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## NOTABLE CANCER CENTER MEMBER

Teresa Woodruff, PhD



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**T**eresa Woodruff, Executive Director of Northwestern University's Institute for Women's Health Research and the Thomas J. Watkins Memorial Professor of Obstetrics and Gynecology at the Feinberg School of Medicine, says it was her mother's love of science that inspired her to pursue a career in the field. "She was always doing the most amazing things in her first grade class," says Woodruff, whose mother taught first grade in Kankakee, Illinois for over 30 years. "I was influenced very early by her passion for education and science."

While her initial goal was to follow in her mother's footsteps and become a first grade teacher herself, it wasn't long before Woodruff's interest in scientific research took over. While pursuing her bachelor's degree at Olivet Nazarene University in Bourbonnais, she says she "soon realized it was research that captured my energies and interests." After receiving her B.A. in chemistry & zoology in 1985, Woodruff went on to Northwestern University where, in 1989, she earned her PhD in biochemistry, molecular biology, and cell biology.

Dr. Woodruff was asked to head the Institute for Women's Health Research (IWHR) when it opened one year ago. With its goal of accelerating the rate of scientific discoveries that impact women's health, the Institute fosters research by developing a wide range of coordinated projects and encouraging

collaboration among researchers in a number of different disciplines. The IWHR reports directly to the Dean of the Feinberg School of Medicine, rather than a specific department, in order to facilitate this multidisciplinary approach.

“Northwestern is world-renowned for its excellence in reproductive science,” says Woodruff. “And the Institute helps us apply those scientific discoveries to clinical practice across women’s health.” The Institute is an umbrella organization that supports the research community by creating opportunities for studying the sex differences in a range of medical disciplines, accelerates the translation of research into practice, trains women’s health experts and engages the community through its Women’s Health Registry ([whr.northwestern.edu](http://whr.northwestern.edu)). It serves as a central depository of the research and program information that impacts women’s health throughout Northwestern University and its affiliated clinical partners.

After serving as Basic Science Director for the Lurie Cancer Center for a number of years, Dr. Woodruff became the chief of the newly created Division of Fertility Preservation in the Department of Obstetrics and Gynecology. “While they are live-saving, cancer treatments can limit or destroy a young patient’s ability to conceive children,” say Woodruff. “Because cancer treatments have improved, life expectancy for young cancer patients has increased leading to the urgent need to preserve fertility now for later use.”

Dr. Woodruff recently won a \$21 million National Institute of Health (NIH) Roadmap Grant to study fertility preservation in young cancer patients and provide information and support to patients coping with a variety of medical, psychological, and social issues surrounding cancer treatment and fertility. The program, called The Oncofertility Consortium, is facilitating collaboration within disciplines and among institutions in order to encourage creative approaches to these problems. (Dr. Woodruff coined the term, “oncofertility,” to describe this new field.)

To help this growing cadre of patients, Northwestern University’s Feinberg School of Medicine and the Lurie Cancer Center are working together to develop new technologies that allow patients to conceive after cancer treatment. These multidisciplinary projects

include one of Dr. Woodruff’s own projects to preserve and grow human follicles. The study involves harvesting follicles from ovaries of those donated by eligible cancer patients and coaxing those follicles to mature into eggs. It is hoped that when the patient is ready to conceive, the frozen tissue can be thawed and the follicles matured for the patients use.

The Oncofertility Consortium involves close collaboration with several other institutions around the country and Woodruff says she is especially proud of the role the Lurie Cancer Center has played. “Once we developed the network of activity here at the Cancer Center, it became clear that this was something other institutions could copy — and begin delivering this new kind of care to their patients, too” she says. Over the past year, she adds, Northwestern University researchers have provided the templates for their clinical research, including many of their protocols, to 50 other institutions around the country. “So many clinicians were looking for ways to provide these services to their cancer patients and just didn’t have the roadmap to get that done. So we’ve provided it, and now have this magnificent network that works together in a very altruistic way to develop technologies that help preserve fertility in young cancer patients.”

The Northwestern team has also created a Website, [www.myoncofertility.org](http://www.myoncofertility.org), to disseminate information about its Consortium efforts as well as a site created especially for patients, their partners and parents.

Woodruff says that the ability to directly impact patients’ lives is the most rewarding aspect of her work. “Scientists often talk about the ability to take something from the bench to the bedside, but we are actually doing that here,” she says. “Seeing the kind of work that we have developed in the mouse being adapted to human cells and then used to treat patients is a remarkable aspect of what we’re doing.”

Had she not become a scientist, Woodruff says she would have been a first grade teacher or played cello for the ELO (Electric Light Orchestra). “My fallback is music,” she says with a smile. Fortunately, for thousands of young cancer patients, as well as women of all ages facing a variety of health concerns, Woodruff decided to pursue her first passion of scientific research instead.

## NOTABLE CANCER CENTER MEMBER

Richard Longnecker, PhD



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An academic scientist's success is measured not only by his own accomplishments, but also "by what those he's trained have gone on to do," says Richard Longnecker, PhD. Longnecker, John Edward Porter Professor of Biomedical Research and past Director of the Integrated Graduate Program at Northwestern University's Feinberg School of Medicine and Director of the Viral Oncogenesis Basic Science Program at the Robert H. Lurie Comprehensive Cancer Center of Northwestern University, says training new scientists and mentoring them in their careers has been one of the most rewarding aspects of his work.

Longnecker's own career path began at the University of Michigan in Ann Arbor where he earned a bachelor's degree in cellular and molecular biology with honors in 1982, but he credits his mother, Jo, in encouraging him in his early "scientific experiments." At Michigan, he worked on the yeast cell cycle and was mentored by Professor John Pringle. It was at Michigan that Longnecker got interested in the regulation of cell growth and its relationship to cancer. Longnecker then went on to perform graduate work at the University of Chicago with Dr. Bernard Roizman working on Herpes Simplex Virus (HSV), taking a brief hiatus from cancer research, and earned his PhD in virology in 1987. His post-doctorate work (from 1988 to 1993) was performed at Harvard under yet another mentor, Dr. Elliott Keiff. At Harvard, Longnecker worked on Epstein-Barr virus, the first human virus associated with cancer. Thus, he was able to combine his love of virology with that of oncology. Longnecker credits his

early mentors with making him a better scientist and guiding him in his career.

Since joining Northwestern in 1993, Longnecker's primary research focus has been on the Epstein-Barr virus (EBV), which is associated with a variety of human cancers such as Burkitt's Lymphoma, Hodgkin's Lymphoma, and nasopharyngeal carcinoma. Research in the Longnecker laboratory focuses on several aspects of EBV pathogenesis. First, his laboratory is interested in the cancer association. Specifically, research is being conducted to understand the molecular basis of the ability of EBV to be an important part in the transition of a normal cell into a cancer cell.

Second, the laboratory is interested in understanding the ability of the virus to persist and remain latent in the human host. In this regard, the laboratory is developing animal models for EBV latent infections. These studies will be important in understanding the unique ability of EBV to remain latent in the human host and the disease syndromes associated with these latent infections. EBV, like all herpes viruses, is able to establish lifelong infections usually associated with this disease.

Finally, the Longnecker laboratory is investigating viral entry, assembly, and cellular genes that are required for viral entry. Overall, Longnecker hopes his studies will provide insight for the development of novel therapeutics for the treatment of EBV-related malignancies, an understanding of the virus life cycle, and an understanding of signal transduction and cell growth regulation in lymphocytes. Work on these fundamental aspects of EBV biology in his laboratory is supported by multiple NIH grants from both the National Cancer Institute (NCI) and the National Institute of Allergy and Infectious Disease (NIAD).

Dr. Longnecker also heads a research project to develop novel therapeutics for EBV-associated cancers, for which he recently won a NCI grant. Longnecker is working with Lurie Cancer Center members, Drs. Leo Gordon and Andrew Evens, to find treatments for a variety of hematopoietic cancers associated with EBV, such as EBV-associated Hodgkin's lymphoma and B cell proliferative disorders associated with HIV infection or immune suppression.

While Longnecker clearly loves delving into the how's and why's of basic science, he appreciates the opportunity his work with the Lurie Cancer Center has provided him to apply scientific

discoveries to clinical practice and make a contribution to patient care. "It's gratifying to be able to extend scientific understanding to therapies that may directly benefit others," he says.

When he's not researching or teaching, Longnecker likes to spend time with his family. He and his wife, Megan McNerney, an MD-PhD, in the Department of Pathology at the University of Chicago, have a 12 month-old daughter, Elizabeth. While Longnecker says he used to spend his free time sailing, fishing, or playing tennis and golf, since Elizabeth arrived, he prefers spending time with her and his wife. "My daughter is my hobby now," he says.

In addition to the accomplishments noted above, some of Longnecker's other achievements include being a Regents Alumni Scholar at the University of Michigan; a Fellow, Special Fellow, and Scholar of the Leukemia Society of America; and an editorial board member for several journals including the *Journal of Virology*. He has served on multiple advisory committees, including those that review private foundation grants, as well as numerous NIH grant review committees. Despite his many personal accomplishments, however, Longnecker says it is his students' success that he is most proud of.

"My students and post-docs have done everything," he says. "Some are academic scientists, some work in the pharmaceutical industry, one runs a venture capital fund for biotechs, and others are actively involved in teaching at the high school and college levels getting young people excited about science." Longnecker emphasizes that careers in academia are no longer the only successful outcome for those pursuing a scientific occupation. "For one thing, there probably aren't enough positions for everyone," he says. "But, as long as they are using the skills they've gathered while working in the lab, there's a wide range of successful outcomes for them."

Though his student days are behind him, Longnecker says he is still learning, and still benefiting from mentors like Drs. Steve Rosen and Pat Spear at Northwestern. "Becoming a successful scientist requires nurturing throughout one's career," he says. "Whether it's helping you think about a question in a new way, working with you to finish a paper, or someone like Steve Rosen pointing you in the direction of new research opportunities. Mentorship means being a little bit of everything, even being just a friend."

## NOTABLE CANCER CENTER MEMBER

William Catalona, MD



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As a young medical student at Yale University, William Catalona, imagined life as a physician and anticipated how he would use his newly acquired skills to provide his patients with the best care possible. But Catalona now Professor of Urology at Northwestern University's Feinberg School of Medicine and Director of the Clinical Prostate Cancer Program at the Robert H. Lurie Comprehensive Cancer Center of Northwestern University, also wanted to make a contribution to medical science. "I was hoping I could give something back," he says.

Catalona approached one of his professors and was advised to choose a problem with a high rate of incidence that medicine had been struggling to solve without success. After exploring several options, Catalona homed in on the two most important problems facing prostate cancer patients at the time: late diagnosis and the unacceptable side effects of surgical treatment.

"Prostate cancer was the most common cancer in men and the second leading cause of cancer death," Catalona says. "The majority of those diagnosed already had metastases and a poor prognosis." One of the reasons for this was because the only available diagnostic test was a digital rectal exam. The exam was not only unpleasant for patients, but its accuracy was dependant on the expertise of the physician and varied widely depending on the individual doctor's skill and experience.

In addition, the surgical techniques then used to remove tumors resulted in impotence and often left patients incontinent as well, something many considered worse than the disease itself. So, starting in the 1980's, Catalona set out to address these two urgent problems—and eventually helped solve them both.

Dr. Catalona was the first to demonstrate that the Prostate-Specific Antigen (PSA) test, a simple blood test that involves little discomfort or inconvenience for the patient, could be used as a screening tool for prostate cancer, allowing doctors to detect the disease far earlier than they had been able to with the rectal exam alone.

Previously used as a monitoring test to determine whether a patient was responding to treatment, Catalona wondered if the PSA could also be used as a diagnostic tool. His research proved it could and his findings were published in *The New England Journal of Medicine* in 1991. Soon after, the PSA test became the gold standard for prostate cancer diagnosis, allowing physicians to detect the disease in its earliest stages for the first time. “With the PSA test, there has been a 75 percent reduction in the percentage of men with metastatic disease at the time of diagnosis since 1992,” says Catalona. “And there has been a 37 percent decrease in age-specific death rates in the US alone.”

Later that decade, Dr. Catalona also conducted the initial feasibility studies and headed the multi-institutional research program that led to the refinement of the PSA test, called the “free” PSA. This blood test, which came to market in 1997, allows physicians to better determine the level of antigen present in a patient’s blood whose initial PSA results are just slightly elevated and fall within a “gray zone.” This sensitive test helps doctors determine which patients should undergo a biopsy and which can skip the procedure.

Catalona was mentored by Patrick C. Walsh, the surgeon who developed the nerve-sparing radical prostatectomy, while he was a urology resident at the Johns Hopkins Hospital in Baltimore. This new technique, which preserved sexual function and helped patients avoid other devastating side effects associated with earlier surgeries, revolutionized prostate cancer treatment. Today, Catalona has become

the foremost expert in the procedure, having performed more of them than any other surgeon—over 5,000 to date—treating patients from throughout the world.

Though the PSA tests and nerve-sparing surgery have moved detection and treatment forward, Catalona continues to look for new ways to save and improve lives by concentrating on cancer genetics. “There have got to be even better ways to diagnose and treat this disease,” he says. “If we can unravel the genetics of cancer, we might come up with better diagnostics, treatments, and maybe even ways to prevent it.”

Catalona is currently co-chair of a Specialized Program of Research Excellence (SPORE) grant at the Lurie Cancer Center that involves close collaboration with all other prostate cancer SPOREs (11, total). The principal goal of this research is to identify risk allele signatures for aggressive and non-aggressive cancers using DNA samples and patient histories. Researchers in the program are examining data collected from all participating institutions, including Northwestern University, the Mayo Clinic, the University of Chicago, and others to see if the alleles in patients with varying forms of aggressive or indolent tumors show different patterns, or “signatures.” (The study is also dedicated to innovative therapeutics, cancer prevention, and ways to improve patients’ quality of life.)

This focus of the SPORE project was first suggested by Catalona who, along with Jeffrey Gulcher, PhD, co-founder of the biopharmaceutical company deCODE Genetics, and other deCODE scientists, discovered and validated several risk alleles for prostate cancer. Using DNA samples and patient histories supplied by Catalona’s patients, their research demonstrated that risk is associated with the “dose” of alleles an individual receives from their parents. (They also found that these alleles could make someone more susceptible to either prostate or breast cancer, depending on the patient’s gender.) The deCODE genetics, Inc. research group, including Catalona as the principal North American collaborator published their findings in an article for *Nature Genetics* in 2006.

Catalona is also a part of the International Consortium for Prostate Cancer Genetics (ICPCG), a group of researchers working to

find out why prostate cancer is inherited in some families, as well as a multi-institutional study of a new tumor marker, called Pro-PSA, for which the researchers hope to gain FDA approval. He says preliminary studies show the marker may prove to be an even more accurate screening tool for prostate cancer than the PSA test.

In addition to his research efforts, Catalona runs the Urological Research Foundation, a fundraising organization established over 20 years ago to provide patient education and support research into the prevention, detection, and treatment of cancer and other diseases of the prostate.

Reflecting on his career as both a researcher and clinician, Catalona says he enjoys working in both arenas. “Seeing patients every day, getting to know them, and seeing what their biggest problems are allows me to focus on those areas in my research,” he notes. He also savors the opportunity to help patients and families directly. “I really think it’s important for patients to have doctors whom they can trust, who will be their advocates,” he says. “Cancer patients and their families go through such a trying time and it's very, very gratifying when you can make this difficult experience nothing more than a bump in the road for them.”