# TABLE OF CONTENTS

Welcome to NACP ................................................................. 2-3
NACP Logo Interpretation ..................................................... 4
NACP Cores ........................................................................ 5-12
  Administration Core ......................................................... 5
  Evaluation Core ................................................................ 6
  A Diagnostic Evaluation Model for Complex Research Partnerships with Community Engagement: the NACP model. .... 7
  Training Core .................................................................. 8
  Training Activities ............................................................ 9
  Outreach Core .................................................................. 10
  Outreach Activities ............................................................ 11
  Developmental Core ......................................................... 12
NACP Research Project Abstracts .......................................... 13-17
Previously Funded Project ....................................................
  Environmental Health Studies on the Navajo Reservation .... 13
Currently Funded Projects .....................................................
  Microbes, Bile Acids and Colorectal Cancer ...................... 14
  Functional Genetic Variants as Modifiers of Prostate Cancer Progression in Native Americans ....................... 15
  Physical Activity and Cancer among Native American Cancer Survivors: A Pilot Study ............................... 16
  Disruption of Endocrine Pathways by Environmental Arsenic and Development of Estrogen Receptor-Negative Breast Cancer .................. 17
NACP Faculty and Staff ....................................................... 18-21
Internal Advisory Committee ............................................... 22
Program Steering Committee .............................................. 23
Outreach Community Action Committee ............................. 24
Ya’at’eeh, Loloma, Skugtash, and Good Day from faculty, staff, and students of The Partnership for Native American Cancer Prevention program (NACP)!

Our partnership is a collaboration between Northern Arizona University (NAU) and the University of Arizona Cancer Center (UACC). We are funded under parallel grants from the National Institute of Health (NIH) and The National Cancer Institute (NCI). We are dependent on collaboration, communication, and meeting the expectations of our Internal Advisory Committee (IAC), the Program Steering Committee (PSC), the National Cancer Institute, and Native American communities in the Southwest.
NACP began in 2002. For over a decade we have built research capacity at NAU and UACC. We are working towards eliminating cancer disparities in Native Americans of the Southwest through recruiting and supporting Native Americans as well as other researchers. In doing so, we have created a strong pipeline for Native American students in research-related fields. The overall objective of NACP is to alleviate the unequal burden of cancer among Native Americans of the Southwest through our research, training, outreach programs.

The goal of the Developmental Core is to jointly develop research projects with the Native Americans of the Southwest. All programs and research projects originate in the community in partnership with our students, staff, and faculty. Our programs are designed to facilitate the entry of Native Americans in the research and training relevant to the community needs.

The goal of the Training Core is to increase the number of Native American students entering careers in cancer research and healthcare. Programs are implemented to increase the numbers of entering freshmen as well as transfer students from tribal and community colleges to our institutions. This undergraduate training program helps to prepare students to enter graduate research and professional programs.

The goal of the Outreach Core is to strengthen collaboration between NAU and UACC with the Native Americans of the Southwest to increase community cancer prevention activities and cancer control training for health professionals. In turn we hope that this will result in increase in the number of Native Americans who receive cancer screening.

Going forward, we aim to sustain and improve our programs. We have a strong and promising faculty development programs for cancer researchers to improve the competitive stance of cancer research and training. Subsequently, students will benefit from their mentorship in our program and it will boost their retention and graduation rates in biomedical sciences and healthcare professions. We also aim to sustain the development of community education program and research for cancer prevention while continuing to meet the unique needs of the Native Americans of the Southwest.

Thank you for your interest in the Partnership for Native American Cancer Prevention. Please feel free to contact us with any additional questions or concerns. We welcome new partnerships and new research project ideas.

Sincerely,

The faculty, staff, and students of NACP
The Partnership for Native American Cancer Prevention
Northern Arizona University
University of Arizona Cancer Center

Logo Interpretation

Community
A child and adult

The University of Arizona
The Saguaro, native to Tucson and Sonora Desert

National Cancer Institute
Prayer Feathers, symbols of blessing and curing

Two sets of handprints, a symbol of the ancient handprints upon the earth and the continue legacy of people

Northern Arizona University symbols of mountains and clouds

Four spiral representing the journeys and pursuits of all people in the four directions. The spiral begins with the community

Mountains

Sky and Clouds

Pottery inspired symbols representing the elements of the earth and our connection to it

Canyons and Rivers

Water
The Partnership for Native American Cancer Prevention
Northern Arizona University
University of Arizona Cancer Center

Administration Core

The Administration Core provides oversight of the administrative, management, and financial operations of NACP.

ADMINISTRATIVE SERVICES AND SUPPORT

**Daily Functions:** Under the direction of the Program Manager and Research Administrator, the NACP program offices execute the administrative functions of NACP on each of the campuses and in interactions between campuses and between NACP members and communities. Major functions include:

- Planning and scheduling NACP meetings, conferences, and workshops
- Assembling NACP progress reports, including progress reports for internal and external evaluation (IAC and PSC), renewals and summaries for the National Cancer Institute
- Providing administrative assistance for presentations, manuscript preparation, and submission
- Assisting investigators with preparation of applications for university, tribal and council IRB approvals
- Tracking student progression into graduate programs and careers
- Maintaining a record of NACP meetings in communities
- Publishing brochures and fliers while coordinating public relations efforts such as the NACP website
- Arranging travel and travel reimbursements for NACP members and visitors (including PSC members, community advisory network members, seminar speakers, etc.)
- Scheduling and coordination NACP of seminars
- Coordination of NACP-related courses and preparation of associated classroom materials
- Assisting students with enrollment in NACP courses, applications for scholarships and fellowships and obtaining letters of recommendation
Evaluation Core

NACP has developed and refined effective approaches to planning and evaluation. These approaches include: a collaborative multiple PI executive committee structure; a strong and active Internal Advisory Committee (IAC); a systematic approach to meetings and interactions for collaborators and for NACP as a whole; a comprehensive, focused outcome oriented evaluation system and the use of evaluation data in continuous improvement of NACP’s activities; an efficient and productive structure for soliciting new research projects and potential research participants; and a talented, engaged Program Steering Committee (PSC) whose advice is acted upon and incorporated in Partnership plans.

Evaluation Data Collection & Reporting Process. Monthly, quarterly, and annual evaluation requests are sent to participants based on a combination of logic model metrics, benchmarks, milestones, and programmatic queries. After a 6 month pilot we moved to an online open-source data collection system, Lime Survey, for a majority of the data collection (http://www.limesurvey.org) that produced instrument oriented data bases. As a further evolution of the system, we are in the process of developing robust relational databases for the program that will simplify queries and metric evaluation across the cores, as well as within cores. The current data bases include student tracking data base; outreach activity and impact data base; training data base (including mentor/mentee data bases), and a research/science data base, plus an administrative core (planning and evaluation) data base.

Student Tracking. Currently, student tracking data is collected each semester (fall, spring, and summer) from NACP mentors/key staff, and administrative files, including students working on research projects and those involved in NACP training programs (especially summer programs). The student evaluation data also includes mentor and mentee evaluation and skill assessments three times a year.
A diagnostic evaluation model for complex research partnerships with community engagement: The Partnership for Native American Cancer Prevention (NACP) model

Authors: Robert T. Trotter II, PhD, Kelly Laurila, MA, Dave Alberts, MD, Laura F. Huenneke PhD

PMID:25265164 [PubMed - indexed for MEDLINE]
PMCID:PMC4293028 [Available on 2016-02-01]

The Partnership for Native American Cancer Prevention (NACP) is a partnership between Northern Arizona University and the University of Arizona Cancer Center. Partnerships have high failure rates; research indicates that 60-80% of voluntary partnerships fail for a variety of reasons. Cross-organizational programs like NACP often run into silo issues and the problems due to significantly different organizational cultures including different goals, objectives, rewards, and assumptions. We have paired a classic evaluation model (tracking program processes, outcomes & impacts) which allow us to evaluate progress towards program goals and objectives with advances in community engaged model derived from industry–university partnership models. This coupled approach allows the evaluation team to provide “near real time” feedback to the program to identify issues and offer possible solutions.

Understanding how the NACP partnership works is critical to NACP’s long-term success. To better understand and evaluate the NACP partnership we developed a program specific questionnaire provides additional evaluation data that allows us to understand how the partnership structure changes through time and identify areas for improvement. The partnership questionnaire asks questions about joint work (collaborations), communication, cooperation, conflict, and trust. These can be analyzed, which allows for better feedback regarding key players in the partnership, identifies places where there may be fragmentation occurring and provides understanding of the critical roles that key players have in developing and maintaining a strong partnership.

Providing rapid feedback to the program is an important element of the evaluation process. The evaluation team provides quarterly reports to the program in addition to meeting regularly with NACP staff and attending NACP meetings and events. Evaluation reporting highlight progress towards the NACP’s Training, Research and Outreach components goals and objectives showing change through time, as well as areas that are exceling and areas for improvement.

Evaluation data has also been utilized to better understand the strategies for successful navigation of research training opportunities of Native American students to meeting career goals. Increased graduation rates of students participating in training programs (63 percent of Native American students who participate in NACP received bachelor’s degrees compared to the national average of 38 percent). Our findings include: (1) a web of support and multiple opportunities ensures higher success for Native American undergraduates than a traditional pipeline approach to training; (2) multiple entry points into research training opportunities helps address the unique needs of Native-American students; (3) engaged mentoring and chances for students to learn about careers or graduate programs are critical for the success of Native American students.
The Partnership for Native American Cancer Prevention
Northern Arizona University
University of Arizona Cancer Center

Training Core

Native Americans are the most underrepresented racial/ethnic group among physicians and scientists. According to the CDC, the number one cause of death among Native Americans is cancer. This is in contrast to the majority population for which heart disease is the number one killer. With the large number of tribes in Arizona, the state’s universities are ideally positioned to train a greater number of Native Americans for biomedical careers. It is anticipated that this can be an effective approach to addressing cancer health disparities in Native American communities.

The NACP Training Core provides Native American students with mentoring and research experiences of importance to their own communities to help them achieve their training goals for a career in the health sciences. Activities in which NACP trainees engage include:

- Summer programs to transition from high school or community college to the university
- Mentored projects with investigators conducting cancer-related research
- Summer internships at other institutions
- Development of an individualized career plan
- Attendance at national meetings focused on health research in Native American communities
- Mentoring sessions with Native American researchers as role models
- A graduate programs primer that provides guidance on applying for post-baccalaureate degree programs.

Evaluation data shows that the NACP Training Core is making an impact. Between 2009 and 2014, the 6-year baccalaureate graduation rate for Native American students in the US was 38%. In contrast, the NACP Native American students had a substantially higher graduation rate of 68%. NACP began another 5-year project period in September, 2014. The Training Core looks forward to continually increasing the number of Native Americans in biomedical careers, so as to reduce the burden of cancer in their communities. The overall goal of the proposed NACP Training Core is to provide Native American students with mentoring and research experience to help them achieve their individualized career development plans in cancer-related research.

Specific Aims
1. Mentor Native American students to succeed in their undergraduate studies and expose them to hands-on research and Native American role models.
2. Provide activities to successfully transition Native American undergraduate students into advanced degree programs which will train them to address cancer health disparities in their communities.
3. Mentor NACP junior faculty and provide cultural competency training in partnership with the Outreach Core for all NACP faculty and staff.
NACP Training Core Activities

RESEARCH
- NAU-Intro to research- This program aims to support four Native American first and second year college students or first year tribal/community college students with an introduction to the field of cancer-related research with the goal to transition them into a higher level of research.
- NAU-Research- This program aims to support four students to improve their preparation and training for biomedical and behavioral sciences at the PhD level. This includes continuation of research and exposure to cancer related careers.
- UA-UBRP- This program allows for UA students to work with NACP investigators and other UA faculty to conduct a research project for 10 weeks. Students also participate in introductory research seminars and other workshops to enhance their research experience. Each year we aim to support six students.
- Graduate Summer Transitional Enrichment Program (G-STEP)- A summer research program at UA to assist Native American Students with additional experiences to help ensure their transition to advanced degrees and research programs. Each year we propose to support four students.

EXPOSURE TO CANCER CAREERS
- UA Intro to Oncology Careers for NA- Students are able to enroll in a one-unit course during the fall semester that is led by faculty or graduate students already conducting research relevant to Native Americans or Native American students working in cancer-related areas.
- Native American Scientist Role Models- To provide Native American cancer research exposure to students within NACP through scientific seminars at UA and NAU. This program also offers the opportunity for students to attend and present at other National research related conferences.
- Graduate Primer Premier Program (GPP) - A mini conference at the UA to provide students in NACP about UA graduate programs in biomedical and cancer research. This includes faculty and UA staff presenting on a variety of topics from admissions to financial aid as well as students touring laboratories and other related facilities, held in conjunction with the Undergraduate Biology Research Program poster session in January.

PROFESSIONAL DEVELOPMENT
- Individual Professional Development (IDP) plans created with each student to help in the transition from undergraduate to graduate and professional programs.
- Mentor NACP junior faculty and provide cultural competency training in partnership with the Outreach Core for all NACP faculty and staff.
Outreach Core

The overall goal of the NACP Outreach is to build on the achievements of our current program to influence policy and systems that include community-led research/intervention projects, utilizing Community Based Participatory Research and the Community Readiness Model to implement cancer prevention control, and develop culturally competency for Health care providers.

Background: Despite underreporting, epidemiologic data support that American Indians (AI) in the Southwest have higher rates than the non-Hispanic white (NHW) population for several cancer types, including liver, stomach, gallbladder and kidney. AI in the Southwest are more likely to be diagnosed with late stage cancers than NHW, especially the “screenable” cancers of cervix, colorectal and breast. Survival is lower in AI than NHW as a result.

Methods: The NACP Outreach Core aims to:
1. Collaborate with Tribal/Community Partners to assess their current level of readiness to implement cancer program activities (from lower impact awareness and education to higher impact clinical practice and policy change), track progression, and provide feedback.
2. Develop, implement and evaluate a toolkit and training program that can be delivered through multiple modalities to provide AI cultural competency specific to cancer for healthcare providers and researchers.
3. Five community projects will be developed by and for Southwest AI communities that will support increased use of primary and secondary cancer prevention strategies.

Results: During the 2009-2013 project period, we implemented activities to educate AI communities to take action to prevent and control cancer in collaboration with the Hopi Tribe, Navajo Nation/Flagstaff community, and the Tohono O’odham Nation. This collaboration provided 369 documented activities reaching almost 62,000 people. We collaborate with our training and research cores through trainings and conferences to disseminate research findings to the community and build relationships for the development of tribally-directed research projects.

Conclusion: We will use a Community Based Participatory Research (CBPR) approach and utilize the Community Readiness Model (CRM) that provides each participating community with documented progress in capacity development to implement cancer prevention and control (CPC) programs. We will provide resources and technical assistance to our AI partners to implement community-led CPC projects through a small grants initiative to further develop the infrastructure at the community level.
NACP Outreach Core Activities

The NACP Outreach Core has been working to build relationships with AI communities in Arizona to address cancer care disparities since 2002. During the 2009-2013 project period, we partnered with to implement activities to educate AI communities to take action to prevent and control cancer. In collaboration with our Tribal partners, we provided 369 documented activities, reaching almost 62,000 people. While we collaborate with our Training and Research Cores to disseminate research findings to the community and build relationships that facilitate tribally-directed research projects, our program is not itself a research program. During the next 5 – year project period (2014 – 2019), we will engage our Arizona Native communities in the following projects:

COMMUNITY READINESS ASSESSMENT
We will utilize the Community Readiness Model (CRM) to determine each participating tribe/community partners’ level of readiness to implement cancer prevention and control (CPC) programs. We will also aid in the development of a strategical plan and provide assistance for future cancer research and programs.

CULTURAL COMPETENCY TRAINING
Cultural competency improves provider-patient interactions and researcher-Tribe/participant interaction, thereby improving the quality of cancer care and increasing participation in research. We intend that superior care and superior research will improve cancer disparity rates.
AIM: We will develop, implement and evaluate a toolkit and training program that can be delivered through multiple modalities to provide an AIAN cultural competency training specific on cancer for healthcare providers and researchers.

COMMUNITY GRANTS
We have developed a small community grants program that will provide resources directly to AI Tribes/communities and increase capacity in AI CPC programs. By providing this support, we engage an increasing number of communities and provide technical assistance to improve their research and CPC programming to address cancer care disparities. We will fund annually five community-initiated projects each year (2014-2019) supporting increased use of primary and secondary cancer prevention through a small grants program.
AIM: Five community projects will be developed by and for Southwest AI communities that will support increased use of primary and secondary cancer prevention strategies.

COMMUNITY ACTION COMMITTEE
Community Action Committee (CAC) members are volunteers from Native communities and cancer-affiliated organizations responsible for planning, assessing, and implementing actions for community readiness to adopt CPC approaches and improve health outcomes within a defined geographic area of the state. Each CAC member is an integral part of the leadership team providing direction and vision toward the achievement of the goals of the NACP Outreach Core. The CAC consists of 3 task forces: Community Grants, Community Readiness Model, and Cultural Competency. CAC members meet quarterly; 1 in-person and 3 by telephone and web. The task forces meet monthly to discuss progress on goals and objectives specified in the 5-year project period 2014-2019.
The Partnership for Native American Cancer Prevention
Northern Arizona University
University of Arizona Cancer Center

Developmental Core

The Developmental Core is responsible for overseeing the procedures for development, initial review and ongoing evaluation of research projects that meet the constraints of the NACP, i.e., the project must be collaborative, with co-investigators from NAU and UACC, and with tribal co-investigators when appropriate; the project must be relevant to tribal communities in Arizona; and the project must be relevant to cancer, in terms of defining or addressing issues of cancer disparities, and in providing cancer research training for Native students.

The overall goal of the NACP Developmental Core is to foster and support culturally-appropriate research capacity at our institutions both through research projects and through faculty recruitment and development. We work to increase the number and diversity of researchers at NAU working on cancer related project, and to increase their research success through individual Development Plans, as described in the Training Core Program.

We work to increase specific outcomes of:
1. Successful external funding for NAU researchers in areas related to cancer and cancer disparities,
2. Peer reviewed publications in areas of cancer research and cancer disparities,
3. Collaborative community interactions through cultural training, tribal consultation for project development and dissemination of research results.

The Developmental Core interacts with the Outreach and Training Cores, as well as the Internal Advisory Committee (IAC), in ways that are essential to the success of the NACP. The Outreach Core advises the Developmental Core on opportunities for community engagement and on the research and training needs of community partners, who serve as the focus for the development of new pilot research projects. The Developmental Core works with the Outreach Core to provide lay summaries of research projects for dissemination to tribal communities; and researchers will be available for interviews for newspapers and radio programs and for presentation to NA conferences such as the Navajo Nation Human Subjects Research Board and Native Health Research Conferences. The Outreach and Training Cores collaborate to provide the Developmental Core and funded NACP investigators with cultural competency training that will strengthen our ability to understand and address the needs of the communities we serve. The Developmental Core also houses the research projects that provide the research training opportunities for our Native students. Lastly, the IAC provides evaluation of scientific merit and cultural relevance for all new proposals, and evaluates the progress and proposed directions for continuing proposals.
Environmental Health Studies on the Navajo Reservation

Principal Investigator: Jani C. Ingram, PhD (NAU)

Student researchers: Daniel Begay, Jonathan Credo, Erik Peaches, Brandon Garcia, Tommy Rock, Andee Lister, Mackenzie Simmonds, Joshua Froyum, Brooke Dalton, Carl Haskie, Richelle Thomas, Alexis Parks (as pictured below left to right)

The research focus in the Ingram lab is the study of environmental contaminants with respect to their impact on health. A major part of our research has focused on characterizing uranium contamination in water and soil as well as some preliminary work in the area of plants and livestock. Our lab has recently begun to focus on arsenic contamination in well water as well. A critical aspect of our research has been to foster collaborations with the Navajo community and leaders to build trust, obtain access to field samples and gain insights into their health concerns. Recruiting Navajo and other Native American students to work with on the research has been critical to the success of the studies. Another important aspect of our research has been to build an interdisciplinary, collaborative team of scientists with expertise in analytical chemistry, geoscience, cancer biology, and social sciences. The projects are funded by the National Cancer Institute, the National Institute of General Medicine Sciences, the Environmental Protection Agency, the United States Geological Survey, and the National Science Foundation.

Dr. Ingram is a member of the Navajo Nation (born to the Náneesht’ ézhi clan) and is involved in outreach activities for Native American students in undergraduate and graduate research. She is the director of the Bridging Arizona Native American to Bachelor Degrees (NIH Bridges to Baccalaureate) and the Principal Investigator for the Partnership for Native American Cancer Prevention Training Core. Since coming to NAU in 2002, she has mentored over 90 students (high school, undergraduate, and graduate students) who have worked with her on various research projects; over 50 of those students are Native American. Although Dr. Ingram’s research project is no longer directly funded by NACP she continues to mentor students in environmental health science research and serves as an important research lab experience for many NACP students.
Microbes, Bile Acids and Colorectal Cancer

**Co-leaders:** J. Gregory Caporaso, PhD, (NAU), Talima Pearson, PhD (NAU), Peter Lance, MD, FRCP, (UACC)

Colorectal cancer is the second most common cause of deaths from cancer. Formerly relatively uncommon among Native Americans, colorectal cancer is now increasing in this population. An important risk factor is family history, i.e. having a close family member who was diagnosed with the disease. For those without a family history of the disease (the majority of those who develop colorectal cancer), the most important risk factors are a lack of physical activity and obesity.

It is increasingly realized that the fecal mass in the large bowel (colon and rectum), consisting as it does of trillions of bacteria, is a very important environmental factor in sustaining a healthy colon and rectum and, when perturbed, acting as an important risk factor for colorectal cancer; the fecal bile acids are cofactors with the fecal bacteria in these roles in health and disease. It is thought that lifestyle, particularly the diet, may have an important bearing on the types and abundance of intestinal bacterial and the bile acid profile.

In the Microbes, Bile Acids and Colorectal Cancer project we are investigating the bacterial and bile acid profiles in stool specimens from 433 individuals who developed colorectal polyps (adenomas). These individuals were participants in a clinical trial designed to test ursodeoxycholic acid (UDCA) as a means to prevent colorectal cancer. These participants were divided into two groups: one that received the treatment and the other that received a placebo. UDCA treatment reduced the risk of developing colorectal cancer for males, but not females. Stool samples from these participants are ideal for determining how gut bacteria and bile acids are related to each other and the development of colorectal cancer. We also aim to explore whether the bacterial communities and bile acids that are associated with the development of colorectal cancer are independent of race/ethnicity and thus reflect the sharing of environmental factors such as diet. We therefore aim to collect and analyze stool specimens and dietary information from 50–70 year-old NA men and women, with a focus on members of the Navajo Nation (though not exclusive) residing in urban and rural communities. We are confident that from these studies we will learn crucial facts about what constitutes a “healthy” fecal colorectal environment and how it might be possible in the future to sustain a healthy fecal environment in order to prevent colorectal cancer.

We have begun to characterize the communities of bacteria from the stool samples associated with the UDCA clinical trial and initial analyses support our hypothesis that significant changes in the gut microbial communities occur after treatment. We are now in the process of trying to characterize these changes and identify the species and strains that may be driving the community changes.
Prostate cancer rates vary widely among races in the United States. Among all races, prostate cancer is clinically variable and can range from localized disease that does not require active treatment to aggressive disease associated with a high risk of mortality. Prostate cancer is the most common form of cancer diagnosed among U.S. men, and family history has been found to be the single most significant predictor of prostate cancer risk. This suggests that inherited genetic variants play a strong role in determining a man’s risk of developing prostate cancer. Genetic studies have found numerous specific genetic variants that are associated with prostate cancer risk. While many of these variants are relatively common, they individually contribute only a small amount to one’s cancer risk. Moreover, studies have found that many genetic risk factors for prostate cancer vary significantly in their frequency across different races. In these studies Native American populations have not been analyzed. There is a need to understand the molecular mechanisms underlying clinically aggressive prostate cancer in all men, including Native Americans.

Our goal is to better understand the genetic and molecular risk factors that correlate with aggressive prostate cancer. Our experimental approach will characterize genetic biomarkers and risk factors of particular importance to Native American populations.

Glossary of study terms:
- **Cancer risk factor**: Any attribute that affects an individual’s risk of cancer (for example, smoking is a risk factor for lung cancer)
- **Genetic cancer risk factor**: A genetic trait that can be passed from one generation to the next and is associated with increased cancer risk
- **Genetic variant**: Any difference in the genetic makeup of individuals, specifically in the sequence of DNA. Genetic variants are often called *polymorphisms* or *alleles* or SNPs (*single nucleotide polymorphisms*)
- **Genome-wide association studies (GWAS)**: Studies aimed at identifying the particular genetic variants that act as risk factors for any inherited trait, including cancer susceptibility
- **Protein-coding gene**: A part of the genome that encodes the instructions for creation of a protein. Protein-coding genes are comprised of DNA that is transcribed to RNA which is then translated to a protein
- **Non-coding RNA (ncRNA) gene**: A part of the genome that is transcribed into RNA, but does not encode a protein. ncRNA gene products often have important regulatory effects on other genes
- **MicroRNA (miRNA)**: A non-coding RNA molecule that is very small and can silence protein-coding genes via RNA-RNA pairing. miRNAs are created through precursor stages that include pri-miRNA and then pre-miRNA
- **MicroRNA Response Element (MRE)**: A region of a gene that can bind with a microRNA; when an MRE binds to a microRNA the associated gene is typically silenced
- **Long-noncoding RNA (IncRNA)**: A non-coding RNA molecule that is large (>200 nucleotides) and can influence the activity of protein-coding genes in many different ways
- **Competitive endogenous RNA (ceRNA)**: RNA molecules (typically including RNA from protein-coding genes and/or long-noncoding RNAs) that compete with one another to bind with microRNAs via a shared MRE
- **Stem cell**: Cells that can self-renew to form more stem cells and these undifferentiated cells can differentiate into specialized cell types
- **Cancer stem cells (CSCs)**: CSCs are tumor cells that have properties associated with normal stem cells
Physical Activity and Cancer among Native American Cancer Survivors: A Pilot Study- Preliminary focus group and interview findings

Co-leaders: Dirk De Heer, PhD, (NAU), Anna Schwartz, PhD, (NAU), Jennifer Bea, PhD (UACC)
Program Coordinator: Etta Yazzie, RN (UACC/NAU)
Student Researchers: Shauntey Cleveland (NAU), Shelby Dalgai (NAU), Kaitlyn Haskie (NAU), Pearl Nez (NAU), Mark Lee (UACC), Luis Valdez (UACC),

Background: Studies have shown that physical activity in cancer survivorship can lead to improved quality of life and disease free survival, particularly for colorectal and breast cancer. Relatively moderate amounts of physical activity may be needed, such as walking 30 minutes daily at 2.5 miles per hour. None of these studies, however, were focused on Native American cancer survivors.

Objective: To conduct focus groups and interviews with Navajo cancer survivors to learn about their exercise beliefs, preferences, barriers and interest in a cancer survivor physical activity program.

Methods: Focus groups and individual interviews with Navajo cancer survivors in an urban and rural setting were conducted, led by an experienced bilingual (Navajo & English) focus group leader. Audio recordings of conversations were translated and transcribed in full. Software for qualitative data analysis (NVIVO) was used to summarize major themes.

Preliminary Findings: Overall, participants believed that physical activity was important for improving health during and following cancer treatment. Several factors that may adversely influence engaging in physical activity included: 1) a feeling of separation from their social network, in part due to lack of knowledge about cancer among family members and others; 2) fatigue and temporary activity limitations related to treatment; 3) lack of communication between healthcare personnel and cancer patients about post-treatment appropriateness of timing, duration and intensity of activity; and 4) resource limitations. Patients expressed a strong desire to improve health, and activity preferences expressed favored outdoor activity and walking interventions.

Conclusion: In order to increase and maintain an active lifestyle, a community-based program tailored to meet the needs for Navajo cancer patients is essential. A setting which combines easily accessible and affordable ways to engage in moderate physical activity with social support appears preferable. In addition, education for caregivers about cancer and its treatment may be needed.
Disruption of Endocrine Pathways by Environmental Arsenic and Development of Estrogen Receptor-Negative Breast Cancer

**Co-leaders:** Cathy Propper, PhD, Donato Romagnolo, PhD

Many chemicals released into the environment, either through human activities or natural geological processes, affect the function of human beings. Arsenic is a common chemical naturally found in ground and surface waters, and exposure to arsenic through drinking water can induce shifts in natural physiological function. In some parts of the globe, levels of arsenic are so high that ingestion through food or water is enough to cause severe toxic effects. In other parts of the world, such as in Arizona, arsenic levels in water resources are above the Environmental Protection Agency’s recommended limits. These levels of arsenic exposure, while not high enough to be highly toxic, are sufficient to interact with natural chemicals in the bloodstream called hormones that are important to maintaining normal function of cells and tissues.

Estrogen is a natural hormone important in normal breast function, but also has effects on breast cancer outcomes. Many cancers are sensitive to estrogen (termed estrogen receptor positive breast cancers). Treatment of these cancers relies on many drug therapies including some that block the ability of estrogen to increase the size and number of tumors. Recent evidence suggests that arsenic acts as a disrupter of estrogen action and may affect changes in estrogen processes that could shift the effectiveness of these drug therapies. Therefore, arsenic exposure may affect the treatability of the tumors.

While breast cancer incidence rates in Arizona Native American populations does not differ from non-native populations, breast cancer still remains the most deadly cancer for Navajo and Tohono O’odham women in Arizona. Furthermore, the mortality rate for this disease is above that of non-native populations. The reasons for this difference in survivorship are not well defined, but potential explanations include differences in screening rates, access to treatment, and differences in response to drug therapies. Early evidence in our laboratories and others indicate that arsenic affects estrogen-based processes, suggesting that arsenic exposure could play a role in the progression of estrogen sensitive breast cancers. This project will investigate whether arsenic affects estrogen biology such that exposure interacts with a common drug therapy used in the treatment of estrogen responsive cancers. Specifically, we will use three research models for breast cancer, zebrafish, mice and tissue cell lines, to determine whether arsenic affects estrogen-like processes associated with breast cancer and one of its chemotherapeutic options.

Our project advances the overall goals of the NACP by developing cancer research in Dr. Propper’s laboratory with the expertise of Dr. Romagnolo’s background in cancer biology. We will honor the culture of the Native American communities we serve by collaborating with water managers and human health personnel to formulate appropriate arsenic education programs in local communities. Last, we will increase the number of Native American students trained in cancer research and health care policy.
NACP Faculty and Staff

Leadership

Laura Huenneke, PhD
Lead Principal Investigator.
Principal Investigator, Developmental Core
Professor, School of Environmental Science
Laura.Huenneke@nau.edu

Jani Ingram, PhD
Lead Principal Investigator.
Principle Investigator, Training Core
Professor of Chemistry and Biochemistry
Jani.Ingram@nau.edu

Octaviana Trujillo, PhD
Principal Investigator, Outreach Core
Research Director, Center for American Indian Resilience
Professor, Department of Applied Indigenous Studies
Octaviana.Trujillo@nau.edu

Dave S. Alberts, MD
Lead Principal Investigator
Director Emeritus, University of Arizona Cancer Center
Dalberts@uacc.arizona.edu

Margaret Briehl, PhD
Principal Investigator, Training Core
Professor, Department of Pathology
mmbriehl@pathology.arizona.edu

Teshia Solomon, PhD
Principal Investigator, Outreach Core
Director, Native American Research and Training Center
Associate Professor, Department of Family and Community Medicine
solomont@email.arizona.edu

Jesse Martinez, PhD
Principal Investigator, Developmental Core
Director of Education and Outreach
Professor, Department of Cell & Molecular Medicine
jmartinez@uacc.arizona.edu

Maria Elena A. Jackson, MA
Program Manager
Maria.Jackson@nau.edu

Maria Lluira-Prevatt, PhD
Research Administrator
mprevatt@uacc.arizona.edu

Lily-Ann Tso, BS
Administrative Assistant
Lily-Ann.Tso@nau.edu

Debbie Aguirre
Administrative Assistant
rodrigud@email.arizona.edu
NACP Faculty and Staff

Evaluation Core

Kelly Laurila, MA
Lead Evaluator
Kelly.Laurila@nau.edu

Laurie Rogers, MA
Evaluation Research Coordinator
Laurie.Rogers@nau.edu

Training Core

Christal Black, MA
Program Coordinator
Christal.Black@nau.edu

Tiffani Begay, BS
Program Coordinator
tiffanibegay@email.arizona.edu

Outreach Core

Carol Goldtooth, MPH
Community Health Educator
Carol.Goldtooth@nau.edu

Desiree Jones, MPH
Community Health Educator
djones1@email.arizona.edu

Kellen Polingyumptewa
Community Health Liaison
Kpolingyumptewa@hopi.nsn.us

Mary Koithan, PhD, RN, APRN, BC
Co-Investigator
Associate Dean, Professional and Community Engagement, College of Nursing
mkoithan@email.arizona.edu

Christina Laukaitis, MD, PhD
Co-Investigator
Director, Division of Genetic Consultation and Counseling
Assistant Professor, Department of Medicine
cmlaukai@email.arizona.edu

Amanda Urbina, BS
Administrative Assistant and American Indian Research Center for Health Scholar
urvina2@email.arizona.edu
Functional Genetic Variants as Modifiers of Prostate Cancer Progression in Native Americans

Jason Wilder, PhD
Project Co-Leader
Associate Professor and Chair, Department of Biological Sciences
Jason.Wilder@nau.edu

Ronald Heimark, PhD
Project Co-Leader
Professor, Department of Surgery
rheimark@email.arizona.edu

Disruption of Endocrine Pathways by Environmental Arsenic and Development of Estrogen Receptor-Negative Breast Cancer

Cathy Propper, PhD
Project Co-Leader
Professor, Department of Biological Sciences
Catherine.Propper@nau.edu

Donato Romangnolo, PhD, MSc
Project Co-Leader
Professor, Nutritional and Cancer Biology, Department of Nutritional Sciences and College of Agriculture and Life Sciences
donato@email.arizona.edu
Physical Activity and Cancer Among Native American Cancer Survivors

Dirk de Heer, PhD, MPH
Project Co-Leader
Associate Professor, Department of Physical Therapy and Athletic Training
Dirk.deHeer@nau.edu

Jennifer Bea, PhD
Project Co-Leader
Assistant Professor, Department of Medicine
jbea@uacc.arizona.edu

Anna Schwartz, PhD, FNP-BC, FAAN
Project Co-Leader
Associate Professor, School of Nursing, College of Health and Human Services
annaschwartz@peoplepc.com

Etta Yazzie, RN
Program Coordinator
etta.yazzie@usoncology.com
Internal Advisory Committee
Northern Arizona University
The University of Arizona

Karen Francis-Begay, MA, UA
Assistant Vice President, Tribal Relations

Manley Begay Jr., Ed.D, NAU
Professor, Applied Indigenous Studies

Carol Bender, PhD, UA
Program Director, UBRP & BRAVO, Molecular and Cellular Biology

Elizabeth Calhoun, PhD, MEd, UA
Associate Vice President for Population Health and Management

Francine Gachupin, PhD, MPH, CIP-UA
Assistant Professor, Department of Family and Community Medicine

Chad Hamill, PhD, NAU
Assistant Professor of Ethnomusicology

Maria-Elena A. Jackson, MA, NAU
NACP Program Manager

Paul Jagodzinski, PhD, NAU
Dean, College of Engineering, Forestry, and Natural Sciences

Jennie Joe, PhD, UA
Retired-Professor, Department of Family and Community Medicine

Rick Kittles, PhD, UA
Professor, Division of Urology, Department of Surgery

Joseph Martin, EdD, NAU
Special Advisor to the President, Native American Affairs

Maria Lluria-Prevatt, PhD, UA
NACP Research Administrator

Karen Pugliesi, PhD, NAU
Dean, College of Social and Behavioral Sciences

Debera Thomas, DNS, NAU
Dean, School of Nursing
Program Steering Committee

Thomas Becker
Oregon Health and Science University

Timothy Byers
University of Colorado Cancer Center

Norman Drinkwater
University of Wisconsin Cancer Center

Felicia Schanche Hodge
Center for American Indian/Indigenous Research and Education (CAIIRE)

John Ojeifo
National Cancer Institute

Peter Ogunbiyi
National Cancer Institute

Raymond Reid (not pictured)
John Hopkins Study Center

Isabel Scarinci
University of Alabama Birmingham
NACP Outreach Community Action Committee

**Michael Allison**  
Native American Liaison, Arizona Department of Health Services

**Janelle Jensen**  
Chairperson, Tohono O'odham Cancer Partnership

**Susan Levy**  
Communications Coordinator, Native Health

**Abby Lohr**  
Director of Community Resource and Grants Manager, Susan G. Komen Foundation, Southern Arizona

**Darlene Lopez**  
Health Assistant, Healthy O'odham Promotion Program

**Cora Maxx-Phillips**  
Consultant and Advisory Board Member, National Resource Center for Tribes, Southwest Research and Information Center

**Phoebe Mills-Cager**  
Wellness Director, Tucson Indian Center

**Jamie Ritchey**  
Director, Tribal Epidemiology Center at Inter Tribal Council of Arizona

**Eva Sekayumptewa**  
Director, Hopi Tribe Social Services

**Emery Tahy**  
Epidemiologist, Inter Tribal Council of Arizona

**Bess Tsosie**  
Secretary/Treasurer, Mariano Lake Chapter

**David Tsosie**  
President, Azee’Bee Nahagha of Dine’ Nation

**Bill Ward**  
President and Founder, Community Health Advocate Men’s Cancer and Health Issues  
Co-founder, Arizona American Indian Men’s Health Coalition

**Virginia Warren**  
Cancer Control Office Chief, Arizona Department of Health Services

**Angie Williams**  
Director, Navajo Nation Breast and Cervical Cancer Prevention.

**Shannon Williams**  
Program Coordinator, Radiation Exposure Screening and Educational Program (RESEP), North Country Health Care Center

**Del Yazzie**  
Acting Director, Navajo Epidemiology Center
The Partnership for Native American Cancer Prevention
NACP

Contact Information

P.O. Box 5659
Peterson Hall Room #312
Flagstaff, AZ 86011
Grant# 2U54CA143925

1501 N. Campbell Ave
P.O. Box 245043
Tucson, AZ 85724
Grant# 2U54CA143924

NAU: http://nau.edu/nacp/
UACC: http://azcc.arizona.edu/research/disparities/nacp/