



Tumor markers

Lujain Bawaliez
Reem Rawashdeh
Misyana Hijazeen

Definition

A Tumor marker is a biochemical indicator for the presence of a tumor. In clinical usage, the term usually refers to a molecule that can be detected in plasma or other body fluids.

Although tumor markers can be elevated in the setting of cancer, some patients may not show marker elevation and, on the other hand, benign conditions can also cause false-positive elevation of these markers

Characters of an ideal tumor marker

- Produced specifically by either malignant or premalignant tissue that has a high predisposition of progressing to malignancy.
- Produced at high levels in all patients with a specific tumor type.
- Produced in an organ-specific manner.
- Measurable in an easily accessible body fluid during early malignancy or during a premalignant phase.

Categories of Tumor Markers

1. Tumor-derived

- Molecules produced by the neoplastic cells includes :
 - Differentiation antigens
 - Oncofetal antigens(CEA/AFP)
 - Isoenzymes (PAP/NSE)
 - Hormones (HCG/ACTH)
 - Tissue-specific proteins (PSA)

2. Tumor-associated (host-response)

- Metabolic and immunologic products of normal tissues produced in response to the presence of the neoplastic tissue.
- Tumor-associated markers have been used with tumor-derived markers to provide additional information about certain cancers, to determine or confirm the extent of the disease or its prognosis. and to therefore aid in therapeutic management.

Where are tumor markers typically found?

A. Circulating markers:

- blood.
- urine.
- Stool.
- Saliva.

B. Tissue markers :

- bone marrow.

Uses

Tumor markers are used for :

- Screening
- Determining diagnosis and prognosis
- Assessing response to therapy
- Detecting early or recurrent metastasis

Non-cancerous conditions cause tumor markers to rise:

- Anemia.
- Thyroid disease.
- Ovarian cysts. (benign)
- Kidney disease.
- Kidney stones.
- Hepatitis.
- Sarcoidosis.

EXAMPLES OF TUMOR MARKERS

Table 1 Summary of the most common tumor markers associated with abdominal and pelvic tumors

Most common tumor markers	Tumor
CEA (carcinoembryonic antigen)	Colorectal cancer
PSA (prostate-specific antigen)	Prostate cancer
AFP (alpha-fetoprotein)	Hepatocellular carcinoma, germ cell tumor
CA 19-9	Pancreatic cancer
CA 125	Ovarian cancer
B-HCG (beta subunit of human chorionic gonadotropin)	Germ cell tumor
LDH (lactate dehydrogenase)	Germ cell tumor
CgA (chromogranin A)	Neuroendocrine tumors

B-HCG

- HCG is produced by syncytiotrophoblasts in the placenta during normal gestation and forms the basis for pregnancy tests for urine or serum samples.
- Structurally composed of two peptides, the beta-subunit has a unique carboxyl terminal.
- The placental hormone HCG comes closest to being an ideal tumor marker.
- Used to detect both gestational and germ-cell-derived choriocarcinoma

B-HCG

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

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

Normal value : 4ng/ml > (the higher a man's PSA level, the more likely it is that he has prostate cancer.)

Elevated in :

- Prostate cancer
- BPH
- prostatitis

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

Normal value: 2.5 ng/ml >

Elevated in :

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

AFP

- a protein that the liver makes when its cells are growing and dividing to make new cells.
- Usually high in unborn babies.

AFP

- Normal value : 8ng/ml >
- **Elevated in :**
 - Cancer of the liver, ovaries, or testicles.
 - Renal cell carcinoma
 - Cirrhosis
 - Chronic acute hepatitis

CA-19-9

- also known as Sialyl Lewis-a, is a cell surface glycoprotein complex.
- For pancreatic cancer the reported sensitivity and specificity for the diagnosis of pancreatic cancer are 79% and 85%.
- It was first described using a mouse monoclonal antibody in a colorectal carcinoma cell line

CA-19-9

- Normal value: 37 U/mL >
- **Elevated in :**
 - Pancreatic cancer
 - Pancreatitis
 - Obstructive jaundice
 - Cholangitis
 - Other cancers such as (cholangiocarcinoma/ colorectal)

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.

CA-125

- Normal value: 37 U/mL >
- **Elevated in:**
 - Ovarian cancer
 - Endometriosis
 - PID
 - Pregnancy
 - Liver disease

Screening with markers

- Several liquid biopsy-based assays that test for multiple tumor markers to detect cancer early :
 - PapSEEK : ovarian and endometrial cancer-related alterations in DNA obtained from fluids collected during a routine Pap test.
 - CancerSEEK is a blood test that detects DNA mutations and protein biomarkers linked to multiple types of cancer.
 - UroSEEK is a urine-based test that detects the most common alterations in 11 genes linked to bladder and upper tract urothelial cancers.



THANK YOU