UNDERSTANDING YOUR PROSTATE **BIOMARKERS**

PCEC
PROSTATE CONDITIONS EDUCATION COUNCIL

WHAT ARE BIOMARKERS AND WHAT DO THEY MEAN FOR ME?

A Biomarker, short for Biological Markers and sometimes just referred to as Markers, are genes, proteins or other substances that can be tested to determine important information about your cancer. Biomarkers can be tested through blood, saliva, urine or tissue samples. Understanding biomarkers can help personalize patient care from early detection, diagnosis, to treatment choices. Advanced science researchers have developed a variety of tests that look at each person's biomarkers and help determine individual risk for prostate cancer, the need for biopsies or repeat biopsies and often the best course of treatment.

Biomarker testing for ***genomic*** and ***genetic*** factors in prostate cancer involves examining the DNA in prostate cells to see if there are any changes that might lead to cancer or affect how it grows.

BIOMARKER/GENETIC TESTING

Biomarker testing looks at the DNA in prostate cells to see if there are any changes that might cause cancer or change how it grows. This type of testing gives a complete picture of your genes, like a big map. Scientists look for mistakes or changes that could increase your risk of getting prostate cancer or make the cancer grow faster.

Your Body's Blueprint: Inside each of your cells is a special code called DNA, which is a blueprint that tells your body how to grow and work. Sometimes, changes in DNA can lead to diseases like cancer.

Genes and Cancer: Genes are like the chapters in your body's instruction manual. Some genes make cells grow out of control, and lead to cancer. In prostate cancer, certain genes play a role in how the cancer grows and spreads.

What Genetic Testing Does: Genetic testing looks closely at the genes inside your prostate cancer cells. It checks for any changes or differences in these genes that might affect how the cancer behaves.

Personalized Treatment: By understanding the genomic/genetic makeup of your cancer, doctors can personalize your treatment plan. They can choose the treatments that may work for you based on your unique genetic information.

Empowering Knowledge: Genetic testing helps doctors make more informed decisions about your care that can help inform treatment decisions.

GENETIC TESTING

Is like zooming in on specific parts of the DNA, focusing on the genes known to be important for prostate cancer. Scientists look for changes in these genes that might increase the risk of developing cancer or affect how the cancer behaves.

This type of testing can provide valuable information about a person's inherited risk of prostate cancer, which is important for individuals with a family history of the disease. Men with a family history of prostate cancer, breast, ovarian, pancreatic, and colon cancer are at a higher risk. Genetic testing can identify inherited mutations that contribute to this increased risk.

Your DNA: DNA is like the instruction manual for your body. It tells your body how to grow, work, and stay healthy. Changes or mistakes in your DNA can increase your chances of getting certain diseases, like prostate cancer.

Special Genes: In genetic testing for prostate cancer, doctors look at certain genes that are known to be linked to the disease. These genes can give important clues about a person's risk of developing prostate cancer and how the cancer might grow and spread.

What the Test Does: The genetic test checks your DNA to see if there are any changes in the genes related to prostate cancer. Finding these changes can help doctors understand your risk of developing the disease and guide decisions about screening and treatment.

Personalized Care: Genetic testing can also help personalize your care. It can give doctors information about which treatments might work best for you based on your unique genetic makeup.

Empowering Knowledge: By understanding your genetic risk for prostate cancer, you can take steps to protect your health. This might include more frequent screenings or making lifestyle changes to reduce your risk.

By having these tests, doctors can learn more about a person's prostate cancer and how it might respond to different treatments. It helps make personalized decisions to make the most informed care decision possible to each patient.

KEY TERMS:

Biomarkers/Markers: Prostate cancer markers are crucial for personalized patient care, aiding in early detection, diagnosis, and treatment decisions. Various tests examine genes or biomarkers to determine an individual's risk for prostate cancer, the necessity of biopsies, and the optimal treatment approach.

ctDNA: Circulating Tumor DNA. This is DNA from cancer cells that is found in the blood. By testing for ctDNA, doctors can learn about the cancer and how it is responding to treatment without needing a biopsy.

Genomic Testing: Looks at all of a person's genes to find any changes that might predispose them to prostate cancer or affect cancer growth.

Genetic Testing: Focuses on specific genes important in prostate cancer, identifying mutations that increase risk or change how cancer behaves.

HRR mutations: Changes in the genes that are responsible for fixing damaged DNA. If these mutations are present, it means these genes might not repair DNA correctly, which can lead to cancer.

- **Homologous Recombination Repair (HRR):** A type of gene that repairs a type of damage to your DNA.
- **Mutation:** A variation in a gene.
- **Acquired Mutation (Somatic Tumor):** Mutations that are not inherited and can occur throughout life. Mutations are not fully random, as several risk factors for increased mutations exist.
- **Inherited Mutation (Germline):** A mutation that is passed down through family members.

HRR Testing: HRR testing looks for changes or problems in the genes that help fix DNA damage in cells. If these genes don't work right, it can increase the risk of cancer, including prostate cancer.

Lab Report: Document that shows the results of medical tests. For prostate cancer testing, a lab report will include details about any genetic changes, like HRR mutations, and other important information that helps doctors understand the patient's cancer and decide on the best treat.

Androgen Receptor (AR): A protein receptor involved in prostate cell growth and development, with implications in prostate cancer progression.

Benign Variant: Are genetic changes that are not associated with disease and are considered harmless.

BRCA1 and BRCA2: These are genes that produce proteins responsible for repairing damaged DNA and maintaining the stability of the cell's genetic material. Mutations in these genes can increase the risk of developing breast, ovarian, and prostate cancers. While BRCA1 and BRCA2 are well-known for their association with breast and ovarian cancer, they also play a role in prostate cancer risk. Mutations in these genes can be inherited from parents and increase the likelihood of developing prostate cancer.

Cascade Testing: Cascade testing involves testing the relatives of individuals who have been identified as having a specific genetic mutation associated with a hereditary condition, such as cancer. The goal of cascade testing is to identify other family members who may also carry the mutation and be at increased risk of developing the condition.

Caveolin-1: Caveolin-1 (Cav-1): A protein that may be associated with tumoral progression for prostate cancer, it has been used as a serum biomarker for active surveillance reclassification.

Circulating MicroRNA (miRNA): Gene regulators in blood that indicate prostate cancer progression.

Circulating Prostate Cells (or Circulating Tumoral Cells (CTC)): Liquid biopsies of blood and can give insight into the spread and aggressiveness of the cancer.

Clinical Utility: Clinical utility refers to the practical value or usefulness of genetic testing results in guiding clinical decision-making and patient management. Practical value of genetic testing in guiding treatment and improving outcomes.

Copy Number Alterations (CNA): Changes in the number of copies of specific DNA segments within the genome of cancer cells.

DNA (Deoxyribonucleic Acid): DNA is a molecule that carries the genetic instructions used in the growth, development, functioning, and reproduction of all known living organisms and many viruses. It is the hereditary material in humans and almost all other organisms.

ERG (ETS-Related Gene): A gene involved in chromosomal rearrangements often seen in prostate cancer, with diagnostic and prognostic implications.

False Positive vs. False Negative: The distinction between incorrect indications of a condition's presence (false positive) and absence (false negative) in testing.

Family History: Medical information about a person's close relatives, including parents, siblings, grandparents, aunts, uncles, and sometimes more distant relatives. This information includes details about medical conditions, diseases, and health behaviors that are common in the family, providing a comprehensive view of genetic and environmental factors that may affect an individual's health.

Gene Expression Profiling: Analyzing gene expression patterns in prostate cancer tissue to understand tumor biology and predict outcomes.

Genetic Counselor: A genetic counselor is a healthcare professional who can provide information and support to individuals or families to help them understand testing available and their genetic information to make informed decisions about their health.

Genomic Instability: Tendency for DNA changes in cancer cells, promoting growth and progression.

Germline Mutation vs. Somatic Mutation: Distinguishing inherited genetic changes (germline) from those acquired during life (somatic), affecting disease risk and treatment.

Germline Mutation: A genetic change that is inherited from parents and present in all cells of the body. These mutations can increase the risk of developing certain diseases, including cancer, and can be passed down to future generations.

Gleason Score: A grading system assessing prostate cancer aggressiveness based on tumor cell appearance.

Hereditary Cancer: Cancer that is caused by inherited genetic mutations passed down from parents to their children. Individuals with hereditary cancer have a higher risk of developing cancer at a younger age and may have family members with a history of the same type of cancer.

HOXB13: This is a gene that provides instructions for making a protein involved in the development and function of the prostate gland. Mutations in the HOXB13 gene have been associated with an increased risk of hereditary prostate cancer, meaning that individuals with these mutations have a higher likelihood of developing prostate cancer compared to the general population.

Ki-67: A protein marker indicating cell proliferation, potentially signaling aggressive prostate cancer.

Liquid Biopsy: Non-invasive testing analyzing bodily fluids such as blood, urine, or saliva that detects and looks at cancer-related biomarkers to get important information about the presence, progression and genetic characteristics of cancer.

Microsatellite Instability (MSI): Condition with DNA errors affecting repair and treatment response.

Molecular Test: Laboratory tests analyzing genetic material or proteins to provide detailed health or disease information.

Multigene Panel Testing: Analyzes multiple genes linked to prostate cancer susceptibility or prognosis simultaneously.

Next-Generation Sequencing (NGS): High-throughput DNA sequencing identifying genetic mutations in prostate cancer patients.

Pathogenic Variants: Genetic mutations that are known to cause or increase the risk of disease, such as cancer.

Pharmacogenomics: Study of how genetic variations influence medication responses, guiding personalized treatment.

Polygenic Risk Score (PRS): Numerical score summarizing genetic disease susceptibility, aiding risk stratification and prevention.

PSA Testing (Prostate-Specific Antigen Testing): A blood test used to measure the level of prostate-specific antigen (PSA) in a man's blood. PSA is a protein produced by both normal and malignant cells of the prostate gland.

PTEN (Phosphatase and tensin homolog): Tumor suppressor gene alterations associated with aggressive prostate cancer.

Risk Stratification: This refers to the process of categorizing patients into different risk groups based on factors such as genetic testing results, tumor characteristics, and other clinical features. Risk stratification helps healthcare providers determine the most appropriate treatment approach and predict the likelihood of disease recurrence or progression.

Somatic Mutation: Non-inherited genetic changes occurring during life, influencing prostate cancer progression.

Specificity vs. Sensitivity: Accurate identification of true negatives (specificity) and true positives (sensitivity) in testing.

Sporadic Cancer: Cancer that occurs by chance and is not directly linked to inherited genetic mutations. Most cancers are sporadic, meaning they develop because of a combination of genetic, environmental, and lifestyle factors.

TMPRSS2-ERG Fusion: Genetic alteration detected in prostate cancer cells, with prognostic significance.

Tumor Mutational Burden (TMB): Total mutations in tumor DNA, potentially predicting response to treatments like immunotherapy.

Variant Classification: Variant classification involves categorizing genetic variants based on their potential impact on health. Variants are typically classified into categories such as pathogenic (harmful), benign (harmless), or of uncertain significance (meaning their significance is unclear).

Variant of Uncertain Significance (VUS): A genetic variant identified through testing that has uncertain or unknown significance in terms of its association with disease risk. VUS results are inconclusive and may require further evaluation to determine their clinical relevance.

For more information on Biomarkers in Prostate Cancer, please visit www.prostatemarkers.org or call us at 1-866-4Prost8.

TERMS YOU WOULD LIKE TO KNOW MORE ABOUT:

OTHER QUESTIONS FOR YOUR DOCTOR:

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