

Tumor Markers

Tumor markers (TM) are laboratory detectable biomarkers that can be elevated by the presence of one or more types of cancer

- In the narrower (clinical) sense of the word substances that can be **determined** in blood, urine or tissue and have a higher value in cancer
- Used to clarify the diagnosis, monitor the course of therapy and early detection of disease relapse
- Can be **produced** directly by tumor cells or non-tumor cells in response to the presence of a tumor (can also be elevated from non-tumor causes)
- Not used for all cancer screening, only **PSA** (prostate-specific antigen) is used for screening of patients at risk for prostate cancer
- If the tumor marker examination is performed at the appropriate choice and at reasonable intervals, it can be a good aid for the attending physician — determining the response to treatment, disease progression and the patient's prognosis
- Tumor markers can be divided according to the site of production, specificity, chemical structure and biological character [3] [4]

Tumor-specific markers

- Associated with the presence of certain tumor tissue
- Due to the considerable overlap of TM production in different tumor tissues, the specificity is low
- Suitable for monitoring remission of cancer and early diagnosis of disease relapse e.g. CEA (Ca GITu), CA 19-9 (pancreatic cancer), CA 125 (ovarian cancer), etc.

Tissue-specific tumor markers

- Rather related to a certain tissue in which a pathological process can take place (eg tumor growth)
- Often increased from non-tumor causes (e.g. PSA in men - prostate; hCG and AFP - germinal liver tissue) [5] [6]

Humoral

Abbreviation	Name	Physiologically produced	Standard	Increased at	False positive	Note
CEA	carcinoembryonic antigen	epithelial cells during fetal development	<3 µg/l	colorectal cancer, breast cancer, lung cancer, ovarian cancer, liver metastases	cirrhosis, GIT inflammation	
AFP	α-fetoprotein	yolk sac and fetal liver	<10 µg/l	cirrhosis, active hepatitis, nonseminomas, germ cell tumors (teratoma), hepatocellular carcinoma, hepatolastoma	pregnancy	
CA 15-3	Carcinoma antigen 15-3			breast cancer, GIT tumors, glandular epithelial tumors	hepatomegaly, cholangitis, lung disease, renal disorders, pregnancy	↑ breast cancer - sensitivity 75%, specificity 90%, some GIT tumors
MCA	mucinous carcinoma antigen			breast cancer		rise earlier than CA 15-3, use for confirmation at elevated CA 15-3
CA 19-9	carbohydrate antigen			pancreatic cancer, stomach cancer, colorectal cancer, breast cancer	obstructive jaundice	
CA 72-4	carbohydrate antigen			gastric cancer, oesophageal cancer, lung cancer, ovarian cancer		
CA 125	carbohydrate antigen			ovarian cancer	benign ovarian and endometrial conditions, hepatopathy, pancreatitis, pregnancy, menstruation	monitoring of ovarian ca treatment, screening in women with a family history of ovarian cancer
SCC	squamous cell carcinoma antigen			squamous cell carcinomas		
TPA/S	tissue polypeptide	Cell proliferation		various cancers (urinary bladder)		mixture of about 20 cytokeratins, increases in

	antigen			cancer, head and neck cancer)		proportion to the growing tumor
CYFRA 21-1	cytokeratin fragments 19			non-small cell lung cancer		
PSA	prostate specific antigen	into the seminal vesicle fluid to liquefy the ejaculate by prostate cells	<2,5 µg/l < 50 let <5 µg/l 50-60 let 8,5 < µg/l > 60 let	prostate cancer	ejaculation, per rectum examination before collection, BPH	values above 10 µg / l - 50% ca risk, about 20% ca prostate has PSA in the norm
LD	lactate dehydrogenase	liver, myocardium, skeletal muscle, erythrocytes	4,10 µkat/l	testicular tumors, leukemia, RCC, Hodgkin's lymphoma		
ALP	alkaline phosphatase			sarcomas, prostate cancer	bile duct obstruction	
ACP	acid phosphatase			skeletal metastases, prostate cancer		
GGT	γ-glutamyltransferase			metastatic liver disease	alcoholics, bile duct obstruction	
NSE	neuron specific enolase			neuroblastoma, retinoblastoma, malignant melanoma, SCLC	hemolysis	in CNS tumors it is better to determine in cerebrospinal fluid
TK	thymidine kinase			leukemia, lymphoma, non-small cell lung cancer		route of alternative DNA synthesis
hCG	human chorionic gonadotropin	placenta		trophoblast tumors, choriocarcinoma (100 % sensitivity), germinal tumors of testes and ovaries	pregnancy	screening of endangered persons, examination of the β-subunit
PRL	prolactin	during pregnancy and after childbirth		prolactinoma, MEN I	slightly during physical exertion, mental stress	
CT	calcitonin			medullary thyroid carcinoma		
Thyreoglobulin	thyreoglobulin			follicular carcinoma of the thyroid gland		
Ferritin	ferritin			multiple myeloma, AML, Hodgkin's lymphoma		
β2 mikroglobulin	β2 microglobulin			CLL, multiple myeloma, lymphoma		
Paraprotein	paraprotein			multiple myeloma		Bence-Jones protein
VMA	vanillic acid	product of catecholamine degradation		functional tumors of the adrenal glands		determination in urine, or determination of metanephrines (plasma, urinary)
HIAA	5-hydroxyindoleacetic acid	product of serotonin degradation		functional carcinoids		determination in urine

Cell markers

Abbreviation	Name	Physiologically produced	Standard	Increased at	False positive	Note
HER2/neu				breast cancer		target for monoclonal antibodies (Herceptin), increased expression = worse prognosis

Genetic markers

Abbreviation	Name	Physiologically produced	Standard	Increased at	False positive	Note
p53	guardian of the genome	cell cycle regulation		Li-Fraumeni syndrome, sarcomas, breast cancer		
BRCA1/2	breast cancer			breast and ovarian cancer		

References

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