**Table S1 Antibodies were used to IHC**

|  |  |  |
| --- | --- | --- |
| **Antibodies** | | |
| **REAGENT** | **Catalog and Source** | **Dilution** |
| TPI1 | Cat#10713-1-AP, Proteintech, | 1:200(human), 1:100(mouse) |
| CDCA5 | Cat#67418-1-Ig, Proteintech | 1:200(human), 1:50(mouse) |
| p-mTOR | Cat# AF3308; Affinity | 1:50(human), 1:30(mouse) |
| Ki67 | Cat#27309-1-AP; Proteintech | 1:100 (mouse) |
| E-cadherin | Cat#20874-1-AP; Proteintech | 1:100 (mouse) |
| LDHA | Cat#19987-1-AP; Proteintech | 1:100 (mouse) |

**Table S2** **Sequences of the interference TPI1 are the followings**

|  |
| --- |
| **ShTPI1 1** |
| Top strand: |
| 5’-GATCCGCCGTATCATTTATGGAGGCTCTGTGTTCAAGAGACACAGAGCCTCCATAAATGATACGGTTTTTTG-3’ |
| Bottom strand: |
| 5’-AATTCAAAAAACCGTATCATTTATGGAGGCTCTGTGTCTCTTGAACACAGAGCCTCCATAAATGATACGGCG-3’ |
| **ShTPI1 2** |
| Top strand: |
| 5’-GATCCGTCAAGCCCGAATTCGTGGACATCATTTCAAGAGAATGATGTCCACGAATTCGGGCTTGATTTTTTG-3’ |
| Bottom strand: |
| 5’-AATTCAAAAAATCAAGCCCGAATTCGTGGACATCATTCTCTTGAAATGATGTCCACGAATTCGGGCTTGACG |
| **ShTPI1 3** |
| Top strand: |
| 5’-GATCCGCCCGAATTCGTGGACATCATCAATGTTCAAGAGACATTGATGATGTCCACGAATTCGGGTTTTTTG-3’ |
| Bottom strand: |
| 5’-AATTCAAAAAACCCGAATTCGTGGACATCATCAATGTCTCTTGAACATTGATGATGTCCACGAATTCGGGCG-3’ |

**Table S3 Antibodies were used to western blot.**

|  |  |  |
| --- | --- | --- |
| **Antibodies** | | |
| **REAGENT** | **Catalog and Source** | **Dilution** |
| TPI1 | Cat#10713-1-AP, Proteintech, | 1:1000 |
| E-cadherin | Cat#3195; Cell Signaling Technology  Cat#WL01482; wanleibio | 1:1000  1:1000 |
| N-cadherin | Cat#13116; Cell Signaling Technology | 1:1000 |
| Vimentin | Cat#10366-1-AP; Proteintech | 1:1000 |
| t-PI3K | Cat# 11889, Cell Signaling Technology | 1:1000 |
| p-PI3K (Tyr199) | Cat#4228, Cell Signaling Technology | 1:800 |
| t-AKT | Cat#4685; Cell Signaling Technology | 1:1000 |
| p-AKT(Ser473) | Cat#9271; Cell Signaling Technology | 1:1000 |
| t-mTOR | Cat#2983; Cell Signaling Technology | 1:1000 |
| p-mTOR(Ser 2448) | Cat#5536; Cell Signaling Technology | 1:1000 |
| t-70s6k | Cat#34475; Cell Signaling Technology | 1:1000 |
| p-70s6k  (Thr421/Ser424) | Cat#9204; Cell Signaling Technology | 1:1000 |
| CDCA5 | Cat#67418-1-Ig, Proteintech  Cat#sc-365319, Santa Cruz | 1:800  1:500 |
| SQSTM1/p62 | Cat#66184-1-Ig, Proteintech | 1:1000 |
| LDHA | Cat#19987-1-AP; Proteintech | 1:1000 |
| PGK1 | Cat#17811-1-AP; Proteintech | 1:1000 |
| ENO1 | Cat#11204-1-AP; Proteintech | 1:1000 |

**Table S4 Sequences of Primer for Real-time Polymerase Chain Reaction**

|  |  |
| --- | --- |
| **TPI1** |  |
| Forward | 5’- CCCAGGAAGTACACGAGAAG-3’ |
| Reverse | 5’-CAGTCACAGAGCCTCCATAAA-3’ |
| **CDCA5** |  |
| Forward | 5’-CCCGAGAAACAGAAACGTAAGA-3’ |
| Reverse | 5’-TCATTCAACCACGGAGATCAAAC-3’ |
| **SQSTM1** |  |
| Forward | 5’-GGAACAGATGGAGTCGGATAAC-3’ |
| Reverse | 5’-ATCTGTAGGGACTGGAGTTCA-3’ |
| **GAPDH** |  |
| Forward | 5’-GGTATGACAACGAATTTGGC-3’ |
| Reverse | 5’-GAGCACAGGGTACTTTATTG-3’ |

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**Figure S1. High TPI1 expression in BRCA and biological analysis of co-expressed genes with TPI1.**

(**A**) Th expression of TPI1 was significantly higher in 1109 BRCA tissues than that in 113 normal tissues (TCGA). (\*\*\*\**p*<0.0001). (**B**) The Venn diagram (<https://bioinfogp.cnb.csic.es/tools/venny/index.html>) showed 61 genes that were significant associated with TPI1 in BRCA from the intersection of cBioportal database, Linkedomics database, GEPIA database and UALCAN database. (**C**) Co-expressed 61 genes were used for KEGG pathway enrichment analysis. (**D** - **F**) GO enrichment of co-expressed genes in biological process(D), cellular component and (E) and molecular function(F). (P represents the inverse log 10 of FDR values).

** Figure S2. CDCA5 promotes breast cancer cell malignant phenotype.**

(**A**) Expression of CDCA5 was significantly higher in BRCA tissues than that in 113 normal tissues using the Wilcoxon signed-rank test (TCGA). (**B**) Kaplan–Meier plotter showed the high expression of CDCA5 was associated with worse OS from TCGA database. (**C-D**) CCK-8 (C) and EDU(D) assays showed proliferation function of CDCA5. (**E**) Transwell assay shows migration and invasion in T47D cells. (**F-G**) Glucose uptake (F) and lactate production(G) were showed in T47D cells. (**H**) Western blot analysis key protein expression of PI3K/AKT/mTOR pathway, EMT markers and glycolysis markers in T47D cell after overexpression CDCA5 (\*\**p*< 0.01, \*\*\**p* < 0.001, \*\*\*\**p*< 0.0001).