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Regular paper

Retroposition as a source of antisense long non-coding RNAs with possible regulatory functions#

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Long non-coding RNAs (lncRNAs) are a class of intensely studied, yet enigmatic molecules that make up a substantial portion of the human transcriptome. In this work, we link the origins and functions of some lncRNAs to retroposition, a process resulting in the creation of intronless copies (retrocopies) of the so-called parental genes. We found 35 human retrocopies transcribed in antisense and giving rise to 58 lncRNA transcripts. These lncRNAs share sequence similarity with the corresponding parental genes but in the sense/antisense orientation, meaning they have the potential to interact with each other and to form RNA:RNA duplexes. We took a closer look at these duplexes and found that 10 of the lncRNAs might regulate parental gene expression and processing at the pre-mRNA and mRNA levels. Further analysis of the co-expression and expression correlation provided support for the existence of functional coupling between lncRNAs and their mate parental gene transcripts.

Key words: lncRNAs, long non-coding RNAs, retroposition, retrocopies, antisense transcription, RNA:RNA duplexes

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#Information about a preliminary report on the same subject presented at scientific meetings: Oleksii Bryzghalov, Michał Szcześniak, Izabela Makałowska. Polish Evolutionary Conference 2015, Poznan, Poland. *Potential roles of retroposition-derived lncRNAs in splicing regulation* (poster); book of abstracts, page 36.
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Abbreviations: lncRNAs, long non-coding RNAs; miRNAs, microRNAs; NATs, natural antisense transcripts; IRES, internal ribosome entry site; SMD, Staufen-mediated decay; hnRNPs, heterogeneous nuclear ribonucleoproteins; asRNAs, antisense RNAs

Suppl. Tab. 1

parental gene		lncRNA		predicted function(s)
transcript ID	gene symbol	transcript ID	gene symbol	
ENST00000391918	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000597868	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000598871	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000291295	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000594523	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000595072	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000596362	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000477244	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000482455	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000597743	CALM3	ENST00000442008	RP11-116G8.5	splicing
ENST00000599839	CALM3	ENST00000442008	RP11-116G8.5	editing-mirna
ENST00000217244	CSNK2A1	ENST00000526867	RP11-567I13.1	mirna
ENST00000349736	CSNK2A1	ENST00000526867	RP11-567I13.1	mirna
ENST00000400227	CSNK2A1	ENST00000526867	RP11-567I13.1	mirna
ENST00000400217	CSNK2A1	ENST00000526867	RP11-567I13.1	mirna
ENST00000529631	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000529548	FTH1	ENST00000511821	CTD-2139B15.2	splicing-mirna
ENST00000530019	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000532829	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000534180	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000533138	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000534719	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000526640	FTH1	ENST00000511821	CTD-2139B15.2	splicing-mirna
ENST00000532601	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000529191	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000273550	FTH1	ENST00000511821	CTD-2139B15.2	mirna
ENST00000597985	GLTSCR2	ENST00000602330	CTD-2576F9.2	mirna

ENST00000600410	GLTSCR2	ENST00000602330	CTD-2576F9.2	SMD-mirna
ENST00000598959	GLTSCR2	ENST00000602330	CTD-2576F9.2	mirna
ENST00000594182	GLTSCR2	ENST00000602330	CTD-2576F9.2	mirna
ENST00000246802	GLTSCR2	ENST00000602330	CTD-2576F9.2	SMD-mirna
ENST00000594525	GLTSCR2	ENST00000602330	CTD-2576F9.2	SMD-mirna
ENST00000598681	GLTSCR2	ENST00000602330	CTD-2576F9.2	SMD-mirna
ENST00000498474	HDHD1	ENST00000429230	AL589986.2	mirna
ENST00000424830	HDHD1	ENST00000429230	AL589986.2	mirna
ENST00000540122	HDHD1	ENST00000429230	AL589986.2	mirna
ENST00000486446	HDHD1	ENST00000429230	AL589986.2	mirna
ENST00000412827	HDHD1	ENST00000429230	AL589986.2	splicing-mirna
ENST00000381077	HDHD1	ENST00000429230	AL589986.2	mirna
ENST00000330752	HNRNPA1	ENST00000573479	AC021224.1	splicing-mirna
ENST00000550482	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000551702	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000547870	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000550994	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000547708	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000547566	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000340913	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000546500	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000551679	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000548688	HNRNPA1	ENST00000573479	AC021224.1	mirna
ENST00000547276	HNRNPA1	ENST00000573479	AC021224.1	splicing-mirna
ENST00000054950	RCN1	ENST00000379050	TPT1-AS1	mirna
ENST00000577910	RPL17-C18orf32	ENST00000448256	RP11-13J8.1	mirna
ENST00000584895	RPL17-C18orf32	ENST00000448256	RP11-13J8.1	mirna
ENST00000332968	RPL17-C18orf32	ENST00000448256	RP11-13J8.1	mirna
ENST00000394935	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000496182	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000578181	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000422514	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000472628	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000394938	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000355731	RPL23A	ENST00000596427	AC016629.3	mirna
ENST00000494077	RPS10	ENST00000562644	GS1-21A4.1	mirna
ENST00000344700	RPS10	ENST00000562644	GS1-21A4.1	mirna
ENST00000467531	RPS10	ENST00000562644	GS1-21A4.1	mirna
ENST00000480942	RPS10	ENST00000562644	GS1-21A4.1	mirna

ENST00000464218	RPS10	ENST00000562644	GS1-21A4.1	mirna
ENST00000326199	RPS10	ENST00000562644	GS1-21A4.1	mirna

Suppl. Tab. 2

Samples	Experiment	Description
ENCFF013QKL	ENCSR000CQS	RNA-seq on human HUVEC cytosol long polyA- RNA
ENCFF048PAB-ENCFF671GAH	ENCSR000AAA	CSHL Long RNA Seq HAoSMC cell total (SID38242,SID38243)
ENCFF045LMD-ENCFF117AWL	ENCSR000AAB	CSHL Long RNA Seq HBdMEC cell total (SID38244,SID38245)
ENCFF571QGO-ENCFF743YRX	ENCSR000AAC	CSHL Long RNA Seq HBdSMC cell total (SID38220,SID38221)
ENCFF377UBC-ENCFF193YHT	ENCSR000AAD	CSHL Long RNA Seq HBEpC cell total (SID38222,SID38223)
ENCFF563PIQ-ENCFF583EEW	ENCSR000AAE	CSHL Long RNA Seq HBSMC cell total (SID38230,SID38231)
ENCFF155IHS-ENCFF625NHV	ENCSR000AAF	CSHL Long RNA Seq HCAEC cell total (SID38232,SID38233)
ENCFF260DPL-ENCFF988EBG	ENCSR000AAG	CSHL Long RNA Seq HCASMC cell total (SID38234,SID38235)
ENCFF109DZG-ENCFF826JBV	ENCSR000AAL	CSHL Long RNA Seq HNEpC cell total (SID38224,SID38225)
ENCFF567UZO-ENCFF902CHM	ENCSR000AAN	CSHL Long RNA Seq HPASMC cell total (SID38228, SID38229)
ENCFF424ELR-ENCFF708USY	ENCSR000AAO	CSHL Long RNA Seq HPF cell total (SID38238,SID38239)
ENCFF429MGN-ENCFF947LZH	ENCSR000AAP	CSHL Long RNA Seq HPMEC cell total (SID38240,SID38241)
ENCFF890DJO-ENCFF902UZL	ENCSR000AAQ	CSHL Long RNA Seq HRCEpC cell total (SID38206,SID38207)
ENCFF544ZJY-ENCFF869ZVU	ENCSR000AAR	CSHL Long RNA Seq HTEpC cell total (SID38208,SID38209)
ENCFF164YUT-ENCFF426MAO	ENCSR000AAS	CSHL Long RNA Seq HTSMC cell total (SID38503,SID38211)
ENCFF344KCP-ENCFF666CRI	ENCSR000AAT	CSHL Long RNA Seq HUAEC cell total (SID38212,SID38213)
ENCFF685WYQ-ENCFF834EAX	ENCSR000AAU	CSHL Long RNA Seq HUASMC cell total (SID38214,SID38215)
ENCFF461EFB-ENCFF485XEK	ENCSR000AAV	CSHL Long RNA Seq HUtSMC cell total (SID38216,SID38217)
ENCFF088ZKJ-ENCFF610BLQ	ENCSR000AEC	The libraries contained in this experiment come from independent growths of cell line GM12878. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size. These data were collected as part of the RNA Evaluation Study.
ENCFF239AZD-ENCFF305LZB	ENCSR000AED	The libraries contained in this experiment come from independent growths of cell line GM12878. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from

		rRNA-depleted Poly-A+ RNA > 200 nucleotides in size. These data were collected as part of the RNA Evaluation Study.
ENCFF219RWY-ENCFF009ZXH	ENCSR000AEE	RNA Evaluation Gm12878 Long Total from Graveley
ENCFF023VHU-ENCFF392VPX	ENCSR000AEF	RNA Evaluation Gm12878 Long Poly-A+ from Graveley
ENCFF428CJQ-ENCFF486PVW	ENCSR000AEG	RNA Evaluation Gm12878 Long Total RNA-seq from Wold
ENCFF745IAF-ENCFF830IVF	ENCSR000AEH	RNA Evaluation Gm12878 Long Poly-A+ RNA-seq from Wold
ENCFF782PCD-ENCFF902SEE	ENCSR000AEL	The libraries contained in this experiment come from independent growths of cell line K562. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size. These data were collected as part of the RNA Evaluation Study.
ENCFF515MUX-ENCFF934YBO	ENCSR000AEM	The libraries contained in this experiment come from independent growths of cell line K562. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size. These data were collected as part of the RNA Evaluation Study.
ENCFF534SDC-ENCFF450IVD	ENCSR000AEN	RNA Evaluation K562 Long Total from Graveley
ENCFF662LZE-ENCFF930UOM	ENCSR000AEO	RNA Evaluation K562 Long Poly-A+ from Graveley
ENCFF771MAN-ENCFF806RDV	ENCSR000AEP	RNA Evaluation K562 Long Total RNA-seq from Wold
ENCFF176ACR-ENCFF456PAW	ENCSR000AEQ	RNA Evaluation K562 Long Poly-A+ RNA-seq from Wold
ENCFF918SJO-ENCFF965IQH	ENCSR000AEU	RNA-seq on human liver greater than 200bp polyA+
ENCFF413RGP-ENCFF946MFS	ENCSR000AEV	The libraries contained in this experiment come from human fetal urinary bladder tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF917ANZ-ENCFF817YTS	ENCSR000AEW	The libraries contained in this experiment come from human fetal cerebellum tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF164GTC-ENCFF944EAX	ENCSR000AEX	The libraries contained in this experiment come from human fetal diencephalon tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF520PXU-ENCFF652PQZ	ENCSR000AEY	The libraries contained in this experiment come from human fetal frontal cortex tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF726GGW-ENCFF857UYC	ENCSR000AEZ	The libraries contained in this experiment come from human fetal heart tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF309XJY-ENCFF175UXC	ENCSR000AFA	The libraries contained in this experiment come from human fetal kidney tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF029IUF-ENCFF367FJJ	ENCSR000AFB	The libraries contained in this experiment come from human fetal liver tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF268ADF-ENCFF866DJQ	ENCSR000AFC	The libraries contained in this experiment come from human fetal lung tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF724SSX-ENCFF927TYW	ENCSR000AFD	The libraries contained in this experiment come from human fetal occipital lobe tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF067OFR-ENCFF539HLC	ENCSR000AFE	The libraries contained in this experiment come from human fetal parietal lobe tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF679LIW-ENCFF907CXN	ENCSR000AFF	The libraries contained in this experiment come from human fetal skeletal muscle tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF274EWD-ENCFF458UWF	ENCSR000AFG	The libraries contained in this experiment come from human fetal skin tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF359PMJ-ENCFF084PQR	ENCSR000AFH	The libraries contained in this experiment come from human fetal spinal cord tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq

		libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF621GTC-ENCFF789MQT	ENCSR000AFI	The libraries contained in this experiment come from human fetal stomach tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF011IOJ-ENCFF097JQF	ENCSR000AFJ	The libraries contained in this experiment come from human fetal temporal lobe tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF690LJG-ENCFF811KME	ENCSR000AFK	The libraries contained in this experiment come from human fetal thyroid gland tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF690BUS-ENCFF759QKL	ENCSR000AFL	The libraries contained in this experiment come from human fetal tongue tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF418HER-ENCFF603DMU	ENCSR000AFM	The libraries contained in this experiment come from human fetal umbilical cord tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF224DUX-ENCFF534ZJJ	ENCSR000AFN	The libraries contained in this experiment come from human fetal uterus tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF766GYI-ENCFF702BTW	ENCSR000AFO	The libraries contained in this experiment come from human fetal whole eye tissue from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF717FSL	ENCSR000AHH	CSHL Long RNA-seq Human heart from Snyder Lab 097WC
ENCFF388BCD-ENCFF891KWL	ENCSR000COO	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line AG04450. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF300LEY	ENCSR000COX	The libraries contained in this experiment come from mammary gland epithelial primary whole cells, HMEC isolated from independent donors. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted Poly-A+ > 200 nucleotides in size.
ENCFF229LIX-ENCFF503QBP	ENCSR000COY	RNA-seq on human HSMM whole cell long polyA+ RNA
ENCFF153AIN-ENCFF530HNB	ENCSR000COZ	RNA-seq on human HUVEC whole cell long polyA+ RNA
ENCFF031XBL-ENCFF812AVH	ENCSR000CPA	RNA-seq on human HUVEC cytosol long polyA+ RNA
ENCFF809ETA-ENCFF492RYM	ENCSR000CPB	RNA-seq on human HUVEC nucleus long polyA+ RNA
ENCFF050NVH-ENCFF249RAD-ENCFF852SRQ	ENCSR000CPI	The libraries contained in this experiment come from independent growths of skin keratinocytes primary whole cells, NHEK. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted and DSN normalized Poly-A- RNA > 200 nucleotides in size.
ENCFF970EZY-ENCFF759EQF	ENCSR000CPJ	The libraries contained in this experiment come from independent growths of skin keratinocytes primary nuclear extracts, NHEK. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF052HXO-ENCFF063XVI	ENCSR000CPK	The libraries contained in this experiment come from independent growths of skin keratinocytes primary cytoplasmic extracts, NHEK. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF108ERJ-ENCFF372VME-ENCFF699KSV	ENCSR000CPL	The libraries contained in this experiment come from independent growths of skin keratinocytes primary whole cells, NHEK. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF458UOE-ENCFF461AOR	ENCSR000CPM	The libraries contained in this experiment come from lung fibroblast primary whole cells, NHLF isolated from independent donors. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF847EDO	ENCSR000CPU	The libraries contained in this experiment come from mammary gland epithelial primary whole cells, HMEC isolated from independent donors. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted and DNS normalized Poly-A- RNA > 200 nucleotides in size.
ENCFF753LFN-ENCFF919WRF	ENCSR000CPV	RNA-seq on human HSMM whole cell long polyA- RNA
ENCFF050LDX-ENCFF796EUG	ENCSR000CPW	The libraries contained in this experiment come from lung fibroblast primary whole cells, NHLF isolated from independent donors. They are stranded PE76 Illumina

		GAIIx RNA-Seq libraries from rRNA-depleted and DSN normalized Poly-A- RNA > 200 nucleotides in size.
ENCFF050IOC-ENCFF250MPH	ENCSR000CPX	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line AG04450. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted and DSN normalized Poly-A- RNA > 200 nucleotides in size.
ENCFF386XNF-ENCFF617QGC	ENCSR000CQG	RNA-seq on human HUVEC whole cell long polyA- RNA
ENCFF635HCZ-ENCFF655NKJ	ENCSR000CQH	RNA-seq on human HUVEC nucleus long polyA- RNA
ENCFF793MNO	ENCSR000CQN	The libraries contained in this experiment come from independent growths of skin keratinocytes primary cytoplasmic extracts, NHEK. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted and DSN normalized Poly-A- RNA > 200 nucleotides in size.
ENCFF376ZWZ-ENCFF886ZLO	ENCSR000CQO	The libraries contained in this experiment come from independent growths of skin keratinocytes primary nuclear extracts, NHEK. They are stranded PE76 Illumina GAIIx RNA-Seq libraries from rRNA-depleted and DSN normalized Poly-A- RNA > 200 nucleotides in size.
ENCFF676IUE-ENCFF547OMM	ENCSR000CTX	The libraries contained in this experiment come from placental pericytes primary whole cells, HPC-PL isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF827LOA	ENCSR000CUA	The libraries contained in this experiment come from the whole cell fraction of independent isolates of mobilized CD34+ blood progenitor cells. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF495BUA-ENCFF650BVH	ENCSR000CUB	The libraries contained in this experiment come from hair follicle dermal papilla primary whole cells, HFDPC isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF185KMD-ENCFF523ZWF	ENCSR000CUE	The libraries contained in this experiment come from chondrocyte primary whole cells, HCH isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF633KUP-ENCFF861OFI	ENCSR000CUF	RNA-seq on human HOB whole cell long total RNA.The libraries contained in this experiment come from osteoblast primary whole cells, HOB isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF033CRC-ENCFF229KPD	ENCSR000CUG	The libraries contained in this experiment come from saphenous vein endothelial primary whole cells, HSaVEC isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF353DEP-ENCFF870JUS	ENCSR000CUH	The libraries contained in this experiment come from skin fibroblasts primary whole cells, NHDF isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF745UIU-ENCFF102PEV	ENCSR000CUI	The libraries contained in this experiment come from skeletal muscle myosatellite cells isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF146VZC-ENCFF832MKM	ENCSR000CUJ	The libraries contained in this experiment come from aortic adventital fibroblast primary whole cells, HAoAF isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF641WIZ-ENCFF719TPT	ENCSR000CUK	The libraries contained in this experiment come from aortic endothelial primary whole cells, HAoEC isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF042WGS-ENCFF708OYI	ENCSR000CUL	The libraries contained in this experiment come from placental villous mesenchymal fibroblasts primary whole cells, HVMF isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF345WXW-ENCFF853QYK	ENCSR000CUM	The libraries contained in this experiment come from subcutaneous white pre-adipocyte primary whole cells, HWP isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF374KZN	ENCSR000CUN	The libraries contained in this experiment come from mammary epithelial primary

		whole cells, HMEpC. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF761BVV-ENCFF961TGO	ENCSR000CUP	The libraries contained in this experiment come from placental epithelial primary whole cells, HPIEpC isolated from independent donors. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF788QAK-ENCFF848HBI	ENCSR000CUQ	RNA-seq on humn skin melanocytes primary whole cells (NHEM-M2) from rRNA-depleted total RNA greater than 200 nucleotides in size.
ENCFF044EJX-ENCFF722QGY	ENCSR000CUR	RNA-seq on human skin melanocytes primary whole cells (NHEM-M2) rRNA-depleted Total RNA greater than 200 nucleotides in size. (paired end)
ENCFF577SGI-ENCFF901PDQ	ENCSR001HHK	The libraries contained in this experiment come from independent growths of cell line Oci-Ly-7, a peripherial blood sample from a 48 year old male with Non-Hodgkin lymphoma. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF330DCY-ENCFF526VZV	ENCSR052FJA	The libraries contained in this experiment come from H9-derived embryonic stem cells that were differentiated down a smooth muscle pathway. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF728YKK-ENCFF965MCV	ENCSR067UNX	The libraries contained in this experiment come from nuclear fractions of a fibrosarcoma immortalized cell line HT1080 derived from the connective tissue from a 35 year old male. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF088RDE-ENCFF139IXQ	ENCSR109IQO	RNA Evaluation K562 Long Total from Graveley
ENCFF314HNA-ENCFF489KLJ	ENCSR110BDY	The libraries contained in this experiment come from independent isolates of cardiac atrium fibroblast primary cell type (HCF-aa). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF129BNX-ENCFF380AIN	ENCSR118TVR	The libraries contained in this experiment come from epithelial cells of proximal tubule (HRPTE piC). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF127SKO-ENCFF468WWI	ENCSR136WGP	The libraries contained in this experiment come from independent growths of cell line SK-N-DZ, a metastatic neuroblastoma from a 2 year old female. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF361TGG-ENCFF622JNN	ENCSR164OCT	The libraries contained in this experiment come from independent growths of cell line NCI-H460, a male large cell lung carcinoma. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF426EAU-ENCFF546LKT	ENCSR166QLP	The libraries contained in this experiment come from cytoplasmic fractions of a fibrosarcoma immortalized cell line HT1080 derived from the connective tissue from a 35 year old male. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF120PLK-ENCFF805BVE	ENCSR198TKA	The libraries contained in this experiment come from primary mesangial cells (HRMC). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF677ITS-ENCFF690FPX	ENCSR201WVA	The libraries contained in this experiment come from nuclear fractions of a malignant melonoma immortalized cell line SK-MEL-5 derived from a metastatic axillary node of a 24 year old female. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF327XVW-ENCFF691GEO	ENCSR233IJT	The libraries contained in this experiment come from independent growths of primary astrocytes. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF043UOR-ENCFF571GOC	ENCSR244ISQ	The libraries contained in this experiment come from independent growths of H9 embryonic stem cells that were differentiated down a neuronal pathway. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF081AIX-ENCFF855KHP	ENCSR254JJM	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line Daoy. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF486HVD-ENCFF571DWF	ENCSR255NYQ	The libraries contained in this experiment come from nuclear fractions of a neuroblastoma immortalized cell line SK-N-DZ derived from a metastatic site in the bone marrow of a 2 year old female. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF370KUU-ENCFF393LOY	ENCSR291DJH	The libraries contained in this experiment come from cytoplasmic fractions of a malignant melonoma immortalized cell line SK-MEL-5 derived from a metastatic axillary node of a 24 year old female. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.

ENCFF069RCF-ENCFF476GWF	ENCSR292TAP	RNA-seq H1-neuron cellular polyadenlated RNA greater than 200 bp
ENCFF163LRM-ENCFF532LDM	ENCSR310FIS	RNA Evaluation MCF7 Long Poly-A+ from Graveley
ENCFF300CIP-ENCFF353ZKT	ENCSR314LXG	The libraries contained in this experiment come from independent growths of cell line Karpas-422, a B cell from a 73 year old female with non-Hodgkins Lymphoma. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF023GZM-ENCFF714RNK	ENCSR320BRR	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line RPMI-7951. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF565OHH-ENCFF463BFI	ENCSR332DBS	The libraries contained in this experiment come from independent growths of immortalized cell line LHCN-M2. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF519TDF-ENCFF896RUC	ENCSR362HMX	The libraries contained in this experiment come from pericardium fibroblast cells (HPcF). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF047WVA-ENCFF175OKW	ENCSR369RVN	The libraries contained in this experiment come from cardiac ventricle fibroblast cells (HCF-av). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF229QGJ-ENCFF579ZGU	ENCSR371VGV	The libraries contained in this experiment come from independent isolates of myometrial smooth muscle primary cell type (HMSMC). They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF108PJF-ENCFF340QKB	ENCSR373BDG	The libraries contained in this experiment come from independent isolates of kidney epithelial primary cell type (HREpiC). They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF254RPS-ENCFF881JHI	ENCSR379YAE	The libraries contained in this Experiment come from hESC's that were differentiated into cardiomyocytes. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF497BUG-ENCFF551YKI	ENCSR444WHQ	The libraries contained in this experiment come from independent growths of primary cell line HSMM that has been differentiated into myoblasts. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF829OMN-ENCFF824FTM	ENCSR468ION	RNA Evaluation HepG2 Long Total from Graveley
ENCFF152HJN-ENCFF767WGV	ENCSR490SQH	The libraries contained in this experiment come from independent growths of uninduced embryonic stem cell line H7-hESC. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF468DGL-ENCFF985NRJ	ENCSR504VXC	The libraries contained in this experiment come from independent growths of cell line A375, a malignant melanoma from a 54 year old female. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF102BYU-ENCFF469UTN	ENCSR535VTR	The libraries contained in this experiment come from independent growths of cell line HT-1080, a connective tissue fibrosarcoma from a 35 year old male. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF542RJX-ENCFF896LUK	ENCSR568YRP	The libraries contained in this experiment come from independent growths of cell line SJCRH30, a metastatic rhabdomyosarcoma from a 17 year old male. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF885TRK-ENCFF923VSQ	ENCSR569JKX	The libraries contained in this experiment come from cytoplasmic fractions of a neuroblastoma immortalized cell line SK-N-DZ erived from a metastatic site in the bone marrow of a 2 year old female. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF355RVO-ENCFF432WWV	ENCSR580GSX	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line A172. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF041DAC-ENCFF088TZM	ENCSR584JXD	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line Caki2. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF377EHW	ENCSR586SEE	The libraries contained in this experiment come from cytoplasmic fractions of immortalized cell line NCI-H460 derived from a large cell lung carcinoma of a 37 year old male. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from

		rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF557GJS-ENCFF762CTR	ENCSR620NSN	The libraries contained in this experiment come from primary bronchial fibroblast cells (HBF). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF667WSC-ENCFF562TXM	ENCSR625QJI	The libraries contained in this experiment come from nuclear fractions of immortalized cell line NCI-H460 derived from a large cell lung carcinoma of a 37 year old male. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Poly-A+ RNA > 200 nucleotides in size.
ENCFF748MDN-ENCFF904LJF	ENCSR653DFZ	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line G401. They are stranded PE101 Illumina Hhi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF061AQT-ENCFF151JZX	ENCSR667JTA	RNA Evaluation MCF7 Long Total from Graveley
ENCFF346UQA-ENCFF449ASM	ENCSR669KQU	The libraries contained in this experiment come from independent growths of cell line SK-MEL-5, a metastatic malignant melanoma from a 24 year old female. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF798LDD-ENCFF898LWW	ENCSR680USE	The libraries contained in this experiment come from hair follicular keratinocytes (HHFK). They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF519YPL-ENCFF722CAJ	ENCSR696SMK	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line M059J. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF640FPG-ENCFF704TVE	ENCSR797BPP	The libraries contained in this experiment come from independent growths of cell line GM23248, a fibroblast primary cell line derived from an arm skin punch of a 53 year old male. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF018XHI-ENCFF742XJQ	ENCSR815UVL	The libraries contained in this experiment come from independent isolates of mammary microvascular endothelial cell primary cell line (HMMEC). They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF556AGI-ENCFF106YFW	ENCSR822SUG	The libraries contained in this experiment come from airway epithelial cells (HSA EpiC). They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF693OTH-ENCFF757SLT	ENCSR828TEI	The libraries contained in this experiment come from independent growths of primary cell line HSMM that has been differentiated into myotubes. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF147HDX-ENCFF179WOH	ENCSR878EUT	The libraries contained in this experiment come from independent isolates of primary renal glomerular endothelial cells (HGC). They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF435GRI-ENCFF599YDS	ENCSR880EGO	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line SJSA1. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF483CBY-ENCFF980UGD	ENCSR894WMQ	The libraries contained in this experiment come from independent growths of immortalized cell line LHCN-M2 after 4 days of differentiation. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF096DQV-ENCFF370KKZ	ENCSR897KTO	The libraries contained in this experiment come from independent isolates of epithelial cell of alveolus of lung primary of cell type (HPAE EpiC). They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF170AEC-ENCFF962SOD	ENCSR908ZAS	The libraries contained in this experiment come from stem cells that were differentiated down a hepatocytic pathway. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF114MWR-ENCFF780SJS	ENCSR919QJT	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line H4. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF386LKJ-ENCFF455KDZ	ENCSR938LSP	The libraries contained in this experiment come from independent growths of cell line GM23338, an induced pluripotent stem cell (iPSC) line derived from cell line GM23248. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF050BGO-ENCFF059OEN	ENCSR968WKR	The libraries contained in this experiment come from independent growths of bipolar neurons that were differentiated from induced pluripotent stem cells. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA

		> 200 nucleotides in size.
ENCFF220TCD-ENCFF601EJO	ENCSR971GPJ	The libraries contained in this experiment come from independent growths of cell line HT-29, a colorectal adenocarcinoma from a 44 year old female. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF139ZPW-ENCFF255HPM	ENCSR985KAT	RNA Evaluation HepG2 Long Poly-A+ from Graveley
ENCFF384IRC-ENCFF997UVK	ENCSR995JXE	RNA-seq of H1-neuron cellular RNA greater than 200 bp depleted in polyadenlated mRNA
ENCFF416NCQ-ENCFF598YQI	ENCSR919MZM	The libraries contained in this experiment come from independent growths of endometrial microvascular endothelial primary cell line HEMEC. They are stranded PE101 Illumina Hi-Seq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF565OUH-ENCFF452FRR	ENCSR971KNW	The libraries contained in this experiment come from the whole cell fraction of independent growths of cell line MG63. They are stranded PE101 Illumina HiSeq RNA-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF182UOI - ENCFF485DRW	ENCSR420NLC	The libraries contained in this experiment come from independent growths of cell line PC-3, a metastatic prostate grade IV adenocarcinoma from a 62 year old male. They are stranded PE101 Illumina Hi-Seq libraries from rRNA-depleted Total RNA > 200 nucleotides in size.
ENCFF137ADN-ENCFF121YGG	ENCSR000AAH	CSHL Long RNA Seq HCM cell total (SID38202,SID38203)
ENCFF906UPT-ENCFF467LOW	ENCSR000AAI	CSHL Long RNA Seq HDBEC cell total (SID38204,SID38205)
ENCFF755GEI-ENCFF111SEX	ENCSR000AAJ	CSHL Long RNA Seq HDLEC cell total (SID38193,SID38194)
ENCFF684KLL-ENCFF436XMQ	ENCSR000AAK	CSHL Long RNA Seq HDMEC cell total (SID38195,SID38196)
ENCFF581OOH-ENCFF671FKM	ENCSR000AAM	CSHL Long RNA Seq HPAEC cell total (SID38226,SID38227)

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#	SRA Run ID	Tissue
1	SRR1758933	Thymus
2	SRR1758932	Spleen
3	SRR1758931	Spleen
4	SRR1758930	Skeletal muscle
5	SRR1758929	Skeletal muscle
6	SRR1758928	Lymph node
7	SRR1758927	Lung
8	SRR1758926	Lung
9	SRR1758925	liver
10	SRR1758924	Liver
11	SRR1758923	Kidney
12	SRR1758922	Kidney
13	SRR1758920	Colon
14	SRR1758919	Brain
15	SRR1758921	Heart
16	SRR1758918	Brain pituitary
17	SRR1758917	Brain frontal cortex
18	SRR1758916	Brain cerebellum
19	SRR1758915	Bone Marrow

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Co-expressed genes pair	Gene symbols		Retrocopy ID	No. of samples with co-expression
	Parental gene	lncRNA gene		
ENSG00000159199, ENSG00000184900	**SUMO3**	**LINC01088**	retro_hsap_1841	**300**
ENSG00000079974, ENSG00000198242	**RPL23A**	**RABL2B**	retro_hsap_2567	**296**
ENSG00000166435, ENSG00000071082	**RPL31**	**XRRA1**	retro_hsap_794	**296**
ENSG00000170919, ENSG00000049449	**RCN1**	**TPT1-AS1**	retro_hsap_1259	**291**
ENSG00000249307, ENSG00000102030	**NAA10**	**LINC01088**	retro_hsap_13	**92**
ENSG00000244184, ENSG00000112306	**RPS12**	**RP11-314A20.2**	retro_hsap_1797	**89**
ENSG00000185306, ENSG00000142534	**RPS11**	**C12orf56**	retro_hsap_1017	**81**
ENSG00000140459, ENSG00000196262	**PPIA**	**CYP11A1**	retro_hsap_1515	**74**
ENSG00000247363, ENSG00000147604	**RPL7**	**RP11-637A17.2**	retro_hsap_1023	**66**
ENSG00000247774, ENSG00000132635	**PCED1A**	**PCED1B-AS1**	retro_hsap_82	**62**
ENSG00000225595, ENSG00000167526	**RPL13**	**LINC01623**	retro_hsap_3443	**37**
ENSG00000269600, ENSG00000198242	**RPL23A**	**AC016629.3**	retro_hsap_2021	**27**
ENSG00000255351, ENSG00000101266	**CSNK2A1**	**RP11-567I13.1**	retro_hsap_53	**26**
ENSG00000205488, ENSG00000160014	**CALM3**	**CALML3-AS1**	retro_hsap_59	**25**
ENSG00000267165, ENSG00000131165	**CHMP1A**	**RP11-78A19.3**	retro_hsap_75	**24**
ENSG00000269888, ENSG00000198242	**RPL23A**	**RP11-3P17.5**	retro_hsap_2874	**21**
ENSG00000262477, ENSG00000135486	**HNRNPA1**	**AC021224.1**	retro_hsap_1933	**15**
ENSG00000256462, ENSG00000160014	**CALM3**	**RP11-116G8.5**	retro_hsap_59	**11**
ENSG00000248223, ENSG00000167996	**FTH1**	**CTD-2139B15.2**	retro_hsap_3293	**9**
ENSG00000251138, ENSG00000151650	**VENTX**	**RP11-81H3.2**	retro_hsap_1027	**8**
ENSG00000242049, ENSG00000105993	**DNAJB6**	**DNAJB8-AS1**	retro_hsap_54	**6**
ENSG00000267449, ENSG00000198242	**RPL23A**	**RP11-264B14.2**	retro_hsap_1775	**6**
ENSG00000260603, ENSG00000124614	**RPS10**	**GS1-21A4.1**	retro_hsap_1657	**5**
ENSG00000253515, ENSG00000131100	**ATP6V1E1**	**RP11-417F21.2**	retro_hsap_21	**4**
ENSG00000224164, ENSG00000177879	**AP3S1**	**RP3-369A17.4**	retro_hsap_3563	**2**

ENSG00000236922, ENSG00000122643	**NT5C3A**	**LINC01378**	retro_hsap_3084	**1**
ENSG00000270017, ENSG00000105373	**GLTSCR2**	**CTD-2576F9.2**	retro_hsap_1528	**1**