

PanTum Detect Tumor Entity Summary

Preliminary list of solid tumors detectable by PanTum detect:

1. Adenocarcinoma ^{9) 30)}
2. Aerodigestive cancer ³⁵⁾
- **Brain tumor** ^{21) 22) 38)}
 3. Astrocytoma
 4. DIPG/„Pons Glioma“
 5. Ependymoma ²³⁾
 6. Glioblastoma
 7. Medulablastoma
- **Breast cancer** ^{14) 18) 19) 20) 24) 32) 43)}
 8. Breast squamous cell carcinoma ¹⁾
 9. Estrogen Receptor (ER) positive breast cancer
 10. HER2 positive breast cancer
 11. Progesterone receptor (PR) positive breast cancer
 12. Triple negative breast cancer
- **Colorectal cancer** ^{9) 17) 25) 26) 36) 43)}
 13. Colon cancer ^{16) 26) 35) 43) 44)}
 14. Rectal cancer ²⁵⁾
 15. Non-metastatic rectal adenocarcinoma ²⁵⁾
16. Ductal carcinoma ³²⁾
17. Endometrial cancer ²⁸⁾
18. Esophageal squamous cell carcinoma (ESCC) ¹¹⁾
- **Gastric cancer** ^{2) 10) 29) 35) 45)}
 19. Cholangiocarcinoma (bile duct CA)
 20. Gastroesophageal junction cancer ⁴⁵⁾
 21. Hepatoblastoma
 22. Pancreas cancer
 23. Rhabdomyosarcoma
24. Granulosa cell tumor ⁴¹⁾
- **Gynecologic cancers**
 25. Cervix cancer ^{34) 39) 28)}
 26. Ovarian cancer ^{12) 41) 44)}
 27. Uterine cancer
 28. Vaginal cancer
 29. Vulva cancer
- **Head and Neck cancer** ^{3) 4) 5) 8) 15) 31) 35) 42)}
 30. Nasopharyngeal carcinoma ²⁾
 31. Hyperplasie
 32. Squamous Intraepithelial Neoplasm (SIN I – III)
 33. Oral squamous cell carcinoma OSCC ^{1) 3) 5) 8) 15) 22)}
- **Lung cancer** ^{19) 20) 24) 35)}
 34. Bronchial cancer
 35. Small cell lung cancer ³⁵⁾
 36. Non-small-cell lung cancer ^{19) 24) 30) 35)}
 37. Neoplastic lung tissue ³⁰⁾
38. Lymphoma tumor ²²⁾
39. Malignant conjunctival tumor ²¹⁾
40. Melanoma tumors ^{6) 21) 22)}
41. Ocular adnexal tumors ²²⁾
- **Prostate cancer** ¹⁴⁾
 42. PSA positive Prostate Cancer
 43. PSMA positive Prostate Cancer
 44. Prostate squamous cell carcinoma ¹⁾
45. Renal cancer ⁴⁰⁾
46. Squamous cell carcinoma ^{30) 31) 39) 42)}
47. Thyroid cancer (follicular and papillary) ³⁷⁾
48. **Urothelial cancer** ^{11) 24) 43) 44)}
 49. Bladder cancer
 50. Kidney cancer ⁴⁰⁾
 51. Nephroblastoma ³³⁾

Note: lymphomas and leukemias tested thus far have also shown positive for PanTum Detect but are not included in this list of solid tumors.

Disclaimer: this list includes information from the list of publications below as well as from posters presented on scientific congresses and information from clinical practice in real testing situations

Publications

- 2017
- 1) Coy JF: EDIM-TKTL1/Apo10 Blood Test: An Innate Immune System Based Liquid Biopsy for the Early Detection, Characterization and Targeted Treatment of Cancer. *Int J Mol Sci.* 2017 Apr 20;18(4). pii: E878. doi: 10.3390/ijms18040878. Zyagnum Frankfurt, Germany
 - 2) Dong, Y.; Wang, M. Knockdown of TKTL1 additively complements cisplatin-induced cytotoxicity in nasopharyngeal carcinoma cells by regulating the levels of NADPH and ribose-5-phosphate. *Biomed. Pharmacother.* 2017, 85, 672–678. Central Hospital Affiliated to Zhengzhou University, Zhengzhou, China
- 2016
- 3) Grimm, M.; Hoefert, S.; Krimmel, M.; Biegner, T.; Feyen, O.; Teriete, P.; Reinert, S. Monitoring carcinogenesis in a case of oral squamous cell carcinoma using a panel of new metabolic blood biomarkers as liquid biopsies. *Oral Maxillofac Surg.* 2016 Sep;20(3):295-302. Tuebingen University Hospital, Tuebingen, Germany
 - 4) Diaz-Moralli, S.; Aguilar, E.; Marin, S.; Coy, J.F.; Dewerchin, M.; Antoniewicz, M.R.; Meca-Cortés, O.; Notebaert, L.; Ghesquière, B.; Eelen, G.; et al. A key role for Transketolase-like 1 in tumor metabolic reprogramming. *Oncotarget.* 2016 Aug 9;7(32):51875-51897. Universitat de Barcelona, Barcelona, Spain
 - 5) Grimm, M.; Feyen, O.; Coy, J.F.; Hofmann, H.; Teriete, P.; Reinert, S. Analysis of circulating CD14+/CD16+ monocytederived macrophages (MDMs) in the peripheral blood of patients with oral squamous cell carcinoma. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2016 Mar;121(3):301-6. Tuebingen University Hospital, Tuebingen, Germany / Zyagnum AG Frankfurt, Germany
 - 6) Jayachandran, A.; Lo, P.H.; Chueh, A.C.; Prithviraj, P.; Molania, R.; Davalos-Salas, M.; Anaka, M.; Walkiewicz, M.; Cebon, J.; Behren, A. Transketolase-like 1 ectopic expression is associated with DNA hypomethylation and induces the Warburg effect in melanoma cells. *BMC Cancer.* 2016 Feb 22;16:134. Ludwig Institute for Cancer Research, Heidelberg, Australia
 - 7) Xu, I.M.; Lai, R.K.; Lin, S.H.; Tse, A.P.; Chiu, D.K.; Koh, H.Y.; Law, C.T.; Wong, C.M.; Cai, Z.; Wong, C.C.; et al. Transketolase counteracts oxidative stress to drive cancer development. *Proc Natl Acad Sci U S A.* 2016 Feb 9;113(6):E725-34
 - 8) Grimm, M.; Kraut, W.; Hoefert, S.; Krimmel, M.; Biegner, T.; Teriete, P.; Cetindis, M.; Polligkeit, J.; Kluba, S.; Munz, A.; et al. Evaluation of a biomarker based blood test for monitoring surgical resection of oral squamous cell carcinomas. *Clin. Oral Investig.* 2016, 20, 329–338. University Hospital Tuebingen, Germany / Sanford-Burnham Medical Research Institute La Jolla USA
 - 9) Ahopelto, K.; Böckelman, C.; Hagström, J.; Koskensalo, S.; Haglund, C. Transketolase-like protein 1 expression predicts poor prognosis in colorectal cancer. *Cancer Biol. Ther.* 2016, 17, 163–168. University of Helsinki and Helsinki University Hospital, Helsinki, Finland
- 2015
- 10) Song, Y.; Liu, D.; He, G. TKTL1 and p63 are biomarkers for the poor prognosis of gastric cancer patients. *Cancer Biomark.* 2015, 15, 591–597. Central South University, Changsha, China
 - 11) Li, J.; Zhu, S.C.; Li, S.G.; Zhao, Y.; Xu, J.R.; Song, C.Y. TKTL1 promotes cell proliferation and metastasis in esophageal squamous cell carcinoma. *Biomed Pharmacother.* 2015 Aug;74:71-6. The Fourth Hospital of Hebei Medical University, Shijiazhuang, China
 - 12) Ricciardelli, C.; Lokman, N.A.; Cheruvu, S.; Tan, I.A.; Ween, M.P.; Pyragius, C.E.; Ruskiewicz, A.; Hoffmann, P.; Oehler, M.K. Transketolase is upregulated in metastatic peritoneal implants and promotes ovarian cancer cell proliferation. *Clin. Exp. Clin Exp Metastasis.* 2015 Jun;32(5):441-55. University of Adelaide, Adelaide, Australia
- 2014
- 13) Li, B.; Iglesias-Pedraz, J.M.; Chen, L.Y.; Yin, F.; Cadenas, E.; Reddy, S.; Comai, L. Downregulation of the Werner syndrome protein induces a metabolic shift that compromises redox homeostasis and limits proliferation of cancer cells. *Aging Cell* 2014, Apr. 13, 367–378. University of Southern California, Los Angeles, USA / University of Southern California, Los Angeles, USA

- 2013
- 14) Grimm M et al: A biomarker based detection and characterization of carcinomas exploiting two fundamental biophysical mechanisms in mammalian cells. *BMC Cancer*. 2013 Dec 4;13:569. Universitätsklinikum Tübingen, DKFZ Heidelberg
 - 15) Grimm M et al: Transketolase-like protein 1 expression in recurrent oral squamous cell carcinoma after curative resection: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2013 Sep;116(3):e173-8
 - 16) Jansen N and Coy JF: Diagnostic use of EDIM-blood test for early detection of colon cancer metastasis. *Future Oncol*. 2013;9(4):605-9
 - 17) Bentz S et al: Hypoxia induces the expression of transketolase-like 1 in human colorectal cancer. *Digestion*. 2013;88(3):182-92. University Hospital Zurich, Switzerland
 - 18) Rotmann A: The use of new diagnostic tests for the monitoring of new and existing therapies for breast cancer patients. *J. Clin. Oncol., ASCO Meeting Abstracts*. 2013; 31:e22006
- 2012
- 19) Baum R et al: EDIM-TKTL1 blood test: a noninvasive method to detect upregulated glucose metabolism in patients with malignancies. *Future Oncol*. 2012 Oct;8(10):1349-59. Rhönklinikum Bad Berka
 - 20) Feyen O et al: EDIM blood test: a non-invasive method to detect patients with malignancies. *Cell Symposia* July 6-8, 2012: Poster
 - 21) Lange CA et al: Enhanced TKTL1 Expression in Malignant Tumors of the Ocular Adnexa Predicts Clinical Outcome. *Ophthalmology*. 2012 Sep;119(9):1924-9. Epub 2012 Jun 1. University Hospital Freiburg, Germany
 - 22) Wanka C et al: Tp53-induced glycolysis and apoptosis regulator (TIGAR) protects glioma cells from starvation-induced cell death by upregulating respiration and improving cellular redox homeostasis. *J Biol Chem*. 2012 Sep 28;287(40):33436-46. Epub 2012 Aug 10. Goethe University Frankfurt, Germany
 - 23) Wani K et al: A prognostic gene expression signature in infratentorial ependymoma. For the Collaborative Ependymoma Research Network. *Acta Neuropathol*. 2012 May;123(5):727-38. Epub 2012 Feb 10
- 2011
- 24) Kayser G et al: Poor outcome in primary non-small cell lung cancers is predicted by transketolase TKTL1 expression. *Pathology*. 2011 Dec;43(7):719-24. University Hospital Freiburg, Germany
 - 25) Schwaab J et al: Expression of Transketolase like gene 1 (TKTL1) predicts disease-free survival in patients with locally advanced rectal cancer receiving neoadjuvant chemoradiotherapy. *BMC Cancer* 2011;11:363. University Medical Centre Mannheim, Germany
 - 26) Diaz-Moralli S et al: Transketolase-like 1 expression is modulated during colorectal cancer progression and metastasis formation. *PLoS One*. 2011;6(9):e25323. Epub 2011 Sep 27. University of Barcelona, Spain
 - 27) Hartmannsberger D et al: Transketolase-like protein 1 confers resistance to serum withdrawal in vitro. *Cancer Lett*. 2011 Jan 1;300(1):20-9. Epub 2010 Sep 29. Ludwig-Maximilians-University of Munich, Germany
- 2010
- 28) Kohrenhagen N et al: Expression of transketolase-like 1 (TKTL1) and p-Akt correlates with the progression of cervical neoplasia. *J Obstet Gynaecol Res*. 2008 Jun;34(3):293-300. University of Wuerzburg, Wuerzburg, Germany
 - 29) Yuan W et al: Silencing of TKTL1 by siRNA inhibits proliferation of human gastric cancer cells in vitro and in vivo. *Cancer Biol Ther*. 2010 May;9(9):710-6. Epub 2010 May. Central South University, Changsha, Hunan, China
 - 30) Kayser G et al: Lactate-dehydrogenase 5 is overexpressed in non-small cell lung cancer and correlates with the expression of the transketolase-like protein 1. *Diagn Pathol*. 2010 Apr 12;5:22. University Hospital Freiburg, Germany
 - 31) Sun W et al: TKTL1 is activated by promoter hypomethylation and contributes to head and neck squamous cell carcinoma carcinogenesis through increased aerobic glycolysis and HIF1alpha stabilization. *Clin Cancer Res*. 2010 Feb 1;16(3):857-66. Epub 2010 Jan 26

- 32) Schmidt M et al: Glycolytic phenotype in breast cancer: activation of Akt, up-regulation of GLUT1, TKTL1 and downregulation of M2PK. *J Cancer Res Clin Oncol*. 2010 Feb;136(2):219-25. Epub 2009 Aug 5. University of Wuerzburg, Germany. Rotmann A et al: TKTL1 - a new biomarker and its relevance in the daily gynaecological practice. Poster FIGO 2009
- 2009
- 33) Wu HT et al: Anaplastic neuroblastomas express transketolase-like enzyme 1. *J Clin Pathol*. 2009 May;62(5):460-3. Epub 2009 Jan 12
- 34) Chen H et al: Overexpression of transketolase-like gene 1 is associated with cell proliferation in uterine cervix cancer. *J Exp Clin Cancer Res*. 2009 Mar 30;28:43
- 35) Smith IM et al: Coordinated activation of candidate proto-oncogenes and cancer testis antigens via promoter demethylation in head and neck cancer and lung cancer. *PLoS One*. 2009;4(3):e4961. Epub 2009 Mar 23
- 36) Xu X et al: Transketolase-like protein 1 (TKTL1) is required for rapid cell growth and full viability of human tumor cells. *Int J Cancer*. 2009 Mar 15;124(6):1330-7. DKFZ German Cancer Research Centre, Heidelberg, Germany
- 2008
- 37) Zerilli M et al: Increased expression of transketolase-like-1 in papillary thyroid carcinomas smaller than 1.5 cm in diameter is associated with lymph-node metastases. *Cancer*. 2008 Sep 1;113(5):936-44. University of Palermo, Italy
- 38) Völker HU et al: Expression of transketolase-like 1 and activation of Akt in grade IV glioblastomas compared with grades II and III astrocytic gliomas. *Am J Clin Pathol*. 2008 Jul;130(1):50-7. University of Wuerzburg, Germany
- 39) Kohrenhagen N et al: Expression of transketolase-like 1 (TKTL1) and p-Akt correlates with the progression of cervical neoplasia. *J Obstet Gynaecol Res*. 2008 Jun;34(3):293-300. University of Wuerzburg, Wuerzburg, Germany
- 40) Langbein S et al: Metastasis is promoted by a bioenergetic switch: new targets for progressive renal cell cancer. *Int J Cancer*. 2008 Jun 1;122(11):2422-8. University of Amsterdam, The Netherlands
- 41) Schmidt M et al: Glucose metabolism and angiogenesis in granulosa cell tumors of the ovary: activation of Akt, expression of M2PK, TKTL1 and VEGF. *Eur J Obstet Gynecol Reprod Biol*. 2008 Jul;139(1):72-8. Epub 2008 Apr 3. University of Wuerzburg, Germany
- 2007
- 42) Völker HU et al: Overexpression of transketolase TKTL1 is associated with shorter survival in laryngeal squamous cell carcinomas. *Eur Arch Otorhinolaryngol*. 2007 Dec;264(12):1431-6. Epub 2007 Jul 18. University of Wuerzburg, Germany
- 43) Foeldi M et al: Transketolase protein TKTL1 overexpression: A potential biomarker and therapeutic target in breast cancer. *Oncol Rep*. 2007 Apr;17(4):841-5. University Hospital Freiburg, Germany
- 44) Krockenberger M et al: Transketolase-like 1 expression correlates with subtypes of ovarian cancer and the presence of distant metastases. *Int J Gynecol Cancer* 2007 Jan-Feb;17(1):101-6. University of Wuerzburg, Germany
- 2006
- 45) Langbein S et al: Expression of transketolase TKTL1 predicts colon and urothelial cancer patient survival: Warburg effect reinterpreted. *Br J Cancer*. 2006 Feb 27;94(4):578-85. University Hospital Mannheim, Germany
- 46) Staiger WI et al: Expression of the mutated transketolase TKTL1, a molecular marker in gastric cancer. *Oncol Rep*. 2006 Oct;16(4):657-61. Universitätsmedizin Mannheim. University Hospital Mannheim, Germany