

AWARD NUMBER: W81XWH-14-2-0159

TITLE: Prostate Cancer Clinical Consortium Clinical Research Site: Targeted Therapies

PRINCIPAL INVESTIGATOR: David Nanus

CONTRACTING ORGANIZATION: Weill Medical College of Cornell University
New York, NY 10065

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TYPE OF REPORT: Annual

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14. ABSTRACT The Weill Cornell Medical College Prostate Cancer Research Program (WCMC-PCRP) is a Clinical Research Site of the Prostate Cancer Clinical Trials Consortium (PCCTC). The purpose of the research is to lead and participate in Consortium therapeutic and correlative science research protocols. Specifically, our aims are to impact prostate cancer care and outcomes through the development and study of novel targeted therapeutics, discovery of mechanisms of therapy resistance/sensitivity, identification of new therapeutic targets through high quality genomic analyses, providing access to the highest quality PC tissue specimens, and development of molecular imaging techniques with direct relevance to targeted therapies. Our overarching goal is to more effectively bring novel agents and new biomarker driven trials directly to patients				
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1. **INTRODUCTION:** Narrative that briefly (one paragraph) describes the subject, purpose and scope of the research.

The Weill Cornell Medical College Prostate Cancer Research Program (WCMC-PCRP) is a Clinical Research Site of the Prostate Cancer Clinical Trials Consortium (PCCTC). The purpose of the research is to lead and participate in Consortium therapeutic and correlative science research protocols. Specifically, our aims are to impact prostate cancer care and outcomes through the development and study of novel targeted therapeutics, discovery of mechanisms of therapy resistance/sensitivity, identification of new therapeutic targets through high quality genomic analyses, providing access to the highest quality PC tissue specimens, and development of molecular imaging techniques with direct relevance to targeted therapies. Our overarching goal is to more effectively bring novel agents and new biomarker driven trials directly to patients

2. **KEYWORDS:** Provide a brief list of keywords (limit to 20 words).

aurora kinase A, clinical trials, circulating tumor cells, monoclonal antibody, neuroendocrine prostate cancer, next-generation sequencing, prostate cancer, Prostate Cancer Clinical Trials Consortium, prostate specific membrane antigen, translational research program,

3. **ACCOMPLISHMENTS:** The PI is reminded that the recipient organization is required to obtain prior written approval from the USAMRAA Grants Officer whenever there are significant changes in the project or its direction.

What were the major goals of the project?

SOW Major Task 1: Adhere to performance metrics defined by Coordinating Center

SOW Major Task 2: Full participation in the consortium as a member of the Clinical Consortium Committee/Scientific Oversight Committee

SOW Major Task 3: Regulatory review, Clinical trial startup

SOW Major Task 4: Propose clinical trials to Consortium

SOW Major Task 5: Interim data analysis

SOW Major Task 6: Open other Consortium sponsored Clinical Trials at WCMC

SOW Major Task 7: Clinical trial performance

SOW Major Task 8: Investigator analysis, reporting of initial data

SOW Major Task 9: Analysis and reporting of final data

What was accomplished under these goals?

SOW Major Task 1: Adhere to performance metrics defined by Coordinating Center

Subtask 1. Accrue at least 25 patients per year to PCCTC trials: Sixteen (16) patients have enrolled to the 5 currently active PCCTC protocols in this reporting period. Four of the 5 studies were open less than six months.

- PCCTC LOI# c11-092 (“AbiCure”) – activation date: 2/5/2015 – 3 enrolled (+1 additional screen failure)

- PCCTC LOI# c12-108 (“AbiCabazi”) – activation date: 3/26/2015 – **1** enrolled
- PCCTC LOI# c13-124 (“RadPRO”) – activation date: 6/22/2015 – **5** enrolled
- PCCTC LOI# c14-144 (“PCF Challenge”) – activation date: 5/12/2015 - **1** enrolled
- PCCTC LOI# c12-105 (“MLN8237”) – **6** enrolled at Weill Cornell Medical College (WCMC) for this reporting period. In addition, 32 subjects have been enrolled to this study at collaborating outside sites (+7 screen failures), whose research samples have been sent to WCMC for correlative studies.

PCCTC LOI# c12-105: 32 subjects enrolled at collaborating outside sites had research samples sent to WCMC for correlative studies.

PCCTC LOI# c14-144: 16 samples for CTC analysis (14 baseline samples and two progression samples).

PCCTC LOI# 12-107: This trial (TAXYNERGY) is closed to accrual but analysis of data is ongoing (see below). This trial was open at WCMC prior to the start of the grant, and 8 patients were enrolled to it.

Subtask 2. Accrue at least 5% of patients from disproportionately affected populations per year

Two of 16 enrolled patients were Hispanic (6.25%)

Subtask 3. Propose ≥ 2 clinical trials per year or 6 trials over 3 years for consideration by the consortium, which may include biomarker studies: We are co-investigators on a PCF Challenge Award with Duke open this past year, and participated in its design (PCCTC LOI# c14-144). Circulating tumor cells are sent to WCMC for analysis from other centers (Johns Hopkins, Duke and MSKCC). We also proposed (together with the University of Oregon) and will soon open “A Phase Ib/II, Multicentre, Open Label, Randomised Study of BI 836845 in Combination with Enzalutamide, versus Enzalutamide alone, in Metastatic Castration-Resistant Prostate Cancer (mCRPC) Following Disease Progression on Docetaxel-Based Chemotherapy and Abiraterone”. This trial will open first quarter 2016. In addition, a WCMC-initiated multicenter consortium study with funding support from Janssen Biotech, Inc. is in development and will be offered through PCCTC when finalized. The LOI has been submitted to the PCCTC and is pending distribution.

Subtask 4. Participate as a Clinical Research Site in >6 trials initiated by other sites: We have opened 4 trials to date initiated by other sites, including one in which we are co-investigators on a PCF Challenge Award. Other protocols are in various stages of completion and/or start up.

SOW Major Task 2: Full participation in the consortium as a member of the Clinical Consortium Committee/Scientific Oversight Committee

Subtask 1. Participate in ≥ 1 PCCTC committee: Dr. Tagawa is a member of the Scientific Oversight Committee.

Subtask 2. Attend all face-to-face meetings of the PCCTC: Dr. Nanus, Dr. Tagawa and/or Dr. Beltran attended all face-to-face meetings of the PCCTC.

Subtask 3. Participate in scheduled consortium conference calls: Dr. Nanus and/or Dr. Tagawa have participated in all PCCTC scheduled consortium conference calls. Dr. Nanus presented on the conference call for Weill Cornell in December 2015. Dr. Beltran, Dr. Molina and Dr. Tagawa also presented during the monthly investigator meetings in December 2015.

Subtask 4. Participate in review meetings/evaluation by the External Advisory Board (EAB): No EAB meetings have yet occurred.

Subtask 5. Compliance with the operations manual of the Consortium: We have been compliant.

SOW Major Task 3: Regulatory review, Clinical trial startup.

Subtasks 1 thru 4 have each been completed (Submission of protocols for scientific (WCMC Protocol Review Committee) and WCMC Institutional Review Board (WCMC Clinical and Translational Science Center review if indicated); Completion of contractual agreements between Coordinating Center and WCMC; Clinical trial approval at WCMC; and Site initiation visits). Four new (4) consortium trials have been open at WCMC in the past year, with additional trials in various stages of regulatory review.

SOW Major Task 4: Propose clinical trials to Consortium

Subtask 1. Propose new therapeutic trial to Coordinating Center and other Consortium sites: See above (Major Task 1, Subtask 3).

Subtasks 2- thru 7. Subtasks 2 thru 7 are partially accomplished and ongoing as specifically related to each WCMC initiated protocol (Submission of protocol for scientific review; start up at additional sites; clinical trial initiation at WCMC and other collaborating sites; Screen, enroll, and treat subjects; ongoing communication with study sites; Ongoing communication with IRB, DSMB, FDA).

SOW Major Task 5: Interim data analysis

This milestone has not yet been reached. Two PCCTC trials (c12-105 and 12-107) led or co-led by WCMC have or are completing accrual with analysis planned for Fall/Winter 2015.

SOW Major Task 6: Open other Consortium sponsored Clinical Trials at WCMC

See above in Major Task 1 for details.

SOW Major Task 7: Clinical trial performance

See above in Major Task 1 for details.

SOW Major Task 8: Investigator analysis, reporting of initial data

Subtask 1. Verification of data

This milestone has not yet been reached. See Major Task 5.

Subtask 2. Analysis of initial data

PCCTC LOI# c12-105 (“MLN8237”) is expected to achieve enrollment goals and begin data verification and query resolution by Mid-2017. Analysis of data is expected to occur by Winter of 2017. All other studies are still enrolling subject or undergoing data verification.

Analysis of circulating tumor cells for androgen receptor localization at screening and baseline has been performed on CTC samples from the TAXYENERGY study and reported at national/international meetings.

Subtask 3. Reporting of initial data

Two biological correlative data abstracts have reported on circulating tumor cell analysis from the TAXYENERGY trial: A) Baseline analysis of circulating tumor cell (CTC) enumeration and androgen receptor (AR) localization in men with metastatic castration-resistant prostate cancer (mCRPC) in TAXYENERGY. J Clin Oncol 2015; 33 (15 Suppl) Abst 5031; and B) Screening and baseline analysis of circulating tumor cell (CTC) counts and androgen receptor (AR) localization with clinical characteristics of men with metastatic castration-resistant prostate cancer (mCRPC) in TAXYENERGY. European Journal of Cancer 2015; 51 (suppl 3), S498 (abst 2563).

SOW Major Task 9: Analysis and reporting of final data

This milestone has not yet been reached.

What opportunities for training and professional development has the project provided?

Dr. Beltran has had the opportunity to lead a multi-institutional clinical trial (PCCTC LOI# c12-105) as PI, communicating with other sites. She presented these trial results at the ESMO Annual Meeting in October 2016 and continues analysis of response and correlative studies data. She also participates in PCCTC group meetings and trials.

Dr. Beltran, Dr. Molina and Dr. Tagawa presented during the monthly December 2015 Investigator teleconference.

Dr. Tagawa had the opportunity to attend the European Cancer Congress 2015.

How were the results disseminated to communities of interest?

Nothing to report.

What do you plan to do during the next reporting period to accomplish the goals?

We will continue to recruit to currently open consortium studies, as well as open other clinical trials being offered through the consortium. Given that this is the first year of the grant, studies have not been open for the duration of the full year. We expect increased enrollment to consortium studies in the upcoming year. We also currently have a WCMC-initiated study in development, which will be offered to other sites in the consortium in the upcoming year.

4. IMPACT:

Nothing to Report

5. CHANGES/PROBLEMS:

Nothing to Report

6. PRODUCTS:

Two abstracts were presented (one at the 2015 annual meeting for the American Society of Clinical Oncology, and one at the European Cancer Congress 2015).

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

What individuals have worked on the project?

Personnel	Role	Percent Effort
David Nanus	Principal Investigator	10%
Mark Rubin	Co-Investigator	3%
Scott Tagawa	Co-Investigator	3%
Himisha Beltran	Co-Investigator	3%
Irene Karpenko	Clinical Research Coordinator	41.2%
Lauren Emmerich	Research Nurse	18.4%
Gillian Hodes	Data Coordinator	34.1%
Hoda Bashir	Research Nurse	22.3%
Aileen Lee	Data Coordinator	16.7%

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?

David Nanus:

The PCF-Movember Challenge Award (Armstrong), 'Development of Circulating Molecular Predictors of Chemotherapy and Novel Hormonal Therapy Benefit in Men with Metastatic Castration Resistant Prostate Cancer (mCRPC)', on which Dr. Nanus serves as co-PI, received a no-cost extension. The new end date for this project is 7/31/17.

Dr. Nanus received the following new funding in the past year:

**U54 CA210184 (Fischbach/Cantley)
0.6 calendar**

08/29/2016 – 07/31/2021

National Cancer Institute

\$1,343,890

Center on the Physics of Cancer Metabolism

This application seeks to put together a multidiscipline team of experts in various institutions in USA to assemble and develop the infrastructure, capabilities, research programs and network environment that will support and nurture a new trans-disciplinary approach to understanding and controlling cancer.

Role: Co-Investigator

Scott Tagawa:

Dr. Tagawa requested an additional no-cost extension on his DOD grant W81XWH-09-1-059, which was approved. The new end date for this project is 8/16/17.

The PCF-Movember Challenge Award (Armstrong), ‘Development of Circulating Molecular Predictors of Chemotherapy and Novel Hormonal Therapy Benefit in Men with Metastatic Castration Resistant Prostate Cancer (mCRPC)’, on which Dr. Tagawa serves as co-investigator, received a no-cost extension. The new end date for this project is 7/31/17.

Dr. Tagawa received the following new funding in the past year:

Prostate Cancer Research Solicitation (Rubin) 11/1/15 – 1/31/17 0.24 calendar
New York State Department of Health \$31,875
Molecular Determinants of Response and Resistance to Taxanes and Androgen Deprivation Therapy in Castration-Resistant Prostate
This project aims to perform molecular profiling of PC-patient derived CTCs.
Role: Pilot Project Co-PI

Mark Rubin:

Dr. Rubin received the following new funding in the past year:

1UG3OD023183-01 (PI Rubin and Goldstein)

Precision Medicine Initiative HPO

1.2 calendar

National Institute of Health

Grants Officer: Dr. Nicole Redmond; email: nicole.redmond@nih.gov

7/1/16-6/30/21

\$1,200,000/year

Project Goals/Aims: The goal of this project is to build a research cohort of engaged volunteers that reflects the racial, ethnic, and socioeconomic diversity of New York City and the U.S. population. Aim 1. To enroll at least 10,000 multiethnic, pediatric and adult participants in the national PMI cohort in the first year drawn broadly across all clinical populations served by HH, CUMC, NYP, and WCM, Aim 2. To engage community members, leaders and organizations throughout NYC to ensure that the aims of the national PMI are appreciated by the broader community. Aim 3. To establish a Participant Enrollment System (PES) that ensures representation across all clinical areas and diverse demographic groups. Aim 4. To extract all

electronic health record (EHR) data for our participants; to incorporate physical exam, survey, mobile health, and capture city-wide clinical data from our participants; to perform quality control checks data.

Overlap: None

R01 HG008261 01-1A (PI Gerstein)

Prioritizing rare, non-coding variants associated with cancer using functional annotation

0.6 calendar

National Institute of Health

Grants Officer:

2/1/16-1/31/19

\$175,000/year

Project Goals/Aims: Detailed validation of the prioritized germline variants will be performed. From a separate large-scale cohort (of 4000 individuals), we will look at how these rare variants segregate with cancerous individuals versus a control.

Aim 1. Adapt our existing tool for prioritizing somatic variants (FunSeq) to create a generalizable approach for prioritizing impactful non-coding variants (eleVAR). Aim 2. Implement eleVAR pipeline and develop a workflow for tuning and assessing performance, focusing on prostate cancer as a test case for a specific disease Aim 3. High-throughput experimental characterization of ~1200 variants using Clone-seq and luciferase reporter assays Aim 4. Detailed experimental validation of a few non-coding variants from eleVAR.

Role: Co-Investigator

Overlap: None

Prostate Cancer Foundation, Challenge Award (PI Rubin)

Integrative Genomics of Prostate Cancer Progression

1.8 calendar

Prostate Cancer Foundation

Grants Officer: Audrey Gardner; email: agardner@pdf.org; phone: 310-570-4792

10/1/15-9/30/17

\$280,000

Project Goals/Aims: Project Aims:

Aim 1. Collect and histologically characterize original primary ADT-naïve specimens from patients enrolled in the CRPC 500 trial. Aim 2. Determine the molecular landscape of multiple tumor foci from the original ADT-naïve CRPC 500 specimens through DNA and RNA sequencing. Aim 3: Identify molecular mediators of PCa progression and track the progressing clone through an integrative molecular profiling analysis of paired primary ADT-naïve and CRPC specimens.

Overlap: None

RFA#1410200115 (PI Rubin)

Prostate Cancer Research

0.12 calendar

New York State Dept. of Health

Grants Officer: Janet Roach; E-mail: jmr04@health.ny.gov; Phone: 518-474-1222

11/1/15-1/31/17

\$75,000

Project Goals/Aims: This RFA is to support NYS-based research institutions to conduct

hypothesis development research in prostate cancer. This funding is intended to offer investigators opportunities to explore innovative, untested hypotheses, the results of which could provide the scientific rationale upon which new hypotheses or initial proofs-of-principle of innovative hypotheses can be generated.

Overlap: None

Dr. Rubin had the following projects end in the past year:

AACR SU2C Dream Team (Chinnaiyan, A. / Sawyers, C.)

Precision Therapy of Advanced Prostate Cancer

American Association for Cancer Research

Grants Officer: Karen Giles; email: kargiles@umich.edu; phone: 734-763-3821

8/1/12-7/31/16

\$0 (no cost extension period)

Project Goals/Aims: Aim1: Establish a multi-institutional infrastructure linked with appropriate sample and data coordination; Aim 2: Conduct parallel, preclinical in vivo functional studies of resistance biomarkers and of SU2C-PCF sponsored combination therapies.

Role: Team Leader

P50 CA186786 (PI Chinnaiyan)

SPORE in Prostate Cancer, Project 4: Developing Schlap1 and Other lncRNAs as Prostate Cancer

Biomarkers in Urine

National Cancer Institute

9/1/15-8/31/16

\$7,014

Project Goals/Aims: To generate RNA-seq data from clinically localized prostate cancer and receive RNA-seq data from metastatic prostate cancer from *Project 1*. While a number of long non-coding RNAs (lncRNAs) were evaluated, Project 4 focused on the development of Schlap1, which was characterized in collaboration with *GenomeDx* (Prensner, et al., *Nature Genetics* 2013).

U01 CA086402 (PI Thompson, I.)

Biomarkers and clinical parameters associated with Gleason score upgrading

National Institute of Health

Grants Officer: Chris Green; email: greenc@uthscsa.edu; phone: N/A

7/1/14-6/30/16

\$64,897

Project Goals/Aims: Aim 1: To grade and stage, tumor volume, presence of perineural and/or angiolymphatic invasion and margin status of Prostate cancer specimens; Aim 2: Map each individual tumor nodule and provide a separate Gleason score and pathologic tumor (pT) stage.

Roles: Sub-site Principal Investigator

Prostate Cancer Foundation, Challenge Award (Co-PI Rubin / Rickman, D.)

Targeting and mechanistic insights underlying N-Myc driven Neuroendocrine Prostate Cancer

Prostate Cancer Foundation

Grants Officer: Audrey Gardner; email: agardner@pdf.org; phone: 310-570-4792

4/4/14-4/4/16

\$160,000

Project Goals/Aims: To characterize the driving role of N-Myc and AURKA in neuroendocrine prostate cancer with the ultimate goal of more effectively targeting this tumor subclass by disrupting this complex.

Aim 1. Determine the molecular features underlying the driving role of N-Myc in NEPC.

Aim 2. Determine specific mechanisms and approaches to target N-Myc driven NEPC.

Aim 3. Prospective evaluation of the clinical impact of N-Myc associated alterations in patients with advanced prostate cancer.

Starr Foundation Grant, I7-A771 (Solit, D. / Rubin / Darnell, R. / Berger, M. / Beltran, H.)

Genome Sequencing of Outlier Responders to Systemic Cancer Therapies

Starr Cancer Consortium

Grants Officer: Sylvie LeBlancq; email: leblancs@mskcc.org; phone: 212-639-8489

1/1/14-12/31/15

\$165,000

Project Goals/Aims: The primary goal of this effort was to ensure that the development of agents with profound life alternating activity in only a minority of patients is not prematurely halted but rather redirected to the subset of patients most likely to benefit.

Aim 1. Whole exome and mRNA-Seq was performed on patients who achieved durable (>1 year) and major (>70% tumor regression) responses to systemic anticancer therapy for which biomarkers of response or resistance had yet to be elucidated.

Aim 2. Biologically validate select novel mutations identified in the whole genome studies performed in Aim 1.

Starr Foundation Grant, I7-A722 (Chen, Y. / Rubin / Carver, B. / Beltran, H.)

Co-clinical trials using organoids for patients with advanced prostate cancer

Starr Cancer Consortium

Grants Officer: Sylvie LeBlancq; email: leblancs@mskcc.org; phone: 212-639-8489

1/1/14-12/31/15

\$276,500

Project Goals/Aims: This project created organoid lines from advanced prostate cancer patients to generate mutational and copy number data of each organoid line, to determine whether *in vitro* sensitivity could predict for patient response, and to generate potential biomarkers.

Aim 1. Generate clinically well-annotated organoid lines that accurately recapitulate the clinical and molecular diversity of abiraterone-resistant CRPC and NEPC

Aim 2. Characterize the mutational profile and copy number profile of each organoid line

Aim 3. Determine the *in vitro* drug sensitivity profile of organoid lines and correlate with patient response

U01 CA111275 (PI Rubin)

Michigan/Cornell EDRN BDL: A Systems Biology Approach to the Development of Cancer Biomarkers

National Institute of Health

Grants Officer:

08/16/10-12/31/15

\$166,672

Project Goals/Aims:

Aim 1. Characterize and validate the humoral immune response to AMACR in different patient cohorts. Aim 2. Employ high-throughput phage epitope microarrays to identify candidate humoral response markers of prostate cancer. Aim 3. Define and develop a multiplexed protein/epitope microarray to identify prostate cancer based on humoral response.

Himisha Beltran:

Dr. Beltran requested and received approval for a no-cost extension on her Damon Runyon Clinical Investigator Award, “Using High Throughput Genomic Approaches to Improve Management of Neuroendocrine Prostate Cancer”. The new end date for the project is 6/30/17.

Dr. Beltran received the following new funding in the past year:

NY State Department of Health (NYSDOH) Grant (Beltran/Rickman)

Novel Clinically-Relevant Prostate Cancer Models for Co-Clinical Trials

0.216 calendar

New York State Department of Health

Grants Officer: Amy M. Yost, Fiscal and Administrative Coordinator, Bureau of Chronic Disease Control, New York State Department of Health, Riverview Center, 150 Broadway, Suite 350, Menands, NY 12204, Phone: 518-474-1222, Email: canserv@health.ny.gov

11/1/2015-1/31/2017

\$32,608 total DC

Project Goals/Aims: Aim 1. Characterize the interaction between the epigenome and N-Myc signaling in driving NEPC. Aim 2. Develop novel therapeutic approaches to targeting the epigenome and N-Myc in CRPC and NEPC. Aim 3. Determine the clinical relevance of N-Myc, EZH2, and DNA methylation and response to targeted therapy a prospective clinical cohorts.

Role: Pilot Project Principal Investigator

Overlap: None

PCF Challenge Award (Attard/Beltran)

Development and qualification of the PCF SELECT (Specific Evaluation in Liquid biopsies of Established prostate Cancer Targets) plasma DNA assay

0.6 calendar

Prostate Cancer Foundation

Grants Officer: Howard Soule; tel: 310.570.4596

08/22/2016 – 08/22/2018

\$177,000

Project Goals/Aims: 1: To design a targeted NGS panel for evaluation of prostate-cancer specific and clinically-applicable genomic lesions in plasma from men with metastatic prostate cancer. 2: To develop and optimize the ctDNA PCF SELECT assay in a central CLIA/CLEP approved molecular genomics laboratory based on the consortium specifications. 3: To implement the ctDNA PCF SELECT assay at consortium sites to obtain stage 1 qualification in a range of clinical scenarios and interrogate biological and biomarker questions.

Role: Co-Principal Investigator

Overlap: None

U54 CA210184 (PI: Fischbach/Cantley)

Center on the Physics of Cancer Metabolism

0.12 calendar

National Cancer Institute

Grants Officer: Jennifer Meininger email: meiningerjs@mail.nih.gov; Phone: (240) 276-6302

08/29/2016 – 7/31/2021

\$79,746

Project Goals/Aims: The goal of this project is to integrate physical sciences and cancer research perspectives and approaches to address complex and challenging questions in cancer research.

Role: Co-Investigator

Overlap: None

U10CA180821 (Bertagnolli)

Molecular Mechanics of Response to Combination Therapy in Early Lethal Prostate Cancer

0.60 calendar

National Cancer Institute

Grants Officer: N/A

03/1/2016 – 02/28/2017

\$175,688

Project Goals/Aims: 1: To dissect the effect of therapy on the clonal landscape of early lethal PCA using deep DNA sequencing. 2: To assess AR-driven and non-AR driven pathways underlying treatment resistance through transcriptome analysis.

Overlap: None

Dr. Beltran had the following projects end in the past year:

Prostate Cancer Dream Team Translational Cancer Research Grant (Co-Dream Team Leaders C Sawyers and A Chinnaiyan)

Precision Therapy of Advanced Prostate Cancer

Stand Up to Cancer – Prostate Cancer Foundation

Grants Officer: Howard Soule; tel: 310.570.4596

08/01/2012-07/31/2016

\$125,833

Project Goals/Aims: The major goals of this study were to establish a multi-institutional infrastructure incorporating 5 leading prostate cancer clinical sites, 2 sequencing and computational analysis sites, linked with appropriate sample and data coordination; to establish a prospective cohort of 500 patients (the “CRPC 500”) utilizing the multi-institutional infrastructure to support the clinical use of integrative prostate cancer sequencing, analysis, and clinical trial decision making; to conduct parallel, preclinical *in vivo* functional studies of resistance biomarkers and of SU2C- PCF sponsored combination therapies; to identify molecular determinants of abiraterone sensitivity and acquired resistance in patients; to conduct clinical trials of novel combinations targeting AR and/or the PTEN pathway, based on existing preclinical data and an understanding of resistance mechanisms; and to identify molecular determinants of sensitivity and acquired resistance to PARP inhibitors in patients.

Role: Co-Investigator

Starr Cancer Consortium I7-A771 (CoPIs: Solit/Berger/Darnell/Rubin/Beltran)

Genome Sequencing of Outlier Responders to Systemic Cancer Therapies

Starr Cancer Consortium

Grants Officer: Sylvie Le Blancq, leblancs@mskcc.org, 212-639-8489

01/01/2014-12/31/2015

\$165,000

Project Goals/Aims: To identify mechanisms of outlier response to Systemic Cancer Therapies.

The primary goal of this effort was to ensure that the development of agents with profound, life alternating activity in only a minority of patients were not prematurely halted but rather redirected to the subset of patients most likely to benefit.

Starr Cancer Consortium I7-A722 (CoPIs: Chen/Carver/Rubin/Beltran)

Co-clinical trials using organoids for patients with advanced prostate cancer

Starr Cancer Consortium

Grants Officer: Sylvie Le Blancq, leblancs@mskcc.org, 212-639-8489

01/01/2014-12/31/2015

\$350,000

Project Goals/Aims: To establish patient derived organoids for co-clinical trials

PCF Challenge Award (Co-PI Rickman, Rubin, Beltran)

Targeting and mechanistic insights underlying N-Myc driven Neuroendocrine Prostate Cancer

Prostate Cancer Foundation

Grants Officer: Howard R. Soule; tel: 310.570.4596;

1250 Fourth Street, Santa Monica, CA 90401

04/04/2014-04/04/2016

\$250,000

Project Goals/Aims: This grant aimed to elucidate mechanisms by which N-Myc cooperates with Aurora-A to induce a neuroendocrine phenotype and to identify critical downstream targets of the N-Myc/Aurora-A complex.

What other organizations were involved as partners?

This grant is for the PCCTC consortium, which is a collaboration between all consortium sites.

8. SPECIAL REPORTING REQUIREMENTS:

None

9. APPENDICES:

Copies of abstracts (see Major Task 8; subtask 3).

Appendix A: “Baseline analysis of circulating tumor cell (CTC) enumeration and androgen receptor (AR) localization in men with metastatic castration-resistant prostate cancer (mCRPC) in TAXYNERGY.” Journal of Clinical Oncology 2015

Appendix B: “Screening and baseline analysis of circulating tumor cell (CTC) counts and androgen receptor (AR) localization with clinical characteristics of men with metastatic



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Baseline analysis of circulating tumor cell (CTC) enumeration and androgen receptor (AR) localization in men with metastatic castration-resistant prostate cancer (mCRPC) in TAXYNERGY.

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Background: Microtubule-targeted therapy with taxanes is the only chemo with survival benefit in advanced PC. Emerging molecular evidence suggests sensitivity/resistance to taxanes may relate to the ability of microtubules to inhibit AR

nuclear trafficking. CTCs represent a real-time biomarker for molecular testing including taxane-induced microtubule stabilization and AR nuclear localization.

Methods: TAXYENERGY is an international, multicenter phase 2 trial in progressive, chemo-naïve mCRPC men randomized (2:1) to docetaxel or cabazitaxel. Pre-treatment CTCs were enriched from 1 ml blood via a prostate-specific microfluidic device, enumerated, and analyzed by multiplex confocal microscopy for AR cellular localization. Nuclear AR % was calculated by integrating fluorescence intensity in the total cell and nuclear area. Bivariate correlations and multiple regressions examined associations between baseline characteristics and % nuclear AR or CTC count.

Results: 63 men were randomized (median age 70 [range 53–84], median PSA 89 [2.4–1558], 24 [38%] previously received a CYP17 inhibitor and/or enzalutamide, 17 [27%] had visceral metastases). Of 59 with evaluable samples, CTCs were detected in 52 (88%), median 10 CTCs/mL of blood [0–542]. 638 CTCs were analyzed for AR localization with a mean 61.2% [30–85] nuclear AR per subject. Higher baseline LDH, pain assessments, and ECOG performance status were associated with higher CTC counts; LDH ($p = 0.013$) and analgesic scores ($p = 0.036$) remained significant on multivariate analysis. Visceral metastases were associated with a lower fraction of nuclear AR, remaining significant on multivariate analysis ($p = 0.045$). **Conclusions:** Nearly 90% of men with progressive chemo-naïve mCRPC have detectable CTCs available for molecular analysis using this platform, with higher CTC counts associated with adverse prognostic variables. Lower percent of nuclear AR was associated with visceral metastases, suggesting progressive visceral CRPC may be less AR-driven. The predictive value of these biomarkers for taxane response is being evaluated. Clinical trial information: [NCT01718353](https://clinicaltrials.gov/ct2/show/study/NCT01718353)

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Conclusions: In this EAP, pts receiving Abi/Enza with Ra-223 had a longer OS compared with Ra-223 alone, suggesting that this combination may be more effective than Ra-223 alone. The safety profile was comparable between pts with or without concomitant Abi/Enza with no new toxicities reported. These findings require further confirmation and are currently being assessed in a randomized, phase III clinical trial.

Conflict of interest: Advisory Board: Joe O'Sullivan holds consulting/advisory roles with Bayer Janssen, and Astellas. Silke Gillessen holds consulting/advisory roles with Dendreon, Sanofi, Pfizer, Millenium, Amgen, Bayer, Janssen, Astellas, Orion, and Curevac. Axel Heidenreich holds consulting/advisory roles with Astellas, Bayer, Sanofi and Dendreon. Daniel Heinrich holds consulting/advisory roles with Astellas, Bayer and Amgen. Jeremy Gratt holds consulting/advisory roles with Bayer. Kurt Miller holds consulting/advisory roles with Bayer, BMS, Dendreon, Ferring, Janssen, Merck, Pfizer and Roche. Sten Nilsson holds consulting/advisory roles with Bayer. Fred Saad holds consulting/advisory roles with Bayer, Janssen, Astellas and Amgen. Tucci Marcello holds consulting/advisory roles with Atellas and Bayer. Manfred Wirth holds consulting/advisory roles with Janssen, Takeda, Merck, Bayer, Dendreon and Ferring. Joan Carles holds consulting/advisory roles with Bayer, Astellas, Janssen, Pfizer and Sanofi. Corporate-sponsored Research: Joe O'Sullivan has received funding for research from Bayer. Silke Gillessen has received funding for research from Millenium. Axel Heidenreich has received funding for research from Atellas and Sanofi. Kurt Miller has received funding for research from Novartis. Fred Saad has received funding for research (paid to his institute) from Bayer. Manfred Wirth has received funding for research (paid to his institute) from Apogepha, Sanofi-Aventis, Ferring and Takeda. Other Substantive Relationships: Joe O'Sullivan has received honoraria from Bayer, Astellas and Janssen, and speaker's bureau fees from Bayer, and Janssen. Silke Gillessen has received patents and royalties from Proteomedix. Axel Heidenreich has received honoraria and speaker's bureau fees from Astellas, Bayer Dendreon, Janssen, Ipsen, Sanofi and Pfizer. Daniel Heinrich has received honoraria from Janssen-Cilag, Astellas and Bayer, and has had travel, accommodation and/or other expenses paid for by Bayer. Jérémy Lévy is an employee of BIOP and provided statistical support funded by Bayer. Kurt Miller has received speaker's bureau fees from Janssen and Novartis, and has had travel, accommodation and/or other expenses paid for by Janssen and Roche. Sten Nilsson has received honoraria, speaker's bureau fees, and has had travel, accommodation and/or other expenses paid for by Bayer. Fred Saad has received honoraria from Bayer, Janssen, Astellas and Amgen. Manfred Wirth has received honoraria from Apogepha, Astellas, Orion, and Sanofi-Aventis. Joan Carles has received speaker's bureau fees from Janssen and Astellas.

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POSTER

Chromogranin A and Enolase levels in serum as prognostic factors in castration prostate cancer resistant

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Background: The natural evolution of prostate cancer is to a situation of hormone resistance. One possible hypothesis is presence of neuroendocrine differentiation of prostate cancer. Chromogranin A (CGA) and Enolase are serum markers associated with neuroendocrine tumors.

Purpose: Analyze neuroendocrine markers, CGA and enolase as prognostic factors in patients with prostate cancer resistant to castration (CPRC)

Material and Methods: We analyzed prospectively the CGA and enolase in serum of 75 patients with CPRC. We set a high value of serum CGA if it was >100 ug/L and enolase >16 ug/L. CGA-E was defined as having both, only one or none of two biomarkers altered. Survival was defined as time between castration resistant diagnosis and date of death or last control. Survival analysis was performed using Kaplan-Meier method and differences between survival curves were analyzed using log-rank test. Relation between categorical variables was evaluated by chi-square test. A P-value less than 0.05 was considered statistically significant.

Results: Mean age was 68.5 years (42-88). Median follow-up of was 16 months. 41 patients had bone metastasis, 23 patients had lymph node and 11 had visceral metastatic disease. At baseline, 17 patients were enolase-negative (23%), and 57 (76%) were enolase-positive. 39 patients were CGA-negative (52%), and 36 (48%) were CGA-positive. Univariate analysis revealed that both markers (CGA, enolase and CGA-E) were significantly associated to poor prognosis. Patients with higher levels of

CGA or enolase (median, CGA: 27 months; enolase: 9 months) had lower survival than those with normal values (median, CGA: 35 months; enolase: 35 months; p < 0.001 and p = 0.02, respectively). Also, patients with higher values in both markers had worse prognosis than patients with one or neither (median: 7 months; 30 months and NR, respectively; p < 0.001).

There was a significant relationship between CGA-E and response to treatment (p = 0.007), showing a moderate association (Cramer's V = 0.414). Patients with one of two markers altered show lower response rate (8.3%) than those with none markers altered (48.1%) or both markers altered (42.9%).

We did not find relation between hormone-sensitive time and chromogranin and/or enolase elevated.

Conclusion: The prospective analysis conducted suggests that alterations in serum Chromogranin and Enolase could be prognostic and predictive factor in patients with prostate cancer resistant to castration

No conflict of interest.

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POSTER

Screening and baseline analysis of circulating tumor cell (CTC) counts and androgen receptor (AR) localization with clinical characteristics of men with metastatic castration-resistant prostate cancer (mCRPC) in TAXYNERGY

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Background: Taxanes are the only class of chemo with a survival benefit in prostate cancer. Emerging molecular evidence suggests sensitivity/resistance to taxanes may relate to the ability of microtubules to inhibit AR nuclear trafficking. Analysis of CTCs represent a real-time biomarker of taxane drug-target engagement to examine microtubule stabilization and AR nuclear localization.

Methods: TAXYNERGY is an international, multicenter phase 2 trial in progressive, chemo-naïve mCRPC men randomized (2:1) to docetaxel or cabazitaxel with a potential switch to the alternative taxane after 4 cycles if PSA did not decline by at least 30%. Two sets of CTCs were collected (screening and baseline) with no intervening treatment to prospectively assess precision of the primary biomarkers. CTCs were enriched from 1 mL blood via a prostate-specific microfluidic device, enumerated, and analyzed by multiplex confocal microscopy for AR cellular localization. Nuclear AR % was calculated by integrating fluorescence intensity in the total cell and nuclear area. Bivariate correlations and multiple regressions examined associations between baseline characteristics and CTC count.

Results: 63 men were randomized (median age 70, median PSA 89 [range 2.4-1558], 38% previously received a CYP17 inhibitor and/or enzalutamide, 27% with visceral metastases). Analysis of 39 paired pre-treatment samples obtained a median of 6 days (1-20) apart revealed good concordance with a difference of only 0.27% in median percent nuclear AR localization at screening vs baseline. Because of good concordance, screening data was substituted for the 9 patients with unevaluable CTCs at baseline. Of 63 with available baseline or screening samples, CTCs were evaluable in 62 (98.4%). Higher CTC counts were associated with higher baseline LDH and pain assessments; analgesic score (p = 0.0364) and present pain intensity score (p = 0.0031) remained significant on multivariate analysis. As expected in men with progressive CRPC, the majority of the 738 CTCs had nuclear AR localization (mean 62.9%) with observed CTC heterogeneity within patients (range 31-91% within individual subjects).

Conclusions: Using this platform, greater than 98% of men with progressive chemo-naïve mCRPC have detectable CTCs available for molecular analysis, with higher CTC counts associated with adverse prognostic variables. The majority of men at progression from prior AR-directed therapy had nuclear AR localization, though intra-subject CTCs demonstrated heterogeneity. The predictive value of these biomarkers for taxane response is of potential value and is being evaluated as the co-primary endpoint of the study. TAXYNERGY (NCT01718353) is a Sanofi-sponsored study.

Conflict of interest: Ownership: John Stewart owns Sanofi stock. Advisory Board: Fred Saad has had membership on an advisory board for Sanofi.

Scott North has received honoraria from Sanofi for an advisory board meeting. Corporate-sponsored Research: Scott Tagawa has received research funding from Sanofi, Astellas/Medivation, Janssen, Dendreon, Amgen, Lilly, Progenics, Newlink and BMS. Emmanuel S. Antonarakis has received research funding from Janssen, Johnson & Johnson, Sanofi, Dendreon, Exelixis, Genentech, Novartis and Tokai. Fred Saad, Conor Gruber and Mario Eisenberger have received research funding from Sanofi. Timothy Lannin's research laboratory has received funding from Sanofi. Scott North and John Stewart have been involved in corporate-sponsored research. Other Substantive Relationships: Scott Tagawa has acted in a consultancy/advisory role for Sanofi, Astellas/Medivation, Janssen and Bayer. Emmanuel S. Antonarakis has acted in a consultancy/advisory role for Janssen, Astellas, Sanofi, Dendreon, Essa and Medivation, and is also a co-inventor of a technology that has been licensed to Tokai. John Stewart is an employee of Sanofi. Atef Zaher is a contracted employee of Sanofi. Fred Saad has received honoraria from Sanofi, and has acted in a consultancy/advisory role for Sanofi. Mario Eisenberger has acted in a consultancy/advisory role for Sanofi. The following authors have no conflicts of interest to disclose: G. Galletti, S. Tasaki, A. Gjyzezi, D. Worroll, L. Portella, B.J. Kirby, M. Vanhuysse, S. Suri, E. Pratt, D.M. Nanus, P. Giannakakou.

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POSTER

The influence of prior novel androgen receptor targeted therapy on the efficacy of cabazitaxel in men with metastatic castration-resistant prostate cancer

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Background: The treatment armamentarium for metastatic castration-resistant prostate cancer (mCRPC) has expanded with the introduction of several new therapies. In this treatment continuum, it is unclear whether the efficacy of cabazitaxel is affected by prior novel androgen receptor targeted therapies (ART) such as abiraterone acetate and enzalutamide. In this study, we aimed to investigate the influence of prior ART on the efficacy of cabazitaxel in men with mCRPC.

Materials and Methods: Data from an ongoing prospective, multicenter, randomized phase II trial (CABARESC) were used comprising 114 men with mCRPC treated with cabazitaxel (25 mg/m² every 3-weeks) plus prednisone in the post-docetaxel setting. The primary endpoints of the current analysis were PSA response ($\geq 50\%$), and overall survival (OS). Univariate and multivariable analyses were conducted to investigate the influence of prior ART on the efficacy of cabazitaxel as defined by OS and PSA response rates.

Results: From the 114 patients included in this analysis, 44 men received prior ART and 70 men did not receive prior ART before treatment with cabazitaxel. PSA response rates ($\geq 50\%$) while on cabazitaxel treatment were similar in patients with and without prior ART (34% versus 40%, respectively, $P = 0.53$). Likewise, median OS was not significantly different between men with and without prior ART (9.8 months versus 10.6 months, respectively, logrank $P = 0.65$). In multivariable analysis, the only variables significantly associated with OS were performance score, alkaline phosphatase and albumin at baseline.

Conclusion: Our study showed that prior treatment with ART may not influence the efficacy of cabazitaxel in men with mCRPC. With emerging evidence of cross-resistance between the currently available therapies in mCRPC, cabazitaxel provides a good treatment option irrespective of prior treatment.

Conflict of interest: Advisory Board: Andries Bergman and Ronald de Wit have served on the advisory board of Sanofi. Corporate-sponsored Research: Ronald de Wit and Robert van Soest have received research funding from Sanofi. Other Substantive Relationships: Ronald de Wit has received consultancy and speaker honoraria from Sanofi, Janssen, and Millenium. Robert van Soest has received honoraria from Sanofi.

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POSTER

QoLiTime: Quality-of-Life (QoL) analysis of patients with metastatic castration resistant prostate cancer (mCRPC) treated with cabazitaxel in daily clinical practice

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Background: Cabazitaxel (Caba) in combination with Prednis(ol)one is approved for 2nd-line treatment of mCRPC for Docetaxel pre-treated patients. Chemotherapy may have a negative impact on patient's QoL in spite of treatment benefits. Thus, QoL data are important from both physicians' and patients' perspective.

Methods: Patients with mCRPC receiving Caba were included in the non-interventional study QoLiTime. The cancer specific questionnaire EORTC QLQ C30 was handed out to patients at baseline and each cycle. The primary endpoint was the correlation of QoL with biochemical response (PSA decrease $>50\%$) after 4 cycles (C4) of Caba. Secondary endpoints included further QoL analyses as well as TTP, OS and safety of Caba under daily practice conditions.

Results: The total population consists of 527 patients, 406 received 4 cycles of Caba, 266 of those had PSA measurements at BL and C4 and 238 completed the EORTC QLQ 30 at BL and C4. Median age was 72 years with good performance status (ECOG 0:36%; ECOG 1:54%). No significant change in QoL was observed between BL and C4, independent of PSA response. Significant and clinically relevant changes for QLQ scales between BL and C4 were seen in the total population for physical and role functioning (-5.21 , $p < 0.0001$, and -8.79 , $p < 0.0001$), fatigue (6.49, $p = 0.0003$), dyspnoea (6.36, $p = 0.004$) and diarrhoea (9.16, $p < 0.0001$). Other scales did not vary significantly from BL to C4. Changes for physical functioning and pain corresponded with PSA response, with a pain decrease (-7.61) for patients with a PSA decrease $>50\%$ and a pain increase (3.44) for patients with a PSA decrease $<50\%$. The TTP in this setting was 8.3 months, OS was 16.8 months. No new safety signals were seen.

Conclusions: This study is the largest prospective analysis of QoL to date in patients receiving Cabazitaxel for mCRPC. Symptom increases were seen in typical areas of chemo toxicity such as fatigue and diarrhoea, but QoL was maintained during the 12-week observation period. Change of pain from BL to C4 differs significantly between patients with a PSA response $>50\%$ and a PSA response $<50\%$. Caba was safe and effective in this clinical practice setting.

This study is funded by Sanofi.

No conflict of interest.

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POSTER

Cabazitaxel for metastatic castration-resistant prostate cancer (mCRPC) real data in real life

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Background: Cabazitaxel, a novel taxane developed to overcome Docetaxel resistance showed an overall survival improvement after Docetaxel in mCRPC (Tropic Study). The overall survival in mCRPC patients is clearly increasing in the last five years due to new treatments approved. We perform a retrospective analysis of the clinical outcome with Cabazitaxel in the community setting in two major hospitals in Madrid.

Material and Methods: Patients (Pts) with mCRPC after Docetaxel failure (follow-up >6 months) were included. Pts received Cabazitaxel 25mg/m² every 3 weeks + prophylactic GSCF until progressive disease or unacceptable toxicity. Radiological assessment were defined according PCWG2 criteria and RECIST 1.1.

Results: 64 pts were identified, 47 met all criteria. Median age was 69 yo (47–83), ECOG 0–1: 70%. Bone metastases: 85% (80% with >10 bone metastases), visceral disease: 20% and lymph node metastases: 34%. Gleason score ≥ 8 : 61%. 98% pts received Docetaxel as first line treatment with a median of 8 cycles (4–12). 57% of pts received Cabazitaxel as 2nd line treatment with a median of 8 cycles (3–19), 70% showed $>50\%$ decrease in PSA, 22% had partial response, 7% progressive disease and 70% obtained stable disease. Most frequent Grade >3 adverse events were: G3–4 neutropenia: 14%, febrile neutropenia 15%, asthenia 44%, anaemia 8%, diarrhoea 4%, the median PFS was 7 months 95% CI (4.2–