Personalised cancer treatment: known markers in treatment

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Personalised cancer treatment – known markers and what they mean for treatment

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Known markers and what they mean for treatment

Overview

Personalised, targeted and hormonal treatments all depend on genetic mutations that can be identified in cancer cells to be effective. These mutations are sometimes referred to as “ markers”. The markers can manifest through over-expression, lack of expression or mutated expression of specific proteins.

Some markers can be targeted using specific treatments whereas some can act as measurements for disease diagnosis, prognosis and treatment response.

Drug target markers

The genes listed below have all been associated in cancer, the majority of which can also be treated.

Known marker	Cancers they’re associated with / may benefit from targeted therapy	Related treatment/response to treatment
ALK[EB1]–anaplastic lymphoma kinase (*)	• Anaplastic large-cell lymphoma • Familial neuroblastoma (nerve cell)	• Crizotinib (Xalkori®) • Pemetrexed (Alimta®)

	• Non-small cell lung cancer (NSCLC)	
AR– androgen receptor	• Bladder • Breast • NSCLC • Ovarian • Prostate	• Abarelix (Plenaxis®) • Bicalutamide (Casodex®) • Flutamide (Eulexin®) • Gonadorelin (Factrel®) • Goserelin (Zoladex®) • Leuprolide (Lupron®)
BRAF– v-raf murine sarcoma viral oncogene homolog B1	• Colon • Lung • Melanoma (skin) • Nervous system • Thyroid	• Cetuximab (Erbitux®) • Panitumumab (Vectibix®) • Vemurafenib (Zelboraf®)
BRCA1– breast cancer susceptibility	• Breast • Lung	• Cisplatin (Platinol®)

gene 1	• Ovarian	• Prophylactic surgery (prevention)
BRCA2– breast cancer susceptibility gene 2	• Breast • Ovarian	• Tamoxifen (Nolvadex®) • Prophylactic surgery (prevention)
c-Kit/CD117/SCFR – mast stem cell factor receptor (*)	• Acute myelogenous leukemia (AML) • Gastrointestinal stromal tumour (GIST) • Melanoma	• Imatinib (Gleevec®) • Sorafenib (Nexavar®) • Sunitinib (Sutent®)
c-MET/HGFR – mesenchymal epithelial transition factor/hepatocyte growth factor receptor	• NSCLC • Ovarian	• Erlotinib (Tarceva®) • Gefitinib (Iressa®)
COX-2/PTGS2 –	• NSCLC	• Celecoxib

cyclooxygenase-2/ prostaglandin-endoperoxide synthase-2		(Celebrex®)
EGFR/ErbB-1/ HER1 – epidermal growth factor receptor (*)	• NSCLC	• Cetuximab (Erbitux®) • Erlotinib (Tarceva®) • Gefitinib (Iressa®) • Panitumumab (Vectibix®)
ER– oestrogen receptor (*)	• Breast • Female reproductive tract (cervical, fallopian, ovarian, uterine)	• Anastrazole (Arimidex®) • Exemestane (Aromasin®) • Fulvestrant (Faslodex®) • Goserelin (Zoladex®) • Letrozole (Femara®) • Leuprolide (Eligard®, Lupron®, Viadur®)

		• Medroxyprogesterone, (Provera®, Amen®, Curretab®, Cycrin®) • Megestrol acetate (Megace®, Megace® ES) • Tamoxifen (Nolvadex®) • Toremifene (Fareston®)
ERCC1– excision repair cross-complementation group 1	• Bladder • Colorectal • Gastric • Lung (NSCLC and SCLC) • Ovarian	• Carboplatin (Paraplatin®) • Oxaliplatin (Eloxatin®)
HER2/HER2neu/ ErbB-2 – human epidermal growth factor receptor 2 (*)	• Breast • Colorectal • Gastric • Gastroesophageal	• Doxorubicin (Adriamycin®, Rubex®) • Epirubicin (Ellence®) • Lapatinib

		(Tykerb®) • Liposomal doxorubicin (Caelyx®, Myocet®), • Trastuzumab (Herceptin®)
	• Ovarian	
KRAS– Kirsten murine sarcoma virus (*)	• Colon • NSCLC • Pancreatic	• Cetuximab (Erbitux®) • Erlotinib (Tarceva®) • Gefitinib (Iressa®) • Panitumumab (Vectibix®)
MGMT– O-6-methylguanine-DNA methyltransferase	• Breast • Glioblastoma multiforme (brain) • Melanoma • NSCLC • Oesophageal • Oligodendroglio mas	• Resistant to temozolomide (Temodar®)

	• Pituitary gland carcinoma	
MRP1– multidrug resistance-associated protein 1	• Breast • Head and neck • Lymphoma	• Resistant to doxorubicin (Adrimycin®), vinca alkaloids, methotrexate (Trexall®)
PGP– p-glycoprotein	• Breast • Head and neck • Lymphoma • Ovarian	• Resistant to doxorubicin (Adriamycin®), epirubicin (Ellence®), liposomal-doxorubicin (Doxil®), paclitaxel (Taxol®), docetaxel (Taxotere®), vinblastine (Velban®), vincristine (Oncovin®), vinorelbine

		(Navelbine®)
PIK3CAα– phosphatidylinositol-4, 5-bisphosphate 3-kinase, catalytic subunit alpha	• Breast • Colorectal • Gastric • Glioblastoma • Lung • Ovarian	• Lapatinib (Tykerb®) • Resistant to cetuximab (Erbitux®), panitumumab (Vectibix) • Decreased response to trastuzumab (Herceptin®)
PR– progesterone receptor (*)	• Breast • Female genital tract cancer • Ovarian	• Anastrozole (Arimidex®) • Exemestane (Aromasin®) • Foremifene (Fareston®) • Fulvestrant (Faslodex®) • Gonadorelin (Factrel®) • Goserelin (Zoladex®)

		• Letrozole (Femara®) • Leuprolide (Eligard®, Lupron®, Viadur®) • Medroxyprogesterone (Provera®, Amen®, Curretab®, Cycrin®) • Megestrol acetate (Megace®, Megace® ES) • Tamoxifen (Nolvadex®)
PTEN–phosphatase and tensin homolog	• Breast • Colon • Glioblastoma • Head and neck • NSCLC	• Resistant to cetuximab (Erbitux®), erlotinib (Tarceva®), gefitinib (Iressa®), panitumumab (Vectibix®), trastuzumab

		(Herceptin®)
RRM1– ribonucleotide reductase subunit M1	• NSCLC • Pancreatic	• Decreased response to gemcitabine (Gemzar®), hydroxyurea (Hydrea®, Droxia®)
SPARC– secreted protein acidic rich in cysteine	• Breast • Gastric • Head and neck • Melanoma • Pancreatic	• Albumin-bound paclitaxel/nab-paclitaxel (Abraxane®)
TLE3– transducin-like enhancer of split	• Breast • Ovarian	• Docetaxel (Taxotere ®) • Paclitaxel (Taxol®),
TOPO2α– topoisomerase IIα	• Breast • Colon • SCLC • Ovarian	• Doxorubicin (Adriamycin®) • Epirubicin (Ellence®, Pharmorubucin®) • Liposomal doxorubicin

		(Caelyx®, Myocet®)
TS– thymidylate synthetase	• Breast • Colon • Gastric • Head and neck • Liver • NSCLC • Pancreatic	• Resistant to 5-fluorouracil (Adrucil®), cytarabine (Cytosar-U®), pemetrexed (Alimta®)
TUBB3– Class III - tubulin	• NSCLC • Ovarian	• Docetaxel (Taxotere ®) • Paclitaxel (Taxol®) • Vinorelbine (Navelbine®)

(*) – Targetable genes and proteins that can also be measured to determine treatment response, cancer diagnosis and prognosis.

Diagnostic and prognostic markers

The following markers are all related to diagnosis, prognosis and treatment progress.

Known marker	Associated cancer	Role
α (alpha)-fetoprotein	• Germ cell	Germ cell tumour staging, prognosis,

		response to treatment
	• Liver	Liver cancer diagnosis, response to treatment
β (beta)-2-microglobulin	• Chronic lymphocytic leukaemia (CLL) • Lymphoma • Multiple myeloma	Prognosis, response to treatment
β (beta)-human chorionic gonadotropin (β-hCG)	• Choriocarcinoma (uterine) • Testicular	Staging, prognosis, response to treatment
BCR-ABL fusion gene	• Chronic myeloid leukaemia (CML)	Diagnosis, disease status monitoring
BRAF (mutation V600E)	• Colorectal • Melanoma	Response to targeted treatment
CA15-3/CA27. 29	• Breast	Treatment success, disease recurrence
CA19-9	• Bile duct	Treatment success

	• Gallbladder • Gastric • Pancreatic	
CA-125	• Ovarian	Diagnosis, treatment response, disease recurrence
Calcitonin	• Medullary thyroid	Diagnosis, treatment success, disease recurrence
Carcinoembryonic antigen (CEA)	• Breast • Colorectal	Breast cancer recurrence, treatment response Colorectal disease advance
CD20	• Non-Hodgkin lymphoma (NHL)	Response to targeted treatment
Chromogranin A (CgA)	• Neuroendocrine tumours	Diagnosis, treatment response, disease recurrence
Chromosomes 3, 7,	• Bladder	Disease recurrence

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Cytokeratin fragments 21-1	• Lung	Disease recurrence
Fibrin/fibrinogen	• Bladder	Treatment response
Human epididymis protein 4 (HE4)	• Ovarian	Disease progression, disease recurrence
Immunoglobulins (antibodies)	• Multiple myeloma (MM) • Waldenström macroglobulinemia (blood)	Diagnosis, treatment response, disease recurrence
Lactate dehydrogenase	• Germ cell tumours	Staging, prognosis, treatment response
Nuclear matrix protein 22	• Bladder	Treatment response
Plasminogen activator inhibitor (PAI-1)	• Breast	Grading, treatment planning

Prostate-specific antigen (PSA)	• Prostate	Diagnosis, treatment response, disease recurrence
Thyroglobulin	• Thyroid	Treatment response, disease recurrence
Urokinase plasminogen activator (uPA)	• Breast	Grading, treatment planning

Meta description

Cancer markers can help with the diagnosis and treatment of cancer and can give access to targeted therapies.

Keywords

Cancer markers, genetic markers, diagnostic markers, drug target markers

Copyscape

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[EB1]If these are genes not proteins then they should be in italics