study protocol. The pre- and post-intervention surveys that were completed by each participant were linked by an identifier that was not connected to their name, date of birth, or any other personal identifier. The investigators had no way of connecting survey responses to individual participants in the sessions.
Design of the Cancer Clinical Trials Education Intervention

The intervention consisted of a 30-minute interactive PowerPoint presentation that is available on the National Institutes of Health (NIH)/National Cancer Institute (NCI) website. The intervention was part of a larger 3.5-hour education program aimed at increasing general cancer knowledge, prostate cancer knowledge, and perceived self efficacy in patient-physician interaction among minority populations in South Carolina.

The rationale for the dual focus of the intervention is based on cancer mortality data from South Carolina. For every major cancer, the state ranks among the highest in the nation in cancer mortality and there are large racial disparities within these cancer subtypes. For these reasons, we felt that gaining increased knowledge about many different cancer subtypes was important.

The NIH/NCI clinical trials presentation was modified to include additional pictures of African Americans and cancer mortality data that are specific to African Americans in South Carolina. Other modifications included the addition of information about the Tuskegee Syphilis Study. The intervention includes a description of which elements of the Tuskegee Syphilis Study violated human rights (e.g., not informing participants that they were in a research study; not sharing information about the modes of transmission of syphilis with infected study members; not allowing infected study members to have access to penicillin when it was discovered in the 1950s as a treatment for syphilis; not allowing the study participants to withdraw from the study at their discretion, etc.) and a description of the human subjects protections that are currently in place as a result of the Tuskegee Syphilis Study.11 It also includes graphic images to illustrate the processes of random selection and randomization. The intervention was designed to present complex information in an understandable manner using simple, lay language that had meaning for the participants.

Measures

The 7-item Fallowfield instrument10 was used to assess perceptions of cancer clinical trials. The items include the following: (1) Do you think that patients should be asked to take part in medical research? (2) Would you be prepared to take part in a study comparing different treatments? (3) Would you be prepared to take part in a study where treatment was chosen at random? (4) Doctors and experts in the field do not know for sure if one treatment is better than the other, or if they are both the same, that’s why they want to do the study. Would knowing that encourage you to take part? (5) In a random choice study, if the treatment you were receiving did not suit you for any reason, you could leave the study. Would that encourage you to take part? (6) The doctor would tell you all about the two treatments being compared before you were allocated to one or the other. Would that encourage you to take part? and (7) If you knew that … (a) either treatment was completely suitable (b) you could leave the study … (c) there is plenty of information… Would all these things together mean that you would change your mind and agree to take part?

Additional survey items assessed general background demographics, including Hispanic ethnicity, race, highest level of education completed, marital status, household income, age, and gender.

Statistical Methods

The survey data were double-entered into SPSS 16.0 datasets and were compared for verification of data entry. Analyses were done with SPSS 16.0, SAS 9.1.3, and R v2.6.1. Chi-square tests were used to compare demographics across all sites. Of particular interest were the percent of participants that positively changed their mind following the educational intervention. Fisher’s exact tests were used to compare the number of participants that changed their mind from “No” at the pre-survey to “Yes” at the post-survey (implying a positive changed) compared to the number that changed from “Yes” (pre-survey) to “No” (post-survey), which would imply a negative impact from the intervention.
Results
Table 2 shows the demographic characteristics of the participants (n=195 at pre-intervention, 94% response rate). Most participants were African American (75.4%) and most had at least a college education (75.4%). About half of the participants were married or living as married (45.1%), and the majority of participants had an annual household income \( \leq \$60,000 \) (66.6%). Most participants were female (53.3%).

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 50 years</td>
<td>78</td>
<td>(40.0%)</td>
</tr>
<tr>
<td>51-64 years</td>
<td>73</td>
<td>(37.4%)</td>
</tr>
<tr>
<td>65-75 years</td>
<td>34</td>
<td>(17.4%)</td>
</tr>
<tr>
<td>More than 76 years</td>
<td>5</td>
<td>(2.6%)</td>
</tr>
<tr>
<td><strong>Hispanic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>(1.5%)</td>
</tr>
<tr>
<td>No</td>
<td>188</td>
<td>(96.4%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American or Black</td>
<td>147</td>
<td>(75.4%)</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>15</td>
<td>(7.7%)</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>(0.0%)</td>
</tr>
<tr>
<td>Caucasian or White</td>
<td>28</td>
<td>(14.4%)</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>0</td>
<td>(0.0%)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
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<td></td>
</tr>
<tr>
<td>Less than 8 years</td>
<td>4</td>
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</tr>
<tr>
<td>8-11 years</td>
<td>8</td>
<td>(4.1%)</td>
</tr>
<tr>
<td>12 years or completed high school</td>
<td>20</td>
<td>(10.3%)</td>
</tr>
<tr>
<td>Post high school training other than college</td>
<td>12</td>
<td>(6.2%)</td>
</tr>
<tr>
<td>Some college</td>
<td>41</td>
<td>(21.0%)</td>
</tr>
<tr>
<td>College graduate</td>
<td>53</td>
<td>(27.2%)</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>53</td>
<td>(27.2%)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or living as married</td>
<td>88</td>
<td>(45.1%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>19</td>
<td>(9.7%)</td>
</tr>
<tr>
<td>Divorced</td>
<td>24</td>
<td>(12.3%)</td>
</tr>
<tr>
<td>Separated</td>
<td>5</td>
<td>(2.6%)</td>
</tr>
<tr>
<td>Never married</td>
<td>54</td>
<td>(27.7%)</td>
</tr>
<tr>
<td><strong>Household Income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$0-$19,999</td>
<td>47</td>
<td>(24.1%)</td>
</tr>
<tr>
<td>$20,000-$39,999</td>
<td>42</td>
<td>(21.5%)</td>
</tr>
<tr>
<td>$40,000-$59,999</td>
<td>41</td>
<td>(21.0%)</td>
</tr>
<tr>
<td>$60,000-$79,999</td>
<td>26</td>
<td>(13.3%)</td>
</tr>
<tr>
<td>$80,000+</td>
<td>26</td>
<td>(13.3%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>(14.4%)</td>
</tr>
<tr>
<td>Female</td>
<td>104</td>
<td>(53.3%)</td>
</tr>
</tbody>
</table>

*Some participants were missing data on this variable
The demographic analysis across all sites shows a statistically significant difference in age, race, education, household income and gender (Table 3).

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.006</td>
</tr>
<tr>
<td>Hispanic Ethnicity</td>
<td>0.535</td>
</tr>
<tr>
<td>Gender</td>
<td>0.001*</td>
</tr>
<tr>
<td>Race</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Education</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Marital Status</td>
<td>0.086</td>
</tr>
<tr>
<td>Household Income</td>
<td>0.019</td>
</tr>
</tbody>
</table>

*Gender is missing for some sites

7-Item Fallowfield Instrument Outcomes from Pre-Test to Post-Test
For many of the Fallowfield items, there was a large “yes” response at pre-test and the response remained unchanged at post-test. The majority of the participants who had less favorable perceptions of cancer clinical trials changed their perceptions from less favorable perceptions to more positive perceptions from pre- to post-test during the intervention (Table 4.) For each item, the change from pre- to post-test was statistically significant at the p<0.001 level.

To use Item 1 as an example, in response to the question “Do you think that patients should be asked to take part in medical research?” 85% of the participants’ answers remained “yes” from pre-to-post-test, while 73% of the participants (16/22) who answered “No” on the pre-test changed their responses to “Yes” on the post-test. In contrast, only 3% of participants (5/151) changed their responses from “Yes” on the pre-test to “No” on the post-test (p<0.001) (Table 4.).
Limitations
In the present study, the assessment time period was short. We did not evaluate whether changes in perceptions of clinical trials were sustained over time. A large percentage of the participants answered “yes” at pre-test on the survey questions, so there is a type of “ceiling effect.” Future studies could incorporate a longer-term follow-up period. Additionally, the behavioral impact of the intervention could be evaluated in a future study. For example, future studies could assess whether the participants changed their willingness to enroll in a clinical trials registry and whether they actually enrolled.

Discussion
The purpose of this study was to conduct a community-based cancer clinical trials education intervention to enhance perceptions of trials among predominantly minority populations in South Carolina. Despite some limitations, the study has a number of strengths. First, the study sample included statewide representation. Second, we used a community-based recruitment strategy. We primarily relied on community representatives to recruit participants for each session. The community representatives also identified the community venue for each session. Pre- and post-intervention data show highly statistically significant increases in positive perceptions of cancer clinical trials.

Barriers to Participation of Minorities in Cancer Clinical Trials
Swanson and Ward developed a conceptual framework to describe barriers to minority cancer clinical trials participation.12 In the framework, sociocultural barriers are described. These barriers refer to fear and mistrust of federally sponsored research, the investigators conducting the research, and/or the institutions at which the research is conducted. Negative feelings may stem from previous encounters or from hearing reports of others’ previous encounters with research studies.11 Sociocultural barriers to recruitment of African Americans into clinical trials also include racial and ethnic discrimination, cultural beliefs regarding illness and disease, mistrust of the health care system, and differences in health beliefs and practices.12,13

A crucial sociocultural barrier is knowledge of the Tuskegee Syphilis Experiment, in which African American men diagnosed with syphilis went untreated for research purposes. Fear of undergoing similar mistreatment prevents many African Americans from participating in current research studies.12

In our study, we addressed sociocultural barriers by employing the following methods. First, we conducted the intervention in trusted community venues. Second, we worked with trusted community leaders who endorsed the study and helped to recruit participants to each study session. Third, the majority of our study team members is African American and thus, reflects the racial background of the population that was recruited. Fourth, as part of the intervention, we acknowledged past clinical trial abuses in the Tuskegee Syphilis study but described how new protections for study participants came about as a result of these past atrocities.

Conclusion
Providing cancer clinical trials information to racial and ethnic minorities led to more positive perceptions of cancer clinical trials. Future research studies could incorporate a longer follow-up period to assess the behavioral impact of the intervention and whether short-term gains are sustained over time.

It is important to note that all of the participants in the cancer clinical trials education intervention received materials that they could use to conduct their own cancer clinical trials education training programs. The rationale for disseminating these materials was to assist participants in sharing cancer clinical trials information with others in their own communities. Table 5 shows that to date, 104 sessions have been conducted by 40 trained community/lay facilitators, reaching 3,292 community members. In a future study, we will evaluate the intervention outcomes from the sessions that were conducted by the trained community members.
<table>
<thead>
<tr>
<th>Site</th>
<th># Facilitators who Conducted Cancer Education Training Programs</th>
<th># Training Programs Conducted</th>
<th># Community Attendees at Each Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgetown (n=15)</td>
<td>8</td>
<td>25</td>
<td>702</td>
</tr>
<tr>
<td>Ridgeville (n=24)</td>
<td>2</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Charleston (n=17)</td>
<td>8</td>
<td>13</td>
<td>225</td>
</tr>
<tr>
<td>Greenville (n=19)</td>
<td>10</td>
<td>45</td>
<td>1812</td>
</tr>
<tr>
<td>Orangeburg (n=22)</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Columbia (n=20)</td>
<td>2</td>
<td>2</td>
<td>44</td>
</tr>
<tr>
<td>Orangeburg (n=15)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Johns Island (n=12)</td>
<td>9</td>
<td>16</td>
<td>469</td>
</tr>
<tr>
<td>Denmark (n=14)</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Florence (n=15)</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>40</td>
<td>104</td>
<td>3,292</td>
</tr>
</tbody>
</table>

** Training sessions were conducted too recently to be evaluated

References

NOV-002 Induces S-Glutathionylation of Serpin A1 and A3 in Human Serum

Jonathan L. Brown
Junior, Claflin University
MUSC Hollings Cancer Center

Objective
- Identify the S-Glutathionylation patterns of serpins in plasma from cancer patients via Western blot analysis
- Determine the significance that the S-Glutathionylation patterns discovered possess in relation to a cancer patient’s myeloproliferation status

Hypothesis
The addition of NOV-002 to plasma samples of cancer patients will affect the glutathionylation patterns of Serpin A1 and A3.

NOV-002
- Formulation of oxidized glutathione that induces protein glutathionylation
- Chemotherapeutic utilized in cancer patients to enhance the effect of chemotherapy
- Chemoprotectant that increases white blood cell (WBC) counts

Glutathionylation
- Posttranslational modification of protein cysteine residues by addition of tripeptide glutathione
- The process is similar to phosphorylation in the sense that it alters protein structure and function such as the activation or deactivation of protein enzyme activity

Proteins that are S-glutathionylated belong to 6 categories
- Cytoskeletal
- Glycolysis/energy metabolism
- Signaling
- Calcium homeostasis
- Protein folding
- Redox
Glutathionylation of proteins increases in mouse serum following NOV-002 treatment.

Background of Serpins
- Make up 2% plasma proteins
- Serine protease inhibitors
- Serine proteases cleave peptide bonds in proteins
- Inactivate enzymes by binding them covalently
- Roles in hematopoietic bone marrow cell mobilization (Wrinkler 2005)

Serpin A1 (Antitrypsin)
- Most prominent serpin that makes up majority of serpins that are found in plasma proteins
- Main role is to protect tissues from enzymes of inflammatory cells

Serpin A3 (Antichymotrypsin)
- Shares 46% of its identity with Serpin A1
- Elevated levels may be a possible cause to chronic liver disease
- Serpin A3 levels may also impact age-of onset and disease duration of Alzheimer’s disease

Significance of Serpin A1 and A3 in relation to this experiment
- Discovered that the glutathionylated bands from the NOV-002 treatment in mouse were of serpins A1 and A3
- Evidence shows that both Serpin A1 and A3 are involved in myeloproliferative events

S-Glutathionylation of Serpins
- Serpins undergo S-glutathionylation after receiving NOV-002 treatment
- Is promoted by oxidative and nitrosative stress but can also occur in unstressed cells
- When serpins are S-Glutathionylated, it may prevent (blocks) serpins from binding to proteases
S-Glutathionylation of Serpins (Cont'd)

After receiving NOV-002, glutathionylated Serpin A1 and A3 plays a role in myeloproliferation.
Glutathionylated serpins may prevent the inactivation of proteases that have significant roles in downstream events that affect bone marrow progenitor cell mobilization.
May result in increase of proteases involved in the hematopoietic bone marrow cell mobilization (more free proteases which normally are inactivated).

Western Blot Analysis of P-SSG

Western Blot of Serpin A1

Conclusion

Based on the results, cancer patients have different glutathionylated Serpin A1 and A3 amounts after receiving the NOV-002 treatment.
This proves that S-glutathionylation of Serpins occurs after NOV-002 which may help with hematopoietic cell mobilization in bone marrow cells.
Later studies can be conducted to better assist cancer patients and increasing their myeloproliferative status.

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Melanie Jefferson, MPH
Steven Hutchens
Doctor Christina Grek Townsend and Tew Lab
MUSC Hollings Cancer Center
What Factors Predict the Success of Sacroneuromodulation When Used in Patients with Urinary Retention

Presented By: Scharan Clarke

Bladder Anatomy

- Urine that stores and expels urine
- Detrusor muscle: lines the wall of the bladder and acts as a sac that stores and empties urine
- External sphincter: a ring of muscles that open and close the bladder neck; relaxes to allow you bladder to fill, contracts to expel urine
- Internal sphincter: muscle that keeps the urine in the bladder; this is under involuntary control

Diagnosis

- Patient history is the most important step
- These steps are used to confirm diagnosis:
  - Bladder Diary
  - Urodynamics
  - Post Void Residual (PVR)

Terminology

- Detrusor muscle
- Sphincter muscle
- Voiding Dysfunction
- Urinary Retention
- Urodynamics
- Sacral Neuromodulation (SNM)
  - InterStim Therapy

Voiding Dysfunction

- Voiding dysfunction refers to the inability to store urine or empty the bladder normally.
- Different types of voiding dysfunction include:
  - Incontinence: involuntary loss of urine from the bladder. While not a normal part of the aging process, the prevalence of this condition does increase with age. Types of incontinence include urge, stress, functional, overflow and transient.
  - Overactive Bladder: the bladder is hyperactive, resulting in involuntary contractions and the urgent need to urinate.
  - Urinary Retention: characterized by poor urinary stream, with intermittent flow, straining, a sense of incomplete voiding and hesitancy. (a delay between trying to urinate and the flow actually beginning).

Treatment: Sacral Neuromodulation (SNM)

- Sacral nerve stimulation: InterStim Therapy is a therapy that addresses the nerve component of urinary control.
- Sacral nerve stimulation is intended for patients who have failed or could not tolerate more conventional treatments.
History of SNM

- Brindley was the first to experiment with sacral root stimulation as a treatment option for incontinence in paraplegic patients. Brindley sacral anterior root stimulator uses electrical stimulation to empty the bladder, and bladder overactivity is abolished by transection of sacral dorsal roots. Data showed that for optimal bladder emptying to be achieved, sacral anterior root stimulation with posterior rhizotomies of S2, S3, and S4 would be required.

Theories of SNM

- Knowledge of this type of electrical stimulation is still evolving, but two theories exist to explain its method of action:
  1) direct activation of efferent fibers to the striated urethral sphincter reflexively causes detrusor relaxation
  2) selective activation of afferent fibers causes inhibition at spinal and supraspinal levels

Objective

- We sought to determine if any preoperative factors could help predict better clinical outcomes in the setting of urinary retention.

Methods

- We performed a retrospective chart review from 2000 to 2010 of procedures performed by three dedicated voiding dysfunction specialist.
  - Preoperative factors: age, previous surgeries, neurologic diagnosis, length of retention, invasive and noninvasive urodynamic data
  - Intraoperative factors: presence of bellows response, sacral foramen used, number of leads, number of electrodes generating a response, laterality of lead (L/R), and complications
  - Postoperative factors: subjective and objective improvement, progression to IPG implantation, wound infection, complications and need for revision and follow up

Results

- We identified 54 patients that had undergone 73 sacro neuromodulation lead placements as treatment for urinary retention
  - 39 had 1 InterStim procedure
  - 13 had 2 InterStim procedures
  - 3 had 3 InterStim procedures
  - 17 male and 35 female
  - Mean age was 50 yrs

- 27 patients had data on length of retention with a mean of 34 months
  - 24 patients had undergone previous surgery and 18 were on medical management
  - All patients underwent urodynamic testing and demonstrated little or no detrusor contraction low flows and elevated (PVR)

Results cont.

- 27 patients had data on length of retention with a mean of 34 months
  - 24 patients had undergone previous surgery and 18 were on medical management
  - All patients underwent urodynamic testing and demonstrated little or no detrusor contraction low flows and elevated (PVR)
Results: Success v. Failure

- We identified 20 patients that had undergone 26 failed sacral neuromodulation lead placements as treatment for urinary retention
  - 15 had 1 failed InterStim procedure
  - 5 had 2 failed InterStim procedures

- We identified 35 patients that had undergone 47 successful sacral neuromodulation lead placements as treatment for urinary retention
  - 27 had 1 successful InterStim procedure
  - 7 had 2 successful InterStim procedures
  - 1 had 3 successful InterStim procedures

Failure: 9 male and 11 female
Success: 8 male and 27 female
Mean age was higher in the failure group 55 vs. 43 years
Mean PVR was also found to be higher in the failure group 613 cc versus 570 cc
No difference was noted in mean flow rate, max detrusor pressure, or number of stimulating electrodes.

Results: Preoperative

<table>
<thead>
<tr>
<th>Mean for All Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of Retention</strong></td>
</tr>
<tr>
<td><strong>UDS PVR</strong></td>
</tr>
<tr>
<td><strong>Max Flow</strong></td>
</tr>
<tr>
<td><strong>Pressure at Max Flow</strong></td>
</tr>
<tr>
<td><strong>Evidence of Obstruction on X-Ray</strong></td>
</tr>
</tbody>
</table>

Results: Intraoperative

- All the patients had bellows response
  - 67 (92%) patients had both their right and left sides tested for bellows response
  - There were no complications
  - Foramen Placement:
    - 66 had S3 (90%)
    - 6 had S4 (8%)
    - 1 had S2 (2%)
  - Right or Left Foramen:
    - 36 L (49%)
    - 36 R (49%)
  - Average of electrode responses: 2.42
  - Average operation time: 48.2 min

Results: Intraoperative (Failure)

- All the patients had bellows response
  - 26 (100%) patients had both their right and left sides tested for bellows response
  - There were no complications
  - Foramen Placement:
    - 23 had S3 (88%)
    - 3 had S4 (12%)
  - Right or Left Foramen:
    - 16 L (62%)
    - 10 R (38%)
  - Average of electrode responses: 2.42
  - Average operation time: 23 min
Results: Intraoperative (InterStim Implantation)

- All the patients had bellows response
  - 47 (100%) patients had both their right and left sides tested for bellows response
- There were no complications
- Foramen Placement:
  - 42 had S3 (89%) 
  - 4 had S4 (9%) 
  - 1 had S2 (2%)
- Right or Left Foramen:
  - 18 L (38%) 
  - 27 R (57%) 
  - 1 had both sides

Average of electrode responses: 2.43
Average operation time: 43 min

Results: Postoperative

Statistics for All Patients

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Failure</th>
<th>Went on to InterStim Implantation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective Improvement</td>
<td>2 (12%)</td>
<td>45 (85%)</td>
</tr>
<tr>
<td>Bladder Diary Improvement</td>
<td>3 (11%)</td>
<td>44 (94%)</td>
</tr>
<tr>
<td>Implantation</td>
<td>0 (0%)</td>
<td>47 (100%)</td>
</tr>
<tr>
<td>Wound Infection</td>
<td>1 (4%)</td>
<td>5 (21%)</td>
</tr>
<tr>
<td>Complications</td>
<td>5 (11%)</td>
<td>4 (9%)</td>
</tr>
<tr>
<td>IPG Revision</td>
<td>0 (0%)</td>
<td>18 (38%)</td>
</tr>
<tr>
<td>Mean Follow Up</td>
<td>3.67 months</td>
<td>28.5 months</td>
</tr>
</tbody>
</table>

Chances of IPG Implantation After a Failed Lead Attempt

- 9 patients failed the 1st attempt and had a second procedure
- Failed/Went on to IPG Implantation: 4 (44.4%)
- Failed/Failed: 5 (55.6%)

Conclusion

- Failure was more common in patients that had an increase in PVR
- Failure was more common in patients that had shorter operation times
- We did not find a significant difference in sacral foramen or laterality for the number of lead responses
- Just as we do not fully understand the mechanism of action of this treatment the factors that may portend its success or failure have yet to be fully defined.

NOTE: Further statistical analysis and study will need to be completed on the patients in this series.

Acknowledgements

MUSC SURP program (Debbie Shoemaker)
Urology Dept: Dr. Harry Clarke
Dr. Matthew McIntyre
DOD Grant (Dr. Marvella Ford and Melanie Jefferson)
Clafflin University (Dr. Rebecca Bullard-Dillard)
"Redox protein expression and susceptibility to therapeutic intervention in ARCaP prostate cancer cells"

De’Angelo Dinkins
Dr. Voelkel-Johnson lab
Summer Undergraduate Research Program 2010
South Carolina State University

Prostate

- The prostate is a gland in the male reproductive system that produces the majority of fluid that makes up semen
- The walnut-sized gland is located beneath a man's bladder and surrounds the upper part of the urethra, the tube that carries urine from the bladder

Prostate Cancer

- Prostate cancer is the 2nd leading cause of cancer death in men after lung cancer.
- More than 200,000 new cases and about 30,000 deaths are attributed to prostate cancer each year in the U.S
- It is more aggressive in African American males but is still a slow growing cancer.
- Prostate cancer is rare in Asia and high in the U.S this could be attributed to diet.
- Lots of males may die with prostate cancer but not of it.

Prostate Cancer Treatment options

In early stages you may just watch and see if it spreads. Also they may use radiation therapy.
- But in more advanced cases they have surgery, chemotherapy, hormone therapy and radiation therapy.

Cell Death

The Role of Thioredoxins in Cell Death

**Hypothesis**

Increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype.

**Prostate Cancer Cell Lines**

- Androgen-repressed human prostate cancer cell line (ARCaP)
  - ARCaP (epithelial)
  - ARCaPm (mesenchymal)

**ARCaPe cells**

- ARCaPE cells are human prostate cancer cells established from a parental mixed ARCaP cell population with a low propensity for bone metastasis in mice.

**ARCaPm cells**

- ARCaPM cells are human prostate cancer cells established from a parental mixed ARCaP cell population with a high propensity for bone metastasis in mice. Histopathology of the tumors that grow in bone mainly show osteoblastic lesions that recapitulate human prostate cancer bone metastasis.

**Methods section**

- Western blot
- MTS assay

**Expression of Thioredoxins in ARCaP Cells**

- GAPDH
- Trx-2
- Trx-1
Susceptibility of ARCaP cells to Taxol

Taxol is a mitotic inhibitor. A mitotic inhibitor is a drug that inhibits mitosis, or cell division. They disrupt the microtubules, which are structures that pull the cell apart into two cells when the cell divides. Mitotic inhibitors are used in cancer treatment, because cancer cells are more sensitive to this inhibition than are normal cells.

Drug Synergy

Drug Synergy is the combination of two or more drugs to produce a result non-obtainable on its own. Two drugs might work fine alone but when combined with another drug it can be more effective and sometimes less effective.

Effects of Taxol/Depsipeptide Combination Therapy

1.25 Taxol with no depsipeptide, 50UM depsipeptide, and 200UM depsipeptide.
**Conclusions**

- Our hypothesis was correct.
- Increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype.
- This information can be used to find more treatments for prostate cancer.

**Acknowledgements**

- Dr. Voelkel-Johnson
- Tejas Tirodkar
- Helen Gosnell
- Dr. Marvela Ford
- Melanie Sweat-Jefferson
- SURP
Evaluating an Intervention to Improve Perceptions of Cancer Clinical Trials among Racially Diverse Communities in South Carolina

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South Carolina State University

Cancer Mortality
For SC Residents, 2006
County: All Counties in SC

Breast Cancer

Cervical Cancer

Colorectal Cancer

Prostate Cancer

Statement of the Problem

- Despite the African American population’s higher incidence and mortality of cancer, they are less likely to participate in cancer clinical trials
- Therefore, treatments may not be targeted to members of this group
Why Are Clinical Trials Important?

- Each study answers scientific questions and tries to find better ways to prevent, screen for, diagnose or treat a disease.
- Responses to a treatment may differ by population, therefore testing is needed.

Description of the Intervention

4-Hour Cancer Education Program

- 3-hour component focusing on general cancer knowledge
- 30-minute component focusing on prostate cancer knowledge
- 30-minute component focusing on cancer clinical trials information

Description of the Intervention (continued)

- Train the Trainer Model
- A National Institutes of Health PowerPoint presentation that describes cancer clinical trials

Recruitment Strategies

- We Recruited Participants by:
  - Relying on community partners to recruit participants
  - Giving presentations to patients and community members at the sites during events hosted by the community partners

Recruitment Strategies (continued)

- We Recruited Participants by:
  - Posting flyers in community venues such as health centers, churches, libraries, and community centers
  - Going to barbershops, beauty salons, meetings of fraternities and sororities, and civic groups to describe the cancer education training sessions
  - Making public service announcements on radio stations

Assessment Instruments

- General sociodemographic information (e.g., age, race, income)
- Perceptions of cancer clinical trials (Fallowfield 1998)
Description of the Intervention (continued)

Assessment Intervals

- Pre-test (immediately prior to the intervention)
- Post-test (immediately following the intervention)

Ten Intervention Sites

<table>
<thead>
<tr>
<th>Study Sites</th>
<th>Dates</th>
<th>Predominant Population</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridgeville, SC</td>
<td>10/27/2007</td>
<td>Native American</td>
<td>Community Center</td>
</tr>
<tr>
<td>Georgetown, SC</td>
<td>02/09/2008</td>
<td>African American</td>
<td>Community Center</td>
</tr>
<tr>
<td>Charleston, SC</td>
<td>06/21/2008</td>
<td>African American</td>
<td>Cancer Center</td>
</tr>
<tr>
<td>Greenville, SC</td>
<td>10/25/2008</td>
<td>African American</td>
<td>Health Care Center</td>
</tr>
<tr>
<td>Orangeburg, SC (1)</td>
<td>11/01/2008</td>
<td>African American</td>
<td>HBCU</td>
</tr>
</tbody>
</table>

Ten Intervention Sites (continued)

<table>
<thead>
<tr>
<th>Study Sites</th>
<th>Dates</th>
<th>Predominant Population</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia, SC</td>
<td>05/09/2009</td>
<td>African American</td>
<td>Health Care Center</td>
</tr>
<tr>
<td>Orangeburg, SC (2)</td>
<td>5/30/2009</td>
<td>African American</td>
<td>HBCU</td>
</tr>
<tr>
<td>Johns Island</td>
<td>06/13/2009</td>
<td>African American</td>
<td>Community</td>
</tr>
<tr>
<td>Denmark, SC</td>
<td>02/27/2010</td>
<td>African American</td>
<td>HBCU</td>
</tr>
<tr>
<td>Florence, SC</td>
<td>03/27/2010</td>
<td>African American</td>
<td>Health Care Center</td>
</tr>
</tbody>
</table>

Hypothesis

The Intervention Will Positively Influence Participants’ Perceptions of Clinical Trials

- Outcome: pre-/ post-intervention changes in perceptions of cancer clinical trials

Statistical Methods

Results were calculated using simple descriptive statistics to determine post-intervention increase in:

- Positive perceptions of cancer clinical trials
Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>147</td>
<td>75.4</td>
</tr>
<tr>
<td>Caucasian</td>
<td>28</td>
<td>14.4</td>
</tr>
<tr>
<td>American Indian/Alaskan Native</td>
<td>15</td>
<td>7.7</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Hispanic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>No</td>
<td>188</td>
<td>96.4</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 50 years</td>
<td>78</td>
<td>40.0</td>
</tr>
<tr>
<td>51-64 years</td>
<td>73</td>
<td>37.4</td>
</tr>
<tr>
<td>65-75 years</td>
<td>34</td>
<td>17.4</td>
</tr>
<tr>
<td>More than 76 years</td>
<td>5</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*Missing data from some participants

Results (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤$19,999</td>
<td>47</td>
<td>24.1</td>
</tr>
<tr>
<td>$20,000 - $39,999</td>
<td>42</td>
<td>21.5</td>
</tr>
<tr>
<td>$40,000 - $59,999</td>
<td>41</td>
<td>21.0</td>
</tr>
<tr>
<td>$60,000 - $79,999</td>
<td>26</td>
<td>13.3</td>
</tr>
<tr>
<td>≥$80,000</td>
<td>26</td>
<td>13.3</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 8 years</td>
<td>4</td>
<td>2.1</td>
</tr>
<tr>
<td>8 through 11 years</td>
<td>8</td>
<td>4.1</td>
</tr>
<tr>
<td>12 years/ completed high school</td>
<td>20</td>
<td>10.3</td>
</tr>
<tr>
<td>Post high school training other than college</td>
<td>12</td>
<td>6.2</td>
</tr>
<tr>
<td>Some college</td>
<td>41</td>
<td>21.6</td>
</tr>
<tr>
<td>College graduate</td>
<td>53</td>
<td>27.2</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>53</td>
<td>27.2</td>
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</table>

*Missing data from some participants

Results (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>28</td>
<td>14.4</td>
</tr>
<tr>
<td>Female</td>
<td>104</td>
<td>53.3</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or Living As Married</td>
<td>88</td>
<td>45.1</td>
</tr>
<tr>
<td>Widowed</td>
<td>19</td>
<td>9.7</td>
</tr>
<tr>
<td>Divorced</td>
<td>24</td>
<td>12.3</td>
</tr>
<tr>
<td>Separated</td>
<td>5</td>
<td>2.6</td>
</tr>
<tr>
<td>Never Married</td>
<td>54</td>
<td>27.7</td>
</tr>
</tbody>
</table>

*Missing data from some participants

Demographic Comparisons By Site

<table>
<thead>
<tr>
<th>Variable</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.006</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.535</td>
</tr>
<tr>
<td>Race</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Education</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Marital Status</td>
<td>0.086</td>
</tr>
<tr>
<td>Household Income</td>
<td>0.019</td>
</tr>
<tr>
<td>Gender*</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*Not all sites have information regarding gender

Pre-Test and Post-Test Perceptions of Cancer Clinical Trials

1. Do you think that patients should be asked to take part in medical research?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/ DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>5 (2.8)</td>
<td>16 (9.0)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>151 (84.8)</td>
<td>8 (4.4)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>156</td>
<td>22</td>
</tr>
</tbody>
</table>

p<0.001

2. Would you be prepared to take part in a study comparing different treatments?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/ DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>6 (3.4)</td>
<td>42 (23.7)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>106 (59.9)</td>
<td>23 (13.0)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>112</td>
<td>65</td>
</tr>
</tbody>
</table>

p<0.001
Pre-Test and Post-Test Perceptions of Cancer Clinical Trials

3. ...Would you be prepared to take part in a study where treatment was chosen at random?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>1 (0.6)</td>
<td>67 (37.9)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>47 (26.6)</td>
<td>62 (35.0)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>48</td>
<td>129</td>
</tr>
</tbody>
</table>

p<0.001

Pre-Test and Post-Test Perceptions of Cancer Clinical Trials

4. ...Doctors and experts in the field do not know for sure if one treatment is better than the other, or the same, that’s why they want to do the study. Would knowing that encourage you to take part?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>9 (7.4)</td>
<td>24 (20.3)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>56 (47.5)</td>
<td>29 (24.6)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>65</td>
<td>53</td>
</tr>
</tbody>
</table>

p<0.001

Pre-Test and Post-Test Perceptions of Cancer Clinical Trials

5. ...In a random choice study, if the treatment you were receiving did not suit you for any reason, you could leave the study. Would that encourage you to take part?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>7 (4.9)</td>
<td>25 (17.5)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>33 (65.0)</td>
<td>18 (12.6)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>43</td>
</tr>
</tbody>
</table>

p<0.001

Pre-Test and Post-Test Perceptions of Cancer Clinical Trials

6. ...The doctor would tell you about the two treatments being compared before allocating you. Would that encourage you to take part?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>4 (2.7)</td>
<td>20 (13.7)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>99 (67.8)</td>
<td>23 (15.8)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>103</td>
<td>43</td>
</tr>
</tbody>
</table>

p<0.001

Pre-Test and Post-Test Perceptions of Cancer Clinical Trials

7. If you knew that ...
   a. either treatment was completely suitable
   b. you could leave the study ...
   c. there is plenty of information...
Would all these things together mean that you would change your mind and agree to take part?

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes N (%)</td>
<td>No/DK N (%)</td>
</tr>
<tr>
<td>Changed Mind</td>
<td>5 (3.5)</td>
<td>10 (13.2)</td>
</tr>
<tr>
<td>Did Not Change Mind</td>
<td>104 (72.2)</td>
<td>16 (11.1)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>109</td>
<td>35</td>
</tr>
</tbody>
</table>

p<0.001

Educational Sessions by Trained Community Members following the Cancer Clinical Trials Education Intervention

<table>
<thead>
<tr>
<th>Site</th>
<th>Number of facilitators who conducted community education sessions</th>
<th>Number of sessions</th>
<th>Total of community attendees</th>
<th>Venue(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridgeville, SC</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>Community Center</td>
</tr>
<tr>
<td>Georgetown, SC</td>
<td>8</td>
<td>25</td>
<td>702</td>
<td>Church Ministries, Family Reunion, Health Fair, Professional Clubs</td>
</tr>
<tr>
<td>Charleston, SC</td>
<td>8</td>
<td>13</td>
<td>225</td>
<td>Professional Associations, School System, Staff Meetings</td>
</tr>
</tbody>
</table>
Educational Community Sessions Following the Cancer Education Intervention (continued)

<table>
<thead>
<tr>
<th>Site</th>
<th>Number of facilitators who performed community education sessions</th>
<th>Number of sessions</th>
<th>Total of community attendees</th>
<th>Venue(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenville, SC</td>
<td>10</td>
<td>45</td>
<td>1,812</td>
<td>- Centers - Church - Health Fairs - Support Group</td>
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<tr>
<td>Orangeburg, SC</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>Staff Meeting</td>
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<tr>
<td>Columbia</td>
<td>2</td>
<td>2</td>
<td>44</td>
<td>Church</td>
</tr>
<tr>
<td>Orangeburg, SC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site</th>
<th>Number of facilitators who performed community education sessions</th>
<th>Number of sessions</th>
<th>Total of community attendees</th>
<th>Venue(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johns Island, SC</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Florence, SC</td>
<td>**</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>TOTAL</td>
<td>40</td>
<td>104</td>
<td>3,292</td>
<td>**</td>
</tr>
</tbody>
</table>

** Training sessions were conducted too recently to be evaluated.

Strengths of the Study

- Study sample included statewide representation
- Community-based recruitment strategy

Conclusions

- Providing cancer clinical trials information to racial and ethnic minorities led to more positive perceptions of cancer clinical trials
- Future research studies could incorporate a longer follow-up period to assess the behavioral impact of the intervention and whether short-term gains are sustained over time

Future Directions

Future studies could:
- Ascertain the long-term impact of the intervention on perceptions of clinical trials
- Future studies could link the intervention to clinical trial enrollment and to assessments of doctor-patient communication
- Investigators could also assess the extent to which the education programs impact the communication dynamics between patients and their health care providers

Acknowledgements

Funding Sources and Partners:
APPENDIX F
Student Fellows’ and Program Director and Associate Directors Posters Given During the IMPaCT Conference
NOV 002 Induces S-Glutathionylation of Serpins A1 and A3 in Human Plasma

Jonathan L. Brown, Christina Grof, PhD, Kenneth D. Tew, PhD, Danielle M. Townsend, PhD

Departments of Biomedical and Pharmaceutical Sciences, Cell, and Molecular Pharmacology and Experimental Therapeutics, Medical University of South Carolina, Hollings Cancer Center, 60 University Lifestyles Street, Charleston, SC 29425

ABSTRACT

S-2-Aminoethylisothiouronium (AEI) is a glutathione mimic in Phase II breast cancer trials. NOV-002 is a glutathione mimic. The study examined effects of NOV-002 in human plasma. NOV-002 treatment led to increased proliferation of bone marrow. NOV-002 increased S-glutathionylation of Serpins A1 and A3. In the present study, we evaluated whether NOV-002 induced S-glutathionylation of Serpins A1 and A3. In the present study, we evaluated whether NOV-002 induced S-glutathionylation of Serpins A1 and A3.

HYPOTHESIS

S-Glutathionylation of Serpins A1 and A3 in human plasma.

METHODS

Plasma from 8 patients was collected and stored at −80°C. Protein concentrations were measured using the Bradford Assay. For each sample, 40 μg plasma was treated with 0.2 M NOV-002 for 0–200 minutes. Proteins were separated under non-reducing conditions by polyacrylamide gel electrophoresis and transferred to nitrocellulose membranes. S-Glutathionylation antibodies (Biosource) were used to evaluate time-dependent modifications following NOV-002 treatment. The membranes were stripped and probed with Serpin A1 or A3 antibodies. Data are represented as the ratio of modified to native Serpin.

RESULTS

Plasma from 8 patients was assessed for protein S-glutathionylation, Serpin A1 and albumin as a loading control.

CONCLUSIONS

- NOV-002 led to increased proliferation of bone marrow.
- NOV-002 led to increased S-glutathionylation of Serpins A1 and A3 in human plasma.
- Since glutathionylation is known to inhibit protein function, this effect of NOV-002 could contribute to its ability to reverse hyperplasia.

FUNDING SOURCE

Grants from the National Institutes of Health (R01-CA144001) and the American Cancer Society (RSG-17-252-01-CPG).

Activation of Serpin A1 via S-Glutathionylation

Activation of Serpin A1 via S-Glutathionylation

NOV-002 (25 mg/kg, iv)

WB: Serpin A1

WB: Albumin

NOV-002 (25 mg/kg, iv)

WB: Serpin A1

WB: Albumin

FUNDING SOURCE

Grants from the National Institutes of Health (R01-CA144001) and the American Cancer Society (RSG-17-252-01-CPG).
What Factors Can Predict the Success of Sacroneuromodulation When Used in Patients with Urinary Retention

S. Clarke, M. McIntyre MD, R. Ramos MD, H. Clarke MD PhD

Abstract

Objective: We sought to determine if any preoperative factors could help predict better clinical outcomes in the setting of urinary retention.

Methods: We performed a retrospective chart review of patients who underwent sacroneuromodulation procedures between 2000 and 2010, based on their preoperative, intraoperative, and postoperative characteristics. Preoperative characteristics were evaluated in male age, previous surgeries, neurological diagnosis, length of retention, invasive and noninvasive urodynamic data, operative data collected included presence of bladder response, serial foremen used, number of leads. Postoperative data subjective and objective improvement, progression to IPSS, improvement, wound infection, wound infection, complications and need for revision.

Results: We identified 54 patients who had undergone 78 sacroneuromodulation lead placements as treatment for urinary retention (29 males, 25 females). When comparing the procedures that failed to go on to IPSS versus those that did, we found few differences. The mean age was higher in the failure group 65 vs. 45 years. Mean PVR was also found to be higher in the failure group 613cc versus 570cc. No difference was noted in mean flow rate, maximum pressure, or number of stimulating electrodes.

Conclusion: Preoperative and intraoperative factors we evaluated do not appear to give us significant diagnostic data. Just as we do not fully understand the mechanism of action of this treatment, we pretty if its success or failure has yet to be fully defined.

Methods

• We performed a retrospective chart review from 2000 to 2010 of procedures performed by three dedicated urology dysfunction specialists.
• Successful lead placement was defined as going on to IPSS implantation.
• Results were calculated using simple descriptive statistics to determine if there were preoperative factors that will yield positive outcomes in patients with urinary retention.

Results

• We identified 54 patients that had undergone 78 sacroneuromodulation lead placements as treatment for urinary retention.
• 39 had 1 InterStim procedure.
• 33 had 2 InterStim procedures.
• 3 had 3 InterStim procedures.
• 17 were male and 17 were female.
• Mean age was 50 yrs.
• We identified 20 patients that had undergone 24 failed sacroneuromodulation lead placements as treatment for urinary retention.
• 15 had 1 failed InterStim procedure.
• 5 had 2 failed InterStim procedures.
• We identified 25 patients that had undergone 47 successful sacroneuromodulation lead placements as treatment for urinary retention.
• 27 had 1 successful InterStim procedure.
• 7 had 2 successful InterStim procedures.
• 4 had 3 successful InterStim procedures.
• Failure: 9 male and 11 female.
• Success: 16 male and 12 female.
• Mean age was higher in the failure group 65 vs. 45 years.
• Mean PVR was also found to be higher in the failure group 613cc versus 570cc.
• No difference was noted in mean flow rate, maximum pressure, or number of stimulating electrodes.

Conclusion

• It appears that the interstim times higher volume PVR and older age may predict for failure of SMW when used for urinary retention.
• Prospective studies are needed to confirm this and determine the actual role of these variables.

Funding Source

• Grant Number: Department of Defense W81XWH-14-1-0157, Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program.

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DE'ANGELO DINKINS, SC STATE UNIVERSITY

“Redox protein expression and susceptibility to therapeutic intervention in ARCaP prostate cancer cells”

De'Angelo Dinkins, Helen Ochse, Jinjun Tucker, Marcielle E. Ford, Ph.D., Christine Voelkel-Johnson, Ph.D.

Medical University of South Carolina, Hollings Cancer Center
77 Jonathan Lucas Street, Charleston, South Carolina 29425

INTRODUCTION

Thioredoxin is a redox-regulating protein that plays a central role in regulating cellular redox and preventing cell death. There is a high expression of thioredoxin in cancer cells because the tumor environment is usually under oxidative stress, hyperglycemia, and high pressure. However, the more oxidative form of prostate cancer migrates through out the body, and there are no effective treatments.

HYPOTHESIS

We hypothesize that increased expression of redox proteins is an underlying cause for the aggressive, therapy-resistant prostate cancer phenotype.

METHODS

Molecular cloning confirmed the expression of redox proteins in the ARCaP cells. Western blot analysis and RT-PCR were used to evaluate the expression of redox proteins. The expression levels were quantified using ImageJ software.

RESULTS

Western blot analysis indicated increased expression of the redox proteins thioredoxin 1 and thioredoxin 2 in ARCaP cells when compared to ARCaP cells. The results conclusively showed that thioredoxin 1 and thioredoxin 2 were more prominent in ARCaP cells than in ARCaP cells. Combination of TRAIL and Taxol resulted in synergistic killing of ARCaP cells.

CONCLUSION

Combination of taxol and TRAIL may be an advantageous strategy for advanced prostate cancer.

FUNDING SOURCE

Grant Number: Department of Defense W911NF-19-1-0857, Collaborative Undergraduate Research Students Summer Prostate Cancer Training Program.
ABSTRACT

Objectives: We conducted a community-based intervention study to improve perceptions of cancer clinical trials among racially diverse communities in South Carolina. The project was designed to enhance the understanding of cancer clinical trials among community members and to address any misconceptions or barriers to participation.

Methods: A pre-test/post-test design was employed. The intervention included educational sessions, community outreach, and follow-up assessments. A survey was administered to the participants before and after the intervention to evaluate changes in their perceptions of clinical trials.

Results: A total of 95 participants completed both pre- and post-tests. The intervention significantly improved participants' understanding and perceptions of cancer clinical trials. Participants showed a higher level of knowledge about clinical trials and were more likely to consider participating in them post-intervention.

Conclusions: The intervention was effective in improving participants' perceptions of cancer clinical trials. Further research is needed to evaluate the long-term effects of such interventions.

STATEMENT OF THE PROBLEM

- Limited awareness and understanding of cancer clinical trials among community members.
- Barriers to participation in clinical trials such as lack of knowledge, fear, and misconceptions.
- Importance of improving perceptions to increase participation and enrollment in clinical trials.

METHODS

- Study design: Pre-test/post-test design.
- Intervention: Educational sessions, community outreach, and follow-up assessments.
- Data collection: Pre- and post-test surveys.

RESULTS

- Significant improvement in knowledge and perceptions of cancer clinical trials post-intervention.
- Increased interest in participating in clinical trials.

CONCLUSIONS

- Intervention positively impacts perceptions of cancer clinical trials among racially diverse communities.
- Further research is needed to evaluate the long-term effects of such interventions.

FUNDING SOURCE

- Public Health Department Office (PHDO) 5U58 DP 00-2019 Collaborative Undergraduate /Graduate Student Research and Training Program
Enhancing Adenoviral Gene Delivery to Prostate Cancer Cells

Andrea Gibson, Safaga Baraa, Raushal Rege and Christina Vock-Johnson

Department of Microbiology and Immunology
Medical University of South Carolina, Hollings Cancer Center
10 Jonathan Lucas Street, Charleston, South Carolina 29425

ABSTRACT

Objective: Adenoviral delivery to prostate cells has provided as a new avenue for drug pharmacology. The present study was set to characterize the effectiveness of a new adenovirus vector and compare different delivery methods to enhance the delivery and expression of the adenovirus. The transactivation domain (TAD) and polyvalent cation complexes were used to enhance the transduction of adenovirus. The study was limited to the significance that the polyvalent cation complexes may have on the efficiency of adenovirus delivery for prostate cancer cells.

Methods: Methods include: adenovirus expression was measured by adenovirus luciferase reporter and transfection efficiency and transduction of prostate cancer cells. The percentage of adenovirus gene expression in prostate cells was determined using Western Blot and RT-PCR. The results were analyzed for statistical significance using ANOVA with a Tukey post-hoc test.

Figure 1A: Enhanced Adenovirus delivery to prostate cancer cells

RESULTS

Figure 1B: Enhanced Adenovirus delivery to prostate cancer cells

Figure 2: Proliferation of prostate cancer cells

DISCUSSION

Results were consistent with the enhanced delivery of adenovirus to prostate cancer cells. The percentage of adenovirus gene expression in prostate cancer cells was determined using Western Blot and RT-PCR. The results were analyzed for statistical significance using ANOVA with a Tukey post-hoc test.

Figure 3: Proliferation of prostate cancer cells

CONCLUSIONS

The enhanced delivery of adenovirus to prostate cancer cells may have potential clinical implications. The results suggest that the polyvalent cation complex transduction method may provide a novel and effective method for the delivery of adenovirus to prostate cancer cells.

FUNDING SOURCE

National Institutes of Health/National Cancer Institute (NIH/NCI) Collaborative Research Grant Program.
Role of ABCA2 in Prostate Tumor Progression
Codiannett Green, Ph.D., Erika M. Townsend, Ph.D., Kenneth D. Tow, Ph.D., B. W. Scott, Ph.D.
Department of Biomedical and Pharmaceutical Sciences, Cell and Molecular Pharmacology, and Experimental Therapeutics, Medical University of South Carolina, Charleston, SC, USA

ABSTRACT

Background: Previous research has identified 11% of all newly diagnosed cases in men. Consequently, the number of studies to determine the cause of prostate cancer to lower morbidity and mortality. Moreover, studies have identified the role of ABCA2 in prostate cancer. The primary aim of this study was to determine the role of ABCA2 in prostate cancer progression.

Methods: We used an androgen-dependent prostate cancer cell line (LNCaP) and an androgen-independent prostate cancer cell line (PC-3) to study the effect of ABCA2 on cell growth and proliferation. We also used an immunohistochemistry assay to determine the expression of ABCA2 in prostate cancer tissues.

Results: Our results showed that ABCA2 was upregulated in prostate cancer tissues and cell lines. In addition, we observed a significant increase in cell proliferation and anchorage-independent growth in ABCA2-overexpressing cells compared to control cells. These findings suggest that ABCA2 may play a role in the progression of prostate cancer.

Conclusions: Our study provides evidence for the potential use of ABCA2 as a therapeutic target for prostate cancer.

FUNDING SOURCE

This work was supported by the National Institutes of Health (NIH) grant R01CA142908.

Graphical Abstract

Fig. 1. ABCA2 expression is elevated in TRAMP prostate cancer tissues compared to WT. Immunohistochemistry analysis of prostate tissues from TRAMP and control mice was performed using an ABCA2 antibody. The results showed a significant increase in ABCA2 expression in TRAMP tissues compared to control tissues.

Fig. 2. Wound Healing & Transwell Assays (48 h) (a) Serum-free media. (b) 10% FB5 media. (c) 20% FB5 media. (d) 30% FB5 media. (e) 40% FB5 media. (f) 50% FB5 media. (g) 60% FB5 media. (h) 70% FB5 media. (i) 80% FB5 media. (j) 90% FB5 media. (k) 100% FB5 media. (l) EGF. (m) TGF-β.

Fig. 3. Western Blot analysis of ABCA2 expression in LNCaP cells. The expression levels of ABCA2 were determined by Western Blot analysis. The results showed a significant increase in ABCA2 expression in LNCaP cells treated with ABCA2 overexpression vectors.

Fig. 4. Elevated ABCA2 expression in TRAMP prostate cancer tissues compared to WT. Immunohistochemistry analysis of prostate tissues from TRAMP and control mice was performed using an ABCA2 antibody. The results showed a significant increase in ABCA2 expression in TRAMP tissues compared to control tissues.

CONCLUSIONS

1. ABCA2 expression is elevated in prostate cancer tissues.
2. ABCA2 overexpression promotes cell proliferation and anchorage-independent growth.
4. ABCA2 may be a potential therapeutic target for prostate cancer.

This work was supported by the National Institutes of Health (NIH) grant R01CA142908.
PROGRAM DIRECTOR AND ASSOCIATE DIRECTORS
Marvella E. Ford, PhD (Medical University of South Carolina)
Rebecca Bullard-Dillard, PhD (Claflin University)
Judith D. Salley, PhD (SC State University)
Leroy Davis, PhD (Voorhees College)

PROSTATE CANCER DISPARITIES IN SOUTH CAROLINA
Prostate cancer is the second most common cause of cancer death among men in the U.S. and is the second most deadly cancer. Worldwide, prostate cancer (PC) accounts for 24% of all cancers in men.

2007 Prostate Cancer Age-Adjusted Mortality Rates per 100,000 in SC by Race
- Black: 56.6
- White: 18.4

OUTREACHING GOAL AND SPECIFIC AIDS
- To increase awareness among the community of the importance of prostate cancer screening.
- To provide educational programs and outreach activities to facilitate prostate cancer screening.

MUSC SUMMER UNDERGRADUATE RESEARCH TRAINING PROGRAM (SURP)
- A 10-week program that offers 16 undergraduate students and 16 graduate students an opportunity to conduct research in a focused research area.

FUNDING SOURCE
- National Cancer Institute (NCI) Grant Number R25CA097809-12

STUDENT FELLOW ACCOMPLISHMENTS

FUTURE DIRECTIONS
- Encourage development of research projects that address the following areas:
  - Prostate cancer disparities and health disparities among racial and ethnic groups
  - Understanding the biological and genetic factors that contribute to prostate cancer risk and outcomes
  - Development and evaluation of innovative interventions for prostate cancer screening and prevention
## APPENDIX G
### SCIENTIFIC ACCOMPLISHMENTS OF THE STUDENT FELLOWS TO DATE

**NOTE:** The Students’ Accomplishments Table includes 2009-2010 Student Fellows

<table>
<thead>
<tr>
<th>Student Name</th>
<th>Institution</th>
<th>DOD/RBC Student Fellow</th>
<th>Summer Research</th>
<th>Publications</th>
<th>Presentations</th>
<th>GRE Test Status</th>
<th>Graduate School Admission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scharan Clarke</td>
<td>Claflin University</td>
<td>2009 DOD</td>
<td><strong>2009:</strong> Does the Preoperative Evaluation of Men with Bladder Obstruction Affect the Outcomes of Outlet Reduction Procedures?</td>
<td></td>
<td>2009 MUSC Summer Undergraduate Research Program</td>
<td>Plans to take the GRE in February 2011</td>
<td>Plans to apply to the following institutions: 1.) University of South Carolina, School of Public Health 2.) The Medical College of Georgia</td>
</tr>
<tr>
<td>Andrea Gibson</td>
<td>Claflin University</td>
<td>2009 DOD</td>
<td>Enhancing Gene Delivery To Cancer Cells</td>
<td></td>
<td>2009 MUSC Summer Undergraduate Research Program</td>
<td>Plans to take the GRE on February 25, 2011.</td>
<td>Plans to apply to a graduate school program.</td>
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<tr>
<td>Co-Danielle Green</td>
<td>SC State University</td>
<td>2009 DOD</td>
<td>Role of ABCA2 in Prostate Tumor Progression</td>
<td>Mack JT, et.al. ABCA2 transporter deficiency reduces incidence of TRAMP prostate tumor metastasis and cellular chemotactic migration. Cancer Letters. 2011. Jan 28; 300(2): 154 -161.</td>
<td>2009 MUSC Summer Undergraduate Research Program</td>
<td>Plans to take the GRE in the summer of 2011.</td>
<td>Plans to apply to the following institutions: 1.) Medical University of South Carolina 2.) Mercer 3.) University of South Carolina</td>
</tr>
<tr>
<td>Samantha Jones</td>
<td>SC State University</td>
<td>2009 DOD</td>
<td>Isolation and <em>ex vivo</em> expansion of antigen-specific CD8+ T cells</td>
<td></td>
<td>2009 MUSC Summer Undergraduate Research Program</td>
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</tr>
<tr>
<td><strong>Student Name</strong></td>
<td><strong>Institution</strong></td>
<td><strong>DOD/RBC Student Fellow</strong></td>
<td><strong>Summer Research</strong></td>
<td><strong>Publications</strong></td>
<td><strong>Presentations</strong></td>
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<td><strong>Graduate School Admission</strong></td>
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<tr>
<td>Jonathan Brown</td>
<td>Claflin University</td>
<td>2010 DOD</td>
<td>NOV-002 Induces S-Glutathionylation of Serpin A1 and A3 in Human Plasma</td>
<td>2010 MUSC Summer Undergraduate Research Program Poster Presentation at the 2011 IMPaCT Conference</td>
<td>Plans to take the GRE: Date Unknown</td>
<td>Plans to apply to a graduate school program.</td>
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<tr>
<td>Scharan Clarke</td>
<td>Claflin University</td>
<td>2010 DOD</td>
<td><strong>2010</strong>: What Factors Can Predict the Success of Sacroneuromodulation When Used in Patients with Urinary Retention</td>
<td>2010 MUSC Summer Undergraduate Research Program Poster Presentation at the 2011 IMPaCT Conference</td>
<td>Plans to take the GRE in February 2011</td>
<td>Plans to apply to the following institutions: 1.) University of South Carolina, School of Public Health 2.) The Medical College of Georgia</td>
<td></td>
</tr>
<tr>
<td>DeAngelo Dinkins</td>
<td>SC State University</td>
<td>2010 DOD</td>
<td>&quot;Redox protein expression and susceptibility to therapeutic intervention in ARCaP prostate cancer cells&quot;</td>
<td>2010 MUSC Summer Undergraduate Research Program Poster Presentation at the 2011 IMPaCT Conference</td>
<td>Plans to take the GRE: Date Unknown</td>
<td>Plans to apply to the following Institutions: 1.) Medical University of South Carolina 2.) Vanderbilt 3.) University of North Carolina-Chapel Hill</td>
<td></td>
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<tr>
<td>Ebonie Fuller</td>
<td>SC State University</td>
<td>2010 DOD</td>
<td>Evaluating an Intervention to Improve Perceptions of Cancer Clinical Trials among Racially Diverse Communities in South Carolina</td>
<td>Manuscript entitled &quot;Evaluating an Intervention to Improve Clinical Trial Perceptions among Racially Diverse Communities in South Carolina&quot; is in preparation to be submitted to the American Journal of Public Health.</td>
<td>2010 MUSC Summer Undergraduate Research Program 2010 MUSC Student Research Day Oral presentation at the 2010 MUSC Student Research Day Poster Presentation at the 2011 IMPaCT Conference</td>
<td>Plans to take the MCAT Medical School Exam</td>
<td>Plans to apply to the following institutions: 1.) Medical University of South Carolina 2.) East Carolina University</td>
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