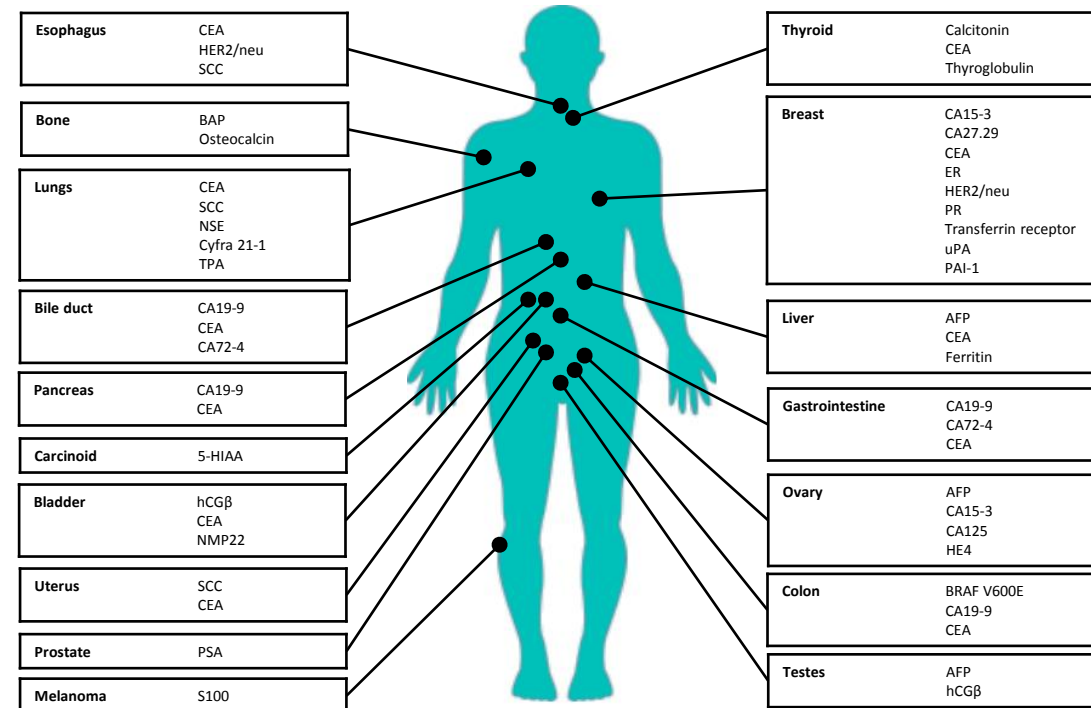# Biomarkers in tumor diagnostics

Tumor markers represent a subset of biomarkers that are indicative for cancerous growth. Most of these marker are being produced by both normal cells as well as tumor cells. The levels at which they are present in bodily fluids like urine, saliva or blood are however typically significantly higher in patients with various malignancies.

There is a plethora of tumor markers[12] being used which can be classified base on their function, the way they are detected, or the kind of sample in which they are measured:

- Oncofetal antigens (OA)
- Tumor associated antigens (TA)
- Hormones and hormone receptors (HR)
- Enzymes and isoenzymes (EM)
- Serum and tissue proteins (ST)
- Cancer stem cells[3] (CS)
- other tumor markers such as genetic markers and biomolecules.

A perfect tumor marker is highly specific and differentiates reliably between healthy individuals and cancer patients. It can be a universal tumor marker or specific for one particular malignancy. It should be allow early detection of early stage tumors and at the same time distinguish tumor stages and have prognostic value for outcome and potential recurrence. Lastly, it should be easily measureable with established techniques to follow any changes during the course of a treatment.

(1) http://www.cancersafe.com/screening/index.asp
(2) http://www.cancer.gov/about-cancer/diagnosis-staging/diagnosis/tumor-markers-fact-sheet
(3) http://www.ncbi.nlm.nih.gov/pubmed/23548926

Cat.	Marker	Gene	GeneID	Uniprot_ID	IV
OA	Alpha-fetoprotein	AFP	174	P02771	yes
OA	Carcinoembryonic antigen (CEA)	CEACAM5	1048	P06731	
OA	Carcinoembryonic antigen (CEA)	CEACAM6	4680	P40199	
OA	Carcinoembryonic antigen (CEA)	CEACAM1	634	P13688	
OA	Carcinoembryonic antigen (CEA)	CEACAM7	1087	Q14002	
TA	5-HIAA	-			
TA	CA15-3	MUC1	4582	P15941	yes
TA	CA19-9				
TA	CA27.29	MUC1	4582	P15941	
TA	CA72-4	-			
TA	CA125	MUC16	94025	Q8WXI7	
HR	Beta-human chorionic gonadotropin (hCGβ)	CGA, CGB	1081/ 1082	P01215/ P01233	
HR	Calcitonin	CALC1	796	P01258	
HR	Chromogranin A (CgA)	CHGA	1113	P10645	
HR	EGFR mutation analysis	EGFR	1956	P00533	yes
HR	Estrogen receptor (ER)	ESR1	2099	P03372	
HR	Estrogen receptor (ER)	ESR2	2100	Q92731	
HR	HER2/neu	ERBB2	2064	P04626	
HR	Osteocalcin	BGLAP	632	P02818	
HR	Progesterone receptor (PR)	PGR	5241	P06401	
HR	transferrin receptor	TFRC	7037	P02786	
HR	transthyretin	TTR	7276	P02766	
EM	Alkaline phosphatase (BAP)	ALPL	249	P05186	
EM	BCR-ABL fusion gene	BCR/ABL1	613/ 25	P11274/ P00519	
EM	BRAF V600E	BRAF	673	P15056	
EM	KIT	KIT	3815	P10721	
EM	KRAS mutation analysis	KRAS	3845	P01116	
EM	Prostate-specific antigen	PSA	354	P07288	yes
EM	Lactate dehydrogenase	LDHA	3939	P00338	
EM	Lactate dehydrogenase	LDHB	3945	P07195	
EM	Lactate dehydrogenase	LDHC	3948	P07864	
EM	Neuron specific enolase (NSE)	ENO2	2026	P09104	
EM	Nuclear matrix protein 22 (NMP22)	NUMA1	4926	Q14980	
EM	plasminogen activator inhibitor (PAI-1)	SERPINE1	5054	P05121	
EM	SCC	SERPINB3	6317	P29508	
EM	SCC	SERPINB4	6318	P48594	
EM	Urokinase plasminogen activator (uPA)	PLAU	5328	P00749	
ST	Apolipoprotein A1	APOA1	335	P02647	
ST	Beta-2-microglobulin	B2M	567	P61769	
ST	Cytokeratin fragments 21-1 (Cyfra 21-1)	KRT19	3880	P08727	
ST	Epididymal secretory protein E4 (HE4)	WAP5	10406	Q14508	
ST	Ferritin	FTL, FTH1	2495/ 2512	P02792/ P02794	yes
ST	Fibrinogen	-			yes
ST	Fibrin D-dimer	-			
ST	S100	S100A1	6271	P23297	
ST	Tissue polypeptide antigen (TPA)	-			
ST	Thyroglobulin	TG	7038	P01266	
CS	Aldehyde dehydrogenase	ALDH1A1	216	P00352	
CS	CD20	MS4A1	931	P11836	
CS	CD24	CD24	100133941	P25063	
CS	CD44	CD44	960	P16070	
CS	Nestin	NES	10763	P48681	yes

Cancer column headers: ALL, AML, BDC, BNC, BRC, CAC, CD, CML, CLL, CRC, CSC, EC, GIC, GCT, HC, LC, LY, MM, MY, NET, NTC, PC, SC, TC, THC, UBC, UC, IV

Body map associations

Site	Markers
Esophagus	CEA, HER2/neu, SCC
Bone	BAP, Osteocalcin
Lungs	CEA, SCC, NSE, Cyfra 21-1, TPA
Bile duct	CA19-9, CEA, CA72-4
Pancreas	CA19-9, CEA
Carcinoid	5-HIAA
Bladder	hCGβ, CEA, NMP22
Uterus	SCC, CEA
Prostate	PSA
Melanoma	S100
Thyroid	Calcitonin, CEA, Thyroglobulin
Breast	CA15-3, CA27.29, CEA, ER, HER2/neu, PR, Transferrin receptor, uPA, PAI-1
Liver	AFP, CEA, Ferritin
Gastrointestine	CA19-9, CA72-4, CEA
Ovary	AFP, CA15-3, CA125, HE4
Colon	BRAF V600E, CA19-9, CEA
Testes	AFP, hCGβ

Legend

ALL	Acute lymphoblastic leukemia	CD	Carcinoid
AML	Acute myelogenous leukemia	CML	Cutaneous melanoma
BDC	Bile duct cancer	CLL	Chronic lymphocytic leukemia
BNC	Bone cancer	CRC	Colorectal cancer
BRC	Breast cancer	CSC	Cancer stem cell
CAC	Cholangiocarcinoma	EC	Esophageal cancer
GIC	Gastrointestinal cancer	MY	Multiple myeloma
GCT	Germ cell tumor	NET	Neuroendocrine tumor
HC	Liver cancer	NTC	Nervous tissue cancer
LC	Lung cancer	PC	Prostate cancer
LY	Lymphoma	SC	Skin cancer
MM	Mucosal melanoma	TC	Testicular cancer
THC	Thyroid cancer	OA	Oncofetal antigens
UBC	Bladder cancer	TA	Tumor associated antigens
UC	Uterine cancer	HR	Hormes and receptors
		EM	Enzymes and modulators
		ST	Serum and tissue proteins
		CS	Cancer stem cells

IV — Independently validated products available on antibodies-online.com

antibodies-online.com