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14. ABSTRACT: The goal of this training grant is to recruit and train meritorious students from the University of District of Columbia, Washington DC in the field of prostate cancer. The following are the main objectives of the training program: (a) To recruit and highly qualified undergraduate students from UDC, (b) expose them to an intellectual environment and provide them with hands-on research training in ongoing research projects and education in prostate cancer research, (c) motivate the recruited students to contribute to prostate cancer research centers at HBCUs. During this training grant period, these objectives were achieved through the following Specific Aims: Aim 1. Selection of students and exposure to the state-of-the-art prostate cancer research environment; Aim 2. Assignment of mentors and research project with realistic goals; Aim 3. Progress report preparation and presentation. Results: During the three year period, a total of 13 students were selected and assigned to the USU-CPDR faculty members, who are actively involved in basic science and translational research. The projects assigned to the students represented high-impact research addressing prostate cancer tumor biology, biomarkers, patient treatment and education. In addition to their project focus, students participated in weekly seminars presented by the USU-CPDR faculty and staff and guest speakers. The scientifically enriched environment provided students the exposure to key aspects in prostate cancer research. Students prepared and presented their research progress in biweekly presentations. At the end of the training, each student presented their completed research project in the form of a written report and a seminar. The students also presented their research findings at the institutional and national meetings focusing on the HBCU training and research. Overall, the HBCU summer collaborative training program between UDC and USU-CPDR has provided unique opportunities for UDC students, who have expressed gratitude for the exposure and future commitment to professional training in prostate cancer research or similar research endeavor.					
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HBCU Summer Undergraduate Training Program in Prostate Cancer: A Partnership Between USU-CPDR and UDC

INTRODUCTION:

This grant award was intended to provide prostate cancer research summer internships to the students of the University of the District of Columbia (UDC) at the Uniformed Services University of the Health Sciences (USU)-Center for Prostate Disease Research (CPDR). The main objective was to train the students in an advanced areas of prostate cancer research through exposing them to clinical, translational and basic science research would encourage them to pursue research or medical careers in prostate cancer or relevant biomedical fields. The USU-CPDR and UDC team developed and executed a well-structured and realistic short term projects from ongoing research areas and offered the students with exciting training opportunities in a multi-disciplinary research environment at the CPDR.

The USU- CPDR is an inter-disciplinary program with over 25 years of experience in integrating clinical, translational and basic science research. CPDR program affiliations include USU, Walter Reed National Military Medical Center (WRNMMC), Joint Pathology Center (JPC) and the multi-center patient database sites including 5 military medical centers and one civilian medical center located throughout the United States. Scientific breakthroughs of CPDR continue to unravel gene defects that have potential as biomarkers and/or therapeutic targets in improving the diagnosis and management of Prostate cancer. CPDR programs have also been contributing to high impact research focusing on Prostate cancer in African Americans, who are at highest risk of this disease. Seamless integration of experts and mentors from many disciplines (urology, genitourinary pathology, cancer biology, epidemiology, medical- and bio-informatics) under CPDR umbrella enrich the state-of-the-art training in Prostate cancer research at various levels. CPDR trainees participate in 3-year MD/PhD post-doctoral fellowships, 6 months research rotation of WRNMMC urology residents (PGY4) ,1-2 year international urology research fellowships, short and long-term training of USU graduate and medical students (MD, PhD, MPH). Summer professional development training program of CPDR is of special relevance to this proposal, as it provides an opportunity for motivated high school and undergraduate college students to gain exposure to the field of Prostate cancer biomedical research. The CPDR has been providing this training to four to six students per year totaling just over 100 students.

The UDC, a Historically Black College and University (HBCU), is Nation's only comprehensive urban land-grant institution and has the traditional land-grant mission of education, research, and public service. The University ranks among the top twenty producers of bachelors' degrees awarded to African American students in the United States, according to the 2002 UDC President's Report. The Master's Degree in Cancer Biology, Prevention and Control, the first master's degree program in the natural sciences at UDC, was established in 2004 and graduated its first students in 2006. The University has a diverse student body with majority of the students classified as minorities.

BODY:

This program was led by Dr. Shiv Srivastava, PhD, Principal Investigator/Program Director (USU-CPDR), Dr. Deepak Kumar, PhD, Partnering PI (UDC) and Taduru Sreenath, PhD, Co-Investigator (USU-CPDR) in the management and administration of the award, selection of the students and mentors, pairing the students with the mentors, selection of the realistic and achievable projects, as well as the continued development and enhancement of this collaborative training program. **The objectives** of this training program were (a) To recruit and motivate highly qualified undergraduate trainees from UDC; (b) To provide them with a stimulating and intellectual environment that promotes state-of-the art training and education in Prostate cancer research; and (c) To motivate young researchers who might contribute to Prostate cancer research centers at Historically Black Colleges and Universities (HBCUs). These objectives were achieved through the following specific aims:

- **Selection of students and expose them to the state-of-the-art prostate cancer research environment.** Meritorious students (4/year; 12 for the 3 year grant period) will be selected and exposed to a well-structured training program that integrates expertise, tools and motivation to pursue careers in prostate cancer research.
- **Assignment of mentors and research project.** The students will be paired with the mentors and will be assigned a specific short-term research project. Student will conduct experiments in their respective laboratories under the supervision of their mentors. During the 12 weeks period, the students will learn key issues in prostate cancer research and will gain hands on experience in prostate cancer molecular biology experiments.
- **Progress report preparation and presentation.** At the completion of training, the students will prepare a written report and present their research at institutional and national conferences.

Task 1: Selection Process: The USU/CPDR summer internship program announcements were made at the UDC through advertisements displayed on the bulletin boards of all the departments, campus newspaper, common meeting areas of students around the UDC campus and UDC website to recruit undergraduate students to pursue an advanced education in medicine or medical research. Overall, 13 students were selected in during this grant period by the USU-CPDR and UDC selection committee, consisted of the faculty advisors for the summer Undergraduate Training Program, the principal investigator (PI), and the Co-PI, selected these students based on their interest in research, transcripts, and letters of recommendation. The following are the successful students recruited for advanced education and training in prostate cancer research:

2015

- Ms. Annie Bagga
- Ms. Mulenga Chileshe
- Mr. Quinton Sistare
- Ms. Shahnoza Dusmatova
- Ms. Shanice Cumbee

2016:

- Ms. Dagmawit Betru
- Ms. Oluwatosin Dairo
- Mr. Ryan Johnston
- Mr. Randy Ricks

2017:

- Ms. Samerawat Desta
- Mr. Randy Ricks

2018:

- Ms. Aliyah Patterson
- Ms. Natashia Benjamin

Research Environment:

CPDR (www.cpd.org) is committed to a multi-disciplinary approach to Prostate cancer research with over 350 publications and continues to make great strides in clinical and basic science research for improving the entire spectrum of care to include diagnosis, treatment, management, and follow-up for prostate cancer patients.

- **CPDR Basic Science Research Program (BSRP):** This multi-disciplinary Prostate cancer research endeavor represents integration of collaborative efforts of 30 plus researchers including over 10 PIs. State-of-the-art cancer biology laboratories at the Rockville, MD site and on USU campus in Bethesda support Prostate cancer biology and genetics focused research credited with discovery, functional and translational evaluations of prostate cancer-gene alterations with potential as biomarkers and therapeutic targets and

development of strategies and resources for translational research.

- **CPDR Prostate Cancer Clinical Center at WRNMMC:** The goals of these efforts are to combine prostate screening, development and maintenance of long term bio-specimen banks, education and counseling, and prostate disease clinical trial research in an efficient, personal, patient-oriented center. This unique approach to the Prostate cancer clinical research has resulted in significant breakthroughs in these areas.
- **USU-CPDR Multicenter National Database:** CPDR has developed a comprehensive database of Prostate cancer patients with longitudinal follow-up within the DoD equal access health care context. With over 25,000 men enrolled to date the CPDR database has become a national resource that enables researchers to conduct important studies using existing data, preserving valuable time and resources.
- **USU and JPC Faculty:** JPC-Genitourinary Pathology Department faculty and staff who have collaborated with CPDR since its inception actively participated in training of UDC students. USU faculty with Prostate cancer research focus from Department of Anatomy, Physiology and Genetics and Department of Microbiology and Immunology actively participated in training of UDC students under the DoD-PCRP HBCU training program.

PI and Training Staff:

Shiv Srivastava, PhD, Principal Investigator: Dr. Srivastava is the Co-Director and Scientific Director at CPDR and holds the Judd W. Moul Basic Science Chair in the Department of Surgery, USU. Dr. Srivastava is an established cancer researcher in a leadership position with a strong academic/administrative track record in the cancer biology and translational research.

Deepak Kumar, PhD, Partnering PI (2015, 2016): Dr. Kumar is a tenured Professor of Biology and Co-Director of the UDC Cancer Research Academy. Dr. Kumar is the Chairperson of the Department of Biology at UDC and an adjunct Associate Professor of Oncology at LCCC at GU. He is a member of the Molecular Oncology program and the Master's Tumor Biology Program committee at UDC. Dr. Kumar has authored multiple publications and has been awarded 5 US and European patents. Dr. Kumar is involved in the overall direction of this proposal from UDC including selection and tracking of students.

Brandy Huderson, PhD, Partnering PI (2017, 2018): Dr. Brandy Huderson took over the responsibility as a Partnering PI role since Dr. Deepak Kumar left UDC to join North Carolina State University. Dr. Huderson is a tenured Assistant Professor of Biology at the UDC and involved in the selection, advising and tracking of students.

Taduru Sreenath, PhD, Co-Investigator and Mentor: Dr. Sreenath is an Associate Director with CPDR and a Research Associate Professor with the Department of Surgery, USU. His scientific interests focus on understanding molecular mechanisms of cancer initiation and development using mouse models. He has made an impact on science through his mentorship and guidance of students and postdoctoral scientists. Several undergraduate students trained by him choose scientific and medical career path. Dr. Sreenath successfully coordinated the summer internship of the UDC students at CPDR under the previously funded grant. He was loved and admired by the students for his dedication.

Training Staff/Mentors: Highly dedicated mentors from USU/CPDR with over 15-30 years of research experience, widely recognized in the clinical and basic science research in prostate cancer field. All of these scientists have extensive experience in teaching and training urology residents, postdoctoral fellows and medical and undergraduate students. These scientists will form the backbone of the summer internship program. Qualifications, track record and research achievements and commitment of the mentors are attached in supporting documentation section. Following mentors will participate in the summer internship of UDC students:

Jennifer Cullen, PhD: Dr. Cullen is the Director of the Epidemiology Research Program of the CPDR and Research Associate Professor in the Department of Surgery, USU. Her research interests include development of

translational research projects, using the integrated clinical, serum and tissue databases. Dr. Cullen is well experienced in training of medical residents and undergraduate students.

Albert Dobi, PhD. Dr. Dobi is an Associate Director of the Basic Science Research Program and at CPDR, and a Research Assistant Professor in the Department of Surgery, USU. His research interests are to determine key elements of prostate tumorigenesis and to develop new approaches towards the treatment of prostate cancer by synergizing state-of-the-art molecular and in silico bioinformatics methodologies. He served as a mentor to UDC students under the previous collaborative HBCU grant.

Alagarsamy Srinivasan, PhD: Dr. Srinivasan is an Assistant Director at CPDR/ Department of Surgery, USUHS and Chief of Molecular Diagnostics and Cancer Vaccine Program. His research at CPDR focuses on cancer biomarkers with a main emphasis on the utilization of humoral (antibodies) and cellular immune responses in cancer diagnostics, prognosis and treatment. Specifically, his laboratory efforts are directed at antibodies and antigens as potential markers in the body fluids for prostate cancer by utilizing several platform technologies including Nanotechnology. He has trained several postdoctoral, doctoral and undergraduate students.

Shyh-Han Tan, PhD: Dr. Tan is an Assistant Director in the Basic Science Research Program, CPDR and Research Assistant Professor in the Department of Surgery, USU. He is a molecular biologist with over 20 years of experience with current research interest on mechanisms of the key gene alterations in prostate cancer. He trained several undergraduate students and mentored UDC students under previous cycle.

Ahmed Mohammed, MD., Ph.D.: Dr. Mohammed is a Staff scientist of Basic Science Research Program, CPDR and Research Assistant Professor in the Department of Surgery, USU. He is a cancer biologist with about 15 years of experience in mechanisms of the key gene alterations in prostate cancer. His focus was to utilize molecular mechanistic findings towards prostate cancer therapy. He trained several undergraduate students and mentored UDC students under previous cycle.

Hua Li, MD., Ph.D.: Dr. Li is a Staff scientist of Basic Science Research Program, CPDR and Research Assistant Professor in the Department of Surgery, USU. He is a molecular pathologist with over 10 years of experience in mechanisms of the key gene alterations in breast and prostate cancer.

Indu Kohaar, Ph.D.: Dr. Kohaar is a Staff scientist of Basic Science Research Program, CPDR and focuses on the early detection research network genes in prostate cancer. She is a molecular biologist with vast experience in the field of genomics.

Dr. William Gesztes, M.D.: Dr. Gesztes is post-doctoral fellow at CPDR. He is focused on the molecular pathology of prostate cancer.

Faculty advisors: The faculty advisors for the USU-CPDR and UDC Collaborative Undergraduate Training Program will be composed of the PI, Partnering PI, Co-Investigators of this proposal and following UDC faculty:

Carolyn Cousin, PhD. is Professor and former Chairperson of Biology in the Department of Biological and Environmental Sciences at UDC. She is currently the Director of the Masters' Degree Program in Cancer Biology, Prevention and Control.

Freddie Dixon, PhD. is a Professor and former Chairperson of Biology in the Department of Biological and Environmental Sciences at UDC. She also serves as a Visiting Professor in the Department of Microbiology and Immunology at GU Medical School, Washington, DC.

The faculty advisors will be responsible for the final selection of trainees from the list of applicants and for the review and oversight of the training program. The PI and the Partnering PI are responsible for appointing the

student mentors, for coordinating the final approval of the student research projects and for providing the students a positive research training experience.

The following are research areas of CPDR:

- Discovery of frequent and potentially causal prostate cancer gene alterations
- Identification of biomarkers that will distinguish between indolent and aggressive Prostate cancer
- Development of new molecular strategies for improving prostate cancer diagnosis and prognosis
- Delineation of hormonal mechanisms involved in prostate cancer onset or progression
- Development and evaluation of novel molecular therapeutic agents for prostate cancer
- Development and maintenance of molecular specimen resources for translational research
- Development of new experimental models with focus on common prostate cancer gene alterations
- Identification of molecular determinants of prostate cancer susceptibility in high-risk groups such as African-Americans
- Epidemiologic research focusing on prognostic markers, racial disparity, obesity, outcomes of various modalities in Prostate cancer and quality of life of patients in relation to various treatments
- Education of next generation of scientists in prostate cancer translational research

Task 2: Assignment of Mentors and Projects and objectives: Once the students were selected, they were paired with the USU-CPDR faculty mentors. Even before the selection process, mentors have developed realistic and well-structured short research projects. Students were exposed to rich environment gain knowledge, expert guidance, and tools to successfully complete the assignments. The knowledge and the technical experience they gained by engaging in experiments, seminars, discussions with scientists, and data presentations during the training period will enhance their understanding of Prostate cancer research and motivate them to pursue careers in basic science or clinical Prostate cancer research.

Assignment of mentors and research projects:

Student: Ms. Annie Bagga (2015)

Mentor: Alagarsamy Srinivasan, Ph.D

Project title: Antigen-Antibody Interactions: identification of antibody specific contact regions involved in binding to ERG

Student: Ms. Mulenga Chileshe (2015)

Mentor: Ahmed Mohamed, MD., Ph.D.

Research Project: Evaluation of the synergistic effects of AR and NOTCH inhibitors in ERG positive prostate cancer cells

Student: Mr. Quinton Sistare (2015)

Mentor: Shyh-Han Tan, Ph.D.

Research Project: Role of ANXA2 in Prostate Cancer Progression

Student: Ms. Shahnoza Dusmatova (2015)

Mentor: Jennifer Cullen, PhD, MPH.

Research Project: Integrated clinic-pathologic and molecular dynamics of novel form of TMPRSS2-ERG hybrid prostate cancers (Prostate cancer)

Student: Ms. Shanice Cumbee (2015)

Mentor: Jennifer Cullen, PhD., MPH.

Research Project: Interrelationship between Race, Body Mass Index, & Gene Expression Levels in Prostate Cancer

Student: Ms. Dagmawit Betru (2016)

Mentor: William Gesztes, MD

Project title: Defining early predictive traits of metastatic prostate cancer

Student: Ms. Oluwatosin Dairo (2016)

Mentor: Taduru Sreenath, PhD

Project title: Mechanisms of ERG induced Cancer Cell Survival

Student: Mr. Mr. Ryan Johnston (2016)

Mentor: Hua Li, MD, PhD

Project title: Baseline expression of Pmepal in mouse tissue panel

Student: Mr. Randy Ricks (2016)

Mentor: Jennifer Cullen, PhD, MPH

Project title: Single-nucleotide Polymorphisms in p53 Pathway and Association with Prostate Cancer

Student: Ms. Samerawat Desta (2017)

Mentor: Ahmed Mohamed, MD., Ph.D

Project title: Evaluation and characterization of ERG selective inhibitor, ERGi-USU and derivatives

Student: Mr. Randy Ricks (2017)

Mentor: Indu Kohaar, PhD.

Project title: Association of TP53 Codon 72 Single-nucleotide Polymorphism (SNP) with Prostate Cancer

Student: Ms. Aliyah Patterson (2018)

Mentor: Albert Dobi, Ph.D

Project title: Recurrent alterations of the Tenascin C (TNC) gene in highly aggressive neuroendocrine subtype of prostate cancer

Student: Ms. Natasha Benjamin (2018)

Mentor: Hua Li, MD., Ph.D

Project title: Exquisite specificity of a PMEPA1 isoform in regulation of the androgen receptor a major player in prostate cancer

Task 3: Training, Goals, and Objectives: Each student carried out the research assignment with a specific objectives that were designated to yield some new data and findings within the 12-week period.

A total of 13 students (2015-2018) from the UDC were recruited for a rigorous 12-week training internship focused on prostate cancer research. Students were exposed to the exciting and timely Prostate cancer research addressing cancer biology, biomarkers, patient treatment and education. The students met with their supervisors, received training in carrying out specific experiments, and recorded the data in electronic laboratory notebooks on a daily basis. The students participated in weekly seminars and presented their progress through structured presentations every two weeks. At the end of the 12 weeks, students made final presentations attended by faculty and staff of CPDR and senior leaderships of USU (Department Chairman), UDC (Dean, College of Arts and Sciences) and other administrative officials from USU. Students submitted the complete report on their projects at the completion of the training period. The students were encouraged to contact the faculty advisors and the mentors and they were advised and guided for their career development and progress and even after training period. All the students and their career progress were monitored.

Laboratory meetings: Through laboratory meetings, seminars, and personal discussions, the students interacted with other fellow students, faculty members, and staff.

- **Weekly meetings:** Students participated in department seminars presented by USU/CPDR faculty and researchers, as well as guest speakers, to understand the research activities and the progress in the field of Prostate cancer.
- **Biweekly seminar presentations:** Students presented their goals, objectives, and experimental plan for the training period in the first presentation and their progress in subsequent presentations.

At the end of the summer experience, each student prepared and presented their research findings as PowerPoint presentations.

- **Final seminar presentation:** Students presented the complete project report and conclusions.
- **Report Submission:** Each student submitted the entire project as a hard copy and an electronic version to the supervisors.

Overall, the USU-CPDR and UDC Collaborative Undergraduate Training Program has provided ground breaking unique opportunities for UDC students, who have expressed gratitude for this eye opening exposure and future commitment to professional training in prostate cancer research or similar biomedical research career. The program engaged prostate cancer researchers and students in mutually beneficial interactions resulting in a very rewarding experience for mentors as well as students in creating and maintaining a strong academic environment for students, who are likely to pursue professional career in medicine or bio-medical research.

Task 4: Periodical meeting of Faculty advisors to monitor Student's progress.

- **Meetings between student and mentor:** Student and mentors met every morning to discuss the plan for the experiments and in the evenings to summarize the experimental results and interpretations.
- Programmed interaction and oversight of the student interns by the PI and Co-PI, faculty advisors, and mentors is presented in the following table:

Time Line	Process	Action	Responsibility
12 weeks prior to Internship start date	Applications	Selection	CPDR-USU and UDC Selection committee
8 weeks prior to Internship start date	Mentors for the program	Appointment	Program Director (PD) and Co-Pis
4 weeks prior to Internship start date	Research Projects	Goals and Objectives	Mentors
2 weeks prior to Internship start date	Research Projects	Approvals	Program Director (PD) and Co-Pis
Day 1	Internship start date	Lab Orientation	Mentors and Students
Week 1	Student Research Goals and Objectives	Weekly Review	Mentors and Students
Week 2	Student Research Progress	Bi-Weekly Review and Presentations	PD, Co-PIs, Mentors and Students
Week 4	Student Research Progress	1st Monthly Review	PD, Co-PIs, Faculty Advisors Mentors and Students
Week 8	Student Research Progress	2nd Monthly Review	PD, Co-PIs, Mentors and Students
Week 10	Student Research Progress	Semi-final Review	PD, Co-PIs, Mentors and Students
Week 11	Completion of Research Experiments	Review and Approval	PD, Co-PIs and Mentors
Week 12	Submission of Research Report	Final Presentation	PD, Co-PIs, Faculty Advisors Mentors and Students

Mentors interacted with students on a daily basis during the entire training program to monitor their understanding of the research and progress. In addition, mentors also formally met with the students once a week to train them in compiling the data, interpretation of the results and the need for additional experiments to achieve goals and objectives of the project. These meetings were mainly focused on specific academic goals of students and guide them in strategizing an individual development plan (IDP). The monthly meetings were conducted to ensure periodic assessments of each student and assist the faculty mentors in determining appropriate interventions in order for the students to accomplish their goals and objectives.

KEY RESEARCH ACCOMPLISHMENTS:

All 13 students selected under HBCU Summer Undergraduate Training Program 2015-2018, in Prostate cancer research, have successfully completed their projects assigned to them. Highlights of their project outline and experimental results are described below:

2015:

Ms. Annie Bagga

- Paratope residues involved in binding to the epitope were analyzed
- Chimeric constructs were generated using split Venus reporter and antibody fragments
- Site-specific mutagenesis was performed using alanine substitutions to identify the candidate residues involved in the interaction
- Arginine and isoleucine are found to be potentially involved in optimizing antibody binding to the epitope.

Ms. Mulenga Chileshe

- Inhibition of AR combined with inhibition of NOTCH signaling resulted in a greater decrease in cell motility and invasion
- Altered EMT and increased differentiation of cells
- Enhanced drug sensitivity,
- Potential inhibition of tumor development and/or progression

Mr. Quinton Sistare

- ANXA2 was cloned into a lentiviral construct
- Viral titer was determined for effective MOI to infect prostate cancer cell lines
- Over expression of low levels of ANXA2 in C4-2B cells increases cell migration
- Higher levels of expression has shown decreased cell migration

Ms. Shahnoza Dusmatova

- Observations proposed, patients $\geq 80\%$ ERG positive have striking difference in comparison to both ERG negative and ERG positive cohorts
- Comparison of ERG-hybrid $< 80\%$ to ERG negative and ERG positive groups revealed significantly lower BMI in a hybrid group
- Majority of patients are CA in hybrid group

Ms. Shanice Cumbee

- Expression correlations of c-MYC, HIPPI, PSGR with BMI vs BCR were found
- Expression correlations of c-MYC, HIPPI with Race vs BCR were found
- Expression correlations of ERG1, ERG3, PSGR in African American/Caucasian Men vs BCR found to be statistically significant

2016:

Ms. Dagmawit Betru:

- p53 does not predict metastasis in high risk patients
- Combining lymphatic invasion with p53 may improve the prediction of metastasis in prostate cancer

Ms. Oluwatosin Dairo

- Various domain deletion AR proteins along with ERG in COS7 and HEK293-TE3 (6L) cells showed AR protein aggregation except with the C'-terminal protein
- All mutant AR proteins have shown physical interactions with ERG proteins by PLA assay

Mr. Ryan Johnston

- The spatial expression Pmepal protein widespread in most of the tissues suggesting critical functions in addition to prostates
- Immuno-histochemical analysis revealed variation in the distribution in anterior, dorsal, lateral and ventral glands
- The expression appears high in lateral and anterior glands

Mr. Randy Ricks

- A total of 616 SNPs (564 p53 target gene SNPs and 52 p53 SNPs) were analyzed on 321 prostate patients (AA = 216 and CA = 105)
- A total of 149 SNPs were found to be significantly associated with race. 3 genes - CDKN1A Cyclin-Dependent Kinase
- Inhibitor 1A (CDKN1A), Sestrin 1 (SESN1) and epidermal growth factor receptor (EGFR) were found to be highly polymorphic (13 SNPs in SESN1, 28 SNPs in EGFR and 9 SNPs in CDKN1A).
- MAF distribution showed that 5 SNPs in EGFR, 5 SNPs in CDKN1A and 6 SNPS in SESN1 were found to be relatively more frequent in AA Prostate cancer than CA Prostate cancer.

2017:**Ms. Samerawat Desta**

- ERGi-USU-6 follows the same pathway as the parental compound (ERGi-USU) by affecting ribosomal biogenesis and induced cell death through cell cycle arrest and apoptosis
- ERGi-USU showed inhibitory effect on RPs3 and RPs6 proteins but not significant as the RIOK2 and ERG
- Inhibition of RIOK2, RPs3, and RPs6 was observed as early as 12 hour post treatment
- RPL13a and RPL7a were minimally affected by the compound

Mr. Randy Ricks

- The association of TP53 Pro72Arg polymorphism and prostate cancer in a case only study consisting of CA and AA patients
- The present study clearly demonstrates population-dependent differences in allele frequencies of TP53 codon 72 SNP in AA and CA Prostate cancer, thereby providing a valuable framework for the interrogating Prostate cancer disparity among different ethnic groups

2018:**Ms. Aliyah Patterson**

- Genomic alterations (primarily amplification) of TNC is associated with major oncogenic drivers of Prostate cancer, such as ERG, AR and MYC in NEPC genomic datasets
- Further studies are warranted to address the mechanistic link between TNC and major Prostate cancer oncogenic pathways in the context of NEPC phenotype

Ms. Natasha Benjamin

- PMEPA1-b is the only PMEPA1 isoform directly binds to AR
- The transmembrane domain of PMEPA1-b protein is crucial to mediate binding between AR and PMEPA1
- These results underscores the promise of the PMEPA1-b driven AR degradation as a new approach in Prostate cancer therapeutic development

REPORTABLE OUTCOMES:

- The program was initiated with the successful applicants meeting with Dr. Shiv Srivastava, Program Director, who provided the students with an overview of the DOD Collaborative Undergraduate HBCU Student Summer Prostate Cancer Training Program, goals and objectives
- Students specific interests were discussed
- Laboratory safety training was given to the students by Laboratory Manager
- Short-term realistic projects within our ongoing Basic and Translational research were designed for students
- Mentors were selected by the PIs based on student's specific research interest
- Mentors worked closely with students to identify a research project to include goals and objectives
- Students presented their research progress to CPDR scientific staff and PI at CPDR Rockville location in biweekly meetings
- Students presented their complete project report and conclusions
- At the completion of training, the students prepared a complete written report to the mentors in a manuscript format

During this period, the students have displayed tremendous of interest in the field of prostate cancer and have gained experience. The results obtained from their experiments will be presented as posters in HBCU conferences at national level.

CONCLUSIONS:

Under this grant period, a total of 13 students were selected and they successfully completed the assigned projects. The students met daily with their supervisors, received training in carrying out the experiments, and recorded the data in electronic laboratory notebooks on a daily basis. The students participated in weekly seminars and presented their experimental goals, designs, and results by PowerPoint presentations every two weeks to show their progress. At the end of the 12 weeks, students made final presentations at the USU conference room attended by faculty and staff of CPDR and senior leaderships of USU (Department Chairman), UDC (Dean, College of Arts and Sciences) and other administrative officials from USU. Students submitted the complete report on their projects. This program has been an extremely rewarding experience for the students, mentors, and for collaborating institutions. The students have won numerous awards at national and local conferences serving toward HBCU training.

During the training period, the students learned the following:

- Basic skills in planning and execution of a research project focused on a defined question related to molecular and cell biology of Prostate cancer or translational Prostate cancer research
- Presentation and development of a practical idea and its significance to Prostate cancer
- Importance of Prostate cancer research in high-risk populations, such as African Americans
- Preparation of high-quality slide presentations on assigned topics
- Preparation of a final written report.
- Maintenance of an electronic record of experiments
- Issues related to laboratory safety and laboratory hygiene
- Appreciation of the power of scientific research and its application in decreasing suffering from a disease such as cancer
- Appreciation of the dedication, perseverance, and effort it takes to perform research of the highest quality in a laboratory

Extended Mentoring: The students trained under this program are in contact with the PD, Co-PIs, Mentors and to continue to interact and discuss their progress and guidance in choosing the appropriate career.

Student Tracking: Interaction of the PIs, Co-Investigators, faculty members and mentors with the students will be continued after the summer program and their graduation. The students were advised to meet quarterly with the mentors and PIs for counsel and to address any concerns towards their IDPs. The mentors and the PIs will also guide students in selecting the study programs (graduate or professional) and writing research statements and providing recommendation letters. The extended mentoring program was designed to help in two important ways: (1) faculty mentoring for scientific exchanges and career advice, and (2) peer connection and peer mentoring where students will exchange their experiences and ideas with fellow students.

The students trained at USU/CPDR will be tracked by UDC PI for 5 years after receiving their degree. Those who are admitted into the master's degree program in Cancer Biology, Prevention, and Control at UDC will be tracked even after graduation. The following tools will be used to track undergraduate students: (1) a status report for each year after graduation, (2) date of admission into a doctoral program or date obtaining a job in the degree profession, (3) date and GPA upon graduation from a graduate program, and (4) employment status for undergraduate students who did not continue their education beyond the baccalaureate degree.

REFERENCES:

None

APPENDICES:

None