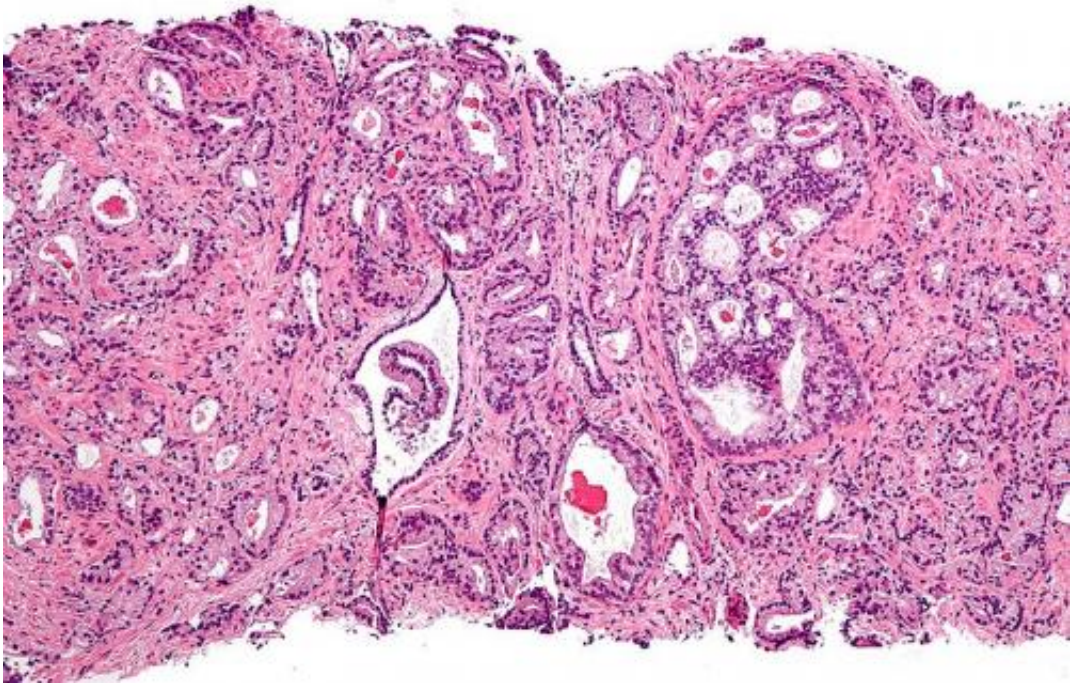
Nanotechnology shows promise for more accurate prostate cancer screening, prognosis

March 16 2015, by Erin Spain



Micrograph showing prostatic acinar adenocarcinoma (the most common form of prostate cancer) Credit: Wikipedia, CC BY-SA 3.0

A Northwestern University-led study in the emerging field of nanocytology could one day help men make better decisions about whether or not to undergo aggressive prostate cancer treatments.

Technology developed by Northwestern University researchers may help solve that quandary by allowing physicians to identify which nascent

cancers are likely to escalate into potentially life-threatening malignancies and which ones will remain "indolent," or non-aggressive.

The prostate-specific antigen (PSA) test was once the recommended screening tool for detecting prostate cancer, but there is now disagreement over the use of this test because it can't predict which men with elevated PSA levels will actually develop an aggressive form of the disease.

"If we can predict a prognosis with our technology, then men will know if their cancer is dangerous and if they should seek treatment," said Vadim Backman, senior author of the study. "Right now there is no perfect tool to predict a prognosis for prostate cancer. Our research is preliminary, but it is promising and proves that the concept works."

Backman is a professor of biomedical engineering at Northwestern's McCormick School of Engineering and Applied Science.

The study, which includes researchers from Northwestern, NorthShore University HealthSystem (NorthShore) and Boston Medical Center, was published online in *PLOS ONE*.

Backman has been studying cell abnormalities at the nanoscale in many different types of cancers, using an optical technique he pioneered called partial wave spectroscopic (PWS) microscopy. PWS can detect cell features as small as 20 nanometers, uncovering differences in cells that otherwise appear normal using standard microscopy techniques.

His previous studies have shown promise that PWS can assess the risk of lung, colon and pancreatic cancers in humans. This sort of prescreening can lead to earlier, life-saving interventions. This is the first study to use PWS to predict a cancer prognosis, the likely course of the disease.

Prostate cancer is the second-leading cause of cancer deaths in American men, but doctors also say it is often overdiagnosed and overtreated. By age 80, more than 50 percent of men will develop prostate cancer but not all will have the aggressive, deadly form of the disease.

However, because their prognosis is unknown, many opt for aggressive treatments that have side effects that cause urinary, bowel and erectile dysfunctions and more.

"The goal is to find specific biomarkers of aggressive cancers," said Charles Brendler, MD, Co-Director of the John and Carol Walter Center for Urological Health & Program for Personalized Cancer Care at NorthShore and author of the study. "These biomarkers will allow us to individualize our treatment recommendations and improve patient outcomes."

To be able to give a patient a prognosis, not just identification of risk of tumors, would be a major advancement, said Dr. Hemant K. Roy professor of medicine and Chief of gastroenterology at Boston Medical Center and an author of the study.

"This approach may allow tailoring of clinical decisions regarding management of patients with prostate cancer, thus maximizing the benefit and minimizing the harms of therapy," Roy said.

In this study, researchers analyzed prostate tissue biopsies from two cohorts of prostate cancer patients. The first cohort included eight men with non-progressing cancer and 10 with progressing cancer. The PWS operator was blinded to the clinical status of the patients.

The second cohort was comprised of 10 progressors and 10 non-progressors in which the PWS investigators were blinded to the entire group.

There was a profound increase in nano-architectural disorder in the progressors as compared to the non-progressors. This assessment may represent a powerful biomarker to predict cancer progression for men with early-stage prostate cancer.

"This study has high quality data because it was done in a blinded fashion," Backman said. "Given that even in the unblinded dataset the investigator responsible for data acquisition was unaware of the clinical status, there is no possibility of bias."

More studies are planned to further this research. Backman also hopes to use similar techniques to predict cancer progression in ovarian, breast and esophageal cancers.

More information: *PLOS ONE*, journals.plos.org/plosone/arti … journal.pone.0115999

Provided by Northwestern University