

**ORIGINAL RESEARCH ARTICLE**

**Differential gene expression and gene ontology associated with breast cancer development and progression: A meta-analysis study**

**Supplementary Files**

**Table S1. Summary of the microarray datasets used for the meta-analyses**

Data sets	Country	Year	Cancer samples	Normal samples	Early	Late	Stage	Platform	No. of probes	Ethnic group	Author
GSE10780	USA	2010	41	142	41	-	-	Affy HG-U133A/+2.0	54,675	-	Chen <i>et al.</i> <sup>1</sup>
GSE10797	USA	2009	28	5	-	-	I-III	Affy HG-U133A/+2.0	22,277	-	Casey <i>et al.</i> <sup>2</sup>
GSE11121	Germany	2008	194	-	194	-	I-III	Affy HG-U133A	22,283	Caucasian	Schmidt <i>et al.</i> <sup>3</sup>
GSE12276	Netherlands	2009	203	-	203	-	-	Affy HG-U133+2.0	54,675	Caucasian	Bos <i>et al.</i> <sup>4</sup>
GSE12763	USA	2009	30	-	30	-	Grade 1-3	Affy HG-U133A	54,675	-	Hoeflich <i>et al.</i> <sup>5</sup>
GSE1456	Sweden	2005	156	-	-	-	I-III	Affy HG-U133A/B	22,283	Caucasian	Pawitan <i>et al.</i> <sup>6</sup>
GSE1561	France	2005	49	-	-	8	I-IV	Affy HG-U133A	22,283	Caucasian	Farmer <i>et al.</i> <sup>7</sup>
GSE15852	Malaysia; China; India	2010	43	42	-	-	Grade 1-3	Affy HG-U133A	22,283	Several	Pau <i>et al.</i> <sup>8</sup>
GSE17907	France	2010	31	3	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Caucasian	Sircoulomb <i>et al.</i> <sup>9</sup>
GSE2034	USA	2005	286	-	-	-	I-I V	Affy HG-U133A	22,283	-	Wang <i>et al.</i> <sup>10</sup>
GSE20685	Taiwan	2011	321	-	-	-	I-IV	Affy HG-U133+2.0	54,675	Asian	Kao <i>et al.</i> <sup>11</sup>
GSE21653	France	2011	263	-	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Caucasian	Sabatier <i>et al.</i> <sup>12</sup>
GSE22544	USA	2004	16	4	-	-	-	Affy HG-U133+2.0	54,675	-	Hawthorn <i>et al.</i> <sup>13</sup>
GSE22597	USA	2011	82	-	-	-	IIIB-IV	Affy HG-U133A	22,283	-	Iwamoto <i>et al.</i> <sup>14</sup>
GSE24185	USA	2012	102	-	88	-	Grade 1-3	Affy HG-U133A	22,283	-	Creighton <i>et al.</i> <sup>15</sup>
GSE29044	Saudi Arabia	2013	19	24	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Arabs	Colak <i>et al.</i> <sup>16</sup>
GSE29431	Spain	2011	48	12	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Caucasian	-
GSE2990	Canada	2006	182	-	182	-	Grade 1-3	Affy HG-U133A	22,283	-	Sotiriou <i>et al.</i> <sup>17</sup>
GSE32072	USA	2012	49	-	-	-	-	Affy HG-U133A	22,283	-	Gonzalez-Angulo <i>et al.</i> <sup>18</sup>
GSE32518	USA	2012	74	-	-	-	I-III	Affy HG-U133A	22,283	-	Bianchini <i>et al.</i> <sup>19</sup>
GSE33116	USA	2011	23	-	-	23	-	Affy HG-U133A	22,283	-	-
GSE3494	Singapore	2005	250	-	-	-	Grade 1-3	Affy HG-U133A	22,283	Asian	Miller <i>et al.</i> <sup>20</sup>
GSE3744	USA	2006	47	-	-	-	Grade 3	Affy HG-U133+2.0	54,675	-	Richardson <i>et al.</i> <sup>21</sup>
GSE38554	Italy	2014	44	-	-	-	-	Affy HG-U133+2.0	54,675	Caucasian	Callari <i>et al.</i> <sup>22</sup>
GSE42568	Ireland	2013	104	17	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Caucasian	Clarke <i>et al.</i> <sup>23</sup>
GSE43358	Belgium	2014	57	-	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Caucasian	Fumagalli <i>et al.</i> <sup>24</sup>
GSE45827	France	2016	132	11	-	-	Grade 2-3	Affy HG-U133+2.0	54,675	Caucasian	Gruosso <i>et al.</i> <sup>25</sup>
GSE4611	Germany	2011	202	-	202	-	I-IV	Affy HG-U133A	22,283	Caucasian	Karn <i>et al.</i> <sup>26</sup>

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**Table S1. (Continued)**

Data sets	Country	Year	Cancer samples	Normal samples	Early	Late	Stage	Platform	No. of probes	Ethnic group	Author
GSE46184	Germany	2014	74	-	-	-	I-IV	Affy HG-U133A	22,283	Caucasian	Milde-Langosch <i>et al.</i> <sup>27</sup>
GSE46222	USA	2013	44	-	-	-	-	Affy HG-U133+2.0	54,675	-	-
GSE48390	China	2013	79	-	-	-	I-III	Affy HG-U133+2.0	54,675	Asian	Huang <i>et al.</i> <sup>28</sup>
GSE51450	Italy	2015	12	-	-	-	Grade 2-3	Affy HG-U133+2.0	54,675	Caucasian	Musella <i>et al.</i> <sup>29</sup>
GSE54002	Singapore	2014	417	16	-	-	-	Affy HG-U133+2.0	54,675	Asian	Tan <i>et al.</i> <sup>30</sup>
GSE54323	Sweden	2015	29	-	-	-	-	Affy HG-U133+2.0	54,675	Caucasian	Foukakis <i>et al.</i> <sup>31</sup>
GSE5460	USA	2008	126	-	-	-	I-III	Affy HG-U133+2.0	54,675	-	Lu <i>et al.</i> <sup>32</sup>
GSE5764	Czech Republic	2007	10	18	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	-	Turashvili <i>et al.</i> <sup>33</sup>
GSE5847	USA	2008	95	-	-	-	I-IV	Affy HG-U133+2.0	22,283	-	Boersma <i>et al.</i> <sup>34</sup>
GSE58812	France	2015	107	-	-	-	Grade 1-3	Affy HG-U133+2.0	54,675	Caucasian	Jézéquel <i>et al.</i> <sup>35</sup>
GSE65194	France	2015	53	11	-	-	-	Affy HG-U133+2.0	54,675	Caucasian	Maubant <i>et al.</i> <sup>36</sup>
GSE6532	Canada	2007	137	-	-	-	Grade 1-3	Affy HG-U133A/B/+2.0	22,283	-	Loi <i>et al.</i> <sup>37</sup>
GSE6596	Germany	2007	25	-	-	-	I-IV	Affy HG-U133A	22,283	Caucasian	Klein <i>et al.</i> <sup>38</sup>
GSE66418	France	2016	123	-	-	-	-	Affy HG-U133+2.0	54,675	Caucasian	Gruel <i>et al.</i> <sup>39</sup>
GSE7390	Canada	2007	197	-	-	-	Grade 1-3	Affy HG-U133A	22,283	Caucasian	Desmedt <i>et al.</i> <sup>40</sup>
GSE71258	USA	2015	69	-	-	-	II-III	Affy HG-U133+2.0	54,675	-	Xiang <i>et al.</i> <sup>41</sup>
E-GEOD-8193	USA	2007	44	-	-	-	Grade 1-3	Affy HT-HG-U133A	22,944	-	Yau <i>et al.</i> <sup>42</sup>
E-GEOD-83232	USA	2016	254	-	-	-	-	Affy HG-U133A/B	22,283	-	-
E-GEOD-9574	USA	2008	14	10	-	-	Grade 1-3	Affy HG-U133A	22,283	-	Tripathi <i>et al.</i> <sup>43</sup>
E-MTAB-1006	Belgium	2013	96	-	-	-	III-IV	Affy HG-U133+2.0	54,675	Caucasian	Van Laere <i>et al.</i> <sup>44</sup>
E-MTAB-1547	USA	2013	208	-	43	15	I-IV	Affy HG-U133+2.0	54,675	-	Van Laere <i>et al.</i> <sup>45</sup>
E-TABM-158	USA	2006	126	-	33	5	I-III	Affy HG-U133+2.0	22,944	Several (African American; Caucasian; others)	Riis <i>et al.</i> <sup>46</sup>

Abbreviations: Affy HG: Affymetrix Human Genome; USA: United States of America.

**Table S2. Top 100 differentially expressed genes in breast cancer development**

Genes	Fold change (disease/control)	Regulation
<i>COL10A1</i>	2.13	Upregulated
<i>COL11A1</i>	1.91	Upregulated
<i>TOP2A</i>	1.73	Upregulated
<i>COL11A1</i>	1.64	Upregulated
<i>CDK1</i>	1.61	Upregulated
<i>TOP2A</i>	1.6	Upregulated
<i>COL10A1</i>	1.55	Upregulated
<i>S100P</i>	1.53	Upregulated
<i>COMP</i>	1.53	Upregulated
<i>INHBA</i>	1.53	Upregulated
<i>ASPM</i>	1.52	Upregulated
<i>NEK2</i>	1.5	Upregulated
<i>MELK</i>	1.49	Upregulated
<i>ATAD2</i>	1.49	Upregulated
<i>RRM2</i>	1.48	Upregulated
<i>CEP55</i>	1.48	Upregulated
<i>MMP1</i>	1.48	Upregulated
<i>RRM2</i>	1.47	Upregulated
<i>MMP11</i>	1.47	Upregulated
<i>DTL</i>	1.47	Upregulated
<i>HMMR</i>	1.47	Upregulated
<i>AURKA</i>	1.46	Upregulated
<i>BUB1B</i>	1.45	Upregulated
<i>BIRC5</i>	1.45	Upregulated
<i>NUSAP1</i>	1.45	Upregulated
<i>BUB1</i>	1.45	Upregulated
<i>PBK</i>	1.44	Upregulated
<i>PRC1</i>	1.44	Upregulated
<i>CDC20</i>	1.43	Upregulated
<i>CXCL10</i>	1.43	Upregulated
<i>CXCL11</i>	1.43	Upregulated
<i>CXCL11</i>	1.42	Upregulated
<i>MMP11</i>	1.41	Upregulated
<i>CCNB2</i>	1.41	Upregulated
<i>DLGAP5</i>	1.41	Upregulated
<i>CEACAM6</i>	1.4	Upregulated
<i>CKS2</i>	1.4	Upregulated
<i>GINS1</i>	1.39	Upregulated
<i>PCLAF</i>	1.38	Upregulated
<i>CENPU</i>	1.37	Upregulated
<i>SPAG5</i>	1.36	Upregulated

(Cont'd)

**Table S2. (Continued)**

Genes	Fold change (disease/control)	Regulation
<i>KIF20A</i>	1.35	Upregulated
<i>CDK1</i>	1.34	Upregulated
<i>HIST1H2BD</i>	1.34	Upregulated
<i>PITX1</i>	1.34	Upregulated
<i>FOXM1</i>	1.33	Upregulated
<i>ADH1B</i>	0.61	Downregulated
<i>PCK1</i>	0.61	Downregulated
<i>WIF1</i>	0.62	Downregulated
<i>LEP</i>	0.63	Downregulated
<i>SFRP1</i>	0.64	Downregulated
<i>CHL1</i>	0.64	Downregulated
<i>VEGFD</i>	0.65	Downregulated
<i>PTPRZ1</i>	0.65	Downregulated
<i>ID4</i>	0.65	Downregulated
<i>FGF2</i>	0.65	Downregulated
<i>ANGPT1</i>	0.66	Downregulated
<i>ABCA8</i>	0.66	Downregulated
<i>S100B</i>	0.66	Downregulated
<i>DST</i>	0.66	Downregulated
<i>ATP1A2</i>	0.66	Downregulated
<i>HLF</i>	0.67	Downregulated
<i>MME</i>	0.67	Downregulated
<i>ADIPOQ</i>	0.68	Downregulated
<i>DMD</i>	0.68	Downregulated
<i>CXCL2</i>	0.68	Downregulated
<i>IL33</i>	0.68	Downregulated
<i>CHRDL1</i>	0.69	Downregulated
<i>SFRP1</i>	0.69	Downregulated
<i>MEOX2</i>	0.69	Downregulated
<i>OXTR</i>	0.7	Downregulated
<i>SCN3A</i>	0.71	Downregulated
<i>PTGS2</i>	0.71	Downregulated
<i>SLC16A7</i>	0.71	Downregulated
<i>TAT</i>	0.71	Downregulated
<i>OLFM4</i>	0.71	Downregulated
<i>PTN</i>	0.72	Downregulated
<i>TIMP4</i>	0.72	Downregulated
<i>CA4</i>	0.72	Downregulated
<i>CLEC3B</i>	0.72	Downregulated
<i>ITM2A</i>	0.72	Downregulated
<i>NR3C2</i>	0.72	Downregulated
<i>TF</i>	0.73	Downregulated

(Cont'd)

Table S2. (Continued)

Genes	Fold change (disease/control)	Regulation
KCNB1	0.73	Downregulated
PLIN1	0.73	Downregulated
ZBTB16	0.73	Downregulated
SLC6A14	0.73	Downregulated
ALDH1A2	0.73	Downregulated
HLF	0.74	Downregulated
RELN	0.74	Downregulated
SFRP1	0.74	Downregulated
CD36	0.74	Downregulated
TCEAL2	0.74	Downregulated
PPP1R1A	0.74	Downregulated
TP63	0.74	Downregulated
KRT14	0.74	Downregulated
EDN3	0.75	Downregulated
CA3	0.75	Downregulated
TGFBR3	0.75	Downregulated
CAPN6	0.75	Downregulated

Table S3. Differentially expressed genes in breast cancer progression

Genes	Fold change (late-stage/ early-stage)	Regulation
DHTKD1	1.21	Upregulated
KCNK12	1.17	Upregulated
EVI5	1.17	Upregulated
SLC35A2	1.15	Upregulated
DPM1	1.14	Upregulated
CBX3	1.13	Upregulated
SEC63	1.13	Upregulated
NSD2	1.13	Upregulated
UBE2A	1.13	Upregulated
CPSF1	1.12	Upregulated
TAX1BP1	1.12	Upregulated
CBX5	1.12	Upregulated
VPS37C	1.12	Upregulated
PRPF31	1.12	Upregulated
FAM120A	1.12	Upregulated
FGF8	1.12	Upregulated
XPO1	1.12	Upregulated
OSBPL2	1.12	Upregulated
RNF10	1.12	Upregulated
TSTA3	1.12	Upregulated

(Cont'd)

Table S3. (Continued)

Genes	Fold change (late-stage/ early-stage)	Regulation
MTHFD1	1.11	Upregulated
CYCS	1.11	Upregulated
SLBP	1.11	Upregulated
YWHAB	1.11	Upregulated
KDM7A	1.11	Upregulated
SMC1A	1.11	Upregulated
YWHAZ	1.11	Upregulated
AMACR	1.11	Upregulated
MDH2	1.11	Upregulated
WIPI2	1.1	Upregulated
HSPH1	1.1	Upregulated
SCAF11	1.1	Upregulated
NSUN5	1.1	Upregulated
NSUN5P2	1.1	Upregulated
EIF2AK1	1.1	Upregulated
PSMF1	1.1	Upregulated
PDIA4	1.1	Upregulated
SLC35A2	1.1	Upregulated
SRP9	1.1	Upregulated
STAU1	1.1	Upregulated
GPR4	1.09	Upregulated
IPO4	1.09	Upregulated
SLC11A2	1.09	Upregulated
RNASET2	1.09	Upregulated
KDELRL2	1.09	Upregulated
TM9SF3	1.09	Upregulated
IARS	1.09	Upregulated
GMPPB	1.09	Upregulated
EIF2B1	1.09	Upregulated
ARPC1B	1.09	Upregulated
RAC1	1.09	Upregulated
CHAF1A	1.09	Upregulated
PTK2	1.09	Upregulated
RNPEP	1.09	Upregulated
SHARPIN	1.09	Upregulated
SRP72	1.08	Upregulated
CUEDC2	1.08	Upregulated
HNRNPA2B1	1.08	Upregulated
APOE	1.08	Upregulated
CES2	1.08	Upregulated
NELFE	1.08	Upregulated
SAFB	1.08	Upregulated

(Cont'd)

Table S3. (Continued)

Genes	Fold change (late-stage/ early-stage)	Regulation
HMGN1	1.08	Upregulated
ARF3	1.08	Upregulated
CS	1.08	Upregulated
EIF5	1.08	Upregulated
CTCF	1.08	Upregulated
UBE2Q1	1.08	Upregulated
RBM39	1.07	Upregulated
MTCH2	1.07	Upregulated
CDK13	1.07	Upregulated
TXNDC5	1.07	Upregulated
CALM1	1.07	Upregulated
PPM1G	1.07	Upregulated
NECTIN2	1.07	Upregulated
RPN2	1.06	Upregulated
MFSN10	1.06	Upregulated
TUBA1B	1.06	Upregulated
PLOD3	1.06	Upregulated
PDIA3	1.06	Upregulated
UBAC1	1.06	Upregulated
GNAS	1.06	Upregulated
PABPN1	1.06	Upregulated
ARL6IP4	1.06	Upregulated
MEA1	1.05	Upregulated
APEX1	1.05	Upregulated
ATP6V0C	1.05	Upregulated
DHX30	1.05	Upregulated
COQ4	1.05	Upregulated
HNRNPU	1.04	Upregulated
CDC37	1.03	Upregulated
CTC1	1.01	Upregulated
MAP3K20	0.92	Downregulated
GALC	0.95	Downregulated
ADD2	0.96	Downregulated

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