

Tumor markars

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Introduction

- Cancer cells: are characterized by 3 properties:
 1. Diminished control of growth.
 2. Invasion of local tissues.
 3. Spread (metastasis) to the other parts of the body.

- Benign tumour cells: are also characterized by 3 properties:
 1. Diminished control of growth.
 2. Do not invade local tissues.
 3. Do not spread to other parts of the body.

- Causes of cancer : cancer may be caused by:
 1. Agents :radiant energy, chemical compounds, and viruses.
 2. Oncogenes: which are genes capable of causing cancer.

- Agents that cause cancer:
- Radiant energy (radiation):
- Ultraviolet rays, x-rays and y rays.
- They cause cancer through:
 1. Direct effects on DNA.....DNA damage.....cancer formation.
 2. Formation of free radical e.g superoxide.....DNA damage.....cancer formaion.

- Chemicals:
- About 80 percent of human cancer are caused by environmental factors. Principally chemicals. exposure to such compounds can occur because :
- Pollution.
- Occupation e.g benzene
- Diet: aflatoxin B1, which is produced by the mold aspergillus flavus and sometimes food.
- Life style e.g cigaratte smoking.

- Oncogenes:
- Human genome contain tow classes of genes:
 1. Oncogenes :which are genes that promote development of cancer (tumors).
 2. Tumor suppressor gene: which are genes that suppress the development of cancer (tumors).

- Tumor markers: are biologic substances synthesized and released by cancer cells, or produced by the host cells in response to the presence of cancerous tissue.
- Site: tumor markers may be present in circulation , in body fluids or associated with cells : in the cytoplasm or on cell membrane.

- Structure:
- Tumor markers may be enzymes, hormones, and proteins (tumor antigen).

Clinical importance of ideal tumor marker:

- Ideally , tumor marker should provide the following uses in patients having cancer:
- Detection of tumors.
- Screening
- Diagnosis
- Staging
- Monitoring
- Assessing prognosis
- Detecting recurrence

Properties of ideal tumor markers:

- Have high disease sensitivity . it should be positive in all patients with particular cancer.
- Have high disease specificity .it should be negative in all normal population.
- Its level reflects the stage of the disease.
- Its level must be stable .
- Organ specific. Positive only in certain organ tumor.

- Types of tumor markers: they are divided in to 2 types cellular and humoral.

1. Cellular (tissue) tumor markers:

- They include antigens located on the cell membrane or intra cellular components as oncogenes.

1. Humoral (serum)tumor markers:

These are substances , which can be detected in serum.

They are usually synthesized and excreted by tumor cells or released on tumor disintegration or formed as a result of reaction of the organism to a tumor.

Classification of tumor markers:

- Tumor markers can be classified into hormones , enzymes and tumor antigens:
 - A. Hormones:
 1. Example of hormones that are used as tumor markers are :ATCH , ADH, calcitonin, HCG, PTH, growth hormone and prolactin.
 2. The production of hormones in cancer involves two separate routs:

- a. an excess production of a hormones by the endocrine tissue that normally produces it.
- b. A hormone may be produced at a distant site by a non-endocrine tissue that normally does not produce the hormone. this condition is called entopic syndrome.

B. enzymes:

1. An increase in an enzyme or isoenzymes is not specific or sensitive enough to be used for identifying the type of cancer or the specific organ involvement.

2. Example of enzymes that are used as tumor markers are :alkaline phosphatase and prostatic acid phosphatase.

C. Tumor antigens:

1. Oncofetal antigens:

- a. These are proteins produced normally during fetal life. they are present in high concentration in the sera of fetuses and decrease to low levels or disappear after birth.
- b. In cancer patients, these proteins re-appear.

- C. the production of these proteins demonstrates that certain genes are reactivated as the result of the malignant transformation of cells.
- D. they include carcinoembryonic antigen(CEA) and alfa-fetoprotein(AFP).
- 2.Other tumor antigen:
 - a.Carbohydrate antigen 19.9

- Cancer antigen 125
- Cancer antigen 15.3
- Cancer antigen 50
- Cancer antigen 27.4
- Squamous carcinoma antigen.
- Prostatic specific antigen.
- Tissue polypeptide antigen

- 3.proteins:
- a.B2 macroglobulin
- B.ferritin.

Examples of some clinically important tumor markers.

- A.AFP(alpha feto protein):
 - 1.This is the major serum protein in fetus.
 - 2.It is synthesized by yolk sac,liver and GIT.
 - 3.AFP level increases in cancers as cancer tests and hepatic carcinoma.

- B.CEA(carmino embronic antigen):
 - 1.A glycoprotein synthesized by tumor cells and normal colonic epithelium.
 - 2.It is carried on the cell surface membrane and normally sheds with feces.
 - 3.In cancer it sheds in serous fluids.
 - 4.Raised level is non specific.
 - a. It is detected in 65 percent of colorectal cancer.
Cancer of colon and rectum.

PSA(Prostatic specific antigen)

1. Widely accepted tumor marker in prostatic cancer.
2. Glycoprotein produced only by prostatic epithelial cells and it is organ specific.
3. Normal level: 0-4 ng/ml.
4. Elevated level (more 4 ng/ml) occurs in:
 - a. 65 percent of localized prostatic cancer.
 - b. 40 percent of benign prostatic hypertrophy.

- D. thyroid: (calcitonin):

First degree relatives of patients with medullary thyroid carcinoma can be screened by measuring calcitonin levels(20 percent of these carcinoma have a familial history.

- E.HCG(Human chorionic gonadotropin):
- 1.produced by placenta , and used for detection of pregnancy.
- 2.reaching maximum level at 8 th week of gestation.
- 3.it is produced also by abnormal trophoblastic tissue.
- 4.it is composed of alpha nonspecific and beta specific subunits.
- 5.it increases in chorion carcinoma and can detect a tumor mass of 1 mg.

- Thank you