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Mind -Boggling Cancer Markers (The New Dawn of Immunotherapy)

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ABSTRACT

To study the Cancer markers is mind -Boggling. It is the new dawn of immunotherapy. This new dawn brings a new beginning. The study gives an idea that How far we have come and where we need to go. Biochemistry, Microbiology, and Pathology are the evidenced-based medicine subjects. Cancer biomarker refers to a substance or process that is indicative of the presence of cancer in the body. A biomarker may be a molecule secreted by a tumor or a specific response of the body to the presence of cancer. Cancer remains the second leading cause of death in US, behind heart disease. Cancer markers and tumor markers are the same things. These markers are substances found in the blood, urine or other body fluids and their levels indicate the presence of certain types of cancer, according to the National Cancer Institute. However, there are also non-cancerous conditions that can affect these markers; therefore, the laboratory personnel performs additional testing, such as biopsies, prior to making a diagnosis. Tumor markers are useful for screening, especially in an asymptomatic population. For diagnosing asymptomatic patients For monitoring during treatment of the patient and for easy detection of cancer Tumor markers are different from substances produced by normal cells, in quality and quantity. Tumor markers may be used to help to diagnose cancer, predict and monitor response to treatment and determine whether cancer has recurred after treatment.

INTRODUCTION

Brain tumors are the leading cause of death by solid tumors in children. Although improvements have been made in their radiological detection and treatment, our capacity to promptly diagnose pediatric brain tumors in their early stages remains limited.(1) Quantitative proteomics represents a powerful approach for the comprehensive analysis of proteins expressed under defined conditions of the brain tumor. The brain tumor is a collection or cancer is a debilitating disease whose trend is continuously increasing.(2) Research investigating biomarkers for early detection, prognosis and prediction of treatment response in breast cancer is rapidly expanding. However no validated biomarker currently exists for use in routine clinical practice, and breast cancer detection and management remains dependent on invasive procedures. Histological examination remains the standard for diagnosis, whereas immunohistochemical and genetic tests are utilized for treatment decisions and prognosis determinations. (3)Osteosarcoma is the most frequent malignant bone neoplasm, followed by chondrosarcoma and Ewig sarcoma. The diagnosis of bone sarcoma is generally made through histological evaluation of a biopsy. (4)It is expected in the near future high risk of human papillomavirus (hr-HPV) testing will be implemented as a primary cervical cancer screening method in some countries. However, only a fraction of hr-HPV positive women will have a clinically relevant lesion. As a result, there is an urgent need to additional biomarkers that can detect these lesions and that can at the same time be applied to cytological specimens.(5)Prostate cancer (PCa) is a leading cause of cancer -related death of men globally. Since its introduction, there has been intense debate as to the effectiveness of the prostate-specific antigen (PSA) test as a screening tool for PCa. It is now evident that PCa test produces unacceptably high rates of false positive results and it is not prognostic.(6)Colorectal cancer(CRC) is the third most common epithelial malignancy in the world. Since CRC develops slowly from the removable precancerous lesions, detection of the lesion at an early stage by regular health examination can reduce the incidence and mortality of this malignancy.(7)Tumor markers provide a minimally invasive, cost-effective source of data values for monitoring disease course, determining prognosis and aiding in treatment planning .(8)Despite extensive progress in treatment of cancer in recent decades, the early diagnosis for gastric cancer (GC) and colorectal cancer (CRC) remains poor. Exploring the diagnostic value of joint detection of thymidine kinase(THI), Carcinoembryonic antigen(CEA), Carbohydrate antigen 19-9(CA19-9) Carbohydrate antigen

72-4 CA in the diagnosis of GC and CRC.(9)Cancer is a major public health issue worldwide, and nowadays, it represents a leading cause of death worldwide.(10)Cancer is the second cause of mortality worldwide, after cardiovascular disease. Increased prevalence of cancer but also the fact that most often the diagnosis is established at a moment when therapeutic resources are already limited.(11) Brest cancer and prostate cancer amount for 26% of all cancers in the United States. (12)Clinical chemistry laboratories played a limited role in the investigation of cancer patients. Examples are urine Bence Jones protein in multiple myeloma, fecal occult blood as a screening test for colorectal cancer and fractional test meals to identify achlorhydria in gastric cancer. Serum uric acid, calcium and alkaline phosphatase were of clinical value in leukemia and bone metastases. Analysis of serum acid phosphatase reported in 1940 showed it was significantly raised in prostate cancer with metastases. Serum alanine and aspartate transaminases, which were raised in hepatocellular carcinoma.(13)The definition of a tumor marker is broad. It consists of any product of either the tumor itself or the host in reaction to the tumor's presence, that distinguishes malignant tissues from benign and measurable in the body fluids or tissues.(14)A tumor biomarker is a substance, measurable in cancer patients, whose detection reflects the presence of a tumor. (15)The brain tumor is a collection or cancer is a debilitating disease whose trend is continuously increasing. The most studied molecular deviations in cancer are genetic alterations. Metabolism of the tumor cell is different to some extent as compared to the normal cell. In order to defeat cancer, mechanism of disease must be well understood,(16)American women will be diagnosed with this neoplasia and that more than 40,000 will die of this disease in the United States.(17) Cervical cancer is the third most common malignancy in women worldwide, down from leading cause of cancer death 50 years ago.(18) Prostate cancer (PCa) is the second most common cause of male cancer related deaths and the most common male non-cutaneous malignancy in the western world.(19) Prostatic acid phosphatase(PAP) is a glycoprotein dimer produced predominately by the prostate and was initially used as a serum biomarker for the detection of metastatic PCa. (20)

History

First biomarker used in the diagnosis of cancers being the Bence-Jones protein in the year 1848. Early in 20 th century the discovery of the other tumor biomarker such as human chorionic gonadotropin (hCG) In 1928, prostatic acid phosphatase (PAP). In 1936, Tissue peptide antigen (TPA).In 1957, alfa-fetoprotein(AFP)CEA was first identified. In 1963,

carcinoembryonic antigen (CEA) in 1965 by Phil Gold and Samuel O. Freedman in human colon cancer tissue extracts. (21). In 1979 Carbohydrate antigen (CA19-9).Their clinical utility has led to their use today as an efficient tool in the diagnosis or the evaluation of response to therapy in the case of various forms of cancer. Clinical chemistry laboratories played a limited role in the investigation of cancer patients. Examples are urine Bence Jones protein in multiple myeloma, fecal occult blood as a screening test for colorectal cancer and fractional test meals to identify achlorhydria in gastric cancer. Serum uric acid, calcium and alkaline phosphatase were of clinical value in leukemia and bone metastases. Analysis of serum acid phosphatase reported in 1940 showed it was significantly raised in prostate cancer with metastases. Serum alanine and aspartate transaminases, which were raised in hepatocellular carcinoma.

SIGNIFICANT GAP IN RESEARCH

With the well-described drawbacks of the PSA test, there is a concerted effort to develop replacement screening tools for PCa. The PSA test is currently the best biomarker for PCarecurrence. ELISA, Spectrometry, and antibody arrays, although each method has its advantage and disadvantages. (6,22). The analysis of a multiple biomarkers may better reflect the disease state of an individual and such multiplex assays are the focus for many groups (23)The CEA blood test is not reliable for diagnosing cancer or as a screening test for early detection of cancer. (24)

Most types of cancer do not result in a high CEA level. Serum from individuals with colorectal carcinoma often has higher levels of CEA than healthy individuals (above approximately 2.5 µg/L) (25) CEA measurement is mainly used as a tumor marker to monitor colorectal carcinoma treatment, to identify recurrences after surgical resection, for staging or to localize cancer spread through measurement of biological fluids. (26).CEA levels may also be raised in gastric carcinoma, pancreatic carcinoma, lung carcinoma, breast carcinoma, and medullary thyroid carcinoma, as well as some non-neoplastic conditions like ulcerative colitis, pancreatitis, cirrhosis, COPD, Crohn's disease, hypothyroidism (27) CEA elevation, is known to be affected by multiple factors. It varies inversely with tumor grade; well-differentiated tumors secrete more CEA. CEA is elevated more in tumors with lymph node and distant metastasis than in organ-confined tumors and, thus, varies directly with tumor stage. Left-sided tumors generally tend to have higher CEA levels than right-sided tumors. Tumors causing bowel obstruction produce higher CEA levels. Aneuploid tumors produce

more CEA than diploid tumors. Liver dysfunction increases CEA levels as the liver is the primary site of CEA metabolism. (28)

MAJOR ADVANCES AND DISCOVERIES

The future is promising for new markers, the discovery of which is greatly enhanced by the availability of molecular-based techniques. Genomic analysis, Gene expression, profiling, investigation of epigenetic changes, proteomic-focused studies and isolation/analysis circulating tumor cells all offer new opportunities for biomarker discovery. (29)

Quantitative proteomics represents a powerful approach for the comprehensive analysis of proteins expressed under defined conditions of the brain tumor. The brain tumor is a collection or cancer is a debilitating disease whose trend is continuously increasing.

EXPERT OPINION

The number of candidate biomarkers for the diagnosis of cervical cancer is overwhelming. However, the majority of these biomarkers are tested on histological samples only. Cytological biomarkers are needed to improve the performance of cervical cancer screening programs. The PROBE design may be used to evaluate the accuracy, but unfortunately, the majority of the candidate biomarkers do not meet these criteria. (30)

WHERE THE RESEARCH GO NEXT?

It is expected in the near future high risk of human papillomavirus (hr-HPV) testing will be implemented as a primary cervical cancer screening method in some countries. However, only a fraction of hr-HPV positive women will have a clinically relevant lesion. As a result, there is an urgent need to additional biomarkers that can detect these lesions and that can at the same time be applied to cytological specimens. Prostate cancer (PCa) is a leading cause of cancer -related death of men globally. Since its introduction, there has been intense debate as to the effectiveness of the prostate-specific antigen (PSA) test as a screening tool for PCa. It is now evident that PCa test produces unacceptably high rates of false positive results and it is not prognostic. Colorectal cancer (CRC) is the third most common epithelial malignancy in the world. Since CRC develops slowly from the removable precancerous lesions, detection of the lesion at an early stage by regular health examination can reduce the incidence and mortality of this malignancy.

CURRENT DEBATE

Tumor markers can't be construed as primary modalities for the diagnosis of cancer. Their main utility in clinical medicine has been a laboratory test to support the diagnosis. New investigative techniques at the cellular and molecular level show great promise at different molecular level show great promise at different potentially malignant lesions but further perspective, in-depth studies are required to determine their practical usefulness.(31)The development of personalized medicine for cancer is closely linked to biomarkers, which may serve as the basis for diagnosis, drug delivery and monitoring of diseases. A major challenge in the development of cancer biomarkers will be the integration of proteomics with genomics and metabolomics data and their functional interpretation in conjugation with data and epidemiology (32) "A combination of selected biomarkers for early detection has the potential to change the way we screen for cancer and is based on same rationale for using combinations of drugs to treat cancers"(33).Researchers have identified an enzyme that is absent in the healthy colon tissue but abundant in colon cancer cells. It appears to drive the conversation of normal tissue into cancer by attaching sugar molecules, or glycons, to proteins in the cell. The findings appeared in the Journal of biological chemistry after a team at the University of Copenhagen studied a group of 20 enzymes that initiate the first step in a distinct kind of glycon modification, called Gal Nac-Type O-Glycosylation found on diverse proteins. These enzymes called Galnactransferases (GalNac-Ts) are found in different amounts in different tissues, but their functions are poorly understood,(34). The idea behind a blood test for the disease is that it looks for traces of faulty DNA that cancer cells release into the bloodstream.The advantages of this are that it would be quicker and less invasive than other tests, such as biopsies and rather less expensive Detecting the disease earlier also opens the way for quicker treatment, which is more likely to be successful treatment. For these reasons, an accurate universal blood test is seen as the most viable basis for a future population wide screening programme for cancer. (35)

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