TUMOR MARKERS

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Content:

-what are the tumor markers
-properties of good tumor markers
-potential uses of tumor markers
-classification of tumor markers

What are the tumor markers?

- Tumor markers are defined as a biochemical substance (e.g. hormone, enzymes or proteins) synthesized and released by cancer cells or produced in the host in response to cancerous substance.
- They are used to monitor or identify the presence of cancerous growth.
- They are different from substances produced by normal cell in quantity and quality.

Classified into :

-1tumor specific antigens
expressed by tumor cell ,not present in normal host cell

-2tumor associated antigens
self antigens produced by tumor cell,present in a subset of normal host cells

Tumor marker may be present in

- **Blood circulation**
- **Body cavity fluids**
- **Cell membranes**
- **Cell cytoplasm**
- **DNA**

A good tumor maker should have those properties:

1.A tumor marker should be present in or produced by tumor itself and may present in healthy tissue in very small amounts or in benign conditions in minimal levels.

2.A tumor marker should be specific for a tissue, it should have different immunological properties when it is synthesized in other tissues.

3. Plasma level of the tumor marker should be in proportion to the both size of tumor and activity of tumor

4. A tumor marker should be present in plasma at a detectable level, eventhough tumor size is very small

5.Half life of a tumor marker should not be very long

Ideal tumor marker

The clinical usefulness of tumor markers can be assessed by determination of
Sensitivity (positive in all patients with this cancer especially in the early stage).
Specificity (negative in normal people and in other diseases or benign conditions).
A ideal tumor marker should have 100% specificity and 100% sensitivity, but it does not exist.

Potential uses of tumor markers

- **Screening**

- **Diagnosis**

- **Prognosis**

- **Response to treatment**

- **Follow up**

Classification:

- **Oncofetal antigens (AFP&CEA)**

- **Enzymes (PSA)**

- **Hormones (HCG)**

- **Carbohydrates (CA19-9&CA-125)**

Classification

- Oncofetal antigens:

AFP:ALPHA-FETOPROTEIN

●Definition of AFP.

-is a protein produced by the **liver** and **yolk sac** of a developing baby during pregnancy.
-AFP is found mainly in **liver cancer** and **germ cell tumors of the testicles or ovaries**.
-Some people with **cirrhosis** or **chronic active hepatitis** also have higher blood levels of AFP.
-AFP is also higher in people with the **rare genetic condition ataxia-telangiectasia**.

AFP cont…

- **potential use of AFP**

-help **diagnose** liver cancer, testicular cancer.
-track cancer **treatment**.
-see if cancer has **come back** after treatment.

- **Results of AFP**

-AFP is measured in **nanograms per milliliter** (ng/mL).
-**Normal** value : **less than 20 ng/mL**.
-**Greater** than **400**ng/mL could be a sign of **liver cancer**.
-Also could be a sign of **cirrhosis** or **chronic acute hepatitis**.

Cont…

CEA: CARCINOEMBRYONIC ANTIGEN

- **Definition of CEA**

-It is produced by **embryonic tissue** of the gut, pancreas, and liver

-It is a complex glycoprotein **elaborated** by many different neoplasms

-It **lacks** both the **sensitivity** and **specificity** required for the detection of early cancers.

CEA Cont…

- **Results of CEA**

-CEA is measured in nanograms per milliliter (ng/mL).

-**Normal** value : **2.5 ng/mL** or lower in nonsmokers

-**Normal** value : **5.0 ng/mL** in smokers

-**Greater** than **20 ng/ml** could be a sign of :

1.colorectal carcinoma
2. Pancreatic carcinoma
3. Gastric and breast carcinoma
4. noncancerous liver diseases (cirrhosis/hepatitis)
5. Ulcerative colitis

Enzymes:

PSA: prostate specific antigen

- **Definition of PSA.**

-a protein produced by normal, as well as malignant, cells of the prostate gland
-Worldwide, prostate cancer is the fourth most frequent malignancy in males.
-it was recommended that both PSA and DRE should be offered every year, starting at 50 years of age for screening.

PSA Cont…

PSA

- **potential use of PSA.**

-**Screening at age 50 or older**

-**Screening at age 40 or 45** if the patient have a **family history** of prostate cancer.

-help in **diagnosis**, assess **response to treatment**, and to look for **recurrence**

- **Results of PSA**

-Results are given in nanograms per milliliter, ng/mL.

-**Normal** value : **4.0** ng/mL

-Elevated in :

1.Prostate cancer

2.prostatitis

Hormones:

HCG: Human chorionic gonadotropin

- **Definition of HCG.**

-Human chorionic gonadotropin (hCG) is a hormone, made up of an alpha and beta subunit, that is produced by the **placenta** during normal gestation and forms the basis for pregnancy tests for urine or serum samples.

-Some abnormal tissues, tumors, and cancers, however, may also produce hCG, making the hCG test useful as a tumor marker.

-Used to detect both **gestational trophoblastic disease (GTD)** and **germ cell tumor**

HCG CON…

●potential use of HCG.

-Help **diagnose** and monitor gestational trophoblastic disease or germ cell tumors.
-Evaluate the effectiveness of **treatment**
-Monitor for **recurrence**
-**Check the pregnancy** in a normal situation.

●Results of HCG

•**Normal** value : **1ng/ml > in non-pregnant**
•Elevated in :
1.Germ cell tumors of the testis
2.Trophoblastic tumors
3.Lymphoproliferative disorders
4.Melanoma
5.Some carcinomas of (GIT/lung/breast/ovary)

Carbohydrates:

1. CA–19-9

- **Definition of CA-19-9.**

-also known as **Sialyl Lewis-a**, is a cell surface glycoprotein complex.

-It may be found in the blood when it is shed by cancer cells.

-For pancreatic cancer the reported **sensitivity** and **specificity** for the **diagnosis of pancreatic cancer are 79% and 85%.**

Cont…

●potential use of CA-19-9.

-help **diagnose** or make decisions about treatment for pancreatic cancer

-Evaluate the effectiveness of **treatment**.

-Monitor for **recurrence.**

●Results of CA-19-9

Results are given in units per milliliter (U/mL).

-Normal value : less than 37 U/mL.

-**greater** than **37 U/ml** could be a sign of :

1. Pancreatic cancer
2. Pancreatitits
3. Obstructive jaundice
4. Cholangitis
5. Other cancers such as (cholangiocarcinoma/ colorectal)

Cont…

2. CA-125

- **Definition of CA-125.**

-antigenic tumor marker that is commonly expressed by the epithelial ovarian neoplasms and other tissues such as cells lining the endometrium, fallopian tubes, pleura, peritoneum, and pericardium.
-one of the serological tests, which is carried out when suspecting ovarian neoplasm
-The specificity is particularly low in premenopausal women; thus, it is most useful in postmenopausal women.

Cont...

- **potential use of CA-125.**

-help in **diagnosis**.

-Evaluate the effectiveness of **treatment**.

-Monitor for **recurrence.**

- **Results of CA-125.**

Results are given in units per milliliter (U/mL).

- normal value : less than 35 U/mL.

-**greater** than **35 U/ml** could be a sign of :

1. Ovarian cancer
2. Endometriosis
3. PID
4. Pregnancy
5. Liver disease

TUMOR MARKER	ASSOCIATED CANCER(S)	USUAL SAMPLE	USE(S)	COMMENTS
AFP (Alpha-fetoprotein)	liver, ovarian, testicular	Blood	Helps diagnose, monitors treatment and for recurrence.	Also elevated during pregnancy and hepatitis.
CA 15-3 (Cancer antigen 15-3 and CA 27.29 are two different tests for same marker	Breast	Blood	Monitors treatment and for recurrence	Also elevated in other cancers (lung, ovarian), benign breast conditions, hepatitis.
CA 19-9 (Cancer antigen 19-9)	Pancreatic, sometimes bile ducts, gallbladder, stomach, colon	Blood	Monitors treatment and for recurrence	Also elevated in other forms of digestive tract cancer, thyroid disease, pancreatitis, inflammatory bowel disease.
CA-125 (Cancer antigen 125)	Ovarian	Blood	Helps diagnose, monitors treatment and for recurrence	Also elevated with other cancers (e.g., endometrial, fallopian tube), pelvic inflammatory disease.

TUMOR MARKER	ASSOCIATED CANCER(S)	USUAL SAMPLE	USE(S)	COMMENTS
CEA (Carcino-embryonic antigen)	Colon, pancreatic, lung, breast, ovarian, medullary thyroid, others	Blood	Stages cancer, determines prognosis, monitors treatment and for recurrence.	Elevated in conditions such as RA, hepatitis, COPD, colitis, pancreatitis, and in cigarette smokers.
HCG (Human chorionic gonadotropin, also called Beta-HCG)	Testicular and trophoblastic disease, germ cell tumors, choriocarcinoma	Blood, urine	Helps diagnose, monitors treatment and for recurrence.	Elevated in pregnancy.
Lactate dehydrogenase (LD, LDH)	Testicular and other germ cell tumors	Blood	Stages cancer, guides treatment, monitors treatment and for recurrence.	Elevated in a wide variety of conditions; may be used in other cancers (e.g., lymphoma, neuroblastoma).
PSA (Prostate specific antigen)	Prostate	Blood	May be used for screening, helps diagnose, monitors treatment and for recurrence.	Also elevated in benign prostatic hyperplasia (BPH), prostatitis; may be used for screening.


THANK YOU!