Supplementary Materials

Association between genome-wide epigenetic and genetic alterations in breast cancer tissue and response to HER2-targeted therapies in HER2-positive breast cancer patients: new findings and a systematic review

Supplementary Table 1. Baseline characteristics of selected cases (*n* = 6) compared to those of the total population of cases (*n* = 22)

Factor	Selected cases (*n* = 6)	Total population of cases (*n* = 22)	*P*-value
	Mean ± SD	Mean ± SD	
Age (years)	51.3 ± 6.1	53.9 ± 10.9	0.87
Body mass index (kg/m^2)	23.8 ± 2.6	25.9 ± 4.4	0.94
Follow-up time (years)	3.8 ± 2.8	4.0 ± 2.9	0.87
	n (%)	*n* (%)	
Grade			
I/II	2 (33%)	12 (54%)	1.00
III	4 (67%)	9 (41%)	
Missing value	0 (0%)	1 (5%)	
Lymph node status			
Negative	0 (0%)	6 (27%)	1.00
Positive	6 (100%)	16 (73%)	
Tumor size (cm)			
≤ 5	5 (83%)	20 (91%)	1.00
> 5	1 (17%)	2 (9%)	
Estrogen receptor status			
Negative	2 (33%)	10 (45%)	1.00
Positive	4 (67%)	12 (55%)	
Progesterone receptor status			
Negative	3 (50%)	13 (59%)	1.00
Positive	3 (50%)	9 (41%)	

Menopausal status			
Pre	2 (33%)	5 (23%)	1.00
Post	4 (67%)	17 (77%)	
Radiotherapy			
No	1 (17%)	8 (36%)	1.00
Yes	5 (83%)	14 (64%)	
Endocrine Therapy			
No	2 (33%)	10 (45%)	1.00
Yes	4 (67%)	12 (55%)	
Chemotherapy			
No	0 (0%)	0 (0%)	1.00
Yes	6 (100%)	22 (100%)	
Trastuzumab treatment completed			
No	0 (0%)	4 (18%)	1.00
Yes	6 (100%)	18 (82%)	

n: Number of subjects; SD: standard deviation.

Supplementary Table 2. Search strategy in PubMed database

Database/Consultation date	#	Concept	Search strategy	Results	Combination of concepts	
					#	Total
Pubmed/ 20210325	#1	Population = breast cancer patients	(("breast neoplasms"[Mesh]) OR (("breast"[tiab] OR "mammary"[tiab]) AND ("cancer"[tiab] OR "cancers"[tiab] OR "carcinoma*"[tiab] OR "neoplasm"[tiab] OR "neoplasms"[tiab] OR "tumor*"[tiab] OR "tumour*"[tiab] OR	446,644	#1 AND #2 AND #3 AND #4 AND #5	758

			"malignancy"[tiab] OR "malignancies"[tiab])))			
	#2	Population = HER2-positive type of BC	("HER2(776-788)" [Supplementary Concept] OR "Receptor, ErbB-2"[Mesh] OR "HER2"[tiab] OR "HER2 positive"[tiab] OR "HER-2 positive"[tiab] OR "human epidermal growth factor receptor 2-positive"[tiab] OR "erbb2 positive"[tiab] OR "erbb-2 positive"[tiab])	42,156		
	#3	Population = treated with anti-HER2 agent	(Trastuzumab[Mesh] OR Lapatinib[Mesh] OR gefitinib[Mesh] OR erlotinib[Mesh] OR "Antibodies, Monoclonal, Humanized"[Mesh] OR Trastuzumab[tiab] OR Lapatinib[tiab] OR gefitinib[tiab] OR erlotinib[tiab] OR Herceptin[tiab] OR "HER2 inhibitor*"[tiab] OR "HER-2 inhibitor*"[tiab] OR "anti-HER2"[tiab] OR "anti-HER-2"[tiab] OR Pertuzumab[tiab] OR Kadcyla[tiab] OR tarceva[tiab] OR	84,468		

			IRESSA[tiab] OR "HER2-targeted"[tiab] OR "HER-2-targeted"[tiab])			
	#4	Exposure = genome-wide methylation and gene expression profile	("methylation"[Mesh] OR "Epigenesis, Genetic"[Mesh] OR "Epigenomics"[Mesh] OR "Epigenome"[Mesh] OR "CpG Islands"[Mesh] OR "CpG Island*"[tiab] OR epigenome*[tiab] OR epigenetic[tiab] OR epigenetics[tiab] OR epigenomic[tiab] OR epigenomics[tiab] OR methylome[tiab] OR methylomes[tiab] OR methylat*[tiab] OR hypomethylat*[tiab] OR hypermethylat*[tiab] OR "EWAS"[tiab] OR "genome-wide association study"[Mesh] OR "alternative splicing"[Mesh] OR "Polymorphism, Single Nucleotide"[Mesh] OR "gene expression"[Mesh] OR "gene expression profiling"[Mesh] OR "Sequence analysis,	1,628,461		

			RNA"[Mesh] OR "DNA copy number variations"[Mesh] OR genomics[Mesh] OR "whole genome sequencing"[Mesh] OR "alternative splicing"[tiab] OR "single nucleotide polymorphism*"[tiab] OR SNP[tiab] OR SNPs[tiab] OR "gene expression"[tiab] OR miRNA[TIAB] OR microRNA[tiab] OR "RNA sequenc*"[tiab] OR "RNA profiling"[tiab] OR "mRNA-seq"[tiab] OR "copy number variations"[tiab] OR GWAS[tiab] OR "genome wide"[tiab] OR genomic[tiab] OR genomics[tiab] OR "whole-genome sequenc*"[tiab] OR WGS[tiab] OR transcriptome[tiab])			
	#5	Outcome = response to treatment	("treatment outcome"[Mesh] OR "Disease-Free Survival"[Mesh] OR "progression-Free Survival"[Mesh] OR "Drug resistance, Neoplasm"[Mesh] OR	5,723,752		

		"survival analysis"[Mesh] OR prognosis[Mesh] OR "Kaplan-Meier Estimate"[Mesh] OR outcome[tiab] OR survival[tiab] OR "pathological complete response"[tiab] OR pCR[tiab] OR sensitivity[tiab] OR benefit[tiab] OR resistance[tiab] OR recurrence[tiab] OR survivors[tiab] OR predictive[tiab] OR predictor[tiab] OR predictors[tiab] OR prognosis[tiab] OR "Kaplan-Meier"[tiab])			

Supplementary Table 3. Summary characteristics of one study of genome-wide DNA methylation measured in breast cancer tissue and risk of recurrence among HER2-positive, trastuzumab-treated breast cancer patients (*n* = 1)

Study design	**Retrospective study:** Furrer [2022]
Breast cancer patients	**Number of patients:** 12 **Mean age:** 51.3 y **Postmenopausal patients:** 67% **ER-positive breast cancer:** 67%
DNA methylation	**Measurement method:** Infinium HumanMethylation450 BeadChip array **Tissue used:** FFPE

	Tumor cell fraction: ≥ 70%
Outcome	**DFS**

DFS: Disease free survival; ER: estrogen receptor; FFPE: formalin-fixed, paraffin-embedded; n: number of studies; y: years.

Supplementary Table 4. Summary characteristics of studies of gene expression measured in breast cancer tissue and risk of recurrence among HER2-positive breast cancer patients treated with HER2 targeted therapies (*n* = 9)

Study design	**Retrospective studies:** *n* = 5 (Khoury[1], Gámez-Pozo[2], Triulzi[3], Merry[4], Zhao[5]) **Prospective studies:** *n* = 4 (Harris[6], Guarneri[7], Sorokin[8], Perez[9])
Breast cancer patients	**Number of patients:** 9 to 849 **Age:** median - 52 to 58 y (*n* = 2) (Gámez-Pozo[2], Triulzi[3]), mean - 55.2 y (*n* = 1) (Sorokin[8]), < 45 y in 60.9% (*n* = 1) (Harris[6]), < 50 y in 48.3% (*n* = 1) (Perez[9]), NR (*n* = 4) (Khoury[1], Merry[4], Guarneri[7], Zhao[5]) **Postmenopausal patients:** NR (*n* = 9) **ER-positive breast cancer:** 43.4% to 69.6% (*n* = 3) (Harris[6], Gámez-Pozo[2], Triulzi[3]); none in one study Sorokin[8]); NR in five study (Khoury[1], Guarneri[7], Merry[4], Zhao[5], Perez[9])
Gene expression	**Measurement methods:** HumanHT-12 v3 BeadChip (*n* = 1) (Khoury[1]), HumanHT-12 v4 BeadChip (*n* = 1) (Triulzi[3]), Affymetrix Human Genome U219 array (*n* = 1) (Gámez-Pozo[2]), Affymetrix GeneChip 3' IVT Express kit (*n* = 1) (Guarneri[7]), Illumina HiSeq 2500 platform (*n* = 1) (Merry[4]), Illumina HiSeq 3000 (*n* = 1) (Sorokin[8]), GeneChip U133 Plus 2.0 Gene Array (*n* = 1) (Harris[6]), DASL technology (*n* = 1) (Perez[9]), Agilent UNC Perou Lab Homo sapiens 1X44K Custom Array/Illumina HumanHT-12 WG-DASL V4.0 R2 expression beadchip/Affymetrix technology using the HG-U133 Plus 2.0 GeneChip array (*n* = 1) (Zhao[5]) **Tissue used:** fresh frozen (*n* = 5) (Harris[6], Khoury[1], Guarneri[7], Merry[4], Zhao[5]), FFPE (*n* = 4) (Gámez-Pozo[2], Triulzi[3], Sorokin[8], Perez[9]) **Tumor cell fraction:** ≥ 70% (*n* = 2) (Triulzi[3], Sorokin[8]), ≥ 80% (*n* = 1)

	(Khoury [1]), ≥ 500 cancer cells per case ($n = 1$) (Harris[6]), NR in five studies (Gámez-Pozo[2], Guarneri[7], Merry[4], Zhao[5], Perez[9])
Outcome	**pCR:** $n = 5$ (Harris[6], Gámez-Pozo[2], Guarneri[7], Merry[4], Zhao[5]) **DFS:** $n = 2$ (Khoury[1], Sorokin[8]) **RFS:** $n = 2$ (Perez[9], Triulzi[3])

DFS: Disease-free survival; ER: estrogen receptor; FFPE: formalin-fixed, paraffin-embedded; n: number; NR: not reported; pCR: pathologic complete response; RFS: relapse-free survival; y: years.

Supplementary Table 5. Summary characteristics of studies of genome-wide miRNA expression measured in breast cancer tissue and risk of recurrence among HER2-positive, trastuzumab-treated breast cancer patients ($n = 2$)

Study design	**Retrospective studies:** $n = 2$ (Du[10], Ohzawa[11])
Breast cancer patients	**Number of patients:** 14 to 40 **Median age:** 55 y (Ohzawa[11]), NR in one study (Du[10]) **Postmenopausal patients:** NR **ER-positive breast cancer:** NR **HR-positive breast cancer:** 42.5% to 50%
miRNA expression	**Measurement methods:** Agilent miRNA array ($n = 1$) (Du[10]), Agilent SurePrint G3 Human miRNA microarray ($n = 1$) (Ozhawa[11]) **Tissue used:** FFPE ($n = 2$) **Tumor cell fraction:** ≥ 80% (Du[10]), NR in one study (Ohzawa[11])
Outcome	**DFS:** $n = 1$ (Du[10]) **pCR:** = 1 (Ohzawa[11])

DFS: Disease free survival; ER: estrogen receptor; HR: hormone receptor; FFPE: formalin-fixed, paraffin-embedded; n: number of studies; NR: not reported; pCR: pathologic complete response; y: years.

Supplementary Table 6. Summary characteristics of one study of genome-wide long intergenic noncoding RNA (lincRNA) expression measured in breast cancer tissue and risk of recurrence among HER2-positive, trastuzumab-treated breast cancer patients ($n = 1$)

Study design	**Retrospective study:** Merry[4]

Breast cancer patients	**Number of patients:** 13
	Mean age: NR
	Postmenopausal patients: NR
	ER-positive breast cancer: NR
lincRNA expression	**Measurement method:** Illumina HiSeq 2500 platform
	Tissue used: fresh frozen
	Tumor cell fraction: NR
Outcome	**pCR**

ER: Estrogen receptor; n: number of studies; NR: not reported; pCR: pathologic complete response.

Supplementary Table 7. Summary characteristics of studies of copy number alterations (CNA) measured in breast cancer tissue and risk of recurrence among HER2-positive breast cancer patients treated with HER2 targeted therapies ($n = 2$)

Study design	**Prospective studies:** $n = 2$ (Guarneri[7], Walsh[12])
Breast cancer patients	**Number of patients:** 11 to 68
	Median age: 54 y for pCR and 50 y for non-pCR (Walsh[12]), NR in one study (Guarneri[7])
	Postmenopausal patients: NR ($n = 2$)
	HR-positive breast cancer: 54.5% (Walsh[12]), NR in one study (Guarneri[7])
CNA	**Measurement method:** Illumina HiSeq ($n = 1$) (Walsh[12]), Affymetrix Genome-wide Human SNP ($n = 1$) (Guarneri[7])
	Tissue used: fresh frozen tumor ($n = 2$) (Guarneri[7], Walsh[12])
	Tumor cell fraction: NR ($n = 2$)
Outcome	**pCR** ($n = 2$)

HR: Hormone receptor; n: number; NR: not reported; pCR: pathologic complete response; y: years.

Supplementary Table 8. Summary characteristics of one study of protein expression measured in blood and risk of recurrence among HER2-positive, trastuzumab-treated breast cancer patients ($n = 1$)

Study design	**Retrospective study:** Yang[13]

Breast cancer patients	**Number of patients:** 6
	Median age: 50 y
	Postmenopausal patients: NR
	ER-positive breast cancer: 33.3%
Protein expression	**Measurement method:** TMT-6 plex Isobaric Label Reagent Set
	Tissue used: blood
Outcome	**pCR**

ER: Estrogen receptor; n: number of studies; NR: not reported; pCR: pathologic complete response; y: years.

Supplementary Table 9. Summary characteristics of studies of somatic or germline mutation profile and risk of recurrence among HER2-positive, trastuzumab-treated breast cancer patients (*n* = 2)

Study design	**Prospective studies:** *n* = 2 (Shi[14], Lesurf[15])
Breast cancer patients	**Number of patients:** 48 to 203
	Median age: 50 y (*n* = 1) (Lesurf[15]), < 65 y in 90.3% (*n* = 1) (Shi[14])
	Postmenopausal patients: NR (*n* = 2)
	ER-positive breast cancer: 48.3% to 58.3%
Polymorphisms analysis	**Measurement method:** Illumina HiSeq 2000 (Shi[14]), whole genome sequencing (WGS) and whole exome sequencing (WES) + Illumina HiSeq 2000 platform (Lesurf[15])
	Tissue used: fresh frozen for somatic mutation (*n* = 2) (Shi[14], Lesurf[15]), blood for germline mutation (*n* = 1)* (Lesurf[15])
	Tumor cell fraction: > 10% (*n* = 1) (Shi[14]), NR in one study
Outcome	**pCR** (*n* = 2)

*One study assessed somatic and germline mutations and used two types of tissue. ER: Estrogen receptor; n: number of studies; NR: not reported; pCR: pathologic complete response; y: years.

Supplementary Table 10. Risk of bias of included studies

Studies	Bias in selection of participants into the study	Bias due to confounding	Bias in measurement of exposure	Bias in measurement of outcomes	Bias due to missing data (selection)	Bias in selection of the reported result	Overall within study risk of bias
Methylation							
Furrer *et al.*, 2022	Low	Moderate	Low	Low	Low	Low	Moderate
Gene expression							
Khoury *et al.*, 2010	Low	Critical	Low	Low	Low	Moderate	Critical
Triulzi *et al.*, 2015	Low	Moderate	Low	Low	Low	Moderate	Moderate
Gámez-Pozo *et al.*, 2014	Moderate	Moderate	Low	Low	Low	Moderate	Moderate
Guarneri *et al.*, 2015	Low	Critical	Low	Low	Low	Moderate	Critical
Merry *et al.*, 2016	No information	Critical	Moderate	Low	Low	Moderate	Critical
Harris *et al.*, 2007	Moderate	Critical	Low	Low	No information	Moderate	Critical
Zhao *et al.*, 2018	No information	Critical	No information	Low	No information	Moderate	Critical
Sorokin *et al.*, 2020	Low	Critical	Moderate	Low	No information	Serious	Critical
Perez *et al.* 2015	Moderate	Moderate	Low	Low	No information	Low	Low
miRNA expression							
Du *et al.*, 2016	No information	Moderate	Serious	Low	Low	Low	Serious
Ohzawa *et al.*, 2017	Low	Critical	Low	Low	No information	Moderate	Critical
lincRNA expression							
Merry *et al.*, 2016	No information	Critical	No information	Low	Low	Low	Critical

Copy number alteration							
Guarneri *et al.*, 2015	Low	Critical	Low	Low	Low	Moderate	Critical
Walsh *et al.*, 2020	No information	Critical	Low	Low	No information	Moderate	Critical
Protein expression							
Yang *et al.*, 2020	Moderate	Moderate	Low	Low	No information	Moderate	Moderate
Somatic or germline mutation profile							
Shi *et al.*, 2017	Low	Low	Low	Low	No information	Low	Low
Lesurf *et al.*, 2017	Low	Critical	Moderate	Low	No information	Low	Critical
Overall across studies risk of bias	No information	Critical	Serious	Low	No information	Serious	

Supplementary Table 11. Genes differentially expressed in breast cancer tissues of cases compared to controls

Gene	Direction change in gene expression in resistant tumors	Reference
HGF, IGF-1, PDGF, PTN, C-MET, LEP-R, PI3K p85, MAP2, SFRP1, p63, BOC	Increased	Harris[6]
ACP2, ACTN4, AGPAT1, AK2, ALDOA, ALG3, AP2A1, AP2M1, APH1A, ARHGDIA, ASNA1, ATP5J2, ATP6V0B, ATXN2L, BACE2, BAT2, BSG, C11orf49, C16orf13, CAPNS1, CDK18, CDK4, CENPB, CHPF, CLPTM1, COPE, COX6C, CPNE1, CSNK1G2, CSNK2B, CSTB, CYC1, DPP7, DSCR3, DUSP3, DYNC1H1, DYRK1A, EFTUD2, EIF5A, EIF5AL1, ENG, ERGIC3, ERICH1, FARSB, FKBP8, GBA, GNB2, GPX4, HIST1H3F, HNRNPL, ITPK1, KDELR1, LSS, LTBP4, MAF1, MED24, MED25, NDRG3, NUCB1, OST4, PCDH1, PHC2, PIGQ, PIGT, PLOD3, POLR2E, PRKACA, PRMT2, PSMB2, PSMD8, PSMF1, PSMG4, PTTG1IP, PYCR2, RAB11B, RNF220, RNPS1, ROD1, RPL18, RPL28, RPS5, SERINC2, SH3GL1, SH3GLB2, SHARPIN, SHISA5, SHKBP1, SLC19A1, SLC25A23, SOD1, SRM, SSNA1, TAF6, TAPBP, TMC6, TMEM54, TP53, TSC22D4, TUBB, UBE2I, VPS28, ABCA3, ABHD12, ABHD14A, ABI1, ACTR1B, AGFG1, AGPAT3, AGTRAP, AHDC1, ALKBH6, ANKS1A, AP2B1, AP3S2, APBA3, ARAF, ARF1, ARF3, ARF5, ARFGAP2, ARHGAP33,	Decreased (*n* = 424)	Gámez-Pozo[2]

ARPC1A, ARPC1B, ARPC4, ASB16, ASL, ATF6B, ATF6B, TNXB, ATG4B, ATG4D, ATP13A1, ATP5D, ATP5J2, PTCD1, ATP5SL, ATP6V0A1, ATP6V0A2, ATP6V0D1, ATXN7L2, BAT5, BATF3, BCAT2, BCKDK, BCL7B, BCL7C, BOK, BTBD2, C10orf25, C11orf90, C17orf68, C18orf10, C18orf23, C19orf12, C19orf28, C19orf56, C19orf62, C1orf144, C20orf24, C20orf27, C20orf4, C20orf54, C21orf33, C21orf59, C8orf30A, C8orf30B, C9orf7, C9orf89, CALCOCO1, CAMK1D, CARS2, CASP2, CDC23, CDC37, CDIPT, CDK11B, CDK20, CDK2AP2, CDS2, CHST10, CKS1B, CNDP2, COMMD9, CORO7, COX8A, CPNE2, CPNE9, CPSF1, CSK, CUTA, CYB5A, CYTH1, DCTN1, DDB1, DDX39, DENND3, DEXI, DGAT1, DHPS, DIP2A, DNASE1, DNER, DNM2, DOCK6, DPM2, DUSP23, DYNLRB1, EIF2C2, EIF3G, ETHE1, FAM136A, FAM96B, FAM98C, FARP2, FASTK, FBXL19, FIBP, FKBP1A, FKBP1A, FKBP1C, FZR1, G6PC3, GART, GBA, GBAP1, GDI1, GGA2, GNA13, GPAA1, GPR137, GPR89A GPR89B, GPR89C, GRINA, GRK6, HIGD2A, HIP1, HIST1H2AC, HIST1H2BG, HIST1H3D, HIST1H3H, HIST1H3I, HIST1H4E, HIST1H4J, HIST1H4K, HIST1H4K, HIST2H3A, HIST2H3C, HIST2H3D, HLCS, HPS4, IFITM2, IMPDH2, IPO13, IPO5, IRF3, KCNK6, KCTD5, KHSRP, KIAA0146, KIAA0355, KIAA1310, KIAA1522, KIAA2013, KIF12, KIF18B, KIF22, KLHDC3, KRTCAP2, LAMP1, LAPTM4A, LAPTM4B, LAS1L, LETMD1, LGMN, LIN37, LOC100294376, TECR, LRFN3, LYPLA1, MAD2L2, MAEA, MAMDC4, MAN1B1, MANBAL, MANF, MGAT4B, MGLL, MIF, SLC2A11, MLLT1, MOBKL2A, MOSPD3, MPDU1, MPND, MPV17L2, MRPL4, MSI2, MSRB2, MTMR14, NARFL, NCKIPSD, NDUFA11, NDUFA3, NDUFA7, NDUFV3, NINJ1, NOMO1, NOMO2, NOMO3, NOP10, NOTCH4, NR1H2, NUBP2, OAZ1, OLFML2A, OR5L1, OR5L2, OS9, OXSR1, PABPC1, PCBD1, PCMT1, PDK3, PEMT, PFKFB3, PFN2, PGD, PGLS, PIGP, PIGU, PIGZ, PIK3R1, PLEKHH3, PNPLA5, POLD2, POLL, POM121C, POMT1, PPFIA3, PPP1R15A, PPP4C, PPP4R1, PPPDE2, PRKCSH, PRMT1, PRR13, PSENEN, PSME3, PTBP1, PTGR1, PTK2, PTPN23, QTRT1, RAB8A, RANGAP1, RHBDF2, RHEB, RHOG, RNF167, RPL13A, RPL15, RPL18A, RPL37, SNORD72, RPN1, RPS2, RPS26, RPS28, RUVBL2, SEMA3F, SF3B4, SFRS15, SLC25A44, SLC35A4, SLC35C2, SLC35E1, SLC38A7, SLC6A9, SMPD4, SNORA23, SNORA47, SNX24, SPATA13, ST6GALNAC6, STK11IP, STK25, SUPT3H, TAF12, TAGLN2, TARS2, TATDN2, TBCD, TCEA2, TCF25, TECR, TFDP1, TGIF1, TIAM1, TIMM16, TLR7, TMEM109, TMEM120B, TMEM161A, TMEM201, TMEM203, TMEM205, TMEM219, TMPRSS9, TNIP1, TRAPPC1, TRAPPC10, TRIM28, TRIP6, TSEN34, TSG101, TXN, UBA52, UBAP2L,		

UBE2G2, UBE2M, UBR4, ULK4, UROD, USP16, USP25, UTY, VPS72, WASF2, WBP2, WDR90, WDTC1, YIF1B, YIPF2, YIPF3, YWHAG, YWHAZ, ZC3H3, ZDHHC18, ZMAT2, ZNHIT1, ZNRD1		
AHI1, APH1A, ATRX, BAT2L2, CALML4, DDX59, DHRS7, EIF4B, ERICH1, EWSR1, FAM198B, FOXP1, GCC2, GTF2H1, HIVEP2, HNRNPA3, IRAK4, IREB2, KIAA1109, KIAA1432, KLHL8, MIA3, MLL5, MON2, NARG2, NEXN, NUCKS1, OPA3, PHF3, PHTF2, PPCS, PPFIBP1, PPIG, PTEN, PYCR2, RECQL, SDCCAG8, SERBP1, SERPINE2, SFRS2IP, SHOX2, SMNDC1, STK38L, STYX, TCF4, TNRC6B, UBQLN2, USP15, ZBTB1, ZBTB43, ZFAND5, ZNF226, ZNF638, ZNF766, MARCHF6, AASDHPPT, ABCB10, ACBD3, ACPP, ACTG2, ACTR2, ACVR2A, ADAM3A, ADAMTS5, ADO, AKR1D1, AKT3, ALPK2, AMMECR1, ANAPC4, ANKRD13C, ANKRD32, ARAP2, ARFGAP3, ARHGAP18, ARID1B, ARID4A, ARL1, ARL6IP5, ARNT, ARRDC4, ASAH1, ASXL2, ATAD1, ATF4, ATG2B, ATP5I, ATXN3, BAG5, BAGE, BAZ2B, BCAP29, BCL2L2, BCL6, BCLAF1, BDNF, BLNK, C10orf119, C10orf4, C12orf11, C12orf24, C14orf145, C15orf40, C1orf156, C1orf25, C1R, C4orf34, C5orf24, C5orf44, C5orf53, C7orf41, CACHD1, CAMK2D, CASC4, CASK, CATSPER2, CCDC14, CCDC76, CCDC88A, CCNL1, CCPG1, CD302, CD48, CD99L2, CDON, CEP57, CEPT1, CHD3, CIR1, CLINT1, CLIP1, CLK3, CMAH, CNIH4, COL4A3BP, CORIN, CORO1C, CREB1, CSDE1, CSNK1G3, CSTF3, CTBP1, CTDSPL2, CYP3A5, DARS, DDHD1, DDX3X, DEGS1, DIDO1, DNAJC13, DNAJC24, DPYSL3, EIF2AK4, EIF4E, EIF4ENIF1, EIF5, EIF5B, ENAH, EPHX4, ERMP1, ETNK1, EXOSC2, FAIM, FAM115A, FAM168B, FAM46A, FAM63B, FAM71F1, FAM83C, FAM98A, FBLN1, FBXO11, FBXO22, FBXW2, FBXW7, FCF1, FDX1, FGFR1OP2, FIP1L1, FKBP3, FLCN, FNIP1, FOSL2, FOXJ2, FOXRED2, FRYL, FYTTD1, GATA2, GGCX, GLIS3, GLS, GLTSCR2, GNAQ, GNPAT, GOLGA2, GOLGA7, GORAB, GPR155, GRB10, GREM2, GUCY1A3, HAUS3, HBS1L, HERPUD2, HIVEP1, HNRNPA0, HNRNPC, IBTK, IGF2, INS-IGF2, IL6R, ING3, INTS6, IQGAP2, ITIH5, ITPRIPL2, KDM2A, KIAA1586, KLF3, LAMC1, LARP1, LLPH, LMAN1, LOC440917, YWHAE, LONP2, LRCH2, LRP10, LRRC17, LRRC58, LRRK2, LUC7L2, LYSMD3, MAF, MAP4K5, MED21, MEP1B, MESDC2, MIER1, MKI67IP, MLL2, MMAA, MORF4L1, MOSPD1, MTIF2, MTMR1, MTR, N4BP2, NAA50, NAP1L1, NFIB, NIPBL, NOL8, NSL1, ORMDL2, OSBPL5, OTUD4, OTUD5, PARP11, PBRM1, PCF11, PDCD7, PDPK1, PGBD2, PGM3, PHF21A, PHKB, PI4K2B, PIK3CG, PLEKHA5, POC1B, POLR3G, PPP1R12A, PPP2R5E, PPTC7, PRIM2, PRKAA1, PRKD3, PRPF39, PTP4A1, PTPDC1,	Increased (n = 425)	Gámez-Pozo[2]

RAB1A, RAB3GAP1, RAB3GAP2, RAPGEF6, RBM16, RBM25, RBM34, RBMS1, RBMS2, RCHY1, RCOR3, RECK, RFTN2, RGL1, RHOQ, RICTOR, RLF, RNF149, RORA, RPAIN, RPL32, RPL9, RRAS2, RSF1, RSRC2, RWDD3, SACS, SCRN3, SCUBE3, SDCCAG1, SEC24A, SECISBP2L, SELT, SFRS12, SFRS13A, SFRS13B, SFRS3, SFRS5, SGK269, SHOC2, SIK2, SIPA1L2, SKI, SLAIN2, SLC25A46, SLC30A5, SLC30A7, SLC36A1, SLC37A4, SLC39A14, SLC3A1, SLTM, SMC3, SMEK2, SMU1, SNAP23, SNAPC4, SNX13, SOS2, SPTLC2, ST3GAL2, STAMBP, STEAP2, SWAP70, SYNE2, SYNJ2BP, TAF1, TAF1A, TAF7, TAGLN, TARSL2, TATDN3, TAX1BP1, TBC1D15, TBCEL, TBRG1, TCF12, TFCP2, THBS2, THOC2, THRB, TIAL1, TIRAP, TLK1, TM4SF20, TMCC3, TMEM167A, TMEM200C, TMF1, TMX3, TNFRSF19, TNRC6A, TOR1AIP1, TPSAB1, TPSB2, TRD@, TRIM24 , TRIM34, TRIM34, TRIM6-TRIM34, TRIM38, TROVE2, TSC22D2, TSEN15, TSHZ3, TTC21B, TWIST1, U2AF2, UBA5, UBE2Q2, UBE3A, UGT2A1, UGT2A2, USH1C, USP3, USP46, USP8, UTP15, VDR, WDR26, WDR44, WDR73, WSB1, XIAP, YAP1, YTHDC2, YWHAH, YY1AP1, ZBTB38, ZCCHC2, ZFP14, ZFP91, ZHX1, ZNF148, ZNF167, ZNF189, ZNF22, ZNF234, ZNF268, ZNF280D, ZNF330, ZNF333, ZNF449, ZNF451, ZNF673, ZNF674, ZNF678, ZNF713, ZRANB1		
PROM1, IRX2, SFRP1, SLPI, RBP1, CBS, AKR1C3, HBA2, BEX2, SELM, ZDHHC8, HS.143018, ZNF462, SNORD13, TMPRSS2, HS.193557, HS.193767, TIMP1	Increased (n = 18)	Khoury[1]
TRIM37, HIST1H2AE, C3ORF14, FAM84B, UTP18, DCK, NXPH1, LFNG, ZNF239, H2AFJ, GCHFR, PLA2G7, GHR, CKS2, XYLT2, EPN3, ZNF296, NCAM2, RPL29, LACTB2, NDST4, SLC35B1, HUS1B, ADORA2A, NME1, NME1-NME2, SH3BGRL, MRPL27, SYNPO2 L, SPATA20, NETO2, HSPA2, NQO1, ASCL2, EXOC2, MYCN, HEBP1, PHB, CNTNAP2, C9orf152, MIPEP, KIAA1467, TOB1, AKR7A3, SLC12A2, CEACAM6	Decreased (n = 46)	Khoury[1]
LTF, LPCAT1, RAB26, C1orf64, KIAA0114, CNTNAP2, CLGN, MGC29506, CNTNAP2, TLR5, MGC29506, LSM7, GALNT7, ARSD, NBEAL2, PNMT, GALNT7, NCOA7, CYP4X1, LFNG, GATM, DNAJC9, FAM84B, XDH, GRB7, TNFSF10, LOC644246, AQP5, GATM, SLPI, RHOC, SPDEF, SECTM1, TNFSF10, MALL, SPDEF, F8, PLA2G16, CAMK2N1, HMG20B, HMG20B, C4orf7, PABPC1L, FGFR4, HSD17B2, EPS8L1, RCAN2, OAZ3, OLFM4	Not reported (n = 49)	Guarneri[7]
ERBB2, GRB7, ORMDL3	Decreased (n = 3)	Triulzi[3]
C1orf186, ESR1, RERG	Increased (n = 3)	Triulzi[3]
C14orf173, C17orf173, C1QTNF7, C2orf48, CDK5R1, CPA3, CPNE5, CTSG, DBN1, DERL3, GPC2, HIST1H2BM, IGFN1, INTS5, KPNA5, LRRC8D, MANF,	Not reported (n = 35)	Triulzi[3]

MEX3A, MS4A2, ODC1, PGAP3, PLEKHA8, PRDM1, PSMD3, RGS13, RIPK4, SLC18A2, SLC8A3, SOX11, TCAP, TNFRSF17, TPSAB1, TPSG1, VPS37B, WASH2P		
RPS3A, PSMD3, MUC6, RPL41, HCAR1, PHB, GSDMB, GOSR1, MYH11, RPL7, KYNU, NME1, MYC, ICT1, EEF1B2, LRRC37BP1, PEG10, NPM1, MAOB, CSTA, HAUS8, HIST1H2AI, PALM3, SFRP1, TOB1, NTRK2, S100B, MYO18A, SCARNA13, EEF1A1, CPD, SELL, GABRP, ID4, GIT1, PIP, SYNM, GNLY, DEPTOR, JAM2, CXCL9, MEG3, POF1B, PABPC1, RPL10, BLMH, ITGB6, CD36, KIAA0100, RPL6, AIM1, GDPD1, HIST1H2BG, PLA2G4A, NME2, ZNF652, GPX3, UTP18, TLCD1, TMEM86A, PPARG, GATM, KAT7, RPS7, FLOT2, MATN2, RBP7, NUFIP2, HNRNPUL2-BSCL2, MME, KLRK1, RPS27, G0S2, RPPH1, LOC541471, CLU, MBTD1, TXNDC5, AP1G2, LOC100132707, PFN1, SLC35B1, SPAG9, PRR13, LDHB, AKAP1, RPL17, ETFB, BCAT1, EIF3H, SNF8, LRRC59, SNHG3, ACSL5, VCAM1, PPP1R9B, ATP8A1, ARHGAP10, VLDLR, SH3D19, CSNK2A1P, TPD52L1, HLA-DMA, NSRP1, GZMK, MIR205HG, CYTIP, PPIA, SYNPO2, NUP93, NEFH, CD3E, EIF3E, PELP1, CDK5RAP3, S1PR1, CGNL1, TRIP10, OXCT1, NPIP, PADI2, SMG8, NPPA-AS1, CCDC11, FAIM3, KIAA0922, ARHGAP26, FHL1, PTN, PDGFA, MPP6, ORMDL3, PPAT, CLK2, F13A1, TOM1L1, GIMAP7, DMD, SCARNA5, AHSA2, PSMC1, TFRC, SPOP, SSH2, NDUFAF2, GGA3, NUP85, SORBS1, SUPT6H, CHI3L1, C17orf80, GNAI1, ARHGEF6, PHF12, FLJ35776, CPED1, AQP3, MEST	Decreased (*n* = 158)	Merry[4]
TMEM107, STAT2, TXNDC16, PCDHGB6, ZNF281, WBP2, ST7-OT4, IFT122, HLA-F-AS1, ACTR1B, ADAL, TMCO1, HMGN3, STT3A, GPATCH2, GSR, RFWD2, MCF2L, MTUS1, DNAAF2, GXYLT1, USP19, NFIA, PSMA1, GCNT1, CCDC71L, TMEM25, B3GALNT2, PCDHGA5, SPOCK1, ANKRD52, BUB3, C21orf33, KIAA1377, PBX2, IDH3B, GPD2, HN1L, ZNF746, MEA1, NSUN3, C1orf38, PIAS3, RAB21, GNPDA1, BRD1, DSTYK, RNF146, CAPG, SAP30L, NEU1, PIM2, NSL1, CAPN2, TSTD1, ENAH, CCDC56, GALNT5, FAM165B, NACC1, CRELD2, FASN, NDUFB1, POLR3F, ZSWIM6, TBC1D9, NAV1, CYSTM1, DENND1B, ABHD2, GPR137B, SMUG1, ATG12, ZNF75D, VHL, PON2, RDH11, ZBTB8OS, CPNE1, TMEM128, ZNF681, LCA5L, CRLS1, TFG, NFKBIA, TCN1, CDK1, PARL, HSD17B6, UBE2Q2, MEPCE, SAA1, CAMSAP2, CLSTN3, CXorf21, EXTL2, ADAR, C1orf210, MOSPD3, AMIGO2, MRPL9, CLDN12, CCDC104, VPS28, C14orf2, GPR160, TIPARP, NUDT3, C10orf35, RPL36A, RABL2B, CDK2, ZNF669, DSTN, DNAJC14, STOML2, PROM2, FAM129A, ANKRD5, PCID2, SSU72, KIAA0101, HDAC7, WDR78,	Increased (*n* = 1383)	Merry[4]

GNPAT, UPRT, NDUFA1, MOK, MARCKS, DDIT3, ZNF577, SLC41A2, MLLT1, C3orf23, GPR56, SEC61B, ACBD6, RNF219, TTPAL, ATOX1, EPRS, PARP1, ZCCHC10, SNORA50, OSGEP, CMPK1, PDGFRL, POFUT2, THBS2, GLT8D2, DDX60L, PPP1R2, TMED7, PAIP1, UBE2F, LYRM5, CBR1, CLEC4A, ZNF92, RNF11, PRAF2, FASTKD3, ZNF738, EIF1B, ARPC1A, GCA, P4HA2, PGK1, RPL35A, TMEM242, CMAS, C12orf26, HSD17B7, SEC13, TBCEL, BPGM, N6AMT2, TCEB1, PLAUR, AGAP3, KITLG, C1orf144, IRAK3, TRAF5, CASP1, PCDHGB8P, AMACR, COMMD5, TCF19, C20orf3, TOMM7, UQCC, FLJ27352, TCEB2, CCND1, UQCRHL, TTC39A, MIR22HG, NT5C3, TSR3, PSMB3, ZFAND6, LYSMD3, IGSF3, PLEKHS1, TSEN34, C4orf32, RRBP1, FAM63A, EMB, AIDA, PTP4A2, CEACAM5, PPP3R1, FAM104B, TPBG, HSPA13, KRAS, UBL4A, HMGXB4, PDIA4, DCTN6, MAN2A1, GABARAPL2, GPR107, CHMP1B, INSIG1, SP100, FIS1, VIMP, COL8A1, ACAD9, SPRTN, RFK, FNTA, KIAA2013, ACACA, KIAA0930, RGS2, NPRL2, HMGN5, MARCHF1, GSTP1, KRTCAP2, MRPS24, HSP90AB2P, BROX, PAM, PHF2, SPINT2, FASTKD5, HPRT1, SPP1, SLC24A3, NMI, PTGFRN, CXCL17, PLAT, KIF13A, FBP1, FFAR2, WRB, PDIA5, RPIA, SRPX2, TNFAIP6, UBFD1, VMP1, LOC400043, LOC100133991, KDELC1, CDCA2, ARMC10, EXOSC4, TM2D3, GLB1, HOXD8, SF3B5, GJA1, POP4, BPNT1, MRPL41, TSR2, TRAPPC3, NRAS, VAPB, PIP4K2B, NUF2, SIX1, UBE2A, FAM46A, RPS27A, GPC6, C20orf20, CD63, NDUFC2, UHMK1, FAM100B, COL5A1, MRPS18B, WDR26, CAPN8, C6orf62, CACUL1, ISOC1, CYB5R1, TCTEX1D2, TMED9, TMEM41B, HRAS, LOC100134229, FAM168A, HDGFRP3, MEF2BNB, TNIK, C21orf88, MACC1, DEDD, ATP6V0C, GADD45GIP1, DTWD2, REEP3, PPP2R2A, NRIP1, MYCL1, TMSB4X, SEC22B, SIKE1, DYX1C1-CCPG1, EEF1A2, ZNF439, C6orf47, TSPAN15, HTRA1, TBL1XR1, ANKRD42, ZNF678, JMJD7, CA12, C17orf108, TEAD4, SLC25A38, BCDIN3D, NBPF1, SLC25A26, PPP1R3C, RNF181, SNX7, SSX2IP, ARPC5L, C20orf24, ANGEL2, DHFR, LUM, ADIPOR1, TRIL, NAA20, PEX7, COX7B, PIR, CAPZB, MSX2, CRIP2, UBE2D2, MRPL15, RNASEH2A, ENSA, CD2AP, MYBL2, PSMD11, SIK1, AKIRIN2, PRSS16, ENPP4, UBE2B, C18orf32, FAM127C, C3orf78, SOX4, ZCRB1, RAB38, LYST, ATP6V1F, AKAP5, COMMD6, GUK1, GAL3ST4, GPX1, RRN3, DDX60, TSTA3, PSMA7, PLEKHG3, SMPDL3B, SCAMP3, PCDHGA10, TSEN15, PCDHB5, GRINA, RBX1, B4GALT1, RPL39, ZNF674, LMNA, FBXL20, LOC375190, SEC11A, SLC25A24, JUN, PSMA4, CBX4, PLAC2, R3HDM2, PERP, TM7SF3, MRPS21, RNF2, SNAPIN, CNIH4, RIN2, TIPRL, CPE, TAX1BP3, BCL9, ZNF362, PSMD13, ZNF768, HLA-C,		

SLC25A44, U2AF1, MFSD5, SPCS1, SLC35D1, NUP133, SRXN1, TGIF2, AKT1, GADD45B, TMEM51, CSRNP2, OCLM, MT1F, SLC25A37, SLC9A8, RPLP1, PLCE1, FRAT2, ZWINT, TAF5L, AKIRIN2-AS1, FAM32A, HSPB1, TCTA, CSTB, TBC1D8B, SLC44A1, OMD, GMNN, MMS19, DYNLT1, CRYZ, NDUFA13, SNORA33, HDAC1, TPI1, NQO1, WIBG, ZNF329, HMCN1, TSFM, DACH1, LOC100507217, MBOAT2, SLC19A2, GSN, C6orf211, AKR7L, FAM114A1, CLDN7, YOD1, RNF24, SUMO3, TOX3, SLC35A1, SAP30, CDKN2B, PSMG3, PAQR7, GOLM1, MOCS2, ATP6V0B, COL10A1, DOK1, ZNF883, ESRRA, COL3A1, C12orf32, SMYD2, POLB, CREB3L1, GOLGA2, PLAC8L1, COPZ2, ENPP1, STMN1, PRRG4, ZBTB2, ZSWIM1, PPP2R5A, ARMCX5, RTP4, FST, C12orf23, LOC100303749, ID2, ABT1, ASAH1, C1orf31, FAM105A, LOC550643, SELT, NDUFAB1, SFXN4, STK35, PREB, HERC5, TRAPPC2P1, ARFGAP3, SRA1, HIST1H2AD, WNT7B, KDELR2, GPX7, NABP2, ZCWPW2, CASP7, TOR1AIP2, USF2, TUBD1, VGLL3, ZNHIT3, C6orf225, STX6, TSPAN1, OMA1, CBX7, COL5A2, ISCU, TRUB1, RUNX1, PCBD2, ACPL2, LOX, ALG14, MLLT6, PIN4, CTNNBL1, SLC35B2, ROR2, PCDHGB3, RBM45, CACYBP, PARD6B, ATRN, MAVS, COX20, GTF2H5, SUB1, MAMLD1, TATDN3, MOCS3, WWP2, KAT6B, NDUFS5, LSM1, PYGO2, AHCY, DYNLT3, NDUFS2, SYTL4, NUDT16L1, COMMD3-BMI1, NUPR1, DBI, MLPH, PRKAG1, MARCH5, HIST1H2BD, CREB3, C1RL, EXOSC1, GFPT1, ANGPTL1, DPY19L1, ZNF649, FAM162A, MRPL20, GPR52, IFIH1, CA8, EMC9, AGPAT1, TTC9, TCEAL8, EMD, MMP2, HIST1H4I, C7orf59, TRAPPC6A, CAPN1, FAM198A, ARID4B, FAM151B, DAZAP1, RARA, EMC8, FAM102A, IGFBP5, TMEM19, NHP2, DBNDD1, ENTPD7, C1orf131, CD9, SLC29A1, FBLN1, OCIAD1, FRG1B, FAM118B, RPS29, LINC00467, MPLKIP, RPS12, FIBIN, PRRC1, SNRPC, RNPEP, IDNK, WIPI1, NDUFB11, EEF1D, PBX1, DYNLRB2, MB, ATP9A, SGPP1, REEP1, AATF, ARV1, ZNF720, AKIP1, EXOC8, CCNC, C16orf80, RAP2C, FAM83H, TFPT, FRK, H1F0, ARL8A, ISLR, EFCAB2, IFIT3, UBTD2, GALNT2, VKORC1L1, REPS2, TIMM10, LMCD1, MGST3, CABYR, AJUBA, SUMF1, RPL39L, EPS8L1, C10orf116, ZFP64, ARF1, PAX9, RGS4, SPA17, RAD51, MOSPD1, SLC1A5, SFXN1, KIFAP3, PPCS, LRRC47, TADA2A, TFB2M, STK25, MBD6, IPMK, TMEM158, C1GALT1C1, SH3BGRL, ZNF69, APAF1, HEY2, SRP9, CDK15, H2AFY, KIF1C, RPL37A, PMVK, DSN1, AP1M2, C12orf57, NUCKS1, C1orf9, MEIS3P1, CNN2, FOLR1, TNC, DPM3, PRDX6, C1QTNF3, SLC22A5, PRDX5, BLOC1S2, KIAA1383, TMBIM4, PFDN6, SNURF, MFSD12, PGBD2, EPB41L1, SLC2A10, ATP6AP1, TMEM110, S100A1, C4orf33, PMAIP1, AMZ2,		

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SLC24A2, TCEAL3, AGR3, ANAPC11, LOC440335, ARL16, FLJ23867, KRTCAP3, CFB, TMEM125, RNU4ATAC, SERPINA3, C1orf226, KLF4, ZNF238, PI3, C19orf33, STRA13, SNORA57, SNORD99, AGR2, CEBPD, SERPINA5, BCAS4, ESR1, FAM195B, IGFBP2, INO80B, MUC5B, MIR4263, IFIT1, MIR558, SNORA61, PRR15, IFI6, TFF1, TFF3, GRB14, MIR4296, TRIM58, NAT1, ASCL2, SNORA21, SNORA25, WFDC2, IFI27, CAPN9, PYCR1, SNORD111, ZG16B, ISG15, BMPR1B, CLIC6, SHROOM1, GDF9, MIR320B2, MIR3662, SNORA32, SNORA70E		
NR for individual analysis, no overlapping	Increased : GSE22358 (n = 488) GSE62327 (n = 548) GSE66305 (n = 105)	Zhao[5]
NR for individual analysis, SOX11, ATP8B2 and ODF2L in all three datasets	Decreased : GSE22358 (n = 493) GSE62327 (n = 424) GSE66305 (n = 450)	Zhao[5]
REPS1, DRAP1, ZNF697, RSPRY1, EPS15, MRPL50, COPS8, VPS26A, UBA3, BCL2L11, TBCA, SAT2, STX7, ARHGAP18, GLIPR1, CWC15, IRAK3, SNRPD3, MSANTD2, NAPEPLD, YWHAQ, MAP1LC3B, PLP2, SPACA6, ACTR6, SAP18, HNRNPH2, FAM117B, SYPL1, NOC3L, STXBP4, B3GALNT1, ENDOD1, NDUFAB1, FGL2, FAM213A, ARL6IP5, RAB28, ATP5I, NPC2, EPHA4, HS2ST1, EED, STT3A, ARPC1A, RNF214, TMOD2, SMC5, ARNTL2, UST, PPP3CB, PEX3, NT5DC1, TXN, SIKE1, SRP54, NMT2, IPMK, C9orf85, KCTD6, FOXO4, PNPLA8, CHPT1, HTATSF1, CCDC28A, CHORDC1, CADM4, LRIF1, RNF5, MMRN2, C16orf87, FAM217B, DCXR, RASGRP1, CXorf38, MMD, AK9, TOM1L1, SRP9, FZD1, C21orf91, LSM3, PRKAA2, USP14, ITIH5, ISCA1, CYYR1, C9orf64, ADAT2, WASHC3, LPL, COMMD10, NDUFA5, GPD1L, SNORA12, ALYREF, FIG4, SLC39A8, GAPT, PDIK1L, TMEM206, HSDL2, SLC12A2, ATG5, IKZF3, SNRPE, CD164, RNGTT, SESN3, ADGRG6, LYVE1, HBS1L, HMCN1, BMT2, CEP57L1, C5orf30, MCTS1, IMMP2L, ARL13B, RHOBTB3, CLIC5, CPXM1, FAM76B, ABRACL, BAG4,	Decreased (n = 402)	Sorokin[8]

PPP3CA, KIF11, CENPE, NR5A2, CLEC14A, SNX3, DPM3, SNHG19, FKBP7, ING3, FRK, NIPSNAP3A, NUDT12, ADAM22, NEK2, TSPAN33, RGCC, RWDD1, PRKAR2B, PDGFRL, HIST1H4C, SMAD9, PLA2G2A, HSPD1P11, ALMS1-IT1, PARM1, ZCCHC17, GABRE, PPP1R1A, THEMIS, COMMD6, FAM184A, MORN2, BMI1, PCDHB3, ZNF132, EEF1A1P1, SNRPG, HIST1H2BK, LRR1, NOV, ALDOC, CDK15, EPHB3, SERPINB8, ARL3, CASP1, FRZB, TSPAN7, AAMDC, CCDC150, ZYG11A, LY96, GATS, GLYATL2, CYSLTR2, MEGF9, KIF20B, TUSC1, IL17RB, CTLA4, GON7, HIST1H4B, AADAT, SEMA5A-AS1, TMEM60, SBSPON, PRKCQ-AS1, ADM, CETN3, IMPA2, TMEM150C, TMEM178B, COX10, DPY19L2, SLC1A2, FOLR2, SLC4A4, FAM155A, SNORA53, DCAF4L1, SLC16A10, TENM2, NDUFAF4, RN7SKP299, SIX1, ST8SIA6, RPP40, ZNF257, MAOA, ST6GALNAC3, HMGN5, TBPL1, PCBP3, EIF3C, NGFR, CD24, HES6, PELI2, PRRG3, MMP12, LDHAL6A, BAALC, ELOVL7, ABCD2, CCNE1, FCN1, IGSF10, SNORA38, CKS2, GNE, RPF2, CLEC10A, RTKN2, RNF144A-AS1, AFF3, SEPT3, DNAJC6, ADCY5, MPIG6B, DMC1, SNORA49, BCL11A, SCARNA1, LAMC2, IGHV3-13, HIST1H2AJ, ADIPOQ, HIST1H3B, CARD8-AS1, CP, SCG2, SULT1C4, SCN9A, NETO2, HSPB6, PTCHD1, CXCL2, RNVU1-15, CDKN1C, NEXMIF, LINC01473, LSM12, MYOT, ATP8A2, TNIP3, LGR6, RBP4, LRRC4C, CIART, MEOX1, MTND1P9, SLC35E4, MT1E, IGHV1-58, MTND4LP30, TOX, RAB11B-AS1, SNORA20, GLDC, NAGS, TMOD1, KIF15, RBBP8P1, SEC14L5, IGHV3-74, ZNF667-AS1, ARL4D, HDAC2-AS2, LIFR-AS1, GLRA3, B3GAT1, TRNP1, SYF2P2, CHST9, RNU7-20P, IGHV4-61, RAB39A, SLC6A14, NKAIN1, BNIP3P10, ANKRD20A5P, BOLA2P2, OR52N4, PLAC8, CENPCP1, LUZP2, TDRD9, PRDM16, PHACTR3, KERA, MRAP2, LINC01139, FOXA3, PLP1, COLCA1, RN7SL434P, TMEM101, LINC00161, LINC02202, CRTAC1, PCK1, LINC00473, KCNG3, CHD5, RPL18AP7, MBOAT4, NXPH1, TRAJ33, TMEM200C, LINC02246, RHOXF1P3, DEFB1, GNG13, SIM1, KCNH2, PPP1R14C, GP2, MIR181A2HG, SLC6A17, GPR26, GABBR2, RN7SL269P, CCL11, GNG4, OPRD1, IGKV3D-15, RNU6-795P, CAMK2N2, SCN2A, SNAP25, RPS12P17, SYNGR3, FAM201A, RN7SL863P, SMCO2, SPRR3, S100B, ANKRD26P4, SLITRK2, RNU6-644P, CRABP1, KRT6A, ROBO2, ADAMTS19, LINC01554, HIST1H1A, SNORA33, CST2, HES5, LY6K, SCN3A, SNORA70E, SIX3, FDCSP, IGHV1-69, GLB1L2, RNY1P12, GSTM1, MIR7849, CBLN1, DLK1, TCN1, RN7SL304P, RMST, MKI67P1, CD300LG, IGLV4-60, LRP2, PATE4, PCSK2, MGAM2, KCNK3, SOX2, DPYSL5, HEPACAM2, PKNOX2		

RNA5SP225, RNA5SP134, RNA5SP514, RNA5SP338, MTRNR2L11, RNA5SP25, RNA5SP29, MTRNR2L12, RNA5SP74, ACE2, RNA5SP325, PCAT18, RNA5SP215, RNA5SP71, LINC00397, PRELID3BP3, LINC01234, FAR2P3, RNA5SP359, RNA5SP444, MAGEC1, TLE1P1, RNA5SP372, EYA4, TDRKH-AS1, SP8, GRTP1-AS1, RNA5SP192, HSD17B1P1, GLYATL1P4, RNU7-169P, GOLGA6B, FAM182B, MIR1301, MIR3942, KLF2P1, RNA5SP259, RNY3P16, RNA5SP490, SLC22A6, HM13-IT1, SCHLAP1, ARIH2OS, RN7SKP86, RNU6ATAC11P, ZPBP2, ABI1P1, C1orf105, TP53AIP1, RPS18P13, RNA5SP48, RNA5SP323, TNNC1, RNA5SP302, RNA5SP145, RNA5SP250, RNA5SP388, RNA5SP517, RNA5SP336, RNU6-759P, RNA5SP68, LINC00273, ACOT1, OR5C1, CKM, C22orf15, ZNF716, SMC2-AS1, AQP4, MYLPF, SMPD5, BIN2P1, RAPSN, WDR88, OR7E117P, GPR83, OR2B6, ACTBP9, ANXA10, NPAS1, RPL38P4, TMEM220-AS1, GRM5-AS1, IGHJ3P, BNIP3P24, LGALS8-AS1, RPL23AP90, LINC00483, LINC02363, TRMT112P3, NANOGP7, APOB, ANKRD20A18P, USP17L7, RNA5SP452, CLPSL2, PPFIA4, RAB5CP1, RN7SL749P, TMEM74B, YBX1P4, DLX4, NUTM2A, RNA5SP513, IGHD2-15, RNA5SP235, RP1, COL6A4P1, LIMD1-AS1, SLC45A2, CCDC74BP1, SCG3, RNU7-124P, RASL11A, CYP2T3P, LINC00689, SAMD11P1, IGHD3-3, LINC01634, RPGRIP1, TMPRSS7, MIR6769A, SPDYE22P, MEP1B, POTEF, SERHL, RN7SL180P, OSMR-AS1, HADHAP1, LINC01010, ANO1-AS2, DOC2A, CELA2B, TMEM92-AS1, GAPDHP2, SCRT1, ARHGAP40, LINC01544, GTF2IP13, ZNF209P, PLEKHD1, AQP4-AS1, RNA5SP301, FAM167B, TUBAL3, PSORS1C2, LINC01774, CELF3, BNC1, HSPB9, RN7SL733P, DPRXP5, ZC3H12B, TIPARP-AS1, KLHDC9, TMPRSS6, CRTC3-AS1, IKBKG, VDAC1P11, RPS23P6, EPX, PCDHB19P, MTRF1LP2, DMRT3, SAG, PTCD1, ARTN, EIF4A1P8, RN7SL32P, PGAM1P5, CFD, CCDC74B, HOXB-AS3, GJB7, POTEE, OR1K1, RPL5P34, RPS14P8, LINC01237, TGFB3-AS1, RAB6C, LIPE-AS1, TRAJ6, SNORD116-18, ASPRV1, ENO1P3, TMEM92, TPTE2P1, ASIC5, MRM1, ENPP7, PLEKHM1P1, SLCO4A1, CASK-AS1, RPL29P14, LRRC29, DNASE1L2, TNFRSF4, RAD51AP1P1, SRGAP3-AS2, SLC2A4, MAGIX, DLEU1-AS1, SMUG1-AS1, RN7SL612P, UCA1, STAG3L5P-PVRIG2P-PILRB, NWD1, SCN11A, TSSK3, LINC01133, ZNF709, PNPLA7, SLC2A1-AS1, MTND2P11, ADAT3, RNA5SP295, APBA3, CHRND, BTBD2, SLC16A8, LINC00484, PKD1L1, BHLHE22, RN7SKP292, RNU4-25P, MRPS18AP1, RN7SL164P, NME2P1, PCDHA12, RPS15AP10, CYP2F2P, RPSAP36, SMIM6, EDRF1-AS1, SCNN1B, OR5BA1P, DUSP14, TSPEAR-AS2, RN7SL812P, ANGPTL7, C8orf46, FAIM2,	Increased (*n* = 1198)	Sorokin[8]

PADI3, SCARNA15, ARSJ, RHOBTB2, ADAMTSL5, PABPC1P3, TMEM178A, RHEBL1, SH3RF2, C2orf42, SPX, RPL7P32, EPN3, PLIN5, LILRA1, LAMTOR5-AS1, HMGA1P4, GRIA4, NRL, ANKS3, IFFO1, SHANK2-AS3, ABHD11-AS1, CES3, ENPP7P4, IGHV2-70, BMPR1APS1, RN7SKP235, POLM, ZNF414, RN7SL263P, EPHA10, CPLX1, D2HGDH, GNB1L, LINC00222, GNMT, FAM66C, UPP2, TRIM7, TYRO3P, UNC5B-AS1, PLEKHH3, RPL7L1P3, ABCC3, WWOX-AS1, TET2-AS1, AP4M1, MEGF10, HNRNPA3P15, SRP14-AS1, CAPN12, CYP2J2, PROB1, TLE6, RN7SKP97, CCDC78, SIGLEC14, CBARP, PTCH2, PROC, PON3, ABCC6, RN7SL521P, THEM5, MXD3, PCED1A, CCDC152, MST1, NPM1P27, ITPK1-AS1, NATD1, DMKN, ATP6V0E2-AS1, NAGLU, LRRIQ1, C5orf66-AS2, P2RY11, ATP8B3, RNU6ATAC16P, CCDC144NL-AS1, ODCP, SLC26A6, FIGNL1, CDC20B, TNFAIP1, ETV5-AS1, SH2D3A, TUSC8, MINK1, HNRNPA1P68, XKRX, WASHC1, PKDREJ, IGLV3-10, SPATA20, RPL3P1, SERHL2, ADGRV1, MFSD10, C2orf72, RN7SKP275, PROSER2-AS1, SMC5-AS1, FCF1P8, ADAMTSL4-AS1, YBX2, ZNF70, KLC4, WNK4, METAP1D, FXN, FEN1, TAC4, SPRN, MIRLET7BHG, C1orf159, ZC3H12D, PIGL, STAB2, SCX, HOXB6, C20orf144, BAALC-AS1, MYH16, ZNF831, CPAMD8, SDR42E1, CLIC3, TAT, LINC01725, ATP2C2, ROR1, PLK2, HOXB5, ENTPD5, RNVU1-1, CAD, RTN4RL2, PODNL1, NYNRIN, PEX6, DHRS4L2, RNU7-181P, CRIP1, PHYHD1, KAT5, NUPR2, ZC3H4, FBXW12, EZH1, FBN3, HILPDA, LINC00672, CEP72, C9orf116, SRRM2-AS1, TOM1, SH2D2A, RNU1-139P, AMER1, ZNF350, FAM186B, BCAR3, CCDC146, NPIPP1, EXOC2, LRRN2, FPGS, SULT1A1, TNRC6C, PLEKHJ1, SLC26A1, UTP15, PHLDB3, GTF2IP20, LINC01569, CORO6, LINC00680, UNC5CL, STX2, RN7SL732P, UNC45A, TOP1MT, MAN2A2, DENND5B, NEU4, FSTL3, KRT81, PSMD9, EPHA3, RRAS2, ATP8A1, TMEM205, LYPD3, SLC28A3, ZDHHC4, SPA17, SYNGR1, ELL, ST20, OCIAD2, NUDT8, RASD1, SNORA71B, TIMM17B, ALDH3B1, NONOP2, TMEM216, MYL5, BMP2KL, LENG8-AS1, CTNS, RTEL1-TNFRSF6B, FBXO27, RAD51D, CHKB, ORAOV1, MYO1G, TM7SF2, SLIT2, GLDN, NSUN5, ZNF714, PRORSD1P, FCGR2C, RGL4, GPT, PSPN, RN7SL608P, ZNF646, CHERP, ABTB2, RPL18P10, PELI3, CHSY3, ATG2A, REEP6, RAB4A, LAS1L, UBAC1, CYR61, CROCC, C1QTNF3, PELI1, MINDY4, PCSK4, PKN3, TMEM94, MRRF, REXO1, GALE, ACSS2, EDN2, B9D2, HOXC4, ABHD11, CLDN12, FLRT1, HAVCR2, DVL1, SPATA24, RIPOR3, C15orf52, FNBP1P1, MAPK10, TMEM126B, GRB10, HIRIP3, CRYZ, PRSS16, C9orf16, WDR97, LZTS2, PMS1, INCENP, CYB561D1, EEF1D,

ZNF826P, ACVR1B, RALGPS1, SYT2, NDE1, RN7SL431P, VAMP4, CARS2, C3orf62, ARHGEF17, ZNF439, TUBGCP6, KIF21A, RFX2, RN7SL660P, TMPRSS9, SP140L, TOLLIP, SNED1, PER2, GRIN1, KAZN, ZNF575, AMOTL2, NKX3-1, NIT1, RPUSD3, TMCC2, SLC25A37, OAZ3, DHX35, GATD1, MPV17, HAUS7, PUF60, C2orf54, ELOF1, ACOT9, UCK1, CDK5RAP3, KAT14, QSOX2, ERCC6L, BCL9, BAIAP2L2, EGFR, TANGO2, CHST3, LPIN1, BEST1, CISD3, ARHGAP29, ACOT2, EEF1A1P3, SCARNA22, TMEM198B, LARGE1, GOPC, MYO18A, SAMD11, MAPKAPK5-AS1, POU2F2, MORC4, NHSL2, KAT2B, TRO, SEPT1, MRPS31P5, MORN4, RAB3B, ACSF2, SLC35A4, ANKFY1, PNKD, RCAN1, FAM98A, CRBN, SETD1A, TAPT1-AS1, PLAU, FHL3, G6PD, ZNF517, RSAD1, ANKHD1, ZNF710-AS1, BOC, KCNK6, IGSF8, COMMD5, RN7SL141P, GPSM1, CBLB, ZNF839, MANBAL, TNPO2, IRF9, PSMG3, CCL5, BIN1, LRRC37B, FADS2, RASSF4, CUEDC1, ANO8, MYBBP1A, KIF21B, SPNS2, WNT7B, NUDT22, FRMD6-AS1, ZMYM3, ZNF44, RBL1, UPF1, PROX2, IDH3G, IKZF4, RPS7, C1orf116, TMC5, PRPF40B, PNPLA2, SIGLEC1, TBC1D22B, OBSCN, ZBTB7C, PIGQ, RRN3, RN7SL394P, TXNL4A, SLC25A1, RRP7BP, MARS, SYDE2, SLFNL1, ZDBF2, EIF3G, KIAA1324, LIMS2, MORN3, SAMD12, AP1G2, SNHG3, NEK7, TCOF1, HELLPAR, SRPK3, DPY19L1, SMARCC2, MICALL2, TXNDC15, GPR180, GGT6, WDFY4, TRIM2, AHCYL2, OTUD6B-AS1, GOLPH3L, IFFO2, SLC35E2B, TMEM132A, HLA-DQB2, PAQR7, LETM1, ZBTB7B, STX5, PTGIS, SNX17, IFT27, TOMM40L, FAH, CENPP, LINC00174, MRPL48, SPPL2B, RN7SKP180, COIL, CACNG4, CAMSAP3, MEF2C, SH3D21, TSHZ1, EPS8L1, CCDC61, KIAA0040, ASPSCR1, IL18BP, CCDC120, RBMS2, MTG1, TBC1D10C, NME4, CABLES1, SNX5, WNK2, N4BP2L1, INPP4A, NEAT1, ANKRD44-IT1, MUC1, ADGRF5, DONSON, TLDC1, ATG10, RASD2, NOXA1, EMC10, SHANK3, ADCK2, ZNF767P, RN7SL513P, SLC12A9, SLC4A5, RPL9, PHF21A, TTLL5, CDHR5, ACOX3, PRKCA-AS1, NFIX, C1QBP, CD37, C1QBPP2, LSM5, ADGRA2, FRMPD3, RABIF, CPT1B, FAM53C, TNFSF15, CCNDBP1, B3GNT5, ZNRF1, PLD2, SLX4, TIMM21, FUK, SETDB1, RNF146, GABARAPL1, ATXN10, SLC12A6, TLN2, REPIN1, AKT1S1, TMC4, SYTL4, DNAJB5, ZNF581, BCAP31, SF3A2, HKR1, CBWD2, PATJ, NADSYN1, RAPGEF5, SIPA1, FYTTD1, IL6R, RRP7A, EME2, LONRF1, FBXL19, RNU1-11P, RPAIN, RAB13, SELENOO, ERO1B, STX1B, RAB11FIP1, DEDD2, KRT8, ZC3H12C, DOCK6, ATAD3B, ARFRP1, GSTK1, FZR1, RAPH1, TRMT2A, FBXO44, BTF3, LINC-PINT, RRP8, SGPP1, FECH, TLE2, RPS20P22, SKAP2, MTA1, FBXO25, NPAS2, EHMT2, PANK2,		

CLDN3, ALDH1A3, FBXO46, ARHGAP5, TMEM150A, SHC1, ACIN1, MORF4L1, LMTK3, LTBP3, TXNRD2, TRMT2B, DNAJC17, RAD51, ZNF737, TMEM120B, TOB1, YARS2, NCOR2, TYW5, DUSP18, CAPRIN2, B3GNT7, LINC00969, MAMDC4, COL27A1, BOK, SYNE3, NDUFV3, MICAL3, GLTP, CHD6, FANK1, TRIT1, HSPB7, ZNF793, DEDD, FUZ, ANKRD49, RNF24, KIAA1191, SLC25A45, SCAF4, TNFAIP3, DVL3, BORCS8, NANOS1, SLC43A2, USP18, VIPR1, PIGU, CAMTA2, DDX27, SSPN, SERPINB1, BAHD1, SHROOM1, NECTIN4, SELENOS, DDR1, RAB35, MAP4K2, NAT10, NUPR1, PGGHG, IPO13, SLC35C2, SAFB2, GTPBP6, RNPS1, ADAP2, FTH1, NRSN2, TRMT10C, EME1, PCDH12, UBE2G1, PSMB6, SHANK2-AS1, SCMH1, SLC22A23, WDR91, ABCF1, ARHGEF11, NR2C2, ADAMTSL4, RPL17, SSBP2, ST5, IL17RC, PAF1, BRD2, MRPL30, S1PR2, CNTN2, SMPD1, LLPH, MAP3K6, UBXN6, APBB3, SARM1, PPP1R3F, NUP160, FBXO32, GTF2E1, TNRC18, TK1, TJAP1, GUSBP1, ARID1A, B4GALT3, E4F1, PLA2G6, RBSN, FBRSL1, ACTR1B, CRIP2, MFN2, MCRIP2, SLFNL1-AS1, ZNF706, CEP120, TNS2, ODF3B, MAPRE3, TAPT1, BAX, RNF19A, SLC2A11, NBEAL2, ABCA7, BDKRB2, HARS, ETF1, UNC13D, BICRA, DNAJC18, THAP6, RPS3A, MTMR10, NAB2, ADGRL1, AVL9, FUT2, DLG4, CLK2, ZNF33B, KRT7, THBS4, PHAX, USP43, PIM3, RAB11FIP5, PKP3, LASP1, LRCH1, ECI1, CYB561, TMEM64, MAP3K12, POFUT1, CENPBD1P1, KAT2A, NDUFA3, ZNF619, COLGALT1, FBXO41, MAPK8IP3, SGTA, SLC15A3, SDHC, LUC7L3, GSDMD, FAM160B2, SPRY1, BNIPL, FAM219A, LEMD3, MYO19, H6PD, RPS17, NFYA, TCF3, TSPOAP1, GUK1, EXD3, SMIM5, MCM3AP, BLOC1S2, SMG1P3, DIAPH1, MTM1, TRIQK, SHKBP1, SLCO2B1, TMEM63C, NOP53, MYDGF, NDUFA12, MTMR1, ZMYND8, SMTN, KLHL24, RAB3D, KIF1C, PLEKHG3, RETSAT, RAB40C, PITPNM3, GPKOW, SLC41A1, FBXO18, MAFK, ERGIC3, FRYL, GJC1, STXBP1, MRPL24, LTBR, PIP5K1C, MADD, FLCN, ZNF431, RBM14, SGSM2, ZNF7, MBD6, HMBOX1, CA5B, SERF2, AP3D1, MEF2A, PELP1, CAMKK1, FASTK, TLE1, GNL3L, CABIN1, TMEM219, GALNT2, RAB11FIP1P1, PTCD2, ZNF276, GNA12, PROM2, MNT, CERS5, CIRBP, CLINT1, HIF1AN, CNOT3, ALAD, ZNF207, HEATR6, TBC1D22A, PPP1R12B, UTP6, BRD1, IGSF9, PPRC1, TNS3, SNX1, RBFOX2, HMG20B, AARS2, CPSF1, ZMIZ2, RGS12, MAT2A, ERICH1, FAM13A-AS1, GOLGA2, SLC35B2, AP5Z1, CCDC125, CLPTM1, CTPS1, GIGYF1, YPEL2, ENO1, VARS, CDC42EP1, TWNK, MOV10, SLC3A2, PIAS3, MAP3K11, RHOT2, CDK13, ALDOA, GLI4, CREBBP, PSMD1, FAM189B, VMP1, ANKRD52, PEG13, ZNF621, ZNF496, RGL2, ZNF281, GGA3, KMT2C,		

TRIM47, FLOT1, MBD1, SMURF1, INTS11, CREB3L4, KANSL3, ZBTB7A, ASS1, CEP104, ABT1, LTBP1, GRHL2, VLDLR, GYS1, LMAN2, TPRN, TMEM259, ZNF814, DDX56, CLUH, CCNG2, ACAP3, WWC1, EHF, ARHGAP27, ARSG, B4GALNT4, DHX34, EIF2B4, TCIRG1, RAPGEF3, TECPR2, SPEN, SLC16A2, RBCK1, ZC3H7B, LINC00963, SLC2A10, ZNF740, SAR1B, ZNF514, TRIM62, INTS1, ZFYVE26, ZNF552, CYB561A3, TPCN1, DCAF11, COPA, CTSD, MED25, KMT2D, NUMB, FBXW4, SRGAP3, BCL9L, GAS2L1, TRIM25, VPS37B, RAB1B, SZT2, PTRH2, TMEM214, ZNFX1, JUN, R3HDM4, PRRC2A, PARP10, FNBP4, POLR3E, REV1, MALAT1, EHMT1, CARHSP1, FUS, DAZAP1, TMC6, LIG3		
AAK1, ABAT, ABCA2, ABCB1, ABI3BP, ACAP1, ACSL5, ADHFE1, ADPGK, ADRB2, AFAP1L2, AMICA1, ANK2, ANKRD44, AOAH, APOBEC3D, APOBEC3H, APOD, APOL3, AR, ARHGAP15, ARHGAP9, ARIH2, ARRDC5, ATAD1, BATF2, BATF3, BIRC3, BLR1, BMP2K, BTK, BTN3A1, C12orf65, C14orf139, C17orf108, C2, C20orf100, C3, C3orf71, C4orf21, C4orf23, C5orf20, C5orf39, CASP5, CCDC69, CCL19, CCL21, CCL5, CCM2, CCNH, CCNL1, CCR10, CCR2, CCR4, CCR6, CCR7, CD160, CD1C, CD1E, CD2, CD247, CD27, CD274, CD37, CD38, CD3D, CD3E, CD3G, CD40LG, CD48, CD52, CD6, CD69, CD72, CD79A, CD79B, CD80, CD8A, CD96, CD97, CLEC10A, CLEC2B, CLEC2D, CLEC4C, CNOT6L, CPXM2, CTLA4, CXCL12, CXCL13, CXCR3, CXCR4, CXCR5, DAAM2, DAZAP2, DENND3, DNAH1, DOC2B, DOCK10, DPEP2, DPPA4, EAF2, EBI3, EDARADD, EIF4A3, EIF4E3, EIF4ENIF1, ELOVL5, ENPP2, EPSTI1, EVI2B, FAM115C, FAM125B, FAM46C, FAM65B, FCRL1, FCRL3, FCRLA, FECH, FERMT3, FGL2, FNBP1, FOXA1, FYN, GALM, GFI1, GIMAP2, GIMAP4, GIMAP5, GIMAP6, GIMAP7, GIMAP8, GIT2, GNB1L, GPR171, GPR174, GPR55, GRAP, GZMA, GZMB, GZMH, GZMK, HAVCR1, HCLS1, HCST, HEMK1, HLA-DOB, HLA-DPB1, HMHA1, HPS1, HSPC157, ICAM3, ICOS, IDO1, IFT57, IGF1, IGLL1, IL10RA, IL11RA, IL12RB1, IL21R, IL2RB, IL2RG, IL7R, INDO, INPP5D, IRF4, IRF8, ISG20, ITGAL, ITGB2, ITK, ITPRIPL1, IVD, JMJD1C, KCNA3, KCNJ10, KIF21B, KLRB1, KLRC3, KLRG1, LARS2, LAX1, LCK, LEPR, LILRA6, LIMD2, LOC388692, LOC440957, LPXN, LTA, LTB, LY75, LY9, LYZ, MAP3K14, MAP4K1, MAPKAPK3, MATK, MBLAC1, MFNG, MGC40069, MGST2, MIR155HG, MIST, MLH1, MLL5, MLPH, MN1, MTUS1, MUSTN1, NCKAP1L, NCOA2, NCR1, NICN1, NKG7, NLRC3, NLRP1, NOD3, NR5A2, NTNG2, NUAK2, OSCAR, P2RX1, P2RY10, P2RY14, P2RY8, PARVG, PDGFD, PECAM1, PHF17, PIM1, PIM2, PIP4K2A, PLA1A, PLCG2, PLCL1, PLCL2,	Decreased ($n =$ 330)	Perez[9]

PLEK, PLEKHO2, POLG, PPAPDC1B, PPARG, PPP1R16B, PRF1, PRKCA, PRKCB1, PRKCH, PRKCQ, PROCA1, PRR22, PSCD4, PTCRA, PTGDR, PTGDS, PTGER4, PTPN22, PTPRC, PTPRCAP, PVRIG, PYHIN1, QRICH1, RAB37, RALGAPA1, RASGRP2, RBM17, RCSD1, RNF19A, SAMD3, SAMD9L, SARM1, SELL, SELP, SEMA4A, 38961, SERHL2, SH2D1A, SH2D2A, SH3TC1, SHD, SLA2, SLAMF6, SLC10A5, SLC14A1, SLIT2, SP140, SPN, SPOCK2, SS18L1, ST3GAL5, STAP1, STARD5, STAT6, TAGAP, TCF7, TCL1A, TFF3, TGFBR2, TIAM1, TIFA, TIGIT, TLR10, TLR9, TM6SF1, TMEM156, TNFAIP8, TNFRSF13C, TNFRSF1B, TNFRSF9, TP53INP1, TSPAN32, TSPAN7, TXNIP, UBD, UBE2G1, UCKL1, USP50, UTRN, VAMP1, VCAM1, WAS, WDR33, XBP1, ZBTB32, ZFP30, ZNF425, ZNF470, ZNF655, ZNF683, ZNF799, ZNF831		
ADAM17, ADAM22, AGRN, AIF1L, ALS2CR12, ANK3, ANKRD36B, ANKRD38, ANKRD7, APCDD1L, ATF6B, ATL3, ATP1A1, ATRN, BBOX1, BCAR1, BCAS2, C18orf45, C1orf133, C5orf46, CAB39L, CAPRIN1, CBX1, CCDC147, CCDC90A, CCNL2, CDH2, CHCHD3, CHRNA3, CPNE2, CRY1, CSDE1, CSPG4, CYP2A13, CYP2D7P1, DCLK2, DCPS, DDX27, DHX29, DHX40, DKFZp761E198, DSC2, EFS, EFTUD2, ENHO, ERCC8, FAM187B, FAM25C, FAM25G, FAM83B, FGF1, GABRP, GLI3, GRHL1, HAO1, HIF1A, HIST1H2AC, HIST1H3D, HOMER1, IHPK3, IL17RC, INHBA, INS, ITGA11, JUP, KCNC4, KIAA0427, KIF26B, KLK5, LAMB3, LAMC2, LCLAT1, LDLRAD3, LIMS1, LOC285359, LOC441376, LOC642636, LOC730243, LSG1, MAGEC3, MAP9, MAPK8, MBIP, MCM8, MLF1, MMACHC, MRPL49, MSH2, MTA3, MTSS1L, NACC1, NOC4L, N-PAC, OGFRL1, OR8U1, P2RX2, PALM2, PCSK1N, PCSK6, PHF6, PIAS2, PIR, PKP3, PLAUR, PPP1CB, PSMB7, PSMC3IP, PSMD14, PTPN20A, PTPRF, PTPRK, PUS3, QSOX1, RAB12, RARG, RHBDL2, RHCE, RNF186, RPL13, RTN4, SAA2, SCUBE3, SDCBP2, SEC22B, SEMA4B, SERPINB5, SERPINH1, SHB, SIP1, SLC34A2, SLC5A9, SLC6A2, SMYD5, SNORD77, SNX12, SORBS1, SS18, SYCE1L, TARBP2, TBC1D24, TCEAL1, TDRD3, TGM5, TMEM127, TMEM167A, TMTC3, TOE1, TRIM16, TWF1, ULK1, VGLL1, VWA1, WNK2, WNT11, WWOX	Increased ($n = 155$)	Perez[9]

Supplementary Table 12. Pathways associated with differentially expressed genes

Pathway	Reference
PI3K pathway	Gámez
EGF receptor signaling pathway	-Pozo

Apoptosis signaling pathway p53 pathway Hypoxia response via HIF activation	[2]
ATM_Pathway ATM_Pathway_Cell_Survival Base_Excision_Repair_Pathway biocarta_activation_of_camp_dependent_protein_kinase_pka_Main_Pathway biocarta_activation_of_csk_by_camp_dependent_protein_kinase_inhibits_signaling_through_the_t_cell_receptor_Main_Pathway biocarta_akap95_role_in_mitosis_and_chromosome_dynamics_Main_Pathway biocarta_akap95_role_in_mitosis_and_chromosome_dynamics_Pathway_.mitotic_chromosome_condensation. biocarta_akap95_role_in_mitosis_and_chromosome_dynamics_Pathway_.mitotic_chromosome_decondensation. biocarta_akt_signaling_Main_Pathway biocarta_angiotensin_ii_mediated_activation_of_jnk_pathway_via_pyk2_dependent_signaling_Main_Pathway biocarta_attenuation_of_gpcr_signaling_Main_Pathway biocarta_chrebp_regulation_by_carbohydrates_and_camp_Main_Pathway biocarta_cystic_fibrosis_transmembrane_conductance_regulator_cftr_and_beta_2_adrenergic_receptor_b2ar_Main_Pathway biocarta_how_progesterone_initiates_the_oocyte_maturation_Main_Pathway biocarta_how_progesterone_initiates_the_oocyte_maturation_Pathway_.oocyte_maturation. biocarta_keratinocyte_differentiation_Main_Pathway biocarta_mapkinase_signaling_Main_Pathway biocarta_mcalpain_and_friends_in_cell_motility_Main_Pathway biocarta_mechanisms_of_transcriptional_repression_by_dna_methylation_Main_Pathway biocarta_mechanisms_of_transcriptional_repression_by_dna_methylation_Pathway_.histone_deacetylation. biocarta_multi_step_regulation_of_transcription_by_pitx2_Main_Pathway biocarta_phospholipids_as_signalling_intermediaries_Main_Pathway biocarta_protein_kinase_a_at_the_centrosome_Main_Pathway biocarta_role_of_egf_receptor_transactivation_by_gpcrs_in_cardiac_hypertrophy_Main_Pathway biocarta_role_of_erbb2_in_signal_transduction_and_oncology_Main_Pathway biocarta_role_of_nicotinic_acetylcholine_receptors_in_the_regulation_of_apoptosis_Main_Pathway biocarta_signaling_pathway_from_g_protein_families_Main_Pathway biocarta_sprouty_regulation_of_tyrosine_kinase_signals_Main_Pathway biocarta_stathmin_and_breast_cancer_resistance_to_antimicrotubule_agents_Main_Pathway biocarta_tgf_beta_signaling_Main_Pathway biocarta_transcription_factor_creb_and_its_extracellular_signals_Main_Pathway biocarta_trefoil_factors_initiate_mucosal_healing_Main_Pathway	Sorokin[8]

Calcium2._Signaling

cAMP_Pathway

cAMP_Pathway_Axonal_Growth

cAMP_Pathway_Cell_Proliferation

cAMP_Pathway_Degradation_of_Cell_Cycle_Regulators

cAMP_Pathway_eNOS_Signaling_Cardiovascular_Homeostasis

cAMP_Pathway_Gene_Expression_via_NFKB2_CREBBP_ELK1

cAMP_Pathway_Glycogen_Synthesis

cAMP_Pathway_Lipolysis

cAMP_Pathway_Oncogenesis

cAMP_Pathway_Protein_Retention

cAMP_Pathway_Regulation_of_Cytoskeleton

Chemotaxis_Driven_by_CCL2

Chemotaxis_Driven_by_IL.8_and_LTB4

EGF_Pathway

EGF_Pathway_Gene_Expression_via_FOS_NFKB2_MYC_STAT1_ELK1_STAT3_JUN

ErbB_Family_Pathway

Estrogen_Pathway

Estrogen_Pathway_Gene_Expression_via_FOS_JUN_ELK1_SP1_POLR2B_CREB3_NFKB2

FGFR_Signaling

FLT3_Signaling_Pathway

FLT3_Signaling_Pathway_Transcription_via_ELK3_MAPK12_CREB3_STAT2

gluconeogenesis

Growth_Hormone_Signaling_Pathway

GSK3_Signaling_Pathway_Glycogen_Synthesis

GSK3_Signaling_Pathway_Protein_Synthesis

HGF_Pathway

HIF1Alpha_Pathway

HIF1Alpha_Pathway_Gene_Expression_via_JUN_CREB3

HMGB1_signaling_through_RAGE

IGF1R_Signaling_Pathway_Cell_Survival

IGF1R_Signaling_Pathway_Protein_Synthesis

ILK_Signaling_Pathway_Loss_of_Occludin_Barrier_Dysfunction

ILK_Signaling_Pathway_MMP2_MMP9_Gene_Expression_Tissue_Invasion_via_FOS

ILK_Signaling_Pathway_Tissue_Morphogenesis

KEGG_Adherens_junction_Main_Pathway

KEGG_Adipocytokine_signaling_Main_Pathway

KEGG_Adrenergic_signaling_in_cardiomyocytes_Main_Pathway

KEGG_Alanine_aspartate_and_glutamate_metabolism_Main_Pathway

KEGG_Apoptosis_Main_Pathway

KEGG_Base_excision_repair_Main_Pathway

KEGG_beta_Alanine_metabolism_Main_Pathway

KEGG_cAMP_signaling_Main_Pathway

KEGG_Central_carbon_metabolism_in_cancer_Main_Pathway

KEGG_Chagas_disease_American_trypanosomiasis__Main_Pathway

KEGG_Chemical_carcinogenesis_Main_Pathway

KEGG_Choline_metabolism_in_cancer_Main_Pathway

KEGG_Drug_metabolism_cytochrome_P450_Main_Pathway

KEGG_Drug_metabolism_other_enzymes_Main_Pathway

KEGG_Epstein_Barr_virus_infection_Main_Pathway

KEGG_ErbB_signaling_Main_Pathway

KEGG_Estrogen_signaling_Main_Pathway

KEGG_Focal_adhesion_Main_Pathway

KEGG_GABAergic_synapse_Main_Pathway

KEGG_Glioma_Main_Pathway

KEGG_Hepatitis_B_Main_Pathway

KEGG_Hepatitis_C_Main_Pathway

KEGG_Herpes_simplex_infection_Main_Pathway

KEGG_Leukocyte_transendothelial_migration_Main_Pathway

KEGG_Lysosome_Main_Pathway

KEGG_MAPK_signaling_Main_Pathway

KEGG_MicroRNAs_in_cancer_Main_Pathway

KEGG_Non_alcoholic_fatty_liver_disease_NAFLD__Main_Pathway

KEGG_Non_homologous_end_joining_Main_Pathway

KEGG_Pancreatic_cancer_Main_Pathway

KEGG_Pantothenate_and_CoA_biosynthesis_Main_Pathway

KEGG_Pentose_and_glucuronate_interconversions_Main_Pathway

KEGG_Prolactin_signaling_Main_Pathway

KEGG_Prostate_cancer_Main_Pathway

KEGG_Protein_digestion_and_absorption_Main_Pathway

KEGG_Protein_export_Main_Pathway

KEGG_Protein_processing_in_endoplasmic_reticulum_Main_Pathway

KEGG_Pyrimidine_metabolism_Main_Pathway

KEGG_Renin_angiotensin_system_Main_Pathway

KEGG_Retinol_metabolism_Main_Pathway

KEGG_Selenocompound_metabolism_Main_Pathway

KEGG_Sphingolipid_metabolism_Main_Pathway

KEGG_Taurine_and_hypotaurine_metabolism_Main_Pathway

KEGG_TNF_signaling_Main_Pathway

KEGG_Ubiquitin_mediated_proteolysis_Main_Pathway

MAPK_Family_Pathway_Chromatin_Remodelling

MAPK_Family_Pathway_Gene_Expression_via_ATF2_JUN_ELK1_NFKB2_CREB3

MAPK_Signaling_Pathway_Gene_Expression_Apoptosis_Inflammation_Tumorigenesis_via_MYC_HSF1_STAT2

MAPK_Signaling_Pathway_Gene_Expression_Cell_Proliferation_Cell_Survival_Tumorigenesis_Differentiation_Development_via_PXN_CREB3_RPS6KA5_RPS6KA6

melatonin_degradation_I

mTOR_Pathway_Translation_Elongation

NCI_amb2_Integrin_signaling_Main_Pathway

NCI_BCR_signaling_Pathway_.cytokine_secretion.

NCI_CD40_CD40L_signaling_Main_Pathway

NCI_CDC42_signaling_events_Main_Pathway

NCI_Class_I_PI3K_signaling_events_mediated_by_Akt_Pathway_.negative_regulation_of_cell_cycle.

NCI_DNA_PK_pathway_in_nonhomologous_end_joining_Main_Pathway

NCI_DNA_PK_pathway_in_nonhomologous_end_joining_Pathway_.double_strand_break_repair_via_nonhomologous_end_joining.

NCI_DNA_PK_pathway_in_nonhomologous_end_joining_Pathway_.V_D_J_recombination.

NCI_ErbB2_ErbB3_signaling_events_Pathway_.myelination.

NCI_FAS_CD95_signaling_Main_Pathway

NCI_Hedgehog_signaling_events_mediated_by_Gli_proteins_Main_Pathway

NCI_IL12_signaling_mediated_by_STAT4_Main_Pathway

NCI_LKB1_signaling_events_Main_Pathway

NCI_LKB1_signaling_events_Pathway_.Pathway_positive_regulation_of_CREB_transcription_factor_activity_via_CRTC2.

NCI_LPA_receptor_mediated_events_Main_Pathway

NCI_Notch_signaling_Main_Pathway

NCI_p38_signaling_mediated_by_MAPKAP_kinases_Main_Pathway

NCI_PDGFR_beta_signaling_Main_Pathway

NCI_Posttranslational_regulation_of_adherens_junction_stability_and_dissassembly_Main_Pathway

NCI_Posttranslational_regulation_of_adherens_junction_stability_and_dissassembly_Pathway_.axonogenesis.

NCI_Presenilin_action_in_Notch_and_Wnt_signaling_Pathway_.apoptosis.

NCI_RAC1_signaling_Main_Pathway

NCI_Regulation_of_CDC42_activity_Main_Pathway

NCI_Regulation_of_nuclear_SMAD2_3_signaling_Pathway_.muscle_cell_differentiation.

NCI_SHP2_signaling_Main_Pathway

NCI_Signaling_events_mediated_by_focal_adhesion_kinase_Main_Pathway

NCI_Signaling_events_mediated_by_HDAC_Class_I_Pathway_.histone_deacetylation.

NCI_Signaling_events_mediated_by_Hepatocyte_Growth_Factor_Receptor_c_Met__Main_Pathway

NCI_Signaling_events_mediated_by_TCPTP_Main_Pathway

NCI_Signaling_mediated_by_p38_alpha_and_p38_beta_Main_Pathway

NCI_Stabilization_and_expansion_of_the_E_cadherin_adherens_junction_Pathway_.actin_cable_formation.

NCI_Validated_transcriptional_targets_of_TAp63_isoforms_Main_Pathway

NCI_Validated_transcriptional_targets_of_TAp63_isoforms_Pathway_.Metastasis.

NCI_Validated_transcriptional_targets_of_TAp63_isoforms_Pathway_.Pathway_degradation_of_TP63.

NGF_Pathway

Nitric_Oxide_Pathway_in_Skeletal_Muscle

noradrenaline_and_adrenaline_degradation

p53_Signaling_Pathway

p53_Signaling_Pathway_Apoptosis

p53_Signaling_Pathway_Breast_Cancer

p53_Signaling_Pathway_Cancer

p53_Signaling_Pathway_Cell_Cycle_Arrest

p53_Signaling_Pathway_Cell_Growth_Accumulation

p53_Signaling_Pathway_DNA_Repair

p53_Signaling_Pathway_Exosome_Mediated_Secretion

p53_Signaling_Pathway_Gene_Expression_Anti.Apoptosis_via_TP53

p53_Signaling_Pathway_Gene_Expression_Cell_Cycle_and_Cell_Growth_via_TP53

p53_Signaling_Pathway_Gene_Expression_Cell_Fate_and_Development_via_TP53

p53_Signaling_Pathway_Gene_Expression_Cell_Signaling_via_TP53

p53_Signaling_Pathway_Gene_Expression_DNA_Replication_and_Repair_via_TP53

p53_Signaling_Pathway_Gene_Expression_ECM_and_Adhesion_via_TP53

p53_Signaling_Pathway_Gene_Expression_Infection_and_Immune_Response_via_TP53

p53_Signaling_Pathway_Inhibition_of_Angiogenesis_and_Metastasis

p53_Signaling_Pathway_Normal_Cell_Cycle_Progression

PPAR_Pathway

PTEN_Pathway_Adhesion_or_Migration

RANK_Signaling_in_Osteoclasts_Pathway

RANK_Signaling_in_Osteoclasts_Pathway_Expression_of_Osteoclastic_Genes_via_JUN_NFAT5_NFKB2_MIT

F_FOS

Ras_Pathway_Apoptosis

reactome_Activation_of_DNA_fragmentation_factor_Main_Pathway

reactome_Adherens_junctions_interactions_Main_Pathway

reactome_Amyloids_Main_Pathway

reactome_Antigen_Presentation_Folding_assembly_and_peptide_loading_of_class_I_MHC_Main_Pathway

reactome_APC_Cdc20_mediated_degradation_of_Nek2A_Main_Pathway

reactome_Budding_and_maturation_of_HIV_virion_Main_Pathway

reactome_Circadian_Clock_Main_Pathway

reactome_Class_C_3_Metabotropic_glutamate_pheromone_receptors__Main_Pathway

reactome_Collagen_degradation_Main_Pathway

reactome_Condensation_of_Prophase_Chromosomes_Main_Pathway

reactome_Cytosolic_tRNA_aminoacylation_Main_Pathway

reactome_DARPP_32_events_Main_Pathway

reactome_Dermatan_sulfate_biosynthesis_Main_Pathway

reactome_DNA_Damage_Telomere_Stress_Induced_Senescence_Main_Pathway

reactome_Endosomal_Sorting_Complex_Required_For_Transport_ESCRT__Main_Pathway

reactome_EPHB_mediated_forward_signaling_Main_Pathway

reactome_Ephrin_signaling_Main_Pathway

reactome_Fatty_acids_Main_Pathway

reactome_FCERI_mediated_Ca_2_mobilization_Main_Pathway

reactome_Formation_of_ATP_by_chemiosmotic_coupling_Main_Pathway

reactome_Glycosphingolipid_metabolism_Main_Pathway

reactome_ISG15_antiviral_mechanism_Main_Pathway

reactome_Meiotic_recombination_Main_Pathway

reactome_Meiotic_synapsis_Main_Pathway

reactome_Metabolism_of_Angiotensinogen_to_Angiotensins_Main_Pathway

reactome_Mitochondrial_tRNA_aminoacylation_Main_Pathway

reactome_Mitotic_Prometaphase_Main_Pathway

reactome_MyD88_Mal_cascade_initiated_on_plasma_membrane_Main_Pathway

reactome_Negative_regulators_of_RIG_I_MDA5_signaling_Main_Pathway

reactome_NoRC_negatively_regulates_rRNA_expression_Main_Pathway

reactome_Oxidative_Stress_Induced_Senescence_Main_Pathway

reactome_Packaging_Of_Telomere_Ends_Main_Pathway

reactome_PKA_activation_in_glucagon_signalling_Main_Pathway

reactome_Post_chaperonin_tubulin_folding_Main_Pathway

reactome_PRC2_methylates_histones_and_DNA_Main_Pathway

reactome_Recruitment_of_NuMA_to_mitotic_centrosomes_Main_Pathway	
reactome_Regulation_of_cholesterol_biosynthesis_by_SREBP_SREBF__Main_Pathway	
reactome_repression_of_WNT_target_genes_Main_Pathway	
reactome_Resolution_of_Sister_Chromatid_Cohesion_Main_Pathway	
reactome_RIG_I_MDA5_mediated_induction_of_IFN_alpha_beta_pathways_Main_Pathway	
reactome_RNA_Polymerase_I_Chain_Elongation_Main_Pathway	
reactome_RNA_Polymerase_I_Promoter_Opening_Main_Pathway	
reactome_RNA_Polymerase_II_Pre_transcription_Events_Main_Pathway	
reactome_Sema4D_induced_cell_migration_and_growth_cone_collapse_Main_Pathway	
reactome_Separation_of_Sister_Chromatids_Main_Pathway	
reactome_SHC1_events_in_ERBB2_signaling_Main_Pathway	
reactome_Signaling_by_constitutively_active_EGFR_Main_Pathway	
reactome_Signaling_by_Hippo_Main_Pathway	
reactome_Signaling_by_NODAL_Main_Pathway	
reactome_The_activation_of_arylsulfatases_Main_Pathway	
reactome_The_NLRP3_inflammasome_Main_Pathway	
reactome_Trafficking_of_AMPA_receptors_Main_Pathway	
reactome_Transport_of_organic_anions_Main_Pathway	
reactome_Vasopressin_regulates_renal_water_homeostasis_via_Aquaporins_Main_Pathway	
reactome_XAV939_inhibits_tankyrase_stabilizing_AXIN_Main_Pathway	
reactome_Xenobiotics_Main_Pathway	
Regulation_of_Cytoskeleton_Remodeling_by_Activin_A	
Regulation_of_Cytoskeleton_Remodeling_by_TGF_and_WNT	
Regulation_of_Repulsive_Axonal_Pathfinding	
Role_of_NTN1_in_Axon_Pathfinding	
superpathway_of_pyrimidine_deoxyribonucleotides_ide_novoi_biosynthesis	
superpathway_of_pyrimidine_ribonucleotides_ide_novoi_biosynthesis	
TGF.Beta_Pathway_Transciption_Arrested_Growth_Apoptosis	
TGF.Beta_Pathway_Transciption_Cell_Growth_and_Mobility_and_Angiogenesis	
tRNA_charging	
UTP_and_CTP_ide_novoi_biosynthesis	
WNT_Pathway_Cell_Survival	
WNT_Pathway_NFAT_Pathway	
X3.phosphoinositide_biosynthesis	
Immune-system related pathways	Triulzi
Proliferation-associated pathways	[3]
Wnt signaling	Khour

Notch signaling		y[1]*
Angiogenesis

Notch signaling | | Guarn

eri[7]* |

*Gene ontology analysis using the online available software PANTHER.

Supplementary Table 13. MicroRNA (miRNA) differentially expressed in breast cancer tissues of cases compared to controls

miRNA	Direction change in gene expression in resistant tumors	Reference
hsa-miR-361-5p, hsa-miR-26a-5p, hsa-miR-365a-3p, hsa-miR-155-5p, hsa-miR-205-5p, hsa-miR-150-5p, hsa-miR-106b-5p	Increased	Du[10]
hsa-miR-4734, hsa-miR-424-3p	Decreased	Du[10]
miR-210, miR-31-3p, miR-449a, miR-449b-5p	Increased	Ohzawa[11]
miR-106b-3p, miR-1180, miR-1238-5p, miR-142-5p, miR-150-5p, miR-181c-5p, miR-182-5p, miR-200a-5p, miR-218-5p, miR-3609, miR-362-5p, miR-3620-3p, miR-4418, miR-4506, miR-4657, miR-505-3p, miR-505-5p	Decreased	Ohzawa[11]

miRNA: microRNA.

Supplementary Table 14. Genes that have been reported to show epigenetic and/or genetic alterations in breast cancer tissues or blood of cases compared to controls and that have been predicted to be targeted by miRNA identified as differentially expressed in breast cancer tissues of cases compared to controls

	Genes that are predicted to be targeted by miRNA identified as differentially expressed in breast cancer tisues of cases compared to controls in the study of Ohzawa and collaborators (12) and Du and collaborators (10) that have been reported to show epigenetic and/or genetic alterations	Reference
Differentially methylated genes	ZNF598, KCNH7, ADAMTS2, SIX2, DOCK1	Furrer [2022]

Differentially expressed gene (at mRNA levels) in at least two studies	ABT1, ANKRD52, ARL3, ATP8A1, BCL9, BLOC1S2, BRD1, C1QTNF3, CARHSP1, CASP1, CDK15, CLEC14A, COMMD10, COMMD5, COMMD6, DAZAP1, DEDD, DPY19L1, DUSP14, EMC10, FEN1, FRK, GALNT2, GGA3, HMCN1, HOXC4, IKZF3, IPMK, IRAK3, IRF9, KIF1C, LASP1, MBD6, MORN2, MYO18A, PAQR7, PLEKHG3, POFUT1, PROM2, PRSS16, RAB4A, RAD51, RNF146, RNF24, SGPP1, SHROOM1, SIKE1, SIX1, SLC25A37, SLC2A10, SLC35B2, SLC41A1, STT3A, SYTL4, TOM1L1, VLDLR, VMP1, WNT7B, ZNF281, ZNF439, ZNF740	Sorokin[8], Merry[4]
	ADAM22, CTLA4, FECH, FGL2, KIF21B, LAMC2, NR5A2, WNK2, ZNF831	Sorokin[8], Perez[9]
	ACSL5, ATRN, FOXA1, MLPH, NACC1, PCSK6, PIM2, PLAUR, RHBDL2, SORBS1, TCEAL1, XBP1	Merry[4], Perez[9]
	ACBD3, AMMECR1, ARHGDIA, ATP6V0B, CD48, ENAH, FOSL2, GNPAT, KDELR1, KHSRP, KIAA2013, LAMP1, LYSMD3, MLLT1, MOSPD1, NSL1, NUCKS1, PFKFB3, PPCS, SLC25A44, ST6GALNAC6, TATDN3, TBCEL, THBS2, TNFRSF19, TSEN15, TSEN34, UBE2Q2, WDR26, WSB1, ZNF674, ZNF678	Gámez-Pozo[2], Merry[4]
	ATAD1, CPNE2, CSDE1, EFTUD2, EIF4ENIF1, SCUBE3, TIAM1, TMEM167A	Gámez-Pozo[2], Perez[9]
	ALDOA, ARHGAP18, ARL6IP5, CLINT1, ERICH1, FAM98A, FBXL19, FRYL, GRB10, HBS1L, ING3, ITIH5, MANBAL, MORF4L1, MTMR1, PHF21A, RBMS2, RPAIN, RRAS2, SHKBP1, TMEM120B, UTP15	Gámez-Pozo[2], Sorokin[8]
	PHB, RBP1, SH3BGRL	Khoury[1], Merry[4]
	NETO2, NXPH1, SLC12A2	Khoury[1], Sorokin[8]
	CDK5R1, ESR1, MEX3A, ORMDL3	Triulzi[3], Merry[4]
	VPS37B	Triulzi[3], Sorokin[8]
	CAMK2N1, CYP4X1, GATM	Guarneri[7], Merry[4]
	CNTNAP2, FAM84B	Guarneri[7], Khoury[1]
	BOC	Harris[6], Sorokin[8]

	SOX11	Triulzi[3], Zhao[5]
	ACTR1B	Gámez-Pozo[2], Sorokin[8], Perez[9]
	ARPC1A, FASTK, TXN	Gámez-Pozo[2], Sorokin[8], Merry[4]
	TOB1	Khoury[1], Sorokin[8], Merry[4]
	SFRP1	Khoury[1], Merry[4], Harris[6]
	RNF19A	Sorokin[8], Perez[9], Guarneri[7]
lincRNA differentially expressed in breast cancer tissues of cases compared to controls	AMPD2, BIRC6, C20orf202, CCDC68, CEP290, CILP, CLVS1, COL5A2, CSNK1A1, DDX51, DR1, EFR3B, EVI2A, EXD1, GMDS, HPGDS, IL1A, IQCJ, LOXL1, MAGI3, MCL1, MICB, NAALADL2, PDIA6, PEX3, PKMYT1, PRSS22, RFX3, RHOU, RHOXF2, RORA, SLC45A4, SPRED1, STX17, SUPT3H, TMED5, TRIM36, UBE2A, UTRN, VCAN, WIPF3, ZIC5, ZNF582, ZNF814	Merry[4]
CNA in breast cancer tissues of cases compared to controls	ABCB10, ABR, ABRA, ACBD3, ACTA1, ACTN2, ADORA1, AGT, AHCTF1, AKT3, ANGEL2, ANGPT1, ARID4B, ATAD2, ATF3, ATP2B4, ATP6V1C1, B3GALNT2, B3GALT2, BAALC, BROX, BTG2, C1orf116, C1orf198, C1orf21, C1orf74, C4BPA, CACYBP, CAMSAP2, CD34, CD46, CDC42BPA, CDC73, CDH4, CENPF, CHIT1, CHMP7, CHRM3, CNST, CNTN2, COL22A1, CR1, CR2, CSMD3, CSRP1, CTHRC1, DCAF13, DCAF4L2, DEGS1, DEPTOR, DERL1, DISC1, DNAH14, DSTYK, DUSP10, EBAG9, EDEM3, EDN3, EFCAB2, EGLN1, ELK4, ENAH, ENPP2, ENY2, EPRS, ESRRG, ETNK2, EXO1, EXOC8, FAM129A, FAM83A, FAM84B, FAM91A1, FBXO28, FBXO32, FBXO43, FLVCR1, FMOD, FZD6, GALNT2, GATA4, GGPS1, GNPAT, GPATCH2, GPR137B, GPR52, GREM2, GRHL2, HAS2, HHAT, HMCN1, HNRNPU, HSD11B1, IBA57, IGFN1, IKBKE, IPO9, IRF2BP2, IRF6, ITPKB,	Guarneri[7]

	IVNS1ABP, KCNH1, KCNK1, KCNK2, KCNT2, KCNV1, KCTD3, KDM5B, KIAA0040, KIF14, KIF21B, KIF26B, KLF10, KLHL20, LAD1, LAMC1, LAMC2, LAPTM4B, LEFTY2, LGALS8, LGR6, LIN9, LMX1A, LPGAT1, LRP12, LRRN2, LYPLAL1, LYST, MAL2, MAPKAPK2, MARK1, MDM4, MGST3, MIXL1, MMP16, MRPL13, MRPS14, MTDH, MTR, MTSS1, NAV1, NCALD, NCF2, NEK2, NEK7, NENF, NFASC, NID1, NIPAL2, NMNAT2, NR5A2, NSL1, NSMCE2, NUCKS1, NUP133, OPN3, OSR2, OTUD7B, OXR1, PBX1, PFKFB2, PGBD5, PHLDA3, PIGR, PIK3C2B, PKHD1L1, PKP1, PLA2G4A, PLD5, PLXDC1, PLXNA2, POLR2K, PPFIA4, PPP1R12B, PPP1R15B, PPP2R5A, PRG4, PROX1, PTDSS1, PTGS2, RAB22A, RAB3GAP2, RAB4A, RABGAP1L, RABIF, RAD21, RARA, RBBP5, RC3H1, RCOR3, RD3, RGL1, RGS2, RGS22, RHOU, RIMS2, RNF139, RNF19A, RNF2, RRM2B, RRP15, RSPO2, SAMD12, SDC2, SERTAD4, SHISA4, SIPA1L2, SLC13A5, SLC25A32, SLC26A9, SLC30A1, SLC30A8, SLC35F3, SLC41A1, SLC45A3, SLC7A13, SMG7, SNX31, SPAG1, SQLE, SRGAP2, STK3, SV2A, SWT1, SYBU, SYT14, TAF1A, TAF2, TAF5L, TARBP1, TATDN3, TGFB2, TIMM17A, TMCO1, TMEM206, TMEM65, TMEM74, TNFRSF11B, TNN, TNNI1, TOMM20, TP53BP2, TPR, TRAF5, TRIB1, TRIM58, TRIM67, TRMT12, TRMT1L, TRPS1, TSEN15, TSNAX, TSPYL5, TTC13, UBR5, UCK2, USH2A, UTP23, VAPB, VASH2, VPS13B, WDR26, WWP1, XAF1, YOD1, YWHAE, YWHAZ, ZBTB37, ZC3H11A, ZFPM2, ZHX1, ZHX2, ZNF124, ZNF281, ZNF572, ZNF670, ZNF678, ZNF706, ZNF831	
Protein differentially expressed in blood of breast cancer cases compared to controls	LDHA, MASP1, DBF4B	Yang[13]

CNA: Copy number alteration; lincRNA: long intergenic noncoding RNA.

Supplementary Table 15. Long intergenic noncoding RNA (lincRNA) differentially expressed in breast cancer tissues of cases compared to controls

lincRNA	Direction change in expression in resistant tumor	Reference
linc-PDE10A-1, linc-ZFP64-5, linc-ARF6-1, linc-FCGR1B-7, linc-SAA2, linc-ZC3H12B-2, linc-TM4SF4-2, linc-DIO3-8, linc-C11orf66, linc-BDH1-3, linc-EFR3A-6,	Decreased ($n = 33$)	Merry[4]

linc-ABCA5-7, linc-PHF10, linc-FAR2-2, linc-MUC20-2, linc-COL28A1, linc-ARPP21-2, linc-AP2B1-2, linc-NADSYN1-1, linc-ARL4D-2, linc-C3orf79-4, linc-NCKAP1-1, linc-SYNPO2-2, linc-SLC39A10-10, linc-TMEM18-13, linc-TMED5, linc-B4GALNT4-1, linc-FAIM3, linc-EFR3A-7, linc-ACTL7A-10, linc-KCNMB2-5, linc-USP16-5, linc-STMN2-1		
linc-TXLNB-1, linc-VCAN, linc-TMEM194A, linc-RNF113A, linc-CBR1-1, linc-DBT-3, linc-VPS8-2, linc-EFR3B, linc-PDE8B-2, linc-CST7-1, linc-KLHL31-1, linc-HTR2A-3, linc-IL18, linc-CLRN2-1, linc-IQCJ, linc-C5orf38-5, linc-TTC15-9, linc-MIA3-1, linc-LAMA4-3, linc-PRPS1L1, linc-RNFT2-1, linc-C4orf45-3, linc-LOC389493-2, linc-METAP1-2, linc-FAM91A1-3, linc-MCL1, linc-SCLT1-6, linc-KCTD7-2, linc-RPP40, linc-TMEM35, linc-MEST-2, linc-FBXO16-2, linc-ZNF8-1, linc-GABRA5-5, linc-TRIM39-1, linc-CEP110-2, linc-PKIA-1, linc-GABRA5-6, linc-KATNAL1-1, linc-RSPH3, linc-FAM114A1-1, linc-PARK2-4, linc-NR3C2-3, linc-NUSAP1, linc-S100B-2, linc-OR5AU1, linc-MAP3K9-1, linc-MCCC2, linc-CREB1-1, linc-IL4R-2, linc-PRSS22, linc-PIK3C2G-2, linc-TOX3-3, linc-ZNF681-4, linc-MAPKAP1-3, linc-UTRN, linc-STIL-2, linc-KIAA1755-3, linc-SNTG2-3, linc-CXCR4-1, linc-FLRT2-1, linc-LOXL1, linc-CSMD1-1, linc-NBPF15-1, linc-AMPD2, linc-HSPG2, linc-C9orf80, linc-RFX3, linc-NDUFV3-1, linc-POLR3A-1, linc-RP9-2, linc-SPATA7-3, linc-TMEM5, linc-DHFRL1-4, linc-COG3-2, linc-LRRTM3-3, linc-MEGF6, linc-WIPF3, linc-OPN4-1, linc-KIAA0141, linc-ZCCHC13-2, linc-DEC1, linc-NAALADL2, linc-NBPF9-9, linc-SAFB-2, linc-MAGI3, linc-TRIML2-5, linc-ZNF814, linc-LRCH2-1, linc-CSNK1A1, linc-NRG2-1, linc-TMEM18-7, linc-MGAT1-1, linc-BIRC6, linc-PPIAL4A-4, linc-EVX2-8, linc-ZNF582, linc-NAP1L2-3, linc-RGPD8-2, linc-FAM84B-4, linc-ATF3-1, linc-MYOT-4, linc-F13A1-1, linc-AGA-2, linc-SH3BGRL2-1, linc-GABRA5-7, linc-RHOXF1-2, linc-BRD9-1, linc-LPHN3-8, linc-ZNF8-2, linc-ZBED3, linc-MICB, linc-RNASEH2B-1, linc-RAPH1-2, linc-ZIC5, linc-DNAH8-2, linc-SUPT3H, linc-HIATL1-1, linc-PKMYT1, linc-MAP2K3-2, linc-PXMP4-2, linc-CCT8-2, linc-EXD1, linc-C5orf32-1, linc-TRIM29-3, linc-DR1, linc-SEPP1-1, linc-IDH3B-1, linc-SPRED1, linc-CSTB-1, linc-SLC25A48-2, linc-TPBG-3, linc-SEP15-3, linc-MRPL46, linc-PRKACB-2, linc-KLF6-2, linc-ZPBP2, linc-ALDH1B1-3, linc-ARHGAP28-2, linc-ARID3B-1, linc-DTL-2, linc-SRP9-1, linc-UBE2A, linc-SLC45A4, linc-STIM2-4, linc-PCF11-2, linc-NOP14-1, linc-ITGB2-1, linc-ANKRD56-1, linc-VIPR2-4, linc-ID2-3, linc-IRX3-5, linc-FAAH2-2, linc-ART1-1, linc-RBKS-1, linc-SLC6A19-1, linc-SSTR1-3, linc-PRKAA2-1, linc-METTL10, linc-CILP, linc-COL5A2, linc-CA5A-2, linc-YIPF5-3, linc-ABI1-1, linc-JAKMIP3-3, linc-SSTR1-2, linc-ZNF99-7, linc-ZKSCAN1-2, linc-LYSMD3-2, linc-WDR26-3, linc-KCNN4, linc-ZNF485-2, linc-ZNF227, linc-KIN-6, linc-FBXW4-3, linc-NBPF9-5, linc-CASP10-2, linc-IARS2-3, linc-OTUD7B-1, linc-	Increased (n = 338)	Merry[4]

GPATCH2-1, linc-ODF3B, linc-C10orf93-1, linc-IGSF5-1, linc-GARS-3, linc-MCTP2-4, linc-POLE4, linc-KLHL18-3, linc-WRB-2, linc-ESRRB-2, linc-SGCG-4, linc-PDCD1-1, linc-PCM1, linc-POLR3G-10, linc-EVI2A, linc-COMMD6-2, linc-RC3H1-2, linc-GPR65-6, linc-TGM3-1, linc-ZNF33A-5, linc-PLA2G2C-1, linc-C10orf122-2, linc-CCNH-2, linc-TRIM36, linc-RBMX-1, linc-C7orf23, linc-CD180-7, linc-C10orf107-1, linc-MAP1LC3B-2, linc-FOXA1-1, linc-CROCC-3, linc-ATF3-2, linc-MIB2, linc-AKAP9-1, linc-ADRA2A-1, linc-RORA, linc-CLASP2-1, linc-URB2-3, linc-OR2D2, linc-FAM71F2-3, linc-USP3-1, linc-CDH11-7, linc-SH3RF2, linc-GAD1-1, linc-DDX51, linc-ALOX12-1, linc-C5orf39, linc-SLC6A19-2, linc-CENPW-2, linc-BCL2A1-3, linc-CCDC39-1, linc-RNF2-1, linc-CCDC68, linc-USP12-5, linc-C6orf145-3, linc-CDH11-4, linc-HNRNPA1-3, linc-C20orf202, linc-PCDH8-4, linc-BTBD3-3, linc-RHOB-8, linc-GRIP1-3, linc-ARHGAP28-9, linc-FAM5C-4, linc-TTC15-1, linc-IRF2BP2-1, linc-ARFIP1-8, linc-GALM-1, linc-SPACA3, linc-NUDC, linc-ZNF648-2, linc-ZNF33A-4, linc-IL4R-1, linc-RNASEH1-12, linc-SHB, linc-ZNF99-5, linc-VN1R5-3, linc-ADRA2A-2, linc-GMDS, linc-NPSR1, linc-C1orf227-1, linc-MBOAT1-2, linc-AUTS2-5, linc-CCM2-2, linc-IKZF2-1, linc-BCL2A1-1, linc-FRG1-5, linc-CELF2-5, linc-MTRNR2L7, linc-GCA-1, linc-C2orf69-1, linc-RHOXF2, linc-HEATR6-2, linc-POLR3G-8, linc-RHOU, linc-RC3H1-3, linc-ZNF492-1, linc-DTNB, linc-BET1-1, linc-ASAP2-4, linc-ZNF726-3, linc-CPO-1, linc-CDH11-2, linc-S100G, linc-RAB40A-1, linc-DACT2-3, linc-EIF2AK3-1, linc-SATB2-2, linc-HERC6-2, linc-SP140-3, linc-CLIC2-2, linc-CIDEA-3, linc-IL1A, linc-STEAP1-3, linc-KIAA1024, linc-WDR53-1, linc-VPS8-3, linc-LRRC49-4, linc-RFPL4A, linc-RALGPS2-2, linc-USP24-2, linc-FOXB2-3, linc-ZNF131-3, linc-KLHDC7B, linc-TSHZ3-6, linc-GRAMD4-2, linc-PDIA6, linc-PHF21A-2, linc-MRGPRF-1, linc-MACF1-2, linc-LOC285033-4, linc-DUSP26-1, linc-RHOB-5, linc-NUDT6-1, linc-GUSB-5, linc-PEX3, linc-C18orf21, linc-CLVS1, linc-DOPEY1-2, linc-C2orf27A-2, linc-OPLAH, linc-RBKS-5, linc-TMEM99-2, linc-CDK13-2, linc-CEP290, linc-ZNF726-2, linc-APLN-1, linc-C9orf131, linc-SLC22A15-1, linc-CBR1-3, linc-CELF2-6, linc-NUF2-1, linc-HPGDS, linc-CPEB2-15, linc-STX17, linc-RTTN-5		

lincRNA: Long intergenic noncoding RNA.

Supplementary Table 16. Copy number alterations (CNA) in breast cancer tissues of cases compared to controls

Chromosome	Gene	Direction change in resistant	Reference

		tumors compared to controls	
Chr1	HIST2H2BE, BOLA1, SV2A, SF3B4, MTMR11, OTUD7B, VPS45, PBX1, LMX1A, RXRG, LOC400794, LRRC52, MGST3, ALDH9A1, TMCO1, UCK2, KLHL20, CENPL, DARS2, ZBTB37, SERPINC1, RC3H1, GPR52, RABGAP1L, CACYBP, MRPS14, TNN, KIAA0040, TNR, RFWD2, PAPPA2, NPL, DHX9, SHCBP1L, LAMC1, LAMC2, NMNAT2, SMG7, NCF2, ARPC5, APOBEC4, RGL1, GLT25D2, TSEN15, C1orf21, EDEM3, FAM129A, RNF2, TRMT1L, SWT1, IVNS1ABP, HMCN1, PRG4, TPR, C1orf27, OCLM, PDC, PTGS2, PLA2G4A, FAM5C, LOC440704, RGS18, RGS1, RGS13, RGS2, UCHL5, TROVE2, GLRX2, B3GALT2, CDC73, KCNT2, NEK7, ATP6V1G3, PTPRC, NR5A2, ZNF281, KIF14, DDX59, CAMSAP2, GPR25, KIF21B, CACNA1S, TMEM9, IGFN1, PKP1, TNNT2, LAD1, TNNI1, PHLDA3, CSRP1, NAV1, IPO9, SHISA4, LMOD1, TIMM17A, RNPEP, ELF3, GPR37L1, ARL8A, PTPN7, LGR6, UBE2T, PPP1R12B, SYT2, KDM5B, LOC148709, RABIF, KLHL12, ADIPOR1, CYB5R1, PPFIA4, MYOG, ADORA1, MYBPH, CHI3L1, CHIT1, LOC730227, BTG2, FMOD, PRELP, OPTC, ATP2B4, LAX1, ZBED6, ZC3H11A, SNRPE, SOX13, ETNK2, REN, KISS1, GOLT1A, PLEKHA6, LOC127841, PPP1R15B, PIK3C2B, MDM4, LRRN2, NFASC, CNTN2, RBBP5, DSTYK, TMCC2, NUAK2, KLHDC8A, LEMD1, CDK18, LOC284578, MFSD4, ELK4, SLC45A3, NUCKS1, RAB7L1, SLC41A1, PM20D1, SLC26A9, AVPR1B, C1orf186, CTSE, SRGAP2, IKBKE, RASSF5, EIF2D, DYRK3, MAPKAPK2, IL10, IL19, IL20, IL24, FAIM3, PIGR, FCAMR, C1orf116, YOD1, PFKFB2, C4BPB, C4BPA, CD55, CR2, CR1, CR1L, CD46, MIR29C, LOC148696, CD34, PLXNA2, LOC642587, MIR205, CAMK1G, LAMB3, G0S2, HSD11B1, TRAF3IP3, C1orf74, IRF6, DIEXF, SYT14, C1orf133, SERTAD4, HHAT, KCNH1, RCOR3, TRAF5, LINC00467, RD3, SLC30A1, NEK2, LPGAT1, INTS7, DTL, PPP2R5A, TMEM206, NENF, ATF3, FAM71A, BATF3, NSL1, TATDN3, C1orf227, FLVCR1-AS1, FLVCR1, VASH2, ANGEL2, RPS6KC1, PROX1, SMYD2, PTPN14, CENPF, KCNK2, KCTD3, USH2A, ESRRG, GPATCH2, SPATA17, RRP15, TGFB2, LYPLAL1, SLC30A10, EPRS, BPNT1, IARS2, RAB3GAP2, MARK1, C1orf115,	CN gain	Guarneri[7]

	MOSC2, MOSC1, HLX, DUSP10, HHIPL2, TAF1A, MIA3, BROX, DISP1, TLR5, SUSD4, C1orf65, CAPN8, CAPN2, TP53BP2, FBXO28, DEGS1, NVL, CNIH4, WDR26, CNIH3, DNAH14, LBR, ENAH, SRP9, EPHX1, TMEM63A, LEFTY1, PYCR2, LEFTY2, C1orf55, ACBD3, MIXL1, LIN9, PARP1, C1orf95, ITPKB, PSEN2, ADCK3, CDC42BPA, ZNF678, JMJD4, SNAP47, ARF1, C1orf35, MRPL55, GUK1, GJC2, IBA57, OBSCN, TRIM11, TRIM17, HIST3H3, RNF187, RHOU, RAB4A, SPHAR, C1orf96, ACTA1, NUP133, ABCB10, TAF5L, URB2, GALNT2, PGBD5, COG2, AGT, CAPN9, C1orf198, TTC13, ARV1, FAM89A, TRIM67, C1orf131, GNPAT, EXOC8, C1orf124, EGLN1, TSNAX, LOC100287814, DISC1, SIPA1L2, KIAA1383, NTPCR, PCNXL2, KIAA1804, KCNK1, SLC35F3, C1orf31, TARBP1, IRF2BP2, LINC00184, TOMM20, RBM34, ARID4B, GGPS1, TBCE, B3GALNT2, GNG4, LYST, NID1, GPR137B, ERO1LB, EDARADD, LGALS8-AS1, LGALS8, HEATR1, ACTN2, MTR, RYR2, ZP4, LOC100130331, LOC339535, CHRM3, FMN2, GREM2, RGS7, FH, KMO, OPN3, CHML, WDR64, EXO1, MAP1LC3C, PLD5, SDCCAG8, AKT3, ZNF238, C1orf100, ADSS, C1orf101, PPPDE1, FAM36A, HNRNPU-AS1, HNRNPU, EFCAB2, KIF26B, SMYD3, TFB2M, CNST, SCCPDH, LOC149134, AHCTF1, ZNF695, ZNF670, ZNF669, ZNF124, VN1R5, ZNF496, NLRP3, LOC148824, OR2C3, C1orf150, OR1C1, TRIM58, OR2L1P, OR2L13, OR2L2, OR2M4, LOC646627, SH3BP5L, ZNF672, ZNF692, PGBD2		
Chr8	PSKH2, ATP6V0D2, SLC7A13, WWP1, FAM82B, CPNE3, DCAF4L2, MMP16, UQCRB, MTERFD1, PTDSS1, SDC2, PGCP, TSPYL5, MTDH, LAPTM4B, MATN2, SNORA72, RPL30, C8orf47, HRSP12, POP1, NIPAL2, KCNS2, STK3, OSR2, VPS13B, COX6C, RGS22, FBXO43, POLR2K, SPAG1, RNF19A, ANKRD46, SNX31, YWHAZ, ZNF706, NACAP1, GRHL2, NCALD, RRM2B, UBR5, ODF1, KLF10, AZIN1, ATP6V1C1, C8orf56, BAALC, FZD6, CTHRC1, SLC25A32, DCAF13, RIMS2, TM7SF4, DPYS, LRP12, ZFPM2, OXR1, ABRA, ANGPT1, RSPO2, EIF3E, TTC35, TMEM74, TRHR, NUDCD1, ENY2, PKHD1L1, EBAG9, SYBU, KCNV1, CSMD3, TRPS1, EIF3H, UTP23, RAD21, RAD21-AS1, SLC30A8, MED30, EXT1, SAMD12, TNFRSF11B, COLEC10, MAL2, NOV, ENPP2, TAF2, DSCC1, DEPTOR, COL14A1, MRPL13, MTBP, SNTB1, HAS2, ZHX2, DERL1, WDR67, FAM83A, C8orf76, ZHX1,	CN gain	Guarneri[7]

	ATAD2, WDYHV1, FBXO32, ANXA13, FAM91A1, TMEM65, TRMT12, RNF139, NDUFB9, MTSS1, LOC157381, ZNF572, SQLE, KIAA0196, NSMCE2, TRIB1, FAM84B, MYC, PVT1, GSDMC, FAM49BKHDRBS3, COL22A1		
Chr17	LOC100131347, PLXDC1, RARA, GJD3	CN gain	Guarneri[7]
Chr20	C20orf85, PPP4R1L, RAB22A, VAPB, APCDD1L, LOC149773, STX16, ZNF831, EDN3, CDH4	CN gain	Guarneri[7]
Chr8	SGK223, GATA4, TNFRSF10A, LOC389641, CHMP7, ADAM5P	CN loss	Guarneri[7]
Chr17	ABR, TUSC5, YWHAE, SLC13A5, XAF1, FBXO39, STX8, WDR16	CN loss	Guarneri[7]
Overall	NR	CN burden higher CN gain	Walsh[12]
Chr8	NR	CN burden higher	Walsh[12]
Chr17	NR	CN burden higher	Walsh[12]

Chr: Chromosome; CN: copy number; NR: not reported.

Supplementary Table 17. Protein differentially expressed in blood of breast cancer cases compared to controls

Gene	Direction change in expression in resistant tumor	Reference
APOA4, LDHB, LDHA, ADH5, TPT1	Decreased ($n = 5$)	Yang[13]
APOB, ITIH4, C9, ITIH3, MASP1, CD14, LCP1, CST3, LBP, MASP2, SRGN, SLC3A2, DBF4B	Increased ($n = 13$)	Yang[13]

Supplementary Table 18. Germline and somatic gene mutations in breast cancer tissues of cases compared to controls

Gene	Type of mutations	Direction change in resistant tumor	Reference
PIK3CA	Somatic	More mutations	Shi[14]
-	Germline	-	Lesurf[15]
-	Somatic	-	Lesurf[15]

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